A FORTNIGHTLY REVIEW

OF THE

IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

VOLUME XIII.

JANUARY TO DECEMBER, 1914.

ISSUED UNDER THE AUTHORITY OF THE

COMMISSIONER OF AGRICULTURE FOR THE WEST INDIES.

London : Messrs. Dulau & Co., 37, Soho Square, W. *Barbados* : Advocate Co. Ltd., Bridgetown.

AGRICULTURAL NEWS

Vol. XIII. No. 305.] SATURDAY, JANUARY 3, 1914. [One penny.

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VOL. XIII No. 305. BARBADOS, JANUARY 3, 1914. PRICE 1d.

CONTENTS.

Market Prices for West Indian Produce during 1913.

THE beginning of the new year affords a favourable opportunity for presenting a general retrospect of the market prices for West Indian produce during the past twelve months. Before proceeding to deal with the numerous matters which call for comment, we have pleasure in stating that during this period, agricultural progress in the West Indies, and in British Guiana has been satisfactory, and that the demand for West Indian produce has, on the whole, been decidedly strong.

The chief limiting factor of agricultural production in these Colonies is, of course, the rainfall, and it may be permissible to refer briefly to this important subject before entering into the main points at issue. Compared with 1912, the weather conditions have, generally speaking, been favourable. In some places, for instance in the Leeward Islands, very dry weather was experienced in the middle of the year, but the conditions improved considerably later on. In other places, for example in St. Vincent and St. Lucia, inconvenience and loss have on one or two occasions been caused during the year by excessive rains. Demerara and Trinidad have happily been spared a repetition of those disastrous droughts which characterized 1911 and 1912; and, taken altogether, climatic conditions have been good and the exports consequently above those of the previous two years.

Turning now to a consideration of the markets, we find changes have taken place of so striking a nature that they must be regarded as characterizing the agricultural year under review. Dealing first with sugar, it will be remembered that the year began with 96° crystals at 4·05c. and 89° muscovados at 3·55. For the first few months there was a steady fall, culminating in a drop to 3·33c. for centrifugals and 2·58c. for muscovados, in May. From that month onwards there was some improvement, but the old level has not yet been regained.

In Barbados and the Leeward Islands, muscovado makers were forced to turn their attention to syrup manufacture, and although in Barbados this was no new development, in Antigua and St. Kitts it was, and consequently, the advice and assistance of the Department of Agriculture were greatly in demand. The latter months of the year saw the sugar market with

its eyes on the United States Government, just as the Jamaica banana growers were anxiously watching in the same direction. The new sugar tariff became law in October, and the repeal of the Dutch colour standard duty came into force at once. What the effect of the new tariff will be, hardly concerns us now, but the publication of books on plantation white sugar manufacture must be regarded as at least an apposite circumstance, which even at the present time is not lacking in significance.

A review of the cacao market, during 1912, demonstrates that the prices ruling in New York and London showed an improvement over those of the previous year, and in spite of a certain amount of grumbling, the average New York quotation for Trinidad cacao was 14¼c. as against about 11½c. for 1912. It is true, however, that during January to April prices kept very close on 15c., but dropped to 14c. in May. Of no little interest is the fact that the supplies from the Gold Coast and other places increased greatly during the year, and not only was there an increase in quantity of these exports but an improvement also in value.

We will turn now to the lime juice market, not because lime cultivation constitutes, at present, the next most important industry in the West Indies, but because the market has been phenomenonly good. Concentrated lime juice in London rose steadily from £18¼ in January, to as high as £33 in December. And the benefit of this favourable state of the market does not end with the sales of produce. At the present time the extension of lime cultivation is being urged, and the market must function as an important factor of encouragement. It will be necessary, however, to keep a watchful eye on Sicily, and also to remember that the increased production which is taking place in the West Indies tends to destroy the very thing it tries to make the most of. Reduction in the cost of production, therefore, should never be lost sight of, in view of the possibility of a depressed market in the future. The fresh lime trade with New York has been equally satisfactory as regards prices, but due care has not been exercised in the shipment of uniform produce, and in its despatch at the time when a demand exists to meet the supply. It is believed, however, that several lessons have been learnt in this respect, and the errors are not likely to be repeated.

A market which has given rise to considerable discussion and anxiety during the year is that of the Sea Island cotton. The Egyptian Sakellarides variety is principally responsible for the unrest. But whereas in the case of the Carolina crop there is undoubtedly foundation for fearing extermination as a result of the competition of this Egyptian lint, in the West Indies it is not so, provided the standard is kept up. If there is any retrogression in cotton production, then Sakellarides will step in; but if seed is selected and wastiness is reduced to a minimum, West Indian cotton will continue to constitute a special class, and to hold its own in the world's market. Reviewing the prices which have ruled, it is observed that a steady rise took place during March, followed by a fall towards the end of April and a steady decline of general West Indian during May and June. Superfine Sea Island remained very firm, and towards the end of June some bales were sold at the high rate of 30*d.* per lb. About this time some medium Sea Island dropped below the American Extra Fine value. This, however, appears to have been the only occasion when West Indian and American prices have touched, and the occurrence is to be explained by facts which depended upon abnormal circumstances. The past West Indian cotton season has been distinctly good, as will be seen by referring to a list of the exports for 1912, published on another page of this issue. Having referred to the subject of cotton exports, it may be mentioned further that the importance of the estate 'mark' has been the subject of official correspondence during the year, as well as the question of early sales and other matters connected with the marketing of cotton from the West Indian Islands.

A comparatively new industry in the West Indies —at least along organized lines—is coco-nut cultivation. The market for coco-nut products has been good both in London and New York. At the commencement of 1912, selected coco-nuts were fetching about $33 in New York. Prices began to rise about the beginning of April, being then about $35. Values rose steadily during the ensuing months to $42 in September. Since that month there has been a slight fall in prices but the market continues to remain firm. In London, West Indian copra has been fetching £33 per ton compared with about £26 at the beginning of the year. Thus, as regards the markets, the coco-nut growers' position has been eminently satisfactory.

At the present time, the production of rubber in the West Indies is hardly more than a minor cultivation, yet the violent reaction on the plantation rubber market was so striking a feature of the past year that it demands at least a brief reference in the present article. Readers will remember that the topic has,

from time to time been the subject of comprehensive articles in this journal, and it will only be necessary here to say that if the rapidly increasing outturn of Plantation Para is to find profitable sale, a re-organization of the industry must take place to ensure uniform production of high-class produce, better selling arrangements, and an extension of the uses to which rubber can be put.

In regard to the stability of the market for the produce of other minor cultivations, reference may be made to the stability of the demand for bay-oil, which has continued throughout the year to be extremely sustained, in spite of the serious competition which bay rum—an article formerly so very popular—is suffering from the innumerable hair washes of the present day. According to reliable reports, it is likely that prices for bay oil will continue to remain steady (about 10*s.* per lb.). This should give confidence to those who contemplate planting bay trees in the West Indies.

Lime oil has also continued during the year to find buyers at rising prices—a circumstance probably due to the high range of values for lemon oil. A parcel of lime oil recently fetched in London 14*s.*: that is to say, nearly twice the price paid at the corresponding period in 1912. No less in demand has been West Indian sandalwood oil, and as Messrs. Schimmel report, the course of the East Indian sandalwood oil market does not materially affect the commercial future of the West Indian oil, for since the West Indian product is used mainly to adulterate the former, it is certain to be in equally strong request whether the East Indian oil rises or not.

Of other minor products, arrowroot, and starches generally, showed a decline towards the end of the year, though the average price for 1913 was not below that of the previous year. Considerable control is exercised over the London arrowroot market by the St. Vincent organization, and recently it has been decided to introduce a minimum price for St. Vincent arrowroot.

In the case of many of the minor industries undergoing development—industries like papaw cultivation, fruit growing, and onion and other vegetable cultivations—the West Indies are looking towards the Canadian demands for these products. Already circumstances have arisen which render the establishment of definite markets for these exports in the Dominion very hopeful, and there is every probability that at the beginning of 1915 we shall be able to record considerable developments in this direction.

ECONOMIC BOTANY.

Breeding Medicinal Plants.—A suggestive article on this subject appears in the *American Breeders' Magazine* for October to December 1913. It is pointed out that an examination of the crude vegetable drugs as they occur on the markets of to-day reveals a mass of inferior materials far in excess of what might be expected. This is principally due to a lack of power to control the production of crude vegetable drugs. Too much is left to nature and not enough to botanists. Cannot the plants, it is asked, yielding alkaloids, glucosides, saponins, resins, oleoresins and other active principles be brought under the influence and control of the breeder? It is suggested that the natural order Solanaceae, in particular, offers a rich field for the development of improved medicinal forms. As is well known, this order includes belladonna, henbane, stramonium and tobacco —all yielding alkaloids and readily amenable to chemical methods of assay. Already some chemical selection work has been done on *Datura stramonium* (the common West Indian weed) and *Datura tatula*. Selections of *D. tatula* gave a variation of alkaloidal percentage of from 0·47 to 0·65. These figures are given mainly as an illustration of the scope which the work under consideration offers to the enthusiastic investigator.

Sweet Potatoes as a Source of Sugar.—The idea involved in the preceding note calls to mind the recent suggestion that the sweet potato might, with botanical and chemical selection, be turned into an important source of sugar. Although from the economic aspect such work would scarcely be justified, it nevertheless possesses several points of considerable interest. In connexion with this line of work a new method for determining sugar in potatoes, described in the *Experiment Station Record* (October 1913), would be of direct importance. The writer maintains that it is not advisable to determine the sugar content of potatoes in the pressed juice since the sucrose in this, when stored for a time, becomes inverted. When the polarimetric method is used the influence which the copper reducing, but optically inactive, bodies exert is eliminated as a factor. The method is also advantageous from the point of rapidity of execution. The use of hot alcoholic digestion for extracting the sugar was found to be the most feasible procedure. It was also determined that the precipitation of dextrose by lead salts is a process which proceeds very irregularly. For the determination of sugar in potatoes, the author advises the uses of the polarimetric method for the inverted substance and the application of the dextrose formula. From this another formula was derived which can be used where dextrose and sucrose are present at the same time.

Aroids in New York.—An interesting account of the aroid collection in the New York Botanical Garden appears in the November issue of the journal of that establishment. West Indian readers will be interested to learn that the giant Philodendron, *Philodendron giganteum*, a native of tropical America, is included in the collection. This plant has been in the collection since 1901, when it was brought from the island of St. Kitts by Dr. Britton, the Director-in-Chief of the Garden. In general, the article contains a great deal of information concerning the economic characters of aroids in the West Indies, which ought to receive the attention of all those interested in this group of plants.

FRUIT AND FRUIT TREES.

THE CUBAN FRUIT GROWERS' AND SHIPPERS' ASSOCIATION.

The above organization has recently been instituted in Cuba by the growers and shippers of fruits, vegetables and other perishable agricultural produce, to take the place of the Cuba Fruit Exchange, in connexion with the management of which there was considerable faction some time ago.

The underlying principles of this new society are somewhat as follows. Only growers may become members unless the Executive Committee vote unanimously to permit anyone not a grower to join. All surplus in the hands of the Treasurer, after paying the operating expenses of the year, is issued as a dividend, save that $2,000 may be taken from such surplus for the purchasing of necessary supplies to be sold to members at exact cost An important feature of the organization is that it is personally represented in the markets of the North and in Cuba by employees hired and paid exclusively by the society and dependent upon giving good results in order to keep their positions. Each member must export all produce through the Association, and sell all citrus fruits in the home market through it if the value of the sale is more than $25, or if he personally makes the sale, he shall pay the usual commission to the Association He may, however, ship to any firm abroad, but if this firm is not amongst those approved by the society, it does not assume any responsibility for the returns from such shipment, nor for the remittance of the returns

The packing of produce is standardized. This will lead to a high reputation for produce bearing the Association's mark.

The general form of organization is that of a Joint Stock Company, this form having been adopted because it is essential under the laws of the island. However, the share of stock issued to members is in reality only a certificate of membership, as it entitles them to no profits.

The employees of the Association in North America, in addition to inspecting the goods there and superintending sales, making remittances of returns, reports, etc., are obliged to present for payment all claims for loss in transit and damages, and will be backed in their just demands by the full influence of the organization.

The manager of the Association is empowered to obtain from the transportation companies the most favourable rates and best facilities for the rapid and safe handling of the produce of its members.

A certain fixed amount is levied against each package of any character shipped by the members, which will be collected from their returns from such shipments.

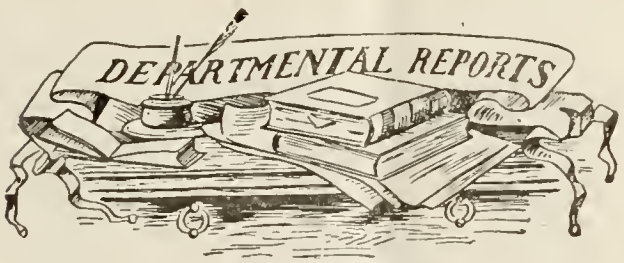
Cacao in Kamerun.—According to an interesting note published in the *Chamber of Commerce Journal* (December 1913), most of the cacao estates in Kamerun (German West Africa) are situated on volcanic soils at the foot of the Kamerun mountains. During the period 1904 to 1906, the cultivation of cacao in this Protectorate, passed through a serious crisis on account of the appearance of the so-called 'brown rot' disease, and about 40 per cent. of the plants were ruined. The people became discouraged and rubber began to be substituted for cacao; but of recent years planters have returned to the old cultivation. From 1906 to 1912—six years—the value of the cocao exported has risen from $277,746 to $1,009,596. Native cultivation of this crop is also extending. While the quantity of cacao obtained by the natives amounted to only 336 tons in 1910, the produce was about 714 tons in 1912.

THE RIPENING OF BANANAS.

The following results, taken from the *Experiment Station Record* (October 1913), have been obtained in the course of an investigation into the changes which take place during the ripening of bananas:—

Ripening changes progress regularly to a maximum and then decline; at its greatest intensity, the heat production is equivalent to approximately 1 calorie per hour per kilogram of bananas. 'The heat liberated is a measure of the activity of one or more of the ripening processes. Analysis has shown that during ripening the banana starch is transformed into cane sugar and the cane sugar into invert sugar, and that there are important changes in the character of the tannin compounds, and that other changes occur, brought about by the production of aroma and flavour bodies, and perhaps in other ways. It has also been found that in addition to the transformation of carbohydrates, there is an actual loss of this food constituent during ripening. From the data for oxygen consumption, carbon dioxide, and heat output, it appears that the heat liberated by the ripening bananas is largely due to the destruction of carbohydrates.' The results which are reported and discussed represent only part of the experimental data which have been accumulated. 'No attempt is made at this time to draw deductions regarding the practical applications which can be made, as this may be done more properly when experiments now under way are completed.'

The Cultivation of Cardamoms in Ceylon.—Nearly every tea planter in Ceylon devotes a small proportion of his estates to the cultivation of cardamoms as a side issue. The cardamom in England and Germany especially has an important use in the manufacture of medicines as a stimulant aromatic, and to neutralize unpleasant tastes in a variety of medicines. In northern Europe, cardamoms are used as a spice for flavouring cakes and in the preparation of liquers. In Germany the perfectly dried seeds or capsules are sold by almost every grocer as a spice for curry and for home-made curry powders. They are also ground in little spice mills, and the powder is used in making certain kinds of bread, in the preparation of sausages, in cookery, and in tinning fish. The essential oil of cardamoms is now being used by some of the largest perfumers in France and the United States. The oil retains its qualities for an indefinite period, if kept in well-stoppered bottles. In India the well-to-do native classes make large use of cardamoms in cookery, flavouring curries, cakes, and confectionery. On the Ceylon plantations coolies gather by hand the cardamom seed capsules, which, spread on trays, slowly bleach and dry in the sun, and are then clipped, graded, and packed in boxes or bags of 50 to 100 lb. for export. Of late a strong demand has arisen from India for dried green cardamoms, which are more highly flavoured than the bleached cardamoms. (*Journal of the Royal Society of Arts*, November 28, 1913.)



ST. VINCENT: REPORT ON THE AGRICULTURAL DEPARTMENT, 1912-13.

This report, which is now being distributed, describes the work done by the Local Agricultural Department during the year ended March 31, 1913.

WORK IN THE BOTANIC GARDENS.

The first section of the publication, dealing with the work in the Botanic Gardens, informs the reader that important road improvements have been effected in the Gardens whereby visitors can now, in a short space of time, obtain a satisfactory view of the Colony's interesting old gardens. A view along the new driving road is illustrated in Fig. 1. of the Report. In addition to this information, an extremely interesting account is provided of the history of the introduction of economic plants into the Gardens.

As regards plant distribution from the nurseries, it may be stated that a considerable number of cacao plants, Para rubber stumps and sugar cane cuttings were sent out. Two hundredweight of seeds of Bengal bean (*Stizolobium atterimum*) was distributed for green dressing purposes.

EXPERIMENTAL WORK WITH COTTON.

Turning to the subject of plot experiments at the Botanic and Experiment Stations, there will be found first an account of the manurial experiments with cotton. It will be seen that owing to unfavourable weather conditions, no conclusive results have as yet been attained as to the advantages of manuring cotton with artificial fertilizers. Another feature of the experimental work with cotton has been the selection for resistance to angular leaf spot disease (*Bacterium malvacearum*) and anthracnose (*Glomerella gossypii*) and West Indian leaf mildew. Some interesting observations are recorded in regard to types of Marie Galante cotton occurring in the Southern Grenadines. It was found that after ginning some of this cotton there were at least three classes of seed: (a) clean, (b) tufted, and (c) woolly. This different seed was planted out and the 'clean' seed gave rise to new types. No conclusive results are yet drawn, as it appears necessary to repeat the experiment under more favourable climatic conditions.

Of great interest and importance locally will be the list of the types of the cotton grown during 1912-13 and described on page 7 of the report, followed by a discussion of the use and significance of the term 'lint index'.

VALUE OF BENGAL BEANS AND GRU-GRU NUTS.

The notes on economic plants deal with the nutritive value of the Bengal bean and the usefulness of the gru-gru palm nut as a source of vegetable oil. For some time in Mauritius, Bengal bean seed has been used as stock food, and according to a report by the Director of the Imperial Institute, the seeds have a high nutritive value and contain no alkaloids or cyanogenetic glucosides. In connexion with the gru-gru palm nut, the reader should refer to the *Agricultural News*, Vol. XII, p. 180, where a report on the sample of these nuts sent from Grenada is presented. The kernels of the nut contain about 56 per cent. of a white crystalline fat which resembles both coco-nut and palm kernel oil, and is worth about the same price per ton.

INSECT PESTS.

The longest section of the report is that dealing with insect pests and fungus diseases. This consists principally of a report by the Entomologist of the Imperial Department of Agriculture, but it contains also, at the conclusion of the section dealing with the pests of pigeon peas, several observations collected during the year by the Agricultural Superintendent. Perusal of this section will show that the inefficiency in St. Vincent of the parasites of the black scale, and the question of wounds on coco-nut and other palms in relation to the prevalence of palm weevil attacks, seem to be two of the main points demanding special attention. In addition, it is interesting to state that the local Department has expended a considerable sum of money upon the purchase of an air-compressing pump and four compressed air knapsack sprayers together with specimens of the 'Furet' duster.

PROGRESS IN THE INDUSTRIES.

Progress in the chief industries has been temporarily retarded by another unfavourable season, and the export of Sea Island cotton again shows a decrease. It has to be borne in mind, too, that wet weather tends to reduce the market value per pound, though in this respect it must be remembered that St. Vincent cotton fetches the highest cotton prices in the world. The exports of Marie Galante have shown a decided increase, and Sakellarides cotton has given very favourable returns in the Southern Grenadines. In St. Vincent, however, it has been found very susceptible to angular leaf spot disease.

Progress in the arrowroot and cassava industries has been satisfactory, not so much owing to favourable yields as to the favourable prices which have been obtained. As regards the minor industries, some importance attaches to the report on ground nut cultivation. The area under this crop is extending, and it may, in the near future, be possible to inaugurate an export trade with Canada in this product under the new preferential tariff arrangement. These references cannot be concluded without mentioning the coco-nut and vanilla industries, both of which show definite signs of development

IMPORTANT CHANGES.

The report of the Agricultural Superintendent concludes with an account of the changes that have taken place in the organization of the department. Stated briefly, these originated with the transfer of the pupils from the Agricultural School—a boarding establishment—to the Botanic Garden, where the boys receive practical instruction daily, accompanied by theoretical instruction at the Grammar School. Thus this side of agricultural education is on a similar basis to that which exists in Dominica. It is one of the duties of the Assistant Superintendent of Agriculture to give the instruction just referred to.

REPORT OF VETERINARY SURGEON.

Appended to the report reviewed above is that of the Government Veterinary Surgeon. This is naturally mainly statistical, but the text contains several interesting facts, the most important of which would appear to be that no case of anthrax was discovered during the year, and that the single anthrax vaccine which has been introduced not only facilitates the regular vaccination work, but enables stock owners to prepare their animals for export in about half the time taken formerly.

COTTON.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date December 15, with reference to the sales of West Indian Sea Island cotton:—

Since our last report about 230 bales of West Indian Sea Island cotton have been sold; half of these are Stains 8·45*d.* to 8·85*d.*, and the remainder are composed of Barbados Old Crop, 17*d.* to 18*d.*, Nevis New Crop, 19*d.* to 21*d*, St. Kitts New Crop 17½*d.* to 20*d*, with a few superfine bags 22*d.* to 22½*d.*

The chief demand is for fineness of staple, thus confirming the advice which we some time ago gave to planters to breed for fineness. All the coarser varieties have to come into competition with Carolina Sea Island, of which there is a large crop, and which is selling at prices from 14*d.* to 17*d.*, and will therefore be more difficult of sale.

Planters will be well advised if they ship their cotton in crop lots and not in odd bales per each steamer. Spinners purchasing 5 bales or over, take notice of the marks and come for the cotton again, whereas, if they purchase odd bags they expect more irregularity and consequently make lower offers for same.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending December 13, is as follows:—

The demand continues for all offerings of odd bags classing Extra Fine at 26c., Extra Fine off in colour at 23c., and Fine to fully off at 20c., the buying being for export and the Northern mills. The unsold stock consists very largely of odd bags classed as Fully Fine and Fine, for which there is no demand, and which Factors are anxious to sell before the Christmas holidays. With orders in hand for quantity we could probably buy at some concession in price.

The Planters' Crop Lots are being sought after at fairly good prices, the buying being principally for French spinners. Included in the above sales are the following crops: 50 bales Palmetto/AHD at 32., 50 bales E. P. Seabrook at 35c. 50 bales, W. G. Hinson/Seaside at 42c., 70 bales, Elias L Rivers at 50 cents.

We quote, viz.,

Extra Fine 26c.	=	14¾*d.*	c.i.f., & 5 per cent.
Fully Fine 23c. to 23½c	=	13¼*d.* to 13½*d.*	,, ,, ,, ,,
Fine 22c.	=	12¾*d.*	,, ,, ,, ,,
Fully Fine off in preparation 20c.	=	1¾*d.*	,, ,, ,, ,,

This report shows that the total exports of Sea Island cotton from the United States to Liverpool, Manchester and Havre, up to December 13, 1913, were 2,787 bales, 4,151 bales, and 2,174 bales, respectively.

According to the Bulletin issued by the Department of Agriculture, Egypt, on the condition of crops in that country on October 31, 1913, it appears that, in Lower Egypt, the first and second pickings of cotton were completed in all except the outlying northern districts; they are satisfactory and above the average; but the third picking promises to be very bad In Upper Egypt the cotton was all picked at the time the report was issued.

EXPORTS OF WEST INDIAN COTTON, 1913.

The following is a statement showing the quantity and estimated value of Sea Island cotton exported from the various West Indian Islands during the year October 1, 1912 to September 30, 1913:—

	Weight in pounds.	Estimated value.
St. Vincent	443,878	£35,141
St. Kitts	374,594	23,645
Barbados	424,392	23,223
Montserrat	292,182	18,478
Antigua	249,433	15,676
Nevis	166,477	10,513
Anguilla	112,138	7,009
Jamaica	59,606	3,571
Virgin Islands	31,775	2,095
	2,154,475lb.	£139,351

In addition to the above Sea Island cotton, a quantity of Marie Galante was also exported as follows: Grenada, 400,723 lb., valued at £11,670; St. Vincent, 58,737 lb., valued at £2,447.

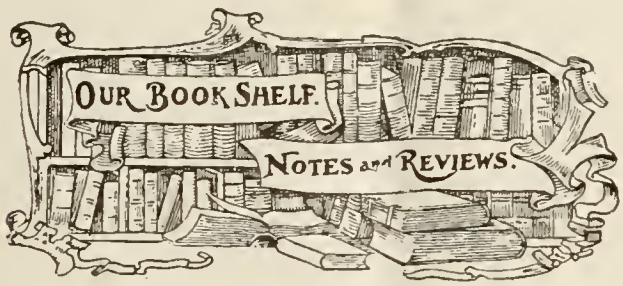
American Sea Island Cotton.—A report has just been received from Messrs. Gordon & Co., Savanna, Georgia, on American Sea Island cotton. This contains amongst other information a letter to producers of Sea Island cotton informing them that the Sea Island cotton-growing industry in America is threatened with destruction owing to the competition of long staple cotton grown in Egypt. This refers to Sakellarides. The necessity for careful cultivation and handling so as to reduce as far as possible the amount of waste in each bale of Sea Island cotton is urged, and the importance of keeping to one strain of seed is pointed out. It is observed that in Egypt a large amount of care is exercised in the matter of grading the cotton in the seed before ginning. Where bales arrive at Alexandria uncompressed they are opened and re-classified for grade and staple, and then re-baled. The utmost care is given to the selection and staple so that the different lengths are not mixed in the same bale.

As regards market values, the interesting fact is noted that the average price of Sea Island was lower than that of Egyptian for the first time since 1905, namely, 19·50c. against 19·76c.

The 1913 crop is reported to have attained a generally favourable start. The soil received a good supply of winter moisture but a dry spring somewhat delayed germination. The acreage has been still further reduced by the substitution of Upland for Sea Island cotton, especially where the latter failed to come up.

The report concludes with the following statement in regard to West Indian supplies: 'The total production in the British West Indies in 1912 is estimated at about 7,000 bales of 350 lb. each, which indicates that this growth has about equalled the Carolina Island's crops, and largely supplies the demand for the Carolinas which were used in former years.'

The reports as to the growing cotton crop in West Africa continue to be most satisfactory, and Mr. Roper the British Cotton Growing Association's Manager in Southern Nigeria has recently made a tour of inspection of the various provinces in the cotton growing districts of Southern Nigeria, and reports very favourably regarding the prospects for the new crop There is a considerable increase in the acreage under cotton, and the climatic conditions have been most favourable.



PRACTICAL SURVEYING AND ELEMENTARY GEODESY. By Henry Adams. *Macmillan & Co. Limited.* London, 1913 Price 4s. 6d.

This book has been written primarily for students preparing for examinations in elementary practical surveying. Great care has been taken to present the information precisely and concisely, and the numerous illustrations (there is scarcely a page without a diagram) are very clear and instructive. Questions and answers are given at the end of the chapters. For agriculturists in the Colonies, who desire to teach themselves something of the practical side of land surveying, this text-book can be strongly recommended. Most of the practical difficulties experienced in the field by the beginner are carefully dealt with and explained. How to find the direction of the base line of a field survey with regard to the points of a compass by the use of an ordinary watch; how to pole out a line where the sight is obscured by hilly ground, by employing a fourth assistant; and how to measure sloping land by 'stepping' and by angular instruments, may be cited as points illustrating the very practical way the author deals with his subject.

Briefly, the book tells the student first how to survey a field and then a small estate. Contouring and levelling are dealt with; also traversing by means of the chain and theodolite. Considerable space is given to the important subject of plan construction. The latter part of the book includes chapters on town and railway surveying; but these are not likely to be of direct value to the agricultural student. The last two chapters, however, on finding the latitude and longitude and on heliographing should be of very general interest.

MANURES AND FERTILIZERS. By H. J. Wheeler, Ph.D., D.Sc. New York: *The Macmillan Company*, 1913.

This volume of some 400 pages is one of the recent text-books on manures and manuring, the latter phase of the subject having particular reference to conditions obtaining in the United States. The book has several good features. It deals with the biological as well as the purely chemical side of the subject. Considerable space is devoted to the employment of sea-weed, human excreta, and waste products (including those of farm crops, e.g. corn cobs and tobacco stems as sources of potash). As would be expected in view of recent research, the so-called 'catalytic fertilizers'—toluene, carbon bisulphide, etc. are not neglected, nor are the artificially produced nitrogenous manures. There are very interesting chapters on magnesia sodium and manganese as manures. The author places great faith in nitrate of soda as a fertilizer, and of course this manure is of great economic importance. No reference, however, is made to the question of the remunerative side of the application of this and other fertilizers; though to be fair, the financial aspect of the subject scarcely comes within the scope of the work, which is essentially a text-book of agricultural chemistry. The student, however, might have been more persistently warned of the danger of generalizing in the matter of profitable manuring, particularly in regard to artificial fertilizers. There is such a thing as over manuring, as well as under manuring; and in tropical soils, especially, mineral manures may easily exert a toxic effect upon crops like cotton and sugar-cane. Moreover, it ought to be emphasized that rainfall is often a limiting factor.

The book is provided with an excellent index, and the subject-matter is well-arranged in numbered paragraphs. Those who want to become acquainted with all the sources of nitrogen, phosphoric acid and potash, and to understand how the different manures work in the soil, are strongly recommended to buy this book.

Another 'Agricultural News'.—We have just received a copy of the newly launched South African sugar journal called the *Agricultural News*. The coming into existence of this paper has been occasioned by the rapid development of cane growing in Natal, Zululand, Mozambique and other provinces in South Africa, and by the urgent necessity for keeping the public educated in all the industry's progressive movements. The South African *Agricultural News* is run on similar lines to the *Australian Sugar Journal*, and provides useful articles on practical matters immediately related to the local industry. Although the new journal devotes also some space to farm affairs of general interest—for instance, dairying—its title does not appear to reflect very happily its actual scope.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture returned to Barbados on December 24, 1913, by the R. M. S 'Balantia', from an official visit to St. Vincent and Antigua.

The Imperial Commissioner of Agriculture will leave Barbados for Jamaica on January 12, 1914, for the purpose of conferring with the Government on agricultural matters in that Colony.

The Imperial Department desires to call the attention of West Indian cotton growers to the Circular issued by the British Cotton Growing Association, in regard to the prizes which the Association are offering for exhibits at the forcoming International Cotton, Fibres and other Tropical Products Exhibition. A silver trophy is to be awarded for the best general exhibit of various varieties of cotton shown by any Government Department of Agriculture in the British Empire; also three silver cups will be presented, namely, one each for the West Indies, Nyasaland and the Anglo-Egyptian Soudan, for the best type of cotton grown on any farm or plantation during the years 1913 or 1914. The Chairman of the Association has expressed the hope that many planters in the West Indies will compete. Further particulars may be obtained from the local Agricultural Officers.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

Local Agents: Advocate Co., Ltd., Broad St., Bridgetown. *London Agents:* Messrs. Dulau & Co., 37, Soho Square, W.; West India Committee, Seething Lane, E.C. The complete list of Agents will be found on page 3 of the cover.

The *Agricultural News:* Price 1*d.* per number post free 2*d.* Annual subscription payable to Agents, 2*s.* 2*d.* Post free, 4*s.* 4*d.*

Agricultural News

VOL. XIII. SATURDAY, JANUARY 3, 1914. No. 305.

NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number reviews the market prices for West Indian Produce which have ruled during the past year.

Under Cotton Notes, on page 8, will be found information dealing with the exports of West Indian cotton during 1913, and other information concerning the market for West Indian cotton.

Under the caption Book Shelf, on page 7, several recent publications will be found reviewed.

An article containing interesting information in regard to co-operation is presented on page 9.

Insect Notes, on page 10, deal, amongst other things, with a newly discovered parasite on the coco-nut beetle.

On page 11, under the heading Live Stock Notes, will be found a suggestive article on the subject of disease without symptoms.

The latest position in the rubber industry is dealt with on page 11.

Under Students' Corner, on page 13, will be found some of the questions set at the recent examination in practical agriculture, conducted by the Imperial Department. Further information as to other papers set, together with the results of the examinations will be given in the next issue of this journal.

Report on Land Settlements, St. Vincent, 1912-13.

Published as a supplement to the St. Vincent *Government Gazette* (November 13, 1913), this report contains several facts of interest. Of the newly acquired lands by the Government, is Belair estate, containing about 400 acres, which has been purchased for sub-division and sale. Its situation about 3 miles from Kingstown on the windward side should prove ideal to meet the demand for land by the residents of Calliaqua and district, to which it is quite near. Survey operations will commence early this year.

With the object of providing cheap and efficient means to the allottees for manufacturing the arrowroot grown on the holdings, leases were entered upon, giving the lessees the right to erect arrowroot works on certain land settlement estates.

The total revenue of the year for Crown Lands and Land Settlement amounted to £1,105, and the total expenditure for the same period came to £1 575. There was a credit balance of some £189 in the hands of the Treasurer, and a sum of £2,632 invested by the Crown Agents for the Colonies on March 31, 1913. Thus at that date the total Land Settlement Fund amounted to £2,821. There was a gross arrearage of £514. There were two forfeitures during the year but no prosecutions.

Notes on the Cacao Market.

The prospects for the Trinidad and Venezuelan crops are good and shipments should by now be in full swing. In Grenada the outlook is equally favourable, although the annual drought has made the crop late in certain districts of the island. St. Lucia, on the other hand, complains of too much rain.

According to the *Gordian* (November 21, 1913)—the leading German paper on the cacao market—supplies from other centres, namely the Gold Coast, San Thomé, and Bahia, have already come into Hamburg in abnormally large quantities. During the first *half* of November, 2,098 tons were received, compared with 1,245 tons for the *whole* of November 1912, and compared with 2,438 tons for the *whole* of November, 1911.

The amount shipped to London during the first half of November 1913 was 4371 bags, of which 2,700 came from Havre, 500 from Lisbon and 500 from Hamburg. Lisbon received 16,606 bags during the same period, of which no less than 14,294 bags came from West Africa.

It will be remembered that we pointed out some time ago that the largest supplies of West African cacao arrive between November and February inclusive. Last year the shipments to England during December were over 1,000 tons more than for the same month in the previous year, and very much above the amounts received during December in previous years.

During the period October 21 to 28, New York received 16,592 bags of which 900 bags were shipped from Trinidad.

According to the London cacao market report in *Tropical Life* (November 1913), the London stock, November 8, 1913, was 75,181 bags compared with 92,793 bags for 1912 and 94,390 bags for 1911. The Havre stock, October 31, 1913, was 161,435 bags as against 148,416 bags for 1912.

The Journal of Agricultural Science.

The October issue of this publication contains, as usual, an account of the leading investigations in agricultural science in England and Wales. W. Gavin contributes another paper dealing with studies in milk records (see *Agricultural News*, Vol. XII, p. 219), more especially on the accuracy of estimating a cow's milking capability by her first lactation yield. The general conclusion arrived at is that with cows giving a fairly high or fairly low first lactation R.M. [=revised maximum—the maximum day-yield of the lactation which is three times reached (or exceeded)], this figure should be used to determine whether they shall be kept or not; but with cows giving a medium first lactation R.M of 10 - 11 quarts, it is worth waiting to obtain the increased accuracy of an estimate based on the means of the first and second lactation R.M.

S. J. M. Auld publishes a paper on the production of hydrocyanic acid during digestion in ruminants. The only danger in this respect appears to be when cyanogenetic foodstuffs like linseed cake are fed with acid-containing or acid-producing foodstuffs. Small quantities of hydrocyanic acid, normally produced, may possibly have a strongly beneficial action.

The same author contributes another paper on the feeding value of Para rubber seed cake. This investigation has already been reported. (See *Agricultural News*, Vol. XII, p. 412.)

Sugar chemists and others will be interested in Davis' and Daishel's account of their work on the estimation of carbohydrates in plant extracts; whilst readers familiar with recent work in Egypt in connexion with cotton will appreciate W. Lawrence Ball's paper on movements of soil water in an Egyptian cotton field. This shows, amongst other things, that the depth of a root can be traced by its drying effect on the soil, and that the rate of evaporation from a field of cotton (20 by 10 metres) averages about 20 tons of water a day, from May to October.

The issue of the journal under review contains also papers by Pickering and Russell on the effect of bastard trenching on the soil and on plant growth, and another by Crowther and Stuart on the distribution of atmospheric impurities in the neighbourhood of an industrial city. Finally, Mackensie and Marshall contribute Part II of their paper on oviotomy in sows. This deals with the question as to whether the black pigmentation that occurs in the bacon obtained from the mammary region in pigs of certain breeds can best be eliminated by 'spaying' or by selection.

Important Meeting of the Antigua Onion Growers' Association.

The recent establishment of the above Association has already been notified in the *Agricultural News*. Readers will be interested to learn that an important meeting was held on December 10, 1913, for the purpose of hearing a report of the Board of Management and an address by Dr. Francis Watts, C.M.G., Imperial Commissioner of Agriculture for the West Indies.

With regard to the question of grading, the Board recommends the adoption of three standards: Grade 1, to consist of onions varying from 1½ to 3½ inches in diameter, and to be called Antigua Firsts: Grade 2, to consists of onions over 3½ inches in diameter, and to be called Antigua Seconds: Grade 3 to consist of onions under 2½ inches in diameter, and to be called Antigua Thirds. The Board has decided upon an official brand which shall be used for marking packages of onions inspected in accordance with the Articles of Association. An important development has been the decision to conduct trials to ascertain whether by careful curing, grading and packing, the marketable qualities of Antigua onions can be increased, and also to endeavour by means of small trial shipments to attract attention to the produce in the Canadian market. To assist these endeavours the Government has sanctioned a grant of £12. In connexion with the question of obtaining fortnightly advices as to the condition of the markets at various intercolonial centres, the Board reports that at no distant date satisfactory arrangements will have been completed for this service.

In the address which followed, by the Commissioner of Agriculture, a short historical account was given of onion cultivation in Antigua, and reference made to the difficulty, owing to the tariff, of finding a market in the United States. It was pointed out that an opportunity was at hand for increasing the trade in onions with Canada, mainly in view of the new steamship facilities and the big demand that already exists in the Dominion for the produce under consideration. Turning to local matters, Dr. Watts pointed out the uncertainty involved in a complete dependence upon intercolonial markets. Reference was then made to the reputation which Antigua onions have, in some places, for being badly packed and of inferior flavour.

Generally speaking, Dr. Watts was of opinion that the flavour of Antigua onions was approved of, but that in this connexion, the trials in regard to ripening already referred to in the report of the Association, would be of considerable importance.

At the conclusion of the proceedings the meeting adjourned to the Botanic Station for the purpose of viewing the plot experiments conducted there with onions. Experiments shown demonstrated the fact that if onion seed is planted direct in the field and not in the nurseries, the crop can be reaped five weeks earlier. This, naturally, is a feature in the cultivation of the crop which cannot be ignored by the practical grower.

INSECT NOTES.

A FUNGUS PARASITIC ON THE COCO-NUT BEETLE.

According to an article in *Tropical Life* for November last, a correspondent of that paper writes from Samoa to the effect that an efficient fungus parasite has been discovered in that island, as an enemy of the coco-nut beetle.

It would appear that Dr. Friederichs, Government Entomologist of Samoa, occasionally discovered these beetle larvae with small brown spots on their backs Examination proved that the spots were the points of attack of a fungus, indigenous to Samoa, which finally causes the death of the insect.

After conducting experiments extending over several months, it has been discovered that artificial cultures of the fungus can be made in traps which attract the adult insect. The traps, or nests, as they are called, are in general principle constructed as follows: A space of about 6 feet square is enclosed by a stone wall or other fence some 15 inches high, and this is filled with rotting husks, old coco nut and other rotting wood; and in addition, on the top of this material, 3 or 4 bags of fresh coco-nut husks are spread. The whole surface is then covered with 4 or 5 inches of soft earth, and this forms the trap which seems very attractive to egg-laying females which come to it in great numbers. The mass of mould and rotting vegetable material is infected with the fungus from artificial cultures, which are made as follows: Large numbers of beetle larvae are captured and confined in boxes, kerosene tins, etc, which are filled with rotting wood and coco nut husks, into which are introduced from time to time large numbers of infected beetle larvae.

The results obtained from these artificial cultures were discouraging at first, but it is now believed that a virulent type of fungus has been developed which can be conveyed in the mould from these cultures to the traps already mentioned, where the growth of the fungus results in the death of the newly hatched beetle larvae while they are still very young. It is stated that these nests are being built by planters about one to the acre throughout the coco-nut plantations, extending into the wild land on all sides for a short distance, and it is expected that a very considerable amount of benefit will be derived from this method of dealing with the pest.

It should be borne in mind, however, that the greatest care will have to be taken in all the adjacent land to remove the native breeding places of the coco-nut beetle, otherwise many eggs will be laid under the ordinary conditions, and this will necessitate a continuance of the practice on a large scale over a much longer period.

It is further stated that on one plantation the results of this practice have been so satisfactory that it has been found difficult to collect any full-grown larvae, the only grubs seen by the men who were collecting having been the small ones only a few days old It is still too early to state anything definite with regard to the beneficial results obtained, but as far as observations are reported, it would appear that the method is a very satisfactory one.

Tropical Life's correspondent in Samoa does not give the name of the coco nut beetle. On reference to the *Agricultural News* for July 6, 1912 (Vol. XI, p. 218), it will be seen that the rhinoceros beetle (*Oryctes rhinoceros*) is a serious pest of coco-nuts, and this may be the species referred to. The question naturally arises as to whether this form of trapping or the use of the fungus, or both together, might be profitable in the West Indies.

Mr. Frank P Jepson, B.A., F.E S., Government Entomologist, Fiji, visited Samoa during April 1912, for the purpose of investigating the rhinoceros beetle, and a report of this visit was published as Bulletin No. 3 of the Department of Agriculture, Fiji; entitled, The Rhinoceros Beetle (*Oryctes rhinoceros*, Linn.) in Samoa

During this visit Mr. Jepson found traps, similar to those already described, in use; but he does not mention the parasitic fungus. The traps were at this time employed to form attractive places for egg-laying, and in them the developing insects were destroyed either by the use of carbon bisulphide or by men and boys who searched the decaying vegetable matter for the grubs and killed them.

From the following, which is quoted from page 17 of his report, it is further shown that the fungus was not known at the time of Mr. Jepson's visit. The discovery of the parasitic fungus and the method of using it appear to be recent developments, and indicate one means by which an introduced pest is made to fit into the environment of a new locality.

'One is led to believe that the only successful means of combating this pest is by the agency of its natural enemies. The pest has been established in Ceylon, perhaps, for centuries, and yet it is hardly regarded as a very formidable enemy. It would appear, therefore, that there is some natural cause to account for this, and the most easily accepted theory is that there occurs in that country a natural check of some kind. The fact of the beetle not being regarded in any very serious light there, probably explains the reason why no research has been undertaken on the matter. The persons interested in Ceylon are not aware of the presence of any natural enemy, but possibly, if the pest was a more formidable one, the matter might have had more attention This insect having been introduced into Samoa, where it does extensive damage, from Ceylon, where its ravages are not so serious, leads one to believe that the pest was introduced while its natural enemies were left behind.'

HOW ORYCTES RHINOCEROS, A DYNASTID BEETLE, USES ITS HORN.

The following note, which appeared in *Science* for December 19, 1913, is of interest in connexion with the reference to the rhinoceros beetle which appears on this page.

'The horn is present on both sexes and is usually longer on the male than on the female, but many males may be found with very short horns and many females with long horns, so that the sexes cannot be separated by this character. The horns vary in length, from 1·5 mm to 10 mm, 6 or 7 mm. being about the average length. The beetles feed on the growing heart in the crown of the coco-nut trees. They usually enter the trees close to the base of a leaf, crawling down as far as they can between the tree and leaf-stem before beginning to bore. The spiny legs enable the beetle to brace itself firmly before it begins literally to root its way into the web-like sheath through which it usually has to pass before it reaches the hard wood. In doing this the head is lowered and the horn thus thrust forward The horn becomes imbedded in the tissue of the plant and when it is raised serves as an anchor to hold the insect while it pulls or pushes its body forward with its legs, or while it tears the tissue of the plant with its heavy mandibles. The insect will always root and push its way as deep as it can before it begins to bore. The amount of power it can develop is truly remarkable.'

LIVE STOCK NOTES.

DISEASE WITHOUT SYMPTOMS.

Considerable attention has been given recently in this Journal to the South American equine disease called Mal de Caderas. According to the Demerara *Daily Argosy* (Mail Edition, December 6, 1913), information and suggestions of a valuable nature bearing on the disease were imparted to the Veterinary Committee of the Board of Agriculture, British Guiana, by Dr. L. S. Sambon, Lecturer on Tropical Diseases at the London School of Tropical Medicine, at a meeting of the committee, which was held at the office of the Director of Science and Agriculture at the Botanic Gardens on Sunday morning, November 23.

Dr. Sambon suggested the necessity for taking precaution in the matter of isolating in stables, specially protected from flies, all animals suffering or suspected to be suffering from the disease. It would also seem, in continuation of this point, that each estate owner, particularly the small proprietor, should be careful in the matter of lending or hireing out his mules or horses to another estate where the disease may have occurred.

The chief point, however, raised by Dr. Sambon, and the one which constitutes the central idea of this article, is this: that whilst cattle and goats appear to be immune to the disease, they may carry the organism and spread it from place to place, without showing any symptoms. To find out whether there is any scientific foundation for this assumption in the case of the disease in question, it would be necessary to institute a series of cross-inoculation experiments, and possibly in the course of further investigation of Mal de Caderas, this important line of work will be followed up.

One of the most classical examples of a disease which can be transmitted by animals without the exhibition of symptoms is the fatal disease of human beings known as Malta fever. A good account of this disease will be found in Circular No. 215, Bureau of Animal Industry, of the United States Department of Agriculture.

As its name implies, this disease was exceedingly prevalent in Malta, and investigations have shown that it is due to a causative organism known as *Micrococcus melitensis*. It has been reported from Spain, Gibraltar, Italy, the Mediterranean Islands, Turkey, China, India, Palestine, the Philippine Islands, North Africa and South Africa—and of the American countries, Venezuela, Brazil, Uruguay, Cuba and Porto Rico.

Investigation has proved that goats are principally responsible for the distribution of this disease, and although the animals appear to be in a state of perfect health, the milk of those goats which are infected is always contaminated with the organism which causes the disease. The fever was practically eliminated amongst English soldiers stationed at Gibraltar, by prohibiting the consumption of raw goat's milk. It may be noted here, that vaccine treatment has not proved satisfactory in controlling the disease in goats. The best course seems to be the detection of infected animals by the agglutination and complement fixation test, and destruction of all reacting animals. The virus may also be carried, it must be remembered, by dogs, rabbits and other animals. Lastly it should be borne in mind that the germ of Malta fever occurs in the urine and faeces of infected goats, so that the sanitary conditions around places where goats are kept should be maintained at a high standard.

RUBBER INDUSTRY.

NOTES ON THE PRESENT POSITION.

The premium in favour of fine hard Para, which constitutes the principle factor of interest in the market, now stands at a lower rate (according to the *India Rubber World* for December 1, 1913) than at any time since the middle of the year, being now at 9½*d.* against 11½*d.* on October 27. In fact, plantation rubber has gone up 2*d.* without any corresponding rise in the fine hard Para standard.

In spite of this favourable turn, great attention is still being directed towards the question of combination for selling plantation rubber. In the *India Rubber Journal* (November 22, 1913) an account is given of the meeting of the sub committee of the Rubber Growers' Association, appointed to investigate the fall in the price of plantation rubber, and to report on the possibility of arriving at some arrangement for protecting the interests of producers. (For an account of a previous meeting in the present connexion see the *Agricultural News*, Vol. XII, p. 395.) The committee have come to the conclusion that any artificial restriction of production is not feasible. They have no doubt arrived at this decision after considering the difficulties which confront plantation interests generally in the way of curtailing the production of particular estates whose costs vary so widely. The committee report, however, that combination on certain lines for selling is advisable but not practicable unless it has the support of producers responsible for at least 50 per cent. of the output of plantation rubber. The committee also realize that no combination can be really effective unless it is backed by a substantial amount in cash.

The Association has refrained from entering into any details in regard to the manner in which it is proposed to carry out the scheme, and the only requirement at present is that companies should vote as to whether the proposals enumerated in principle should be put into practice. The refusal to provide details has, in some quarters, given rise to dissatisfaction, but the Press maintain that the Association has acted wisely in not making public the details of its scheme.

At some of the recent annual meetings of plantation rubber companies, views have been expressed which lead one to the conclusion that combination is not necessarily the only remedy for the present depressed condition of the industry. At one meeting it was stated that the cause of the trouble would appear to be rather that plantation rubber is not sold on its merits, and the remedy would seem to lie in the direction of encouraging its uses rather than in attempting to create or declare a value for it. Considerable importance is attached to the circumstance that the Rubber Producers' Association has now established at Kuala Lumpur an experimental station, where the actual manufacture of vulcanized rubber can be carried on. Should this be placed at the disposal of those who are experimenting with various processes of curing, it may be of considerable service. One rubber manufacturer said he strongly deprecated any attempt to interfere by artificial means with the ordinary course of supply and demand. It was the opinion of this speaker that the forward sales of rubber, which had brought a temporary profit to a number of estates, had done more to bring about the extreme fluctuation in prices than anything else.

GLEANINGS.

According to the *Farmer's Magazine* for November 1913, the best way to heal cuts in the branches of rubber trees is to bind a sliced potato around the wounds.

During November the following plants were distributed from the Botanic Station, Dominica: limes 6,500, Para rubber 100; budded citrus 20; nutmegs 10: making a total of 6,630.

The *Voice of St Lucia* urges that the Colony should introduce measures for the purpose of establishing land banks similar to those that have been introduced into St. Vincent.

Sir Daniel Morris, formerly Imperial Commissioner of Agriculture for the West Indies, has been elected President of the Bournemouth Natural Science Society in succession to Sir Ray Lankester.

A valuable monograph on the economic value of *Shorea robusta* (Sâl) has just been received from the Forest Research Institute, India Sâl is one of the strongest and most durable of Indian timbers.

According to the Grenada Land Officer's Report for November, favourable weather continues to maintain the excellent condition of the crops on the small holdings. A fair second corn crop is expected.

An Ordinance to consolidate and amend the law relating to contagious diseases among animals has just been passed in Antigua. The Act would appear to be comprehensive and to meet fully existing requirements.

The *Annals of Tropical Medicine and Parasitology* (November 7, 1913) issued by the Liverpool School of Tropical Medicine, contains an interesting and lengthy paper on 'vomiting sickness' in Jamaica.

A note appears in the *Gardener's Chronicle*, which says that a satisfactory way to tap Ceara trees is to strip off the outside bark, make a herring bone tapping, and to direct a slight flow of water by means of a syringe down the centre cut.

The *Field* (November 22, 1913) in a short article on the Canary banana, advocates the culture of this tree in English gardens provided with tropical greenhouses. The home grown article is stated to be superior to the imported fruit.

A further amendment has just been received of the Rule forming Schedule I to the St. Vincent Agricultural Credit Societies Ordinance, 1913 The first amendment of the principal rules was made on October 14, 1913 (see *Government Gazette*, October 16, 1913).

Information is presented in the Supplement to the *Jamaica Gazette* (November 1, 1913) to the effect that the number of school gardens in the island has steadily increased and that there are now over 300 doing good work. They have improved in the past year in the following respects: (1) neatness of construction; (2) a better classification of crops; (3) tool supply.

It is stated in the *Agricultural Bulletin of the Federated Malay States* (August 1913) that the gutta percha obtained by tapping *Palaquium oblongifolium* is of good quality and could command satisfactory prices in the market. Gutta percha is usually understood to refer to the coagulated latex from species of the genus Palaquium other than oblongifolium.

It is stated in *Colonial Reports*—Annual, No. 769, that Basutoland during 1912-13 expended a sum of £7,061 on the purchase of stallions and rams. Measures were taken during the year for the eradication of scab. It may be noted in connexion with general agriculture in Basutoland, that it has been decided to establish a small agricultural school and farm in the Territory.

The St Vincent *Sentry* (November 28, 1913) says that in several of the towns and villages of the island, opportunity has been taken by peasants to establish agricultural credit societies under the new Agricultural Credit Ordinance 1913. Already six such societies have been registered as required by the provisions of the Ordinance. The Societies are established respectively in Georgetown, Union, Chateau Belair, Troumaca, Lowmans, and Stubbs.

According to *Diplomatic and Consular Reports*, No. 5210, Annual Series, the outturn of rubber from Portuguese East Africa during 1912 was seriously reduced by the drought. The Mozambique Company has imported a 'Valor' machine battery (see *Agricultural News*, Vol. XII, p. 327), and is conducting experiments to determine whether mechanical extraction of rubber from the Landolphia vines can be substituted for the present method of collection by the natives.

A new machine for extracting sisal hemp fibre is referred to in the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases* (May 1913). This machine is stated to be distinguished by its great simplicity; and the recent trial before a number of managers of plantations in German East Africa showed the extraction of the fibre to be excellent. The 'Roland' machine—as it is called—is built of heavy iron, and the intermediate gearing is mounted on the machine itself, which is besides fitted with ball bearings of a special type, which allow it to run with extraordinary smoothness. About 25 h.p. are required to drive it when working at its maximum.

STUDENTS' CORNER.

JANUARY.

First Period.

Seasonal Notes.

Useful suggestions are made under the heading of Seasonable Hints, in the *Journal of the Jamaica Agricultural Society* (November 1913), in regard to the planting of bananas. It is observed that a good sucker planted with good trenching (drainage) and forking, will bring the fruit in to two or three months ahead of those from trees simply planted in a hole and not forked, and with the land not trenched. It is noted also, that planting of large selected suckers makes a difference of at least one month's growth. In the same way trenching, especially on heavy lands, will make the crop earlier by at least two months. Thus the combined effect of these different operations is to save five months and to obtain better fruit.

Now that cotton picking is in progress, a good opportunity is afforded for studying the fruit and seeds of the plants and the lint which is yielded by it. Particular attention should be paid to the effects of the weather on the opening of the bolls and upon the quality of the lint. Furthermore, the bolls should be carefully watched for insect and fungus attacks. It will be remembered that particularly at the present time, Sea Island cotton for shipment must be carefully graded; that is to say, the produce from various pickings must not be mixed and that all stained cotton and particularly lint which is wasty, must be carefully kept separate from the rest.

In connexion with the Christmas cacao crop an opportunity will be afforded for careful consideration of the question of the fermentation of cacao. A book has recently been published on the subject and fully reviewed in the *Agricultural News*, Vol. XII, p. 321. Attention should be given to the possibility of improving cacao by the inoculation of the beans with the yeast that causes the change of sugar into alcohol. Closely related to the actual process of fermentation is the drying of cacao. In parts of Africa and in other continental tropical countries where heavy rainfall occurs, the employment of drying machines is absolutely necessary, though as a general rule, cacao experts seem to regard sun drying as the more preferable process. The student will remember that at the present time there is some talk of the manufacture on a large scale of vinegar as a by-product of cacao-fermentation. The cost of cacao and its by-products and the market values for the vinegar should receive the student's special attention.

Questions for Candidates.

Preliminary Questions.

(1) Give an account of the characteristics of the leaves of the following varieties of sugar-cane: B.208, B.1753, D.116 and B.4030.

(2) How would you set out, in a field, two lines at right angles to each other?

Intermediate Questions.

(1) What is (a) tuberculosis; (b) Mal de Caderas; (c) erysipelas; (d) contagious abortion? Why have these received so much attention in the West Indies?

(2) How would you proceed to measure the area of a field?

Final Questions.

(1) Give your views as to along what lines new markets may be established in Canada for West Indian produce.

(2) Write an account of the forestry conditions in the island where you reside, giving special attention to the subject of their relation to agriculture.

IMPERIAL DEPARTMENT EXAMINATIONS IN PRACTICAL AGRICULTURE.

The following questions were those set for the preliminary examination, which was held on Monday, October 27, 1913. Of the thirteen questions the candidate was required not to attempt more than nine, among which questions 6 and 7 were to be included:—

1. Explain in detail what use to plants carbon dioxide is (a) in the air (b) in the soil.

2. Give an an account of the life history of the Dodder or Love Vine (*Cuscuta* sp.) and of the vanilla plant. Point out the essential differences in their modes of living and reproduction.

3. Describe, giving practical details, *either* (a) the operation of budding limes, *or* (b) that of the grafting of cacao.

What is the difference between cambium and callus?

4. Explain five of the following terms, giving examples where this can be done: (a) enzyme, (b) metabolism, (c) osmosis, (d) mutation, (e) carbohydrate, (f) phloem, (g) aorta, (h) tracheae, (i) parthenogenesis.

5. Give an account of the physical and chemical characteristics of the soil on the estate you are connected with. In what way is this knowledge likely to be of value to you in practice?

6. Explain carefully what happens to some cotton seed meal in a mouthful of food as it passes through the body of a cow.

7. Describe, by means of labelled large-scale drawings *only*, the structure of any flower you have examined having an inferior ovary. [Written description is not required. Name the plant to which the flower you select belongs.]

8. What action on the soil has tillage by means of the following implements and tools: (a) subsoil plough, (b) harrow, (c) roller, (d) fork, (e) hoe, (f) spade? In what ways is dynamite of value in the cultivation of the soil?

9. What are the effects of drainage? Describe the spstem adopted on any estate you are acquainted with. What methods have to be adopted in keeping the drains in good working order?

10. Distinguish between 'nitrogen fixing' and 'nitrification'. In what ways are these processes important in regard to the use of green dressings?

11. How would you distinguish the following fertilizers by means of their general appearance: (a) nitrate of soda and sulphate of ammonia; (b) basic slag and calcium cyanamide; (c) kainit and nitrate of lime; (d) superphosphate of lime and sulphate of potash?

What is slaked lime composed of? Give three of its uses in the soil.

12. Describe in detail, *either* (a) the structure of a cacao bean covered with pulp as it is removed from the 'pod'; *or* (b) the structure of the underground system of the sugar-cane.

13. Describe the pollination of the flowers of the following plants: (a) Indian corn, (b) vanilla, (c) cotton.

FUNGUS NOTES.

BLACK SPOT OF ROSE LEAVES.

Besides one or more root diseases, there occur on rose bushes grown in West Indian gardens two leaf diseases which give some trouble. These are the rose mildew and the black leaf spot. The former was dealt with at some length in the *Agricultural News* (May 25, 1912) so that it need only be repeated that the simplest remedy consists in dusting the leaves with a mixture of 2 parts by volume of flowers of sulphur with one part of quicklime, applied when the leaves are damp. Sunshine is necessary to generate the effective gas or gases from the mixture.

The black spot disease is less noticed, but is very common. It varies considerably in the severity of its attack. Some traces of it may be found almost at any time, and the leaves very often develop it when senescent, without much harm being done to the plant. It is capable, however, of becoming epidemic and doing much damage by causing repeated premature leaf-fall and thus impoverishing the plant.

On their first appearance the spots are brownish in colour, later they become shining black, and still later the central portion turns grey or brown. They vary from about $\frac{1}{8}$-inch to nearly $\frac{1}{4}$-inch in diameter. The spores are developed in tiny black pycnidia scattered about in the spots. The mycelium of the fungus is largely subcuticular, and a fairly reliable diagnosis of the disease may be made by noticing with a lens the raised radiating lines which mark the course of the hyphae.

The first essential of treatment is the collection of diseased leaves, especially those which have fallen from the plants. By this means alone a very considerable diminution of the disease may be obtained. It should, however, be supplemented in the case of serious epidemics by spraying with a fungicide about once a week until the leaves bearing the spots have all been replaced by healthy foliage. Bordeaux mixture may be used with safety on most varieties of roses if applied in a fine spray. To avoid the trouble of mixing small quantities of Bordeaux mixture, or to avoid damage to delicate varieties, ammoniacal copper carbonate may be used instead. For this fungicide 1 oz. of copper carbonate and about $\frac{1}{2}$-pint of ammonia are used in preparing 8 gallons of the spraying solution. Rub up the copper carbonate into a paste with a little water, dilute the ammonia with four times its volume of water and dissolve the copper carbonate in it by stirring. It is better to leave a little undissolved than to have any excess of ammonia. Make up to 8 gallons with water. The solution should be used quickly after being made because of the rapid loss of ammonia. Copper carbonate may be prepared from copper sulphate by mixing a solution of 10 lb. of copper sulphate in 10 gallons of water with a solution of 12 lb. of washing soda in an equal amount of water, then washing and drying the precipitate which settles out.

It is stated in the *Bulletin of the Department of Agriculture of Trinidad and Tobago*, that in connexion with spraying for bud rot (of coco-nut trees) no definite results have been obtained as only two unsprayed trees in the area selected had died, but the yield from the sprayed trees seemed to be greater. The sugar birds did not pick the flowers from the sprayed trees, which in some measure accounted for the greater yield of the sprayed trees.

FOMES SEMITOSTUS IN BRITISH GUIANA.

The following note by the Government Botanist, British Guiana (Mr. C. K. Bancroft, M.A.), is taken from the *Journal of the Board of Agriculture* of that Colony, for October 1913:—

During a recent visit to the interior of the Colony the writer observed fructifications or 'brackets', as they are popularly termed, of *Fomes semitostus* on a stump of a dead tree (species not known) on a trail leading from Tumatumari to Konawaruk. The brackets were identical with those which occur in the East, possessing dark and light brown zones on the upper surface, a yellow margin or lip and a bright orange-coloured under surface.

This fungus, which is the cause of the common root disease of cultivated Para rubber, is a parasite of considerable economic importance. Its occurrence in the Western Tropics has not to the writer's knowledge been recorded before, and would indicate a much wider distribution of the fungus than has previously been thought to occur.

Its occurrence in South America is of more than individual interest in that it adds another to the list of parasitic fungi of economic importance which are freely distributed in the Tropics. Some of the fungi are *Phytophthora Faberi*, the cause of the pod disease and canker of cacao, *Thyridaria tarda*, the die-back of Hevea and cacao, *Marasmius sacchari*, the root fungus of sugar-cane, *Hymenochaete noxia*, the cause of a root disease of Hevea and cacao. These rank amongst the most important parasites which the cultivator has to deal with in the tropics at the present day. And as the work on plant diseases in the Tropics progresses it is possible that a far wider distribution of parasitic fungi will be shown to occur than is indicated at present. To what extent they may have been introduced from one country to another, or to how far they can really be regarded as native to the countries in which they now occur it is not possible to determine; but the fact that several of the most important fungi which are parasitic on cultivated plants in the Tropics appear to possess such a wide geographical distribution is worthy of mention, in view of the quarantine regulations now being enforced by many tropical countries.

Other 'bracket fungi' commonly seen in the East on dead wood, which were recorded during this visit, were *Polystictus sanguineus* and *Schizophyllum commune*.

THE SOIL.

THE GASES OF SWAMP RICE SOILS.

The cultivation of paddy in Southern India includes amongst other things, the maintenance of swamp conditions, the puddling of the soil (thereby decreasing the natural drainage) and the use of large quantities of green manures. These circumstances must make the soil conditions and the nutrition of the plant very dissimilar to that which occurs in the case of ordinary soils.

Hence the study of the gases in these soils was thought likely to lead to important results. The following are the conclusions drawn as the outcome of such study by W. H. Harrison, M.Sc., and P. A. Sabramania Aiyer, B.A., of the Madras Department of Agriculture:—

(1) The normal fermentation of green manure is swamp paddy soils leads to the production of a relatively large proportion of methane, a smaller amount of nitrogen, together with some carbon-dioxide and hydrogen. (2) The introduction of a crop so modifies the gas production that the proportion of methane in the gas is greatly reduced and that of nitrogen greatly increased. The evolution of hydrogen is practically inhibited. (3) The action of the crop is to restrict the formation of methane and hydrogen either by retarding the rate of fermentation of by a portion of the intermediate products of decomposition being absolved by the roots. There is also evidence adduced to show that the normal evolution of nitrogen is retarded in a simple manner. (4) The soil conditions are shown to be anaerobic in character immediately after water is admitted to the fields, and these conditions persist so long as irrigation proceeds. Under these circumstances, nitrification is impossible and nitrates produced during the dry season are quickly denitrified so that the nitrogen required by the crop is obtained from the ammonia and nitrogenous organic compounds produced by the anaerobic decomposition of the proteids of the green manure. (5) Certain of the substances produced by this decomposition are toxic to the crop, and must be removed in the drainage water, or destroyed by prolonged decomposition before the seedlings are transplanted, otherwise the crop will suffer. The application of green manure to badly drained areas must, therefore, be undertaken with circumspection and caution.

The following conclusions are drawn in regard to the evolution of gases from the soil:—

These investigations have led the authors to the conclusion that the surface film of algae, etc., which covers the surface of the swamp paddy soils, and which evolves large quantities of oxygen, is the chief agent in causing the aeration of the roots of the crops.

The oxygen evolved by this film is dissolved in the irrigation water and thus produces a very highly aerated solution from which the roots derive the oxygen essential for them. In undrained soils this solution does not penetrate into the soil, and, consequently, the roots are congested near the surface of the soil and the amount of soil from which they derive their food is therefore limited and the crop suffers. In drained soils the strongly aerated water penetrates the soil and the roots are able to penetrate to a greater depth. The mass of soil from which the food supply is drawn is increased and the crop benefits in proportion.

Too great a rate of drainage decreases the formation of the film and the aeration of the roots thereby lessened. There is, therefore, for all swamp paddy soils an optimum rate of drainage which produces the greatest aeration and this rate of drainage is a comparatively slow one.

Aeration of these soils by atmospheric oxygen is not as effective in promoting root aeration as is aeration by the water draining through them.

The use of green manures in drained paddy soils induces a greater activity on the part of the surface film, thus leading to a better aeration of the roots.

The above conclusions are taken from an article by the writers mentioned above, in a recent number of the *Memoirs of the Department of Agriculture in India* (Chemical Series).

WEST INDIAN PRODUCTS.

DRUGS AND SPICES IN THE LONDON MARKET.

GINGER.

There has been but a very slow demand for all kinds throughout the entire month. At the first spice auction on the 5th, the offerings amounted to 298 packages from Formosa, all of which were bought in at 45*s.* per cwt. for fair common and 18*s.* for the rest.

NUTMEGS, MACE, PIMENTO AND ARROWROOT.

There was a steady demand for nutmegs at the first auction on the 5th, when 117 packages of West Indian were disposed of at the following rates: 72's to 78's, 6*d.* to 7*d.*, 90's 5*d*, 100's to 110's 4¼*d.* to 4½*d.*, 112's to 122's 4½*d.* to 4¾*d.*, and 138's to 142's 4¾*d.* In the following week, namely on the 12th, 215 packages of West Indian were offered, part of which sold, 66's to 76's fetching 6*d.* to 10*d.*, 78's to 88's, 5½*d.* to 7*d.*, 92's to 105's 4½*d.* to 5*d.* and 118's to 134's 4½*d.* to 5¼*d.* On the 26th there was again a good supply of nutmegs, namely 330 packages of West Indian, part of which was disposed of at similar similar rates to the foregoing.

Of mace, at the first auction on the 5th, 17 packages of West Indian were sold, 1*s.* 9*d.* to 1*s.* 10*d.* being paid for fair reddish, 1*s.* 8*d.* to 1*s.* 9*d.* for dark red, and 1*s.* 5*d* to 1*s.* 6*d.* for broken. A week later there was an increased demand, and 33 packages of West Indian sold at the following rates: good fetching 2*s.* to 2*s.* 3*d.*, fair 1*s.* 11*d.*, ordinary 1*s* 9*d.* to 1*s.* 10*d.*, red 1*s.* 8*d.* and broken 1*s.* 3*d.* to 1*s.* 7d. At the last auction on the 26th mace was still in demand, some 94 packages of West Indian being offered and mostly sold at slightly lower rates. At the beginning of the month pimento was in steady demand at 2½*d.* per ℔., but at the end of the month the offerings were all bought in. Arrowroot was represented at the first auction on the 5th by 20 cases of Natal, 10 of which sold at 6¾*d.* per ℔. At the close of the month the offerings of arrowroot were all bought in.

SARSAPARILLA.

At the drug auction on the 13th, sarsaparilla was represented by 19 bales of grey Jamaica, 13 of native Jamaica, and 5 of Lima-Jamaica. The whole of which was disposed of, except the Lima-Jamaica, none of which found buyers. Of the grey Jamaica, 1*s.* 7*d.* to 1s. 9*d.* per ℔. was paid for fair part chumpy, and 1*s.* 6*d.* for sea-damaged. The 13 bales of native Jamaica realized 10*d.* to 10½d. per ℔. for dullish to fair red and 9*d.* for common dull. A fortnight later, namely on the 27th, only small qualities of sarsaparilla were brought forward, namely 11 bales of Lima-Jamaica, and one bale of native Jamaica. The whole of the former was disposed of privately, and of the latter 11*d.* per ℔. was paid for dull red.

TAMARINDS, LIME OIL, LIME JUICE AND KOLA.

It was reported in the early part of the month that a large quantity of East Indian tamarinds had been sold privately, and that West Indian were getting scarce and not obtainable under 15*s.* 6*d.*, in bond or 16*s.* duty paid. Quantities of both lime oil and lime juice were reported at the end of the month to have arrived, namely, of the former, 15 packages from Dominica and 62 from Montserrat, and of the latter some 500 packages from Dominica. At auction on the 27th, 88 packages of kola were offered and 13 sold, 3*d.* to 3¼*d.* being paid for fair small to bold dried West Indian. Darkish realized 2½*d.*, and slightly wormy 2*d.* per ℔.

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR, December 16, 1913; Messrs. E. A. de PASS & Co., November 21, 1913.

ARROWROOT—3*d.* to 4½*d.*
BALATA—Sheet, 2/8; block, 1/11 per lb.
BEESWAX—£8 10*s.* to £8 17*s.* 6*d.*
CACAO—Trinidad, 66/- to 72/- per cwt.; Grenada, 62/- to 69/-; Jamaica, 60/- to 66/6.
COFFEE—Jamaica, 54/- to 57/-.
COPRA—West Indian, £31 15*s.* per ton.
COTTON—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 17½*d.* to 20*d.*
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—Quiet, 34*s.* to 60*s.*
ISINGLASS—No quotations.
HONEY—24*s.* to 28*s.*
LIME JUICE—Raw, not in request; concentrated, £29 10*s.* to £33; otto of limes (hand-pressed), no quotations.
LOGWOOD—No quotations.
MACE—1/8 to 2/6.
NUTMEGS—4½*d.* to 6½*d.*
PIMENTO—2⅞*d.* to 2½*d.*
RUBBER—Para, fine hard, 3/1; fine soft, 2/7½; Castilloa, 1/8 per lb.
RUM—Jamaica, 2/4 to 5/- per gallon.

New York.—Messrs GILLESPIE BROS. & Co., December 12, 1913.

CACAO—Caracas, 14¼c. to 15c.; Grenada, 13½c. to 13¾c.; Trinidad, 13¾c. to 14c.; Jamaica, 12½c. to 13½c.
COCO-NUTS—Trinidad and Jamaica, selects, $37·00 to $38·00; culls, $23·00 to $24·00 per M.
COFFEE—Jamaica, 10¼c. to 14½c. per lb.
GINGER—8¾c. to 11¼c. per lb.
GOAT SKINS—Jamaica, 50c.; Antigua and Barbados, 45c. to 48c.; St. Thomas and St. Kitts, 42c. to 45c. per lb.
GRAPE FRUIT—Jamaica, $1·50 to $2·25.
LIMES—$4·00 to $5·00.
MACE—50c. to 54c. per lb.
NUTMEGS—110's, 12c. to 12¼c.
ORANGES—Jamaica, $1·25 to $1·50.
PIMENTO—4c. to 4¼c. per lb.
SUGAR—Centrifugals, 96°, 3·54c. per lb.; Muscovados, 89°, 3·04c.; Molasses, 89°, 2·79c. per lb., all duty paid.

Trinidad.—Messrs. GORDON, GRANT & Co., December 22, 1913.

CACAO—Venezuelan, $14·00; Trinidad, $13·25 to $13·75.
COCO-NUT OIL—$1·00 per Imperial gallon.
COFFEE—Venezuelan, 15c. per lb.
COPRA—$5·25 per 100 lb.
DHAL—$4·75 to $5·00
ONIONS—$2·75 to $3·00 per 100 lb.
PEAS, SPLIT—$5·75 per bag.
POTATOES—English, $1·30 to $1·50 per 100 lb.
RICE—Yellow, $5·10 to $5·60; White, $4·75 to $4·80 per bag.
SUGAR—American crushed, no quotations.

Barbados.—Messrs. JAMES A. LYNCH & Co., Ltd., November 29, 1913; Messrs. T. S. GARRAWAY & Co., November 21, 1913.

ARROWROOT—$5·25 to $6·50 per 100 lb.
CACAO—$13·00 to $14·50 per 100 lb.
COCO-NUTS—$24·00.
HAY—$1·50 to $1·60 per 100 lb.
MANURES—Nitrate of soda, $70·00; Cacao manure, $50·00; Sulphate of ammonia, $82·00 to $85·00 per ton.
MOLASSES—No quotations.
ONIONS—$2·75 to $3·00 per 100 lb.
PEAS, SPLIT—$5·80 to $6·00 per bag of 210 lb.; Canada, $4·00 to $4·50 per bag of 120 lb.
POTATOES—Nova Scotia, $2·50 to $4·00 per 160 lb.
RICE—Ballam, $5·30 to $5·40 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
SUGAR—American granulated, $4·00 per 100 lb.

British Guiana.—Messrs. WIETING & RICHTER, December 20, 1913; Messrs. SANDBACH, PARKER & Co., December 19, 1913.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	$9·00 per barrel of 200 lb.	—·—
BALATA—Venezuela block	No quotation	——
Demerara sheet	65c. per lb.	——
CACAO—Native	14c. per lb.	13c. per lb.
CASSAVA—	60c.	——
CASSAVA STARCH—	——	——
COCO-NUTS—	$16 to $20 per M.	$26 per M.
COFFEE—Creole	15c. per lb.	15c. per lb.
Jamaica and Rio	15½c. per lb.	16½c. per lb.
Liberian	13c. per lb.	14c. per lb.
DHAL—	$4·25 to $4·50 per bag of 168 lb.	$4·75 per bag of 168 lb.
Green Dhal	$5·00	—·—
EDDOES—	$1·32	—·—
MOLASSES—Yellow	None	—·—
ONIONS—Teneriffe	——	—·—
Madeira	8c.	8c.
PEAS—Split	$6·00 per bag (210 lb.)	$7·00 per bag (210 lb.)
Marseilles	——	——
PLANTAINS—	10c. to 16c.	—·—
POTATOES—Nova Scotia	$2·25	$2·40
Lisoon	——	—·—
POTATOES—Sweet, B'bados	$1·44 to $1·68 per bag	—·—
RICE—Ballam	No quotation	—·—
Creole	$4·75 to $5·00	$4·50 to $4·80
TANNIAS—	$1·56	——
YAMS—White	$3·00	——
Buck	$1·92	—·—
SUGAR—Dark crystals	$2·10 to $2·15	$2·00
Yellow	$2·40 to $2·50	$2·40
White	$3·75 to $4·00	$4·00
Molasses	——	——
TIMBER—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M.
,, Cordwood	$1·80 to $2·00 per ton	——

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Printed at Office of *Agricultural Reporter*, 4 High Street, Bridgetown, Barbados.

AGRICULTURAL NEWS

Vol. XIII. No. 306.] SATURDAY, JANUARY 17, 1914. [One penny.

AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW
OF THE
IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

VOL. XIII. No. 306. BARBADOS, JANUARY 17, 1914. PRICE 1*d*.

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The International Spirit in Tropical Agriculture.

ONE of the strongest political arguments in favour of State aid and recognition in scientific research is the circumstance that few things have tended more to bring about an intelligent international understanding than the march of knowledge and its application to the affairs of daily life. The time was when the investigator in any country, or even in any institution of that country might, like the alchemists of old, experiment in the strictest seclusion without thought or regard to external activities. But to-day not only has the scientist to be familiar with the records of previous and contemporary work in his own country, but he must also have at his command the opinions, methods and established results that have arisen in foreign places. This requirement, it can be seen, leads to the systematic perusal of foreign literature, to extensive personal correspondence, and to that which is even more important—international conferences. As a good example of a science which has done a great deal to improve international relationships, we may mention the study of genetics. The study of this subject is not limited by political and geographical barriers, but rather has it a positive influence in the direction of their dissolution. It seeks to eliminate war and disease: it endeavours to create new and improved varieties of plants and animals; and above all, it tries to elevate the human intellect and point of view with the object of eventually establishing a scientific basis for human happiness.

But to come to the more restricted aspect of the subject with which we are immediately concerned, it is obvious that international interchange of ideas and facts in regard to tropical agriculture is a matter of the greatest moment. And just as in general scientific research this interchange is necessary for progress, and is conducive to international gratitude and admiration, so the same thing holds good in agriculture: and perhaps in no other branch of scientific work does there exist more inter-dependence and a better goodwill than in investigation work in the Tropics. The reason for this is partly the outcome of the constitution and extent of the

different territories. Most of the tropical countries are either Colonies or Protectorates, or else Powers (at present) of the lower order, where national and commercial predjudices are not strong. Consequently each one, owing to its weakness, is forced to look to the other for help. There is no central clearing house for knowledge, and a constant minding of each other's business is a necessary condition for progress. It would be an easy matter to enumerate a large number of instances showing how foreign tropical territories have assisted one another, but two or three will suffice in the present connexion.

Reference may be made first to the interchange of information and material between entomologists and between mycologists. Recent progress in connexion with the economic employment of natural enemies of insect pests for example, has been largely dependent upon whole-hearted co-operation between investigators, or rather, one might say, between the Governments of foreign tropical territories. Then, again, with the question of varieties of different tropical crops one country may owe a great deal to another. We may, perhaps, with all due modesty, refer to Louisiana's, and to India's and Queensland's obligations to the West Indies for varieties of sugar-cane; though, on the other hand, the West Indies owe a debt of gratitude to the Southern States of America and to India for a vast amount of information concerning tropical crops. Markets exist for the results of scientific work just as they exist for the results of economic production. Other instances of the same kind of thing are to be seen in the extension to East Africa and America of varieties of Egyptian cotton, and in the example set to the rest of the sugar-cane growing world by Java and Cuba in regard to central factories.

Sometimes where keen competition creeps in one might expect something of an inimical spirit to exist. One might understand, for instance, that Java would not be too ready to instruct India in the management of central factories, because India is Java's great commercial market for refined sugar. Similarly Brazil might be imagined to be somewhat antipathetic towards the Federated Malay States; though as far as is known, even in a severe case of competition as this instance affords, one could scarcely believe that the scientific workers in connexion with rubber in each country would be unkindly disposed towards each other. In this connexion one of the weak points involved in the work of technologists paid by commercial undertakings is brought out. Such investigators, quite apart from any natural desire, are sometimes compelled to conform to the policy of those upon whom they are financially dependent, with a result that Science sometimes suffers.

Taking everything into consideration, however, one must admit that the feeling which exists to-day between scientific workers in different tropical countries is one to be admired and an extremely important factor in the development of the Tropics as a whole. As already mentioned, great benefit accrues in this respect, from international conferences. Most people by now will be aware of the circumstance that the forthcoming International Rubber and Fibres Exhibition and the International Congress of Tropical Agriculture are to be held in London during June this year.

These conferences will be influential not only as a means of distributing facts and ideas, and of providing a means of advertisement. They will be influential as well because they will strengthen the goodwill that already exists amongst that large and increasing number of workers of all nationalities who have sacrificed the academic and social advantages of their native countries, for the purpose of devoting their lives to the development of the farthermost portions of the empire.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture left Barbados by the R. M. S. 'Oruba' on the 11th for Jamaica, for the purpose of conferring with the Government of that Colony on agricultural matters.

Mr. H. A. Ballou, M.Sc., Entomologist on the Staff of the Imperial Department of Agriculture left Barbados on Wednesday, January 14, 1914, by the R. M. S. 'Caraquet' for St. Kitts. Mr. Ballou will later visit Antigua and also Montserrat. In the first two islands the principal object of the visit will be to investigate the damage occasioned by soil-inhabiting grubs; in Montserrat, spraying experiments are to be conducted in connexion with the control of scale insects. Mr. Ballou is expected to leave Montserrat for Barbados on February 9.

Mr. W. Nowell, D.I.C., Mycologist on the Staff of the Imperial Department, left on the same date by the same steamer for St. Lucia. The object of his visit is to report on the prevalence of sugar-cane diseases in the island, and to make a general mycological survey of lime and cacao cultivations. Mr. Nowell is expected to leave St. Lucia for Barbados on January 23.

SUGAR INDUSTRY.

EXPERIMENTS WITH SUGAR-CANE IN PORTO RICO, 1913.

The sugar-cane experiments in this territory have been carried on along the same lines as in 1912. In Bulletin No. 5 of the Experiment Station of the Sugar Producers' Association of Porto Rico, where the results for 1913 are recorded, attention is given first to the manurial trials. It is stated that an average yield of 34·49 tons per acre was obtained from first ratoons by the use of a complete fertilizer, or a gain of 6·08 tons over the non-fertilized areas. The series of tests to find out what effect, if any, manures have upon the purity and quality of the juice gave results which show that neither the kind nor the amount of fertilizer effects the sucrose and purity of the juice to any appreciable extent. It is pointed out that those plantations which are making fertilizer tests can profit by this conclusion, as it will not be necessary nor profitable to make analyses of the different plots. As regards the effects of fertilizers when applied to hill land, the result of two years' work leaves no doubt that fertilizing this class of soil with high-grade chemical manures will pay handsomely. Their use over a period of two years has doubled the yield of cane over the plots not fertilized. Thus, contrary to the general belief, these hill soils respond more readily to manures than do the low lands.

Interesting experiments were made during the past year in connexion with hole *versus* furrow planting. There appears to be no difference in the yield obtained under either system of cultivation, but the advantage of planting in furrows rests in the fact that it is much less expensive, and that future cultivation, irrigation, and fertilization are rendered more simple. The hole system is perfectly adapted to poorly drained land where labour is cheap; but times have changed, labour has become scarcer and higher, and a great deal of land has been put into cultivation where drainage is not the main consideration. Conditions to-day require all work possible to be done by animals and mechanical implements.

The experiments conducted by the Association on the question of distance planting proved not only that close planting results in a large increase of yield, but also indicate the reason for this. Where cane is planted too far apart there is not time the first year for it to stool out sufficiently to cover the ground. There are therefore not enough stalks per acre. The results showed that during both years the weight of cane per acre was to a certain extent proportional to the number of canes produced per acre.

Of considerable interest in the West Indies are the results obtained with seedling varieties. Of those which have given satisfaction, Yellow Caledonia, B.3412, B.376, B.4596, D.117, B.1753, White Transparent and B.1376 may be mentioned. In the selection of seedling varieties an important factor which has to be considered is resistance to the attacks of the white grub and other insects. Some of the British West Indian varieties are useful in this respect. It may be interesting to mention that B.1753 is planted on the limestone soils bordering the hills, and has been found after long trial to be well adapted to this class of soil. Four seedling canes have been very fully tested for two years in the uplands. Of these B.208 came first with 38·4 tons per acre and B.1753 second with 33·8; B.306 was third and D.117 fourth.

In conclusion it should be stated that a large amount of work is now being done in Porto Rico in the matter of raising their own seedling varieties. It has been decided to adopt the letter P to designate all seedlings produced at the Experiment Station, whilst those raised at the Federal Station of Porto Rico will carry the affix PR.

THE MANUFACTURE OF WHITE SUGAR.

Modern white sugar manufacture has as its principal requirement the condition that a perfectly clear and light-coloured juice shall be used as the material for crystallization. As pointed out recently in the *International Sugar Journal* (December 1913), all new methods of juice purification are directed towards this condition. In the application of the single or double carbonatation process the clearness of the thick juice leaves nothing to be desired, but during evaporation the liquid becomes very dark in colour owing to chemical changes between glucose and other chemical substances. It is frequently the case that this difficulty is overcome by the employment of the acid-thin juice process, which was described in the *Agricultural News*, Vol. XII, p. 355; but a useful alteration is the method introduced by Messrs. Gordon of Wallaceburg, Canada, and lately described in the *Louisiana Planter* (December 13, 1913) 'The cane juice coming from the cane mill is run through a heater and brought up to a sufficiently high temperature to coagulate all of the free albumen. The juice thus heated and the free albumen coagulated are then cooled down to a low temperature by a process the reverse of the heating process—the use of a cold water cooler. This seems to be the central idea of this new process: the coagulation of the albumen contained in the juice before liming and then having the juice cooled at once and thus avoiding that inevitable inversion that results in the ordinary method of clarification where lime is introduced into the juice before this coagulation of the albumens has been effected. This process avoids any destruction or elimination of glucose, the glucose going in the molasses, thereby retaining the value of this glucose instead of wasting it. The juice thus cooled is then limed in excess and submitted to the carbonatation process, the lime combining with the organic acids of the juice and thus forming a flocculent neutral juice, which, by the carbonatation process, the carbonic acid combining with the lime, produces flocculent neutral juice, which is reheated and readily passed through filter presses, from which it emerges bright and clear as pale sherry wine, and is ready for evaporation in the multiple effects, and for concentration in the vacuum pan. From this it emerges as pale coloured massecuite, and after centrifugaling emerges as pure white sugar, which when passed through the granulators, receives the final touch that makes the produce pure dry granulated sugars.'

The *Cuba Review* (December 1913) reproduces from the *International Sugar Journal* a portion of H. C. Prinsen Geerling's paper dealing with the distribution of the world's sugar. It will be remembered that British India consumes her own produce together with the greater part of that of Mauritius and one-third of that of Java. The United States complement their own scanty production with that from Cuba, Porto Rico, the Hawaiian Islands and many of the Antilles. China and Japan take their supply from Formosa and to some extent from the Philippines, whilst Australia depends on Fiji, Java, and Mauritius. South Africa uses the sugar produced in Natal and Zululand, together with small amounts from Mozambique and Mauritius.

FRUIT AND FRUIT TREES.

THE MANURING OF COCO-NUTS.

Now that the cultivation of coco-nuts is becoming more intensive and extending to include the better lands, the question of maintaining and improving the fertility of the soil in regard to mineral nutrition is receiving considerable attention. In Tobago, an extensive series of manurial experiments were started in 1911 and the results for one year will be found described in Bulletin No. 71 of the Department of Agriculture, Trinidad and Tobago. The results were not conclusive. It was found that the yields from the various plots on each estate varied largely even in two of the control plots. The opinion was expressed that this might be due to the peculiarities of each individual tree, that is, some trees might be naturally more prolific than others It is held that it is necessary to know the natural yield of the group of trees comprising each plot previous to the application of manures. The Department of Agriculture and Board of Agriculture have accordingly considered it advisable to start new series of experiments, the results of which will be published in due course.

Whereas the experiments in Tobago dealt with above, comprise the application of mineral manures principally, it is important not to forget another and equally important aspect of the subject, namely, the application and effect of natural organic manures. This work has been considered in the Seycheiles. It is stated in the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases* (October 1913) that the quantity of mineral matter removed from the soil by the coco-nut palm is considerable when the fibre and the leaves are not returned. The copra itself represents a very small proportion—only about one-fifth of this quantity. It would seem, therefore, desirable to utilize the leaves and other residues before considering other manures of a mineral nature. By far the most interesting suggestion is the recommendation that green manures (*Tephrosia candida*, etc.) should be planted, and that farmyard manure, and particularly seaweed should be used where possible. In connexion with seaweed it will be useful to bear in mind that another excellent manure for coco-nuts derived from the sea could be obtained by the organization of fisheries. In the West Indian islands, there are extensive coco-nut plantations close enough to the sea to render the collection and transportation of these products of the ocean practicable, and the view may be expressed that it would be extremely useful and important if a series of manurial experiments could be conducted with seaweed and fish in the West Indies, not merely to take into account the increase in the number of nuts produced per lb. of manure applied, but also to involve the commercial possibilities of the idea in its widest aspect.

THE 'GOOTEE' METHOD OF PROPAGATION.

Although the process for propagating plants described below has been employed for ages in India and for a considerable period of time in Australia, there seems to be no harm in calling attention to the operation for the benefit of those readers in the West Indies who may not be familiar with the subject. The information has been obtained from the *Queensland Agricultural Journal* (November 1913), though the original source seems to have been the *Tropical Agriculturist* of Ceylon.

The 'gootee' mode of propagating plants is adopted in the case of trees which are difficult to raise by layering, or which seldom set seed, and also as a means of increasing any tree of special merit, or a part of a tree exhibiting a variation which it is desirable to perpetuate. It is often of special value in the propagation of fruit trees, where it is desired to obtain early-bearing plants. In carrying out the operation, it is necessary to select a firm and healthy branch with well-ripened wood immediately under a leaf bud or node: Take off a small rim of bark about 1 inch wide. To this apply a ball of clay soil, holding it securely together with coir fibre, tow or moss, and bandaging all firmly round the branch.

A little above this is hung a pot, and through the hole in the bottom of this vessel a piece of rope is introduced and a knot is tied at the end of the rope, which should fit tightly against the hole when the rope is drawn through. The cord thus secured by its knotted end in the pot, is carried on at full stretch and coiled round the 'gootee'. By this arrangement the water, with which the pot is kept supplied, oozes slowly out, trickles down the rope and along the coil and so distributes itself over the whole 'gootee'. After three or four months young roots should be seen protrudiog through the binding. At this stage the branch may be cut from the parent tree, and planted where it is intended it should remain. The operation may be carried out best in wet weather, commencing as soon as active growth in the tree begins.

Banana Industry in Cuba.—According to the *Cuba Magazine* (September 1913) the commercial production of bananas in Cuba is not a very profitable business chiefly because of lack of transportation, for in most places there are no cart roads, and the fruit has to be brought to the shipping point on mule back. The exporting season lasts but seven or eight months, during only five of which as a rule can good prices be obtained.

The bananas that Cuba exports go principally to Boston, New York, Philadelphia and Baltimore, these shipments amounting to over 2,500,000 bunches a year. It is observed that the number of saleable bunches per acre varies a great deal, due to soil, rain, care, age of plantation, etc., and ranges from 100 to 200 bunches. Bunches under six 'hands' are not sold for export but are fed to cattle; these amount to about 10 per cent. of the planting.

The establishment of banana plantations goes on in Cuba year after year, but it must be remembered that a large amount of this is for the specific purpose of providing the necessary shade for young coffee and cacao until the latter crops are in bearing.

Horticultural Department, New Delhi.—A communication has recently been received from the above newly established institution asking for assistance in the matter of aiding the development of the horticultural department by means of the presentation of interesting trees, shrubs, and palm seeds. The Gardens of the Department, it is understood, are to form the embryo of the horticultural collections of the new capital of British India, and the department is responsible for the creation of all parks, gardens and open spaces in the capital. It is understood that spacious nurseries are in course of erection and a general call is being made to stock them with interesting and useful species.

It is hoped that those authorities to whose notice this information is brought will endeavour to assist this new Indian establishment as far as it lies in their power to do so.

AGRICULTURE AND ELECTRICITY.

EXPERIMENTS WITH THE SOIL, PLANTS AND ANIMALS.

A short time ago an account was published in this journal of the results of Professor Priestley's experiments with electricity on the stimulation of plant growth in the field In continuation of the subject, quite recently, a very interesting paper on electro-agriculture has been read by Mr. T Thorne Baker, A.M I.E.E, F.C.S., and published in the *Journal of the Royal Society of Arts* (December 12, 1913). The first part of this paper deals more particularly with the various means of producing different types of electric current—a technical matter with which the agriculturist is only indirectly concerned. In dealing with the subject, therefore, in the present article, consideration will be given only to the actual results obtained as regards the effect of currents upon the objects dealt with.

It will be interesting to record first, the fact that a plant when alive is a feeble generator of electricity, and if its upper extremities be connected by a conductor through a sensitive electrometer to the roots, an electric current, generated by the live processes going on within the plant will be indicated by the instrument. In this connexion it may be pointed out parenthetically, that these currents are exceedingly minute, and that one of the most essential things in successful electro-agriculture is to employ minute currents or minute amounts of electro-energy comparable with those at work in nature.

The way in which atmospheric electricity passes into the plant appears to be mainly by means of the hairs, each hair acting as a miniature lightening conductor. The effect of electrification may be due to several things. It may cause a contraction in the capillary tubes of the plant stems, which would increase capillary attraction and cause a quicker and more ready rise upwards of the natural juices. The electrical stimulus may possibly assist also some of the enzymic actions taking place during plant nutrition. In considering these matters it is necessary to bear in mind the kind of current that one is working with. A number of experiments made with bacteria, ferments, moulds and other micro-organisms have led investigators to the conclusion that almost every individual plant or organism requires its own particular type of electricity if the best results are to be obtained.

In the discussion following the reading of the paper under consideration, Mr. Newman, Sir Oliver Lodge's collaborator in electro-agricultural research, also dwelt upon the importance of this matter. It would seem that the effect of high frequency currents on plants themselves differs very much from that of high tension continuous currents, though it is probable that both may have a useful effect.

Turning to a consideration of some of the uses to which what is called an 'effluve' discharge has been put, reference may be made to the electro-treatment of fungus diseases. As an example of such treatment, the red variety of the American gooseberry blight was treated with an effluve discharge, but was not killed by it; on first spraying the blight, however, with a weak solution of a soluble sulphide, and then playing on it with a high frequency effluve, ionization of the sulphide was effected, and the nascent sulphur killed the blight organism. Another interesting application of the effluve discharge has been to cheese mites. These little organisms infect the rind of certain cheeses and eventually the inside of the cheese; but the destruction can be stopped owing to the fact that the little animals can be readily electrocuted. By attaching a brush of fine silver hairs in an ebonite handle to the high frequency apparatus, and brushing over the surface of the cheese with it, the surface-organisms are destroyed It is noteworthy that in this instance, again, the kind of current makes a difference, for it was found that one type of effluve discharge not only did not kill the mites but actually invigorated them. Similar experience has been met with in the electro-treatment of fungus diseases of fishes.

The closely related problem of the application of radio-activity to plant growth possesses features of perhaps greater promise than electrical discharges, particularly in relation to the soil. As regards the source of the radio-active material, it may be mentioned that in the preparation of radium there is a large amount of residual waste, which may contain anything up to 1 or 2 milligrammes of radium per ton; and this practically inactive material mixed with many times its own weight of ordinary soil has been found to produce very marked results. The author of the paper under consideration found that cress plants grown on radio-active soil were each 7 to 10 per cent. heavier than the plants grown on ordinary soil. With radishes the result was nothing less than extraordinary, the growth being about three times more rapid. Radium also has a stimulating effect upon germination. Experiments with wheat gave equally favourable results, though it must be remembered that the experiments lately conducted in England with the assistance of the Board of Agriculture gave an increase of 27 per cent. in one year and only 3 per cent. in the next. This renders it necessary to reflect upon whether radio-active substances will be quite so beneficial as Mr. Baker hopes. One thing is certain, that there are now comparatively large sources of radio-active material, chiefly carnatite, to afford an ample supply for purposes of agriculture in the future.

To come now to some practical experiments in the application of an electric stimulus to animal life, it will be seen that in one direction certainly there is great promise of economic success. Young chickens hatched in incubators can be grown under electric stimulus at about double the rate, thus doubling the out-put of a chicken farm and halving the food bill per chicken. But what is of far more importance from an economic standpoint is the decrease of the death roll during the first few days after hatching. In the summer months, under normal conditions, the mortality is often as much as 50 per cent. This disastrous dying off is practically non-existent where suitable electrification is used. In the experiments, the chickens were kept in a chicken house which was electrified by a large helix of heavily insulated wire wound round it in turns about 6 inches apart. The current was applied for ten minutes every hour during the day. There was only a mortality of 1·5 per cent. and as much as 35 per cent. increase in weight of the electrified chickens after three months. The vitality of the treated birds is reported to be remarkable. In the words of the author: 'instead of running away when one puts one's finger to the netting, they will rush up and peck vigorously. During the treatment they are so highly charged with electricity that quite a distinct shock is felt in the fingers on touching them, although the birds themselves are unconscious of anything. The sparks which fly from their beaks on their pecking one's finger do not appear to be felt in the least by them.' It must be borne in mind, however, that too strong or too frequent application is liable to have a harmful rather than a stimulating action.

COTTON.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date December 29, with reference to the sales of West Indian Sea Island cotton:—

Since we last wrote, you about 120 bales of West Indian Sea Island cotton have been sold, chiefly Montserrat 16½*d.* to 18*d.*, Nevis and St. Kitts 18*d.* to 20*d.*, Barbados 16¾*d.* to 19*d.* with some Stains at 9½*d.* to 10*d.* The market remains steady.

The demand continues to run upon the finest qualities, the lower grades being seldom enquired for.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending December 20, is as follows:—

The demand has continued throughout the week for the limited offerings of Extra Fine and Extra Fine off in colour to be found in the daily receipts and this demand is not yet satisfied. There was also a good demand for Fine to Fully Fine off in colour, and Fine at prices ranging from 18c. to 20c., taking such lots as Factors were willing to sell, resulting in sales of about 500 bales.

For Fully Fine there are apparently no orders in the market. The unsold stock of this quality is large and Factors would make some concessions in price to dispose of quantity, wishing to sell before the holidays.

There has been some inquiry for the Planters' Crop Lots, but no sales have been reported

We quote, viz.,

Extra Fine	26c.	= 14¾*d.*	c.i.f., & 5 per cent.
Fully Fine	23½c.	= 13¼*d.*	,, ,, ,, ,,
Fine	20c. to 22c.	= 11¾*d.* to 12¾*d.*	,, ,, ,, ,,
Fully Fine off in preparation	20c.	= 11¾*d.*	,, ,, ,, ,,

This report shows that the total exports of Sea Island cotton from the United States to Liverpool, Manchester and Havre, up to December 20, 1913, were 2,787 bales, 4,571 bales, and 2,729 bales, respectively.

CONTROLLING THE FORMATION OF COTTON BRANCHES.

There appears in *Circular* No. 115 of the Bureau of Plant Industry, United States Department of Agriculture, a paper by O. S. Cook entitled, The New System of Cotton Culture. This system is based on the application of the principle that the control of the vegetative branches of the cotton plant depends largely upon the methods of thinning. The formation of vegetative branches can be arrested by leaving the plants closer together during the early stages, until the stalks have grown beyond the stage where vegetative branches are produced. The essential feature of the new system is later and more gradual thinning. This makes it possible to leave more plants in the rows than is at present customary. The control or suppression of the vegetative branches allows of an earlier development of fruiting branches and leads to the production of an earlier crop. As regards the results which have been obtained in practice with this system, it may be mentioned that in a field of Durango cotton that was thinned in the usual manner to ordinary distances, the yield, on an average, was at the rate of 909 lb. of seed cotton per acre; whereas alternate rows that were thinned late and left with the plants closer together yielded at the rate of 1,391 lb., per acre, or about 53 per cent. higher than the others. The rate of flowering is also increased by the new system. It is interesting to note that many of the plants in the hedge-formed rows—characteristic of the system - possess no vegetative branches at all.

AGRICULTURAL ENGINEERING.

MECHANICAL CULTIVATION OF RICE.

An abstract appears in the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases* (August 1913) which seems to show that the mechanical cultivation of rice yields positive results of considerable importance. The experiments on which the information is based were conducted by the Indo-Chinese Rice Growing Association along the following lines: The seed was sown by a small hand-sower which proved to be a superior method to the transplanting system of the native cultivator. By means of the hand-sower 0·6 acre can be sown in one day and the rice is distributed in small holes in rows 12 to 16 inches apart and 14 inches apart in the rows. The superiority of the machine-sown grain was soon demonstrated, though the necessity for sowing on clean land became evident, as hoeing was a difficult process on the submerged soil. The sown crop came into ear earlier and gave a better promise of yield than that planted in the native style.

The crop was harvested in two different ways in order to compare the results obtained by transplanting and direct sowing. (1) A reaper and binder was used to collect the crops sown or transplanted on 1 hectare (2·47 acres) of ploughed land which was harvested by hand. The largest yield, namely 1 ton 16½ cwt. per acre was obtained in the case of the rice sown on ploughed land, as against 1 ton 3½ cwt of rice transplanted on ploughed land.

Trials were made with a mechanical reaper, but it is believed that really satisfactory results will not be obtained before botanical selection has established a variety with a rigid straw.

ANOTHER MOTOR PLOUGH COMPETITION.

Some time ago in this journal considerable prominence was given to the subject of motor cultivation, and in continuation of the articles referred to, the results of a recent motor plough competition at Konigsburg, published in the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases* (October 1913) will be of interest.

The motor ploughs, thanks to the very favourable soil conditions, worked well. The Stock machine did best, completing 1·73 acres in an hour, compared with 1·36 acres ploughed in an hour by the Ihace motor plough, and 1·11 acres by the Wede machine. The cost of the Stock plough without reversing gear is £833; with it £882. Readers of the *Agricultural News* will remember that a full description of the Stock plough was given some time ago, when the importance of this reversing arrangement was very definitely pointed out. The Ihace motor plough costs £1,127, and is, of course, a much larger machine than the one just referred to. Its breadth of work, for instance, is 7 feet 9 inches, compared with 6 feet 7 inches in the case of the Stock machine.

LIVE STOCK NOTES.

THE CONTROL OF CARRIERS OF DISEASE.

In the eradication of disease, particularly trypanosome diseases, it is imperative to locate the guilty insect carrier before preventive measures can be satisfactorily undertaken. In the case of a disease like surrah, recent work in the Philippines has brought out several interesting features. It was the first thought that blood-sucking insects like *Stomoxys calcitrans* might be the agent of transmission, but results showed that this fly must be regarded as practically a negative factor. Experiments with *Tobanus striatus*, however, have yielded positive results, and it is now known that this common horse fly of the Philippines is a carrier of surrah. In regard to the two insects just mentioned, it may be pointed out that *Stomoxys calcitrans* occurs in the West Indian islands, but *Tobanus striatus* does not; there is one species of Tobanus recorded in these islands, however.

It may be of interest to note parenthetically for those who are not acquainted with these insects, that *Stomoxys calcitrans* is a small fly not unlike the common house fly, whereas the Tobanidae are generally larger, and have a remarkably wide head as a characteristic morphological feature.

Work in other countries besides the Philippines has given rise to evidence which incriminates the house fly as a very general carrier of surrah. It has been ascertained that a species of the Tobanidae in northern Africa is a carrier of Trypanomiasis whilst Tobanus has also been proved experimentally to beone of the carriers of surrah in India and in the Federated Malay States.

Of extreme importance in connexion with the spread of surrah is the predilection of blood-sucking flies for particular hosts. It has been established that if suspected flies are not attracted by the infected hosts disease does not result. The attraction, for instance, may take the form of colour, odour, and degree of temperature. In the matter of colour, certain flies are attracted towards white, but most species are attracted by dark animals. The relation of temperature to parasitism is believed to be of some economic importance, although thus far the matter is rather in the theoretical stage. It has been experimentally demonstrated by Howlett in India that mosquitoes are positively attracted by a temperature higher than the normal. This theory may be extended to the blood-sucking flies generally. Other things being equal, the parasites are attracted towards an animal of high temperature. It has even been asserted in all seriousness by Grassi, the Italian expert on mosquitoes, that these insects are attracted to persons who talk a great deal.

In the matter of the destruction of horse flies, insecticides have been used but these have not proved as satisfactory as the measures which have been exerted in relation to the aquatic habits of Tobanus. Petroleum has been employed for spraying on the surface of stagnant water over which Tobanus eggs are layed so that the larvae when they hatch must pass through the film of oil. In the Philippines blood-sucking flies are generally trapped and collected.

Animals at work or at pasture may be protected from blood-sucking flies by a protective wash. Sores and skin abrasions of all sorts should be kept covered with tar or some other antiseptic greasy substance, disagreeable to flies both of the blood-sucking and biting species.

The last point of interest to which attention will be called is the influence of light intensity upon the presence of these flies. The influence of a dark stable is quite marked in reducing the number of species of flies which obtain access to draft animals. It is recommended that the animals' sheds be constructed with the roof as low as the height of the animals will permit. This can be done without interfering with the supply of fresh air.

Further information in connexion with the matters dealt with above may be obtained by referring to the *Philippine Agricultural Review* (Vol. VI, No. 8) from which most of the foregoing facts have been extracted.

COTTON-SEED MEAL POISONING: IRON AS AN ANTIDOTE.

The following note is taken from the *Experiment Station Record*, Vol. XXIX, No. 5:—

In the course of experiments continuing work previously noted (*E.S.R.* 29, p. 76), the authors were led to the hypothesis that the toxic principle of cotton-seed meal was a constituent group of the protein molecule containing loosely bound sulphur which exerted its toxic effect upon the iron of the blood. Experiments already performed as bearing on this hypothesis will be published in a later paper, and the present paper deals principally with the efficiency of iron as an antidote for cotton-seed meal poisoning. The iron was fed in the form of citrate of iron and ammonia.

Comparing the results obtained with the feed, it was found that the iron fed rabbits consumed nearly 5 times the amount of meal which proved fatal to the average rabbit without iron, and more than twice as much as the greatest amount of meal necessary to kill the rabbit which ate the most meal; that the iron-fed rabbits have survived more than 3 times as long as the average rabbit without iron, and nearly twice as long as the hardiest rabbit; that every rabbit fed with iron and meal gained in weight and each rabbit fed with meal without iron lost in weight.

Each of the 22 rabbits receiving cotton-seed meal without iron died (average, 13 days), while each of the 11 rabbits taking iron with cotton-seed meal survived.

PREVENTION OF CONTAGIOUS ABORTION.

Practically the only method of coping with this serious disease is through prevention. No medicinal treatment has thus far been discovered for the cure of the disease, and the best methods of disinfection known to science are required to eradicate it from a herd. According to *Circular* No. 216, Bureau of Animal Industry, United States Department of Agriculture, as soon as an an animal has aborted, the fetus and membranes should be immediately carried away and destroyed by either burning or by deep burial after covering with lime, as the abortion bacilli are extremely numerous in these tissues. The after-birth, which is retained in most abortions occurring during the later months of pregnancy, should be removed within a few days. If it does not come away readily, it should not be forcibly removed, but the uterus should be irrigated with a gallon or two of a warm disinfectant solution twice daily.

It is not advisable to breed a cow for at least two months after she has aborted, and not even then if the discharge has not ceased. Every care should be taken to prevent the bull from carrying the infection from a diseased to a healthy cow by the systematic application of disinfectants. Care must also be taken to disinfect thoroughly, cattle sheds and yards, together with all implements used in connexion with milking.

EDITORIAL NOTICES

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

Local Agents: Advocate Co., Ltd., Broad St., Bridgetown. *London Agents*: Messrs. Dulau & Co., 37, Soho Square, W.; West India Committee, Seething Lane, E.C. The complete list of Agents will be found on page 3 of the cover.

The *Agricultural News:* Price 1*d.* per number, post free 2*d.* Annual subscription payable to Agents, 22*s. d.* Post free, 4*s.* 4*d.*

Agricultural News

VOL. XIII. SATURDAY, JANUARY 17, 1914. No 306.

NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number deals with international spirit in tropical agriculture. The subject has several points of interest at the present time owing to the forthcoming International Conferences to be held in London early this year.

The subject of manuring coco-nuts is discussed on page 20. Reference is made to the utilization of seaweed and fish.

The question of the application of electricity to agriculture is dealt with at considerable length on page 21, where experiments with soil, plants and animals will be found concisely described.

In this issue, Agricultural Engineering Notes appear on page 22.

Live Stock Notes will be found on page 23.

As is the usual custom at this time of year, summaries of entomological and mycological information presented in this journal during the previous twelve months have been prepared. These will be found on pages 26 and 30, respectively.

An interesting article dealing with the use of dynamite on rubber estates will be found on page 31.

The External Work of the Imperial Department of Agriculture.

Compared with many other departments, the Imperial Department of Agriculture for the West Indies is somewhat peculiarly situated inasmuch as its influence extends almost entirely to places separated from it by the sea. This has, in certain cases, led to the impression that the work is principally of a bureaucratic nature; whereas the fact is, a considerable amount of time and energy is expended in keeping up a close personal contact with the various experiment stations in islands other than Barbados under the advisory influence of the Head Office.

An example of this side of the department's activity is afforded by the recent tour of the Commissioner of Agriculture to St. Vincent and Antigua, and by the one now being made to Jamaica. Such visits afford opportunities for addressing the various organizations and societies, and of pointing out matters which, though they may appear strikingly to the visitor, may pass unnoticed to the resident.

In the last issue of this journal an account was given of Dr. Watts's address before the Antigua Onion Growers' Association. At the time of this visit the Commissioner also had the pleasure of addressing a general meeting of the Agricultural and Commercial Society, and of ranging over the principal industries and pointing out any special features which appeared to him to call for attention. Amongst the points dealt with in this address were the effect of drought upon the composition of sugar-cane and the consequent influence upon milling results; reference was made also to the syrup *versus* muscovado question, as well as to matters connected with the selection and sanitary control of the cotton plant.

In St. Vincent an opportunity offered itself for addressing a meeting on the subject of agricultural education, and although the greater part of the audience were juveniles, the address was, according to the St. Vincent *Sentry*, instructive and weighty, and left the hearers both old and young greatly indebted.

It is hardly necessary to point out that similar visits made by the Entomologist, Mycologist and Veterinary Officer have in their more restricted, yet equally important ways, similar good influences upon general agricultural progress. Careful inspections are made of estates; societies are addressed, and technical advice given to planters who are desirous of receiving it. At the same time from the purely scientific aspect such intermittent contact with the actual field of investigation is not conducive to the carrying on of systematic study along a single line; hence it is found that one of the main objects of the travelling officers is to inspect, advise and, if practicable, to direct local experiments with the object of rendering more complete the investigation of the cause of any disease, in the laboratories of the Head Office. The great value of this sort of collaboration cannot be over-estimated. Field problems cannot be tackled in the laboratory alone, any more than economic and commercial affairs that necessitate live discussion can be carried to a successful conclusion by the mere stroke of the administrative pen.

Survey of Grenada Soils.

As was mentioned in the recently issued report on the Agricultural Department of Grenada, an important line of work that is being carried on in the Government Laboratory is a survey of the soil in the different districts of the Colony. A very interesting preliminary report on this work has recently been received from the Superintendent of Agriculture (Mr. G. G. Auchinleck, B.Sc.), and the following points of interest are herewith extracted.

Samples were taken in seventeen different districts of the island and examined physically. As regards the soil of Good Hope estate, three interesting sections were found to lie on the boundary line between the extensive ash and gravel deposits which form the whole coastal belt of the island and central red larval soils. A point of interest in connexion with the true red soils of this district is that here and there occur numerous spherical particles, which on examination appear to be composed of oxides of alumina and iron with probably an admixture of organic matter. In character they seem to resemble bog-iron-ore and they probably point to the necessity of drainage and to the existence of an excess of iron. On such soils an application of superphosphate would probably be wasted unless preceded by large doses of lime.

An interesting class of soil found in Grenada is the black ash soil, which is for the most part composed of fine compacted volcanic ash, and is by reputation exceedingly difficult to work. Mr. Auchinleck considers that this bad reputation has been enhanced by the severe annual droughts which they undergo and is not due primarily to any abnormality in their physical composition.

The Teaching in a College of Tropical Agriculture.

Since the University of the Philippines has for some years possessed a College of Tropical Agriculture, and since outside India this is the only one existing in the Tropics, the Dean of the College, Dr. Copeland, is obviously in a position to proffer valuable advice and information which could otherwise be obtained only as the result of costly experience. In a letter to the Director of Agriculture, Ceylon (published in the *Tropical Agriculturist* for November 1913), Dr. Copeland, after pointing out the great need for a college in the British Tropics, situated preferably in Ceylon, proceeds to put forward interesting and practical suggestions as to teaching and teachers. 'I do not believe it is practically possible to teach tropical crops in groups as is usually done with the crops of temperate countries, that is as cereals, fruits, trees, etc. The staple tropical crops, such as sugar, tobacco, rice, coco-nut, coffee, cacao, etc., are in every respect so distinct that they can surely best be handled independently of one another.'

The fibre plants, for instance, at the Philippine College, are grouped to constitute a course, for crops like cotton, jute and ramie have essentially nothing in common, and each can best be taken up and settled by itself. At Manila it has been found further, that coco-nut and abaca are quite enough to keep one lecturer very fully occupied. Again, sugar machinery is a subject in itself, and the Philippine College has sent a lecturer to America for a year in order to specialize in this branch. The opinion is expressed that, for teaching purposes, chemistry and bacteriology should be combined. As regards botany, Dr. Copeland strongly emphasizes the great educational value of plant physiology as the basic science in agriculture rather than mycology.

Third International Congress of Tropical Agriculture.

The following extracts are reproduced from the Preliminary General Circular received from the Imperial Institute, in connexion with the above Congress which will be held in June 1914, and may be represented by all countries interested in tropical agriculture and forestry. The Association has requested the committee of the British section, whose headquarters are at the Imperial Institute, to make the necessary arrangements for the meeting, in co-operation with the Bureau of the International Association in Paris.

The Congress will open on Tuesday, June 23, and close on Tuesday, June 30, 1914. As regards the order of business, the morning sittings (10 a.m. to 1 p.m.) will be reserved for papers and discussions on subjects of general importance, each morning being devoted to a single subject: the afternoon sittings (3 to 5 p.m.) will be reserved for papers and discussions on special subjects.

The following subjects are suggested for papers and discussion at the morning meetings: technical education and research in tropical agriculture: labour organization and supply in tropical countries: scientific problems of rubber production; methods of developing cotton cultivation in new countries; problems of fibre production; agricultural credit banks; agriculture in arid regions; problems in tropical hygiene and preventive medicine.

Papers for the afternoon meetings are invited on the following problems relating to tropical agriculture and forestry: the cultivation and production of rubber, cotton and fibres, cereals and other foodstuffs, tobacco, tea, coco-nuts, other agricultural products, forest products; and plant diseases and pests affecting tropical agriculture.

In connexion with the list just given the somewhat remarkable circumstance may be commented upon that sugar by some oversight has been altogether omitted.

The subscription for membership of the Congress will be £1, entitling members to admission to all meetings and receptions, and to receive the volume of printed papers and discussions, on publication.

All correspondence relating to the communication of papers and the arrangements for the Congress should be addressed to the Organizing Secretaries, Third International Congress of Tropical Agriculture, Imperial Institute, London, S.W.

INSECT NOTES.

SUMMARY OF ENTOMOLOGICAL INFORMATION IN THE YEAR 1913.

For several years now it has been customary to present, in an early number of each volume of the *Agricultural News*, a brief review of the main facts of the entomological information which appeared in the Insect Notes during the previous year. Such a summary for 1912 was given at pages 26 and 42, Vol. XII; that for 1913 is given herewith.

During the year under review the reports of the Department of Agriculture in Barbados (p. 58), British Guiana (pp. 266 and 282), and St. Croix (pp. 362 and 378) have been reviewed, as has also the report of Mr. Bodkin, Economic Biologist, British Guiana, on his visit to the United States under the provision of the Carnegie Scholarship Fund (pp. 346 and 362).

Accounts were given for the first time in Vol. XII of two insect pests which seemed to have very considerable possibilities in the direction of doing damage. These were the lime twig borer (*Elaphidion mite*), which at the end of 1912 appeared as pests of limes in Antigua, and a small moth not yet determined, the larva of which injures oranges in Dominica. Other insect pests recorded in the West Indies during the year were those to which reference has been made previously.

A series of articles, six in number, entitled Root Borers and Other Grubs in West Indian Soils presented information calculated to arouse interest in soil-inhabiting grubs, and to result in increased information in regard to these important and little-known insects. These articles were reproduced, with only slight changes in the text, but with the addition of a good series of photographs, in the form of a Pamphlet issued as No. 73, of the series published by the Imperial Department of Agriculture.

In the case of most of the pests of the year it may be convenient to refer to them under crop headings.

SUGAR.

In Barbados (see p. 58) the root borer (*Diaprepes abbreviatus*) continued to be the principal pest of sugar-cane. This insect is abundant only on a restricted area in that island, but causes serious injury year after year. The need of concerted action in carrying out a course of remedial practice by all planters in the infested area is strongly emphasized. A small mite (*Tarsonemis spinipes*) is recorded as causing 'rust' areas on the sugar-cane stalk. The nature and extent of the injury caused by this mite do not appear to be known. It is stated to be controlled by the larva of a Staphylinid beetle.

In British Guiana, on one group of estates (pp. 266 and 282) the systematic campaign was still being carried on against the giant moth borer (*Castnia licus*), the collections of the adults, larvae and pupae reaching enormous figures, with a consequent improvement in the condition of the cane fields.

The collection of eggs of the moth borer (*Diatraea* spp.) still continues and is believed to yield good results. These insects, the small moth borers, are considered to be the most serious pest in British Guiana.

Termites come next in importance to the Diatraea borers. The nature of the attack in the case of the British Guiana termites is different from that experienced in St. Kitts (refer to Vol. XI, p. 282). Flooding the field is efficacious wherever practicable as a method of control, and destruction of nests is recommended as worthy of constant practice. Suggestions are made as to the value of natural enemies, the importance of cane selection and improved estate practice, especially the reduction of the amount of ratooning.

In St. Croix (D.W.I.) (p. 378) the most important insect pest of sugar-cane was the rhinoceros beetle (*Strategus titanus*). A simple and efficient remedy, however, seems to have been devised by the Director of the Department of Agriculture. This consists of a mixture of megass (100 lb.) and Paris green (3 lb.) thoroughly mixed together and used as a poison bait. The rhinoceros beetle being a scavenger eats the poison bait readily and is killed by it. This is another instance of an insect, originally harmless in its habits, becoming a pest under changed conditions. A root borer grub (see p. 394) similar to that in Barbados is known to occur in St. Croix.

Mention is made of sugar-cane pests in the United States by the Government Biologist of British Guiana (see p. 346) who visited that country as a Carnegie scholar under the direction of the Imperial Bureau of Entomology. The attacks of sugar-cane pests were less than in British Guiana. The insects were for the most part the same as or similar to those of the West Indies. The Argentine ant (*Iridomyrmex humilis*), which is a serious pest in the southern part of the United States, does not occur in the West Indies or British Guiana.

The sugar-cane insect pests in Porto Rico were referred to in the same report (p. 346). They are much the same as the ordinary West Indian pests.

Under the title Sugar-cane Pests in Queensland (p. 330) will be found a review of a Bulletin on the Cultivation of Cane upon old Lands, in which cultural methods of dealing with sugar-cane pests are discussed. Under the title Insects Liable to Dissemination in Shipments of Sugar-cane (see p. 205), Circular No. 165 of the Bureau of Entomology, of the United States Department of Agriculture is reviewed. These insects are divided into groups such as moth borers, weevil borers, scale insects and mealy-bugs, soil-inhabiting grubs and other pests, of which the chief are the leaf-hoppers.

The soil-inhabiting grubs including root borers and hard backs were discussed in the series of Insect Notes already mentioned, which appeared at pp. 106, 122, 108, 154, 170, and 186, and as Pamphlet No. 73. Many of the insects dealt with in these notes were pests of sugar-cane.

In Trinidad, the froghopper (*Tomaspis varia*) continued to be a serious pest during 1913. The newly discovered parasites were noted, the use of nitrolim as a fertilizer and insecticide, and of kerosene emulsion and the green Muscardine fungus as insecticides for the control of this pest were mentioned on page 234; while on page 362 further reference was made to the value of the green Muscardine fungus.

This account will be continued in the next issue of the *Agricultural News*.

NOTES ON THE SILKWORM INDUSTRY.

During the past year an attempt has been made to encourage a trial of the silk industry in the West Indies. Eggs of a good strain of Italian (Milanese) silkworm were procured through the kindness of Mr. J. Henry Watson, Manchester, England, and these were received in Barbados on May 5, 1912. It may be noted here that at the time of

their arrival many of them had hatched and others were hatching. No notice had been received that these eggs were coming, and unfortunately no mulberry tree was in the right condition of leaf: in consequence of the long drought all the leaves were hard and dry. By the exercise of much care in feeding and in developing young leaves by pruning and watering the mulberry plants, a few (fifty-six) of the caterpillars successfully completed their growth and became adult, that is, they changed to moths. The male and female moths mated vigorously and several egg clusters were produced but none of the eggs have hatched. It is expected that another trial lot of eggs will be received soon and a further attempt will be made to procure a sufficient number of fertile eggs for distribution. By comparison with the dates given below it will be seen that the life-cycle occupied a shorter period than that given for Cyprus, the larval stage being completed in from twenty-five to thirty days, and that of the pupa in from ten to twelve days; egg-laying began in thirty-seven days from the date of the previous hatching.

In Cyprus, according to the *Cyprus Journal* (October 1913), organized efforts are being made to keep the industry there up to the mark. Breeding experiments have been made with Japanese seed, Broussa seed (white) and Broussa seed (yellow). In the case of the first variety, the eggs hatched out on March 25, 1913, and the moulting ended on May 16, 1913. In the case of the Broussa seed, hatching commenced on April 7, 1913, and ended on May 27, 1913: whilst with the yellow seed, hatching began on April 6, 1913. Fifteen thousand moths which emerged from the Broussa cocoons were females and 14,000 were males. On an average, eighty moths produced one box of seed weighing 1 oz. The article under consideration makes some reference to hygienic conditions, and to the crossing of the varieties. In regard to crossing, one male Japanese was coupled with a female (white) of Broussa. The eggs from this pair will be reared experimentally next season in order to see if medium-sized cocoons can be obtained, having a market in Cyprus. It is expected that the Broussa race will give a good size of cocoons, and the Japanese a good quality of silk.

Those interested in the scientific aspect of silkworm rearing should refer to the monograph by Professor Vernon L. Kellogg of Leland Standford Junior University. In the summary of results and conclusions Professor Kellogg's last statement is that a scientific study of silkworms can be of service in commercial silk culture. Quantity and quality of silk, subsidiary larval markings, winged pattern and winged variations, and the degree of adhesiveness of eggs are all fluctuating, non-alternative characters. Double cocoons is a phenomenon determined by ontogenetic circumstances. Crowding is not the causal circumstance. Fertility is not affected by the age of the egg cells, but seems to be unfavourably affected by the age of the spermatozoa. Old spermatozoa seem less potent than younger ones.

Those who are concerned with the silkworm industry itself will be interested to learn that, according to *The Board of Trade Journal* (December 11, 1913), the cultivation of silkworms and the production of cocoons continue to decrease in France, thereby rendering, at least to some extent, the conditions more favourable for progress in the West Indies.

During 1913 the number of breeders decreased in France from 99,360 in 1912, to 90,517 in 1913; whilst the production of cocoons during 1912 amounted to only 4,417,426 kilogs., valued at 15,635,378 francs, as against 6,278,504 kilogs. last year, valued at 16,044,371 francs. (1 kilog. = 2·2lb.; 25 francs = £1.)

RUBBER INDUSTRY.

REPORT OF THE STANDARDIZATION COMMITTEE.

The appearance of this report marks one of the most important stages in the recent movement towards the organization of the plantation rubber industry. A full account of the report is published in the *India Rubber Journal* (December 13, 1913), and the following essential points contained therein have been abstracted for the benefit of readers of the *Agricultural News*.

The summary of the recommendations shows that the Committee propose to establish a central testing station, which shall examine and issue a certificate of quality corresponding to every ½-ton of rubber delivered from abroad. It is suggested that these tests shall include a determination of vulcanizing capacity (rate of cure); tests on the vulcanized product for the purpose of determining tensile properties, physical condition and stability.

In addition to the testing station, the Committee recommend the equipment of an experimental factory. This part of the institution would undertake to advise regarding mixing, processes, etc., and the best type of plantation rubber for specific purposes. The factory would also give its attention to the introduction of new uses for plantation rubber, besides providing the organization for bringing before the trade the results of technological research. It is expected, too, that steps will be taken to improve and standardize methods on the plantations themselves.

In the words of the Committee's report: 'We are strongly of opinion that the introduction of a system of testing which would clearly indicate quality to the buyer and value to the seller, would result in a material appreciation of prices all round compared with prices for finest grades of wild rubbers.'

As regards the starting and the management of the concern, the Committee recommend that a limited liability company be formed with a nominal capital of £50,000, with a first issue of, say, £20,000 in shares of £1 each. Each rubber company (including continental companies) or individuals desiring to sell rubber under the testing station certificate, should be shareholders of the company. It is estimated that the cost of testing 1 lb. of rubber in the first year with a tonnage to be reported on of 30,000, would be 0·103*d*. In subsequent years this cost for the same amount of rubber, and including both testing station and factory examinations, would drop to as low as 0·046*d*. per lb.

It is suggested that the Bureau should be placed in charge of a consulting technologist, who shall be responsible to a Board appointed by the Rubber Growers' Association.

In connexion with the present production of plantation rubber, it may not be without interest to give a brief account of the distribution of the plantations in the East. At present the Federated Malay States come first with 700,000 acres; Ceylon with 250,000 acres; then Sumatra with 230,000 acres; followed by Java with 200,000 acres; South India with 60,000 acres; North Borneo with 60,000 acres; Burma with 30,000 acres; and French Cochin China with 30,000. It is worthy of note that the port of Singapore occupies a very central geograpical position in regard to plantation Para rubber, being as it were, within touch of some 1,500,000 acres Singapore has undoubtedly a great future before it. (*India Rubber World.*)

GLEANINGS.

The total rainfall in Dominica (Roseau) for 1913 was 69·9 inches, which is 7·60 inches below the average annual rainfall for twenty-one years.

As was prophesied sometime ago in the *Agricultural News*, some dynamite demonstrations with the soil have recently been conducted in Antigua. A full report on these trials will be given at a later date.

A leading article in the *Port-of-Spain Gazette* (December 14, 1913) draws attention to the perfunctory support of the Agricultural College Scheme in that island, and also the lassitude shown in the matter of the establishment of agricultural banks.

From the Antigua Botanic Station there were distributed during December: limes 2,625; onion plants 4,000; miscellaneous economic plants 455; miscellaneous decorative plants 185; seed coco-nuts 1,200; sweet potato cuttings 500; cane plants 14,622.

It is stated in the Trinidad *Mirror* (September 15, 1913), that Crown lands for rice growing will be sold in plots of 2 acres each. It is regarded as a matter of satisfaction that it has been resolved definitely to sell these lands under such conditions.

A very interesting article by Dr. Crosse, appears in the *Louisiana Planter* (December 6, 1913), dealing with the chemical aspects of clarification. Numerous equations are given showing the chemical changes which take place during carbonatation and sulphitation.

According to *The Board of Trade Journal* (December 4, 1914) it is intended in the Central Provinces of India to erect appliances for the production of flour from bananas or plantains. The promoter of this scheme wishes to communicate with firms which make the appliances.

A tentative estimate of the world's rice production this year ranges from 175,000,000,000 to 190,000,000,000 lb. 90 per cent. of which is produced in Asiatic territory, where it comprises the principal crop of nearly half of the world's population. (*Louisiana Planter*, for November 29, 1913.)

An Ordinance has been drafted by the Government of Trindad and Tobago to amend the Sale of Produce Ordinance 1909. This amendment introduces the representation made by the Agricultural Society of Trinidad and Tobago, that the business of dealing in coco-nuts should be carried on only in licensed premises.

The newly formed Department of Agriculture and Forestry of the Chinese republic is taking advantage of the suitable conditions in Hawaii for studying organization and methods of forestry. Attention is being given to systems, which would likely to be of value in China. (The *Hawaiian Forester and Agriculturist*, November 1913.)

In St. Kitts, cotton picking is in full swing and the return both in quantity and quality is very favourable. Prices have been as a rule fairly high, account sales having been received up to 1*s* 8*d*. per lb. It is stated that owing to the recent heavy showers, mildew has appeared in some of the cotton fields, but there has been no loss from boll dropping.

In view of the importance of the matter, the attention of readers of this journal may be called to the decision of the Canadian Government to appoint a Travelling Trade Commissioner who will shortly begin his duties with a tour of the British West Indies, for the purpose of gaining information suitable for the promotion of trade under the Reciprocity Treaty.

In view of the importation of *Diospyros discolor* into Dominica, it may be pointed out that this plant is a native of the Philippine Islands. The fruit is like a large quince, and in some places is called Mangosteen, but its proper name should be the Mabola fruit. The fruits are covered with a reddish down when immature. This falls away when the fruit ripens.

According to the report of the Assistant Agricultural Superintendent, St. Lucia, the weather during the month at Réunion and the Land Settlement has been exceptionally dry—a circumstance that has retarded progress in the nurseries. The rainfall for the month was only just over 2 inches, whilst the sunshine has been particularly fierce for the time of year.

This Department has been notified by a local firm in Barbados, to the effect that frequent enquires have lately been made for Barbados aloes. It may be pointed out that at one time the exports from the island of this produce were worth some £7,000 a year, but in 1911 they were valued at only £125. The industry, such as it is, appears to be followed chiefly by peasants in the south-eastern district of Barbados.

A paper in *Circular* No. 119 of the Bureau of Plant Industry, United States Department of Agriculture, deals with an Arabian variety of alfalfa suitable for cultivation in a very mild climate. Two years ago this alfalfa was tried on a small scale in St. Kitts and results obtained in agreement with those got in America, namely that early growth is very rapid. In St. Kitts, growth did not persist satisfactorily.

It is commonly stated that it is a matter of difficulty to make large profits in the sugar industry. This holds good for the agricultural side, perhaps. But as regards manufacturing and refining the reverse is the case. It is interesting to note in the *International Sugar Journal* (December 1913) that one well known firm declared a dividend in 1910-11 of 42 per cent. A fall took place during the past year when only 18½ per cent. was declared, as compared with 23 per cent. in 1911-12.

EXAMINATIONS IN PRACTICAL AGRICULTURE.

RESULTS AND QUESTIONS SET FOR 1913.

The following are the results of the examinations conducted by the Imperial Department of Agriculture in the Windward and Leeward Islands during November 1913:—

PRELIMINARY EXAMINATION.

(One candidate.)

Centre.	Name.	Result.
Grenada	Cherubim, E. L.	2nd. class.

INTERMEDIATE EXAMINATION.

(Three candidates.)

Centre.	Name.	Result.
Dominica	De Lachevotier, G.	2nd. class.

FINAL EXAMINATION.

(Three candidates.)

Centre.	Name.	Result.
Antigua	Lake, E. H.	3rd. class.
St. Kitts	Owen, A. E.	1st. class.

The questions set for the preliminary examination were published in the last issue of the *Agricultural News*.

INTERMEDIATE EXAMINATION.

The following questions were set in the General Agricultural Science paper in the Intermediate Examination:—

Of the twelve questsons set, not more than eight were to be attempted, in which questions 1 *or* 3 and 2 *or* 4 were to be included.

1. Give an account of any root borers you have found attacking cultivated plants. Describe briefly the life-history of any one of these, and say what order it belongs to.

2. Write a short essay on the utilization of entomogenous fungi in ordinary estate practice.

3. Compare the structure of (a) a mite and a beetle and (b) a worm and a caterpillar.

4. Describe carefully the damage done by, also the cause of and the mode of infection of, any *one* of the following diseases: (a) red rot (rind disease) of the sugar-cane, (b) die back of cacao, (c) back root disease of limes, and (d) anthracnose of cotton.

5. Give an account of the legislation in any island with which you are acquainted for the prevention of plant diseases and pests.

6. Give an account of the composition of farm-yard manure. What effects has it on the soil? How should it be stored in order to reduce loss to a minimum?

7. Describe, in detail, in regard to either cotton *or* corn: (a) how you would select seed for planting after picking, (b) how you would disinfect the seed, (c) how you would test its germination capacity.

8. What factors in your experience mainly determine the fertility of the soil of the estate with which you are connected? What methods are adopted for improving the soil?

9. Describe, in detail, any vegetative propagation operations you have carried out personally.

10. What is osmosis? What experiment would you perform to demonstrate more fully the meaning of your definition?

11. Give details as to the cost of *either* (a) the ploughing of an acre of land on any estate you are connected with, or (b) draining an acre of land under similar circumstances.

12. Write an account of any manurial experiment that you have seen carried out locally. Explain concisely the object of the experiment, the methods employed, and the results obtained.

The questions set in the special crop subjects were as follows:—

SUGAR INDUSTRY.

Part I.—General.*

1. Describe, in detail, how you would select and prepare cane tops for planting.

2. What varieties of sugar-cane do you regard most suitable for the district in which you reside? Describe their characteristics, stating the particular advantages derived from their employment.

3. Give an account of the nature of 'root disease' of sugar-cane. What measures should be adopted for keeping it under control?

4. Describe the cultural operations employed for the soil in your own district in connexion with plant and ratoon canes. Indicate the period at which each operation is carried out.

5. Describe briefly any insect pest of sugar-cane. Give a full account of the damage done and make what suggestions you can as regards keeping the pest under control.

6. Discuss the value of cane tops for fodder. Give details in connexion with their storage and employment.

7. How many cane plants would be required to plant a field of 10 acres? What number of labourers would be ordinarily needed to carry out this work? Give an estimate of the cost of the planting operations.

8. Describe a system of manuring followed in your districts for (a) plant canes, (b) ratoon canes. Give the reasons for the employment of the system.

CACAO.†

1. Describe methods employed in the collecting, fermentation and curing of cacao.

2. What do you regard as the best method of manuring cacao under the conditions obtaining in your locality? State how the manures you apply may be procured.

3. Write an account of the principles of pruning cacao, and the necessary precautions that must be taken in carrying out this operation.

4. Give a list of the principal fungus diseases of cacao and the remedial and preventive measures that should be adopted in order to keep them in check.

5. Describe, in a practical manner, the grafting of cacao. What advantage would you expect to derive from the process?

6. Write a practical account of how you should proceed to plant 20 acres of prepared land in cacao, giving details as regards distances, number of plants required, protection, labour, etc.

7. Describe, in detail, the nursery work involved in the raising of cacao seedlings.

8. Describe carefully the preparation of Bordeaux mixture. Discuss to what extent it should be employed in connexion with the cultivation of cacao.

* In each section eight questions only were to be attempted.

†Questions set in the remaining sections will appear in the next issue.

FUNGUS NOTES.

SUMMARY OF INFORMATION RESPECTING PLANT DISEASES IN 1913.

In accordance with past custom, a review of the principal matters of interest dealt with in the fungus notes published in this journal during the year is given below.

SUGAR-CANE.

On pages 142 and 158 details are given of experiments carried out by F. W. South and W. R. Dunlop of this Department to test the degree of parasitism of *Colletotrichum falcatum* and *Melanconium sacchari*, the two fungi associated with the diseased condition of sugar-cane popularly known in the West Indies as Rind disease. These articles are preceded by a review on page 126 of the previous work on the subject. The result of the experiments with respect to *Colletotrichum falcatum* was the confirmation of the conclusion of previous workers that the fungus is a wound parasite varying greatly in its degree of virulence, and—apart from serious epidemic—causing harm more especially owing to the increase in the glucose ratio produced by its invert action on cane sugar. It was not found in these experiments to be communicated by infected cuttings. No evidence of any ability on the part of *Melanconium sacchari* to act as a parasite was obtained.

In connexion with Marasmius disease of sugar-cane, it is interesting to note (see page 94) the occurrence on an imported Californian grass in Montserrat of a disease very similar to the root disease of sugar-cane. Marasmius fructifications occurred amongst others on the material.

CITRUS PLANTS.

On page 110 appears a note concerning citrus galls from Dominica. Neither the fungus *Sphaeropsis tumefaciens* nor *Bacterium tumefaciens*, the organisms described as producing citrus galls in other countries was found in the material and inoculations carried out by South and Dunlop gave negative results. On page 366 a summary is given of a paper by H. S. Fawcett in which are described an infectious gummosis of citrus trees in California due to *Botrytis vulgaris* and *Pythiacystis citrophthora*, and a method of treatment of the same by means of Bordeaux paste. An important discovery as to the origin of citrus melanose by B. F. Floyd and H. E. Stevens in Florida is noted on page 398. The authors attribute the spots on leaves, stems and fruits to the effect of the germination of the spores of the fungus *Phomopsis Citri* washed down by rain from over-hanging dead twigs.

HEVEA.

The occurrence on Hevea of small rounded woody burrs on the bark, interfering considerably with tapping, is described on page 62. It may be added in this connexion that E. Bateson has recently announced in the *Bulletin of the Federated Malay States* the discovery that the burrs are due to irritation set up by the coagulated latex in old laticiferous vessels. Two articles (pages 222 and 254) deal with the results of an investigation made by C. K. Bancroft into the spotting of plantation Para rubber. Several fungi and a bacillus were found to be connected with different types of spots. The use of formalin solution in the field and of sulphur in the drying houses is recommended. Notes referring to other diseases on Hevea may be found on page 270 (South America) and 286 (Southern Nigeria).

CACAO.

Particulars are given on page 302 of observations on the witch broom disease of cacao made by J. B. Rorer in Dutch Guiana. Rejecting the conclusions of Ritzema Bos as to *Exoascus Theobromae* and of van Hall and Drost as to *Colletotrichum luxificum*, Rorer attributes the disease to a fungus whose fructifications are at present unknown, but which is almost certainly a Basidiomycete. On page 382 appears a review of an important paper by A. Rant, of Java, on the 'pink disease' of cacao, Hevea and other trees caused by *Corticium salmonicolor*. It is shown that the pink incrustation, the silky web which forms on the branches in damp situations, the small pink cushions found in cracks in the bark, and the fungus previously known as *Necator decretus* which kills the twigs, are all forms belonging to the Corticium. It is also shown that there is little or no specialization of the fungus on its many different hosts. The author regards fungicides as of little avail, but Petch reports that in Ceylon under certain circumstances, spraying with Bordeaux mixture is successful in preventing the disease. Diseases of cacao in Southern Nigeria are mentioned on page 286.

COTTON.

The important sterile fungus Rhizoctonia, familiar as causing the disease of cotton seedlings known as sore shin, has been carefully investigated by F. G. F. Shaw in India, a summary of whose results are given on page 46. A fungus, apparently exactly similar in all respects, occurs on ground nut, jute and cowpea, and closely similar forms occur on many other plants of most varied affinities. Cross-inoculations show that the form on jute is highly specialized, those on cotton, ground nut and cowpea much less so. The best means of control lies in the rotation of crops. Inoculation experiments with cotton boll rots are briefly mentioned on page 62, and some interesting information as to the cotton diseases in Southern Nigeria appears on page 287.

This account will be continued in the next issue of the *Agricultural News*.

SOIL IMPROVEMENT.

DYNAMITE FOR RUBBER ESTATES.

The following article has been taken from *Tropical Life* (December 1913). In view of the experiments with dynamite in Trinidad and Antigua, the information is particularly interesting.

Since we contributed our paper to the New York Congress on Farming with Dynamite, we have been pleased to notice what steady progress has been made in familiarizing the planting world with the use of explosives for land cultivation. The latest news on the subject recently came to hand in the shape of the following notes, for which we are indebted to the *Malay Mail*, who tells us that of late much discussion has centred round the topic of the use of explosives in agricultural operations, and a demonstration carried out on the Government Experimental Plantations by Mr. MacQueen, representing Nobel's Explosive Company, Limited, of Glasgow, will doubtless tend to quicken interest in the question.

The most recent application of explosives to agriculture has been in the breaking up of 'hard pan' and other impervious subsoils. Recent experiments in America have demonstrated that 'hard pan' can be blasted with advantage, and, in various parts of the world, many acres of land that hitherto

were practically worthless are now bearing phenomenal crops. It has, moreover, been found possible to reclaim swampy land and to drain swamps by blasting the impervious clay beneath them; and fruit growers in many instances use explosives in preparing the ground for the planting of fruit trees.

It is in breaking up 'hard pan' that the use of explosives is expected to be of most service in the Federated Malay States, and the following experiments were a very successful demonstration of the effectiveness of Nobel's (of Glasgow) gelignite for the purpose, even though the site chosen was not the most suitable, being a very soft soil not particularly in need of treatment. But in the Federated Malay States as in other parts of the world, at a slight distance below the ordinary open subsoil, a hard layer of clay or other practically impervious subsoil is found, which acts as a trap for surface water, impedes the growth of tree-roots, and prevents them getting the necessary sustenance.

Later in a plantation of two-and-a-half-year old rubber trees, Mr. MacQueen placed rows of gelignite* cartridges at a depth of about 2½ feet below the surface, and fired them by means of fuses and detonators. On the surface there was little visible effect of the explosion, but when the soil was turned over, it was found to be split and broken in all directions. The effect of each explosion is stated to be felt over a circle with a radius of 12 feet, and is claimed to have beneficial results over a period of two and a half to three years. And all this at a depth which the coolie with his changkol could not hope to touch. The inclusive cost of boring, explosive fuse and detonator for each hole is at the outside 13c, and the benefit to any plantation of a thorough and comprehensive treatment by explosives is too apparent to need explanation.

Another use demonstrated during the trials was the blasting of holes for planting trees. Half a cartridge was exploded at a depth of 20 inches and when the top soil was scraped off a cavity a foot in diameter was revealed. Of course, what has been said above as to the benefit to the soil in preparing it for the easier growth of the roots applies also in this case, while the whole process is much quicker and handier than digging by hand.

Yet another use is for felling. A large old jungle tree was selected for the purpose, and eight cartridges placed in the centre of the trunk at a height of about 5 feet from the ground brought the tree down in a very small portion of the time which would have been occupied in felling by ordinary methods.

On the question of time occupied in breaking up 'hard pan' by explosive, or 'ploughing by dynamite' as it has been picturesquely termed, Mr. MacQueen stated that with two coolies he bored holes for, and placed in position thirty cartridges, ready for exploding, within an hour. The harder the soil, of course, the more effect has the explosion, this method having been used with most success in the case of laterite soils.

For removing stumps gelignite also has its uses, though to be effective the bore holes must be made very carefully, for in the Federated Malay States most of the trees are of the 'buttress' type, and it is at times, very difficult to judge whether you are boring straight into wood, or out again into the soil. However a large stump was very effectively shattered this morning, showing that a very little work would have removed the whole lot. So far as Malaya is concerned, therefore, we feel that if the use of explosives in agriculture is new, it will soon become popular.

*The City Office of *Tropical Life* has on show a case of dummy facsimiles of all these cartridges, together with fuses, wires, detonators, etc., the whole forming a complete outfit.

ZOOLOGICAL.

WEST INDIAN ARMADILLOS.

Readers of the *Agricultural News* will be interested to learn that Dr. A. H. Clarke, of the Smithsonian Institution, United States National Museum, is publishing in the 'Annals and Magazine of National History' a paper in which he is recording from the island of Tobago, the Grenada dwarf nine-banded armadillo, *Desypus novemcincius hoplites*, and the Trinidad mouse opossum, *Marmosa*.

Armadillos were first reported from Tobago in 1658 by C. de Bochefort. who remarked upon the small size of the local form; but no definite record of the species inhabiting the island has heretofore been published. In Grenada armadillos have been known to occur since 1667, in which year they were reported as common there by Pere du Tertre, who also mentioned that all attempts to introduce them into other of the (then) French islands had met with failure. During a visit of some weeks to Grenada in 1904, Dr. Clarke found that armadillos were not at all uncommon there, though he did not succeed in securing any specimens. For some years the local form had been regularly recorded in the 'Grenada Handbook' under the name of *Dasypus novemcinctus*. In a paper published in 1905 ('The Auk', Vol. 22, July 1905, pp. 270 and 271) Dr. Clarke wrote 'To-day Grenada is the only island (except, of course, Tobago and Trinidad) where the armadillo is found,' and remarked that it was still called there by the same name, Tatu, under which it was referred to by du Tertre and Labat. In 1910 Dr. Glover M. Allen visited the island and secured three specimens upon which he based, in the following year, the name *Dasypus novemcinctus hoplites*. The typical form, *Dasypus novemcinctus novemcinctus*, occurs in Trinidad.

The Trinidad mouse opossum, 'manicou rat' or 'manicou gros yeux', *Marmosa chapmani*, occurs in Trinidad, Tobago, Grenada, Isle Ronde and Carriacou.

ECONOMIC VALUE OF THE BAT.

According to the *Review of Applied Entomology*—Series B: Medical and Veterinary, for October 1913, bats are probably immune from the bite of a mosquito, firstly because of the peculiar formation of the hair covering their bodies and secondly because of their peculiar odour. Bats in general are remarkably free from disease, and this is shown by the fact that although they live in caves in vast numbers, touching one another and even hanging to one another, yet men engaged in collecting bat guano very rarely find a single animal dead.

In Texas, experiments have been made with the object of cultivating bats for the production of guano, and at the same time for the control of mosquitoes. It has been found that a structure large enough to hold 50,000 bats would cost considerably less than £2,400 and that would yield in a year 20¼ tons of guano of an average value of £121 10*s*. During the experiments, enquiries made in the district, of the heads of fourteen families, showed that the number of mosquitoes had abated remarkably, and that the fever which was previously rampant had almost entirely vanished. It is therefore concluded that it is not only commercially, but hygenically profitable, to cultivate bats.

MARKET REPORTS.

London.—The West India Committee Circular, December 30, 1913; Messrs. E. A. de Pass & Co., December 19, 1913.

Arrowroot—3*d.* to 4¾*d.*
Balata—Sheet, 2/8½ to 2/9; block, 1/11½ per lb.
Beeswax—£7 15*s.* to £8 15*s.*
Cacao—Trinidad, 64/- to 75/- per cwt.; Grenada, 58/- to 62/-; Jamaica, 57/- to 62/-.
Coffee—Jamaica, no quotations.
Copra—West Indian, £31 15*s.* per ton.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 16½*d.* to 20*d.*
Fruit—No quotations.
Fustic—No quotations.
Ginger—Quiet, 34*s.* to 60*s.*
Isinglass—No quotations.
Honey—24*s.* to 28*s.*
Lime Juice—Raw, not in request; concentrated, £28 to £29 10*s.*; otto of limes (hand-pressed), 9*s.*
Logwood—No quotations.
Mace—1/7 to 2/6.
Nutmegs—4½*d.* to 6*d.*
Pimento—2*d.* to 2 1/16*d.*
Rubber—Para, fine hard, 3/1; fine soft, 2/6; Castilloa, 1/8 per lb.
Rum—Jamaica, 2/4 to 5/- per gallon.

New York.—Messrs Gillespie Bros. & Co., December 12, 1913.

Cacao—Caracas, 14¼c. to 15c.; Grenada, 13½c. to 13¾c.; Trinidad, 13¾c. to 14c.; Jamaica, 12½c. to 13½c.
Coco-nuts—Trinidad and Jamaica, selects, $37·00 to $38·00; culls, $23·00 to $24·00 per M.
Coffee—Jamaica, 10½c. to 14½c. per lb.
Ginger—8¾c. to 11¼c. per lb.
Goat Skins—Jamaica, 50c.; Antigua and Barbados, 45c. to 48c.; St. Thomas and St. Kitts, 42c. to 45c. per lb.
Grape Fruit—Jamaica, $1·50 to $2·25.
Limes—$4·00 to $5·00.
Mace—50c. to 54c. per lb.
Nutmegs—110's, 12c. to 12¼c.
Oranges—Jamaica, $1·25 to $1·50.
Pimento—4c. to 4½c. per lb.
Sugar—Centrifugals, 96°, 3·54c. per lb.; Muscovados, 89°, 3·04c.; Molasses, 89°, 2·79c. per lb., all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., January 5, 1914.

Cacao—Venezuelan, $13·00; Trinidad, $12·75 to $13·15.
Coco-nut Oil—$1·00 per Imperial gallon.
Coffee—Venezuelan, 14½c. per lb.
Copra—$5·25 per 100 lb.
Dhal—No quotations.
Onions—$2·75 to $3·00 per 100 lb.
Peas, Split—$5·75 per bag.
Potatoes—English, $1·40 to $1·55 per 100 lb.
Rice—Yellow, $5·10 to $5·30; White, $4·70 to $4·80 per bag.
Sugar—American crushed, no quotations.

Barbados.—Messrs. James A. Lynch & Co., Ltd., November 29, 1913; Messrs. T. S. Garraway & Co., November 21, 1913.

Arrowroot—$5·25 to $6·50 per 100 lb.
Cacao—$13·00 to $14·50 per 100 lb.
Coco-nuts—$24·00.
Hay—$1·50 to $1·60 per 100 lb.
Manures—Nitrate of soda, $70·00; Cacao manure, $50·00; Sulphate of ammonia, $82·00 to $85·00 per ton.
Molasses—No quotations.
Onions—$2·75 to $3·00 per 100 lb.
Peas, Split—$5·80 to $6·00 per bag of 210 lb.; Canada, $4·00 to $4·50 per bag of 120 lb.
Potatoes—Nova Scotia, $2·50 to $4·00 per 160 lb.
Rice—Ballam, $5·30 to $5·40 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
Sugar—American granulated, $4·00 per 100 lb.

British Guiana.—Messrs. Wieting & Richter, January 3, 1914; Messrs. Sandbach, Parker & Co., January 2, 1914.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	$9·00 per barrel of 200 lb.	—·—
Balata—Venezuela block	No quotation	——
Demerara sheet	65c. per lb.	——
Cacao—Native	14c. per lb.	12½c. per lb.
Cassava—	96c.	——
Cassava Starch—	——	——
Coco-nuts—	$16 to $20 per M.	$26 per M.
Coffee—Creole	15c. per lb.	15c. per lb.
Jamaica and Rio	15½c. per lb.	16½c. per lb.
Liberian	13c. per lb.	11½c. per lb.
Dhal—	$4·25 to $5·00 per bag of 168 lb.	$4·75 per bag of 168 lb.
Green Dhal	$5·00	——
Eddoes—	$1·20	——
Molasses—Yellow	None	——
Onions—Teneriffe	——	——
Madeira	7c.	12c.
Peas—Split	$6·00 per bag (210 lb.)	$7·00 per bag (210 lb.)
Marseilles	——	——
Plantains—	16c. to 40c.	—·—
Potatoes—Nova Scotia	$2·00	$2·40
Lisbon	——	——
Potatoes—Sweet, B'bados	$1·92 per bag	——
Rice—Ballam	No quotation	——
Creole	$4·75 to $5·00	$4·50 to $4·80
Tannias—	$2·40	——
Yams—White	$2·16	——
Buck	$2·16	——
Sugar—Dark crystals	$2·00 to $2·05	$2·00
Yellow	$2·40 to $2·50	$2·40
White	$3·75 to $4·00	$4·00
Molasses	——	——
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M.
,, Cordwood	$1·80 to $2·00 per ton	——

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PAMPHLET SERIES.

The Pamphlets are written in a simple and popular manner and the information contained in them is especially adapted to West Indian conditions. They contain, amongst other subjects, summaries of the results of the experiment work on sugar-cane and manures, the full official reports of which have only a limited circulation. The number issued up to the present time is seventy. Those mentioned in the following list are still available; the rest are out of print.

SUGAR INDUSTRY.

Seedling and other Canes at Barbados
In 1900. No, 3, price 2*d.*; in 1901, No. 13, price 4*d.*;
in 1902, No. 19, price 4*d.*; in 1903, No. 26, price 4*d.*;
in 1904, No. 32, price 4*d.*

Seedling Canes and Manurial Experiments at Barbados,
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Manurial Experiments with Sugar-cane in the Leeward Islands,
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in 1904-5, No. 42, price 4*d.*; in 1905-6, No. 47, price 4*d.*;
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in 1910-11, price 1*s.*; in 1911-12, price 1*s.*

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The 'Agricultural News' contains extracts from official correspondence and from progress and other reports; and, in fact, any information indicating what is going on in each colony, and the progress made in Agricultural matters throughout the West Indies.

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Printed at Office of *Agricultural Reporter*, 4 High Street, Bridgetown, Barbados.

AGRICULTURAL NEWS

Vol. XIII. No. 307.] SATURDAY, JANUARY 31, 1914. [One penny.

AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW
OF THE
IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

VOL. XIII. No. 307. BARBADOS, JANUARY 31, 1914. PRICE 1*d*.

CONTENTS.

The Philosophy of Sampling.

DR. LEATHER has just published an important paper on the experimental error in sampling sugar-cane,* a contribution which the critical spectator of agricultural science will at once appreciate, because it marks a forward movement in the methods of investigation work with tropical crops. The paper under consideration does not open up a new question, but rather helps to answer an old one. It is the question of the extent to which the sample truly represents the bulk. Apart from its bearing upon the sugar-cane industry, the subject, it can be seen, is of very great significance in agriculture as a whole, underlying, in fact, many of the disabilities with which rural industries are at present afflicted. In the present article, it is not intended to put forward a summary of Dr. Leather's paper. A statement of the actual results obtained will appear elsewhere. In the present discussion, simply the idea involved will be considered, and its general application in agriculture enlarged upon.

In proceeding to do this, it may be well to begin by pointing out that agricultural produce and manufactured articles generally are not homogeneous, and for this reason one portion is never exactly like another portion. This is rendered very obvious by considering one or two examples. Thus if we select, even from a carefully graded bulk of rubber, limes or sugar-canes, what we think to be identical samples and subject them to accurate analysis, we shall not find in the rubber samples the same percentage of caoutchouc, nor in the limes the same percentage of citric acid, nor in the sugar-canes the same percentage of sucrose. No two samples will be exactly alike. So that then among samples of agricultural produce there is always an *error*. The sample is taken to represent the whole; no two samples are alike; and hence it is clear that since there is a divergence between the samples, no such sample can truly represent the whole. The difference between the quality of the sample and that of the whole is the error attaching to the sample.

* *Memoirs of the Department of Agriculture in India* (Chemical Series) Vol. III, No. 4.

In cases where homogeneous material has to be dealt with, there is practically no difference between the quality of the sample and the quality of the whole. Analysis of the most minute samples of pure common salt, for instance, will always give the same results, or if there is some slight variation, it will be due entirely to imperfections in the methods of analysis. Nor is homogeneity confined only to specific compounds: mixtures can also be homogeneous. For instance, with a mixture of alcohol and water, the smallest sample will be truly representative of the bulk. But with materials of the class just mentioned agriculture has practically nothing to do. Agriculture deals typically with substances of extremely variable composition, and it is obviously one of the most pressing duties of science to assist those who are commercially concerned with sampling and those who are chemically concerned, by introducing and familiarizing a dependable system.

Those who follow science progress in relation to agriculture will be aware that during recent years the philosophy of sampling has not been neglected in experimental work. In this connexion reference may be made to the lucid writings of Wood and Stratton at Cambridge in connexion with the sampling of 'roots' from field plots, and in regard to the variability in the results of feeding experiments; there is also Hall's and Russell's investigations at Rothamsted: Gavin's statistical researches with milk records; Leather's work in India; and coming nearer home, Harrison's investigation of the probable error in sugar-cane experiments. And underlying all this work, in spite of its being extremely technical, there is a very practical and moral motive. The aim is to interpret results rationally, and to exercise the greatest caution before laying results before the agricultural public.

Speaking generally, the principal thing in sampling is to decide what the minimum quantity is that may be taken to give a representative value to the whole. In this respect there has been in the past, and there is, too, at the present time, a great deal of personal 'fancy' and 'rule of thumb' at work. Nothing could be less in the interests of science and commerce. One imagines that in a general way the size of the sample selected by those who are not trained technically depends principally upon an a priori knowledge of the degree of homogeneity of the material to be examined; for instance, the degree of homogeneity in a field of diseased sugar-canes will be greater than in one which is entirely healthy; hence even an untrained investigator would know that a larger sample must be taken in the former case. Incidentally the question of sampling in relation to partially damaged products is a matter of great importance all round.

The soil presents extremely difficult problems as regards sampling, because no two samples will be alike; hence in the case of the soil, comparatively large and numerous samples are needed before accurate judgements can be formulated. It is probable, indeed certain, that what we are calling the degree of homogeneity, is an important factor for consideration in regard to the valuation of Plantation rubber. It is easy enough to determine the proximate constituents in a sample of rubber, and to subject the rubber to physical tests: but it is not so easy to say to what extent these results hold good for the entire cargo. Nor do we even know whether these proximate constituents, like caoutchouc for instance, have the same chemical composition in themselves, throughout the whole bulk.

The only way to form a true judgement of the value of any bulk is to decide mathematically how much must be examined to provide a representative sample, or—what is generally required in practice—how many small samples must be taken in order that the arithmetical mean of the quantitative results of their examination may be justifiably taken. We had hoped in the course of this article, which professes to be popular, to avoid a reference to Frequency curves and probable error formulae. Moreover, the mathematical aspect of variability has already been explained in this journal.* But it would be an omission in the present connexion not to invite the reader's attention to the use of the Frequency curve as a simple means of ascertaining the amount of dependence that may be placed on an average, that is, as a means of deciding whether enough small samples have been taken to enable a correct average estimate to be struck. Closely connected with the Frequency curve is the probable error, which is a measure of the reliability either of any one result, or of the mean of a number of results. The probable error of any one result is such that taking any single result at random, the chances are even for or against that result differing from the average by the amount of the probable error. In other words, half the results should differ from the mean by less than the probable error, the other half by more. The probable error of an average can be found by dividing the probable error of one result by the square root of the number of results averaged. The

* Vol. XI, pp. 145, 161, 177.

application of these matters to agricultural science are particularly clearly dealt with in a paper by Wood and Stratton.†

Turning to special consideration of variability in relation to commercial samples in agriculture, we see that it is not always the case that a dependable system can be applied, owing to the circumstance that many factors which determine quality cannot yet be conveniently expressed in figures. It is, however, interesting to observe that in cases where they can, as in the sale of sugar or citrate of lime, the material is comparatively homogeneous, and consequently little difficulty is experienced in the matter of sampling. It is worth reflecting, too, that the object in agricultural manufacturing is to turn the heterogeneous into the homogeneous. As already intimated, the degree of dependency that can be placed on a fixed quantity of sample requires investigation in the rubber industry, and in the case of the cacao trade too. That is because the plantation manufacture of these products does not lead to perfect homogeneity. If the price obtained for produce varied entirely with its real quality, and was not affected by fluctuations in the demand of the consumer, scientific valuation would be likely to become more general than it is. It would be interesting to know exactly the minimum quantity of lint that must be taken from a bale of cotton for the determination of the true average value of the whole. The valuation of cotton, depending as it does upon several measurable physical properties, seems certainly capable of scientific investigation. The same holds good for fibres in general, as well as in the case of other classes of products.

In drawing our considerations to a close, we may fittingly conclude with an appeal regarding the present subject in relation to agricultural education. It has been emphasized in this journal that agricultural bias can be given in rural schools to subjects other than natural science. Of such instances where this can be done, the present one of agriculture in relation to mathematical principles cannot be said to be the least in importance. The future will probably show that it will at all events have to occupy a very important position in the curricula of agricultural colleges, and a preliminary grounding in the principles of the subject during latter years at school should sensibly assist the student to appreciate its application to practical matters in after-life.

† T. B. Wood and F. J. M. Stratton: "The Interpretation of Experimental Results. *Journal of Agricultural Science*, Vol. III, p. 417.

VEGETABLE OILS.

ESSENTIAL OILS USED IN PERFUMERY.

In looking through the list of the botanical sources of the essential oils used in scent-making, which are presented in an interesting paper read before the Royal Society of Arts, and published in that Society's Journal of December 5, 1913, one is struck by the large number of plants familiar in the West Indies, which are important sources of many of the common perfumes. The so-called floral series, for instance, includes the jasmine, rose and orange flower; oils derived from the grasses like citronella and lemon grass oil come from species of Cymbopogon; the citrine series, as the name implies, are got from oranges and lemons; the series of spices are derived from Cassia, cinnamon, cloves and nutmegs. Important in the perfumery industry are the wood series which includes sandal wood and cedar wood. Lastly, the fruit series contains well-known plants like the bitter almond, vanilla and the Tonquin bean.

Mr. J. C. Umney, F.C.S., the writer of the paper, makes the remark that the classification just referred to, although useful botanically, is generally superseded by a classification according to the main constituents of the oils for pharmaceutical purposes. From the classification which is given we see, for instance, that plants like clove, pimento, cinnamon and bay are characterized by their eugenol contents, whereas citronella oil, citrus oils and Cassia, are known by the aldehydes they contain.

Towards the middle of the paper Mr. Umney referred to the agricultural side of the essential oil industry. The island of Reunion is producing large quantities of geranium oil; Paraguay exports a great quantity of pettigrain oil; whilst from the Philippine Islands, Europe is receiving large shipments of the finest ylang-ylang oil, and from Madagascar and the neighbouring islands also, extremely fine ylang-ylang and other oils are shipped. In connexion with lemon grass oil, it is pointed out that this is produced in the East Indies, the Malaya Peninsula, Burma and the West Indies, and that it appears to be in danger of being over-produced, prices having fallen very much during the last few years. The marvellous protective power, it is interesting to note, of lemon grass in the matter of keeping off the tsetse fly, has led to its cultivation and to the distillation of the oil in Uganda, a fair amount having already been marketed from that region. It is stated that it was formerly proposed that the West Indian lemon grass oil was less soluble than that obtained from the East Indies; this does not appear now to be uniformly the case.

Space will not allow further reference to the interesting information which the paper contains. But in conclusion it will be well to point out that those who took part in the discussion following the reading of the paper were of opinion that there is decided scope in the colonies for an extension of the area under the cultivation of plants yielding essential oils.

This article cannot be concluded without some expression of surprise that Dr. T. A. Henry of the Imperial Institute should have made the statement in connexion with starting experiments in the colonies in relation to essential oils, that 'an attempt had been made in the West Indies to grow limes and oranges, but the yield of these fruits was poor, while the class of labour available was unsatisfactory.' As a matter of fact citrus cultivation is one of the most prosperous of the West Indian agricultural industries.

FRUIT AND FRUIT TREES.

VARIATION IN THE SIZE OF COCO-NUTS.

The coco-nut industry in Antigua has for some time been receiving attention from the officers of the Department of Agriculture stationed in that island, and the question as to the suitability of local nuts for seed purposes has, as a natural sequence, received some consideration. To demonstrate how misleading the size of the husked to that of the unhusked nut is, a number of measurements of nuts from Antigua, Dominica and Nevis were made, and the following figures and observations on the subject forwarded by the Agricultural Superintendent, Antigua (Mr. T. Jackson), show the results that have been obtained:—

Diameter of unhusked nuts in inches.	Diameter of husked nuts in inches.	Difference between husked and unhusked nuts in inches.
ANTIGUA NUTS.		
5·56	4·43	1·11
6·36	4·60	1·76
6·00	4·60	1·40
5·56	4·45	1·11
6·00	4·77	1·33
5·82	4·14	1·68
Total 35·30	27·01	8·39
Aver. diam. 5·88	4·50	Aver. diff. in diam. per nut. 1·38
DOMINICA NUTS.		
8·27	4·48	4·04
9·10	4·60	4·50
8·00	4·60	3·40
7·50	4·20	3·30
8·27	4·77	3·30
8·43	4·14	4·20
Total 49·57	36·76	35·03
Aver. diam. 8·26	4·46	5·84
NEVIS NUTS.		
7·99	4·45	3·34
7·31	4·46	2·75
8·27	4·36	3·71
7·95	4·37	3·58
6·68	4·69	1·99
7·95	3·34	4·61
Total 46·15	25·97	19·98
Aver. diam. 7·69	4·33	3·33

The above figures are interesting, and point out in a remarkable manner the great differences in size which exist between the unhusked Antigua coco-nuts and those grown in other places. They also indicate how deceiving these appearances are, for although on comparison the average difference between six unhusked Antigua nuts and six from Dominica was as much as 2·38 inches, the local ones were 0·04 inch larger than the others. Much the same occurs when a comparison is made between the Antigua and Nevis nuts.

In the above tables only the results from the examination of six nuts from each place are given. This was on account of the fact that only a limited number from Nevis were available.

Of those grown in the other two islands, twenty from Dominica were measured and twenty-seven from Antigua. The average diameter of the unhusked nuts from the former was 8·27 inches, that of the husked nuts 4·57 inches. In the case of the local nuts, the figures obtained were 5·81 and 4·42, respectively. It will be seen that there is but little variation in the figures when larger numbers are taken, the average differences in the diameters of the actual nuts being but 0·15 inch in favour of those from Dominica, while the average differences in the thickness of the husk was as much as 2·46 inches.

THE PROFITABLE MANURING OF BANANAS.

Amongst the many matters of interest in the Annual Report on Agriculture in Fiji for the year 1912, is an account of the results of six years' experimental work on the manurial requirements of Chinese bananas.

The average results for six years clearly show the value of manuring bananas in Fiji. In general, the figures indicate that applications of phosphoric acid to the soil tend to increase the size of the bunches, while nitrogen and potash increase the total yield.

Examining the figures in more detail, plot 1, the control, gave a total average weight of crop amounting to 659·5 lb. having 21·1 per cent. of large bunches; plot 2, which received 1 cwt. of sulphate of ammonia per acre, 1½ cwt. of sulphate of potash and 4 cwt. of superphosphate, yielded an average total crop of 1,434·4 lb. giving 41·4 per cent. of large bunches. Doubling the amount of phosphatic manure gave an extra 3·2 per cent. of large bunches.

As regards the financial results obtained, the total value of the produce from the control was 20*s.* 3*d.*; that from plot 2 (see above) was 49*s.* 9*d.*; whilst in the plots where double quantities of nitrogen and phosphorus respectively were applied the values were 59*s.* and 58*s.* respectively.

Figures are given in the report under consideration showing the cost of the manures for each plot ($\frac{1}{10}$-acre) and the net value of the return. In the case of the control, the value of the fruit less the cost of the manure was 20*s.* 3*d.*; in plot 2 the value of the fruit less the cost of the manure was 43*s.* 5*d.*; whilst in the case of plot 8, which received a double quantity of potash, the net value of the fruit was as high as 57*s.* These and the remaining figures show clearly that bananas manured in a proper manner will pay. It has to be remembered, however, that a characteristic feature of many of the soils in Fiji is their want of phosphoric acid. This circumstance must be taken into consideration when applying the results to other places.

Finally the report presents the results obtained from the plots manured for the first time in 1910. In these worn out soils the great advantage of applying phosphoric acid is clearly shown. It was also found that the applications of half quantities of complete manure gave better results than the whole quantity of the complete manure, that is, nitrogen, potash and phosphorus applied at the rate per acre mentioned at the beginning of this article. In conclusion, it is stated that the most satisfactory return from manuring will be obtained only by the application of fertilizers to cultivations which have not been allowed to become too poor, or run down.

SUGAR INDUSTRY.

DENATURED SUGAR.

Sugar for human consumption in France costs 6*d*. per lb. But apart from this kind of sugar there is a large amount sold under the term 'denatured' sugar, that is, sugar to which some substance has been added to make it unfit for food—which is exempt from that taxation which causes the high price of the sugar for consumption as food. The *Louisiana Planter* (December 20, 1913) after giving this information, publishes a very interesting extract from the *Literary Digest* in connexion with the various uses to which sugar can be put for manufacturing purposes. First of all sugar is a common ingredient of many compounds for removing and preventing boiling scale. The shoe blacking industry uses sugar and molasses to a considerable extent. In Europe there seems to be a tendency to use blackings of the older type which are made by the carbonizing action of sulphuric acid on sugar. The product is neutralized and other ingredients added, such as powdered oil and sometimes glycerine.

Perhaps one of the most important industrial uses for sugar is in the manufacture of soap. Sugar is used in this connexion in the place of glycerine. In Germany there is a considerable demand for sugar in the manufacture of explosives, though in the colour and dyeing industries, it is perhaps more widely employed as a reducing agent and as a base. Tanneries, too, use sugar in 'filling' leather, and to some extent in removing lime from hides in the 'dehairing' process. It is interesting to note, also, that ordinary copying ink is made by the addition of one part of sugar to three parts of writing ink.

The silvering of glass mirrors provides another use for sugar. After inversion with acids, it is here used to reduce a solution of silver nitrate which deposits a coating of silver on the glass immersed in solution.

The hardening and strengthening action of sugar in mortar was known to the ancients. In recent times, the Museum of Natural History of Berlin has been rebuilt with mortar consisting of one part of lime, one part of sand, and two parts of sugar.

In many chemical operations sugar is used as a source of carbon of high purity, and in the future it is possible that sugar may become of great industrial importance through its nitro-compounds. Nitro-saccharose (sucrose octonitrate) is a product of gun cotton, which it is said can replace the latter in its numerous applications in explosives, collodion, celluloid and the like.

According to the *International Sugar Journal* (October 1913), to enable cane factories to work for a longer period of the year it is proposed to proceed in the following way: By the usual means, milling or diffusion or a combination of both processes, only about 50 per cent. of the sugar in the cane is exrtacted. The partially exhausted material is then dried in such a manner that it may be indefinitely preserved and stored. At the end of the grinding season the desiccated material is treated again by milling or diffusion or both, and fully exhausted. As advantages of this procedure it is claimed that an important economy is effected. In the first operation when only half of the sugar is extracted, the juice obtained is of high purity. In the second operation, a large proportion of the albuminoids, gums and waxes being coagulated or otherwise rendered insoluble in water, a juice of higher purity than ordinarily again results.

RUBBER INDUSTRY.

FURTHER NOTES ON THE REPORT OF THE STANDARDIZATION COMMITTEE.

There can be no doubt that the principal problem in the plantation rubber industry which requires solution is the question of variability in quality. In the evidence given by witnesses before the committee of standardization this matter is persistently referred to. The experts in question are also unanimous in regard to the suitability of the scheme recently put forward for evaluation, that is, the fixation of the 'real' value of plantation Para. The fundamental point to bear in mind is that the valuation of samples by mere rule of thumb inspection is unreliable and gives only the 'apparent' value: the 'real' value of rubber can be told only by actual test of manufacture.

The report of the standardization committee (published in the *India Rubber Journal*, December 20, 1913) contains a very useful list of recommendations for estate use in the matter of rubber preparation. First of all, points are given which must be observed in the treatment of latex, and in the curing of rubber. In this connexion, cups should be used which can be easily cleaned: copper vessels should be avoided. The addition of water to the cups is unnecessary; water on cuts is not advisable; and latex should be collected with despatch. In the factory, cleanliness is absolutely necessary in every respect; neglect in this direction in inexcusable. The bulking of latex is strongly recommended: the mixing of all latex undoubtedly tends to produce a rubber of greater uniformity. As regards coagulation, acetic acid is recommended as the best coagulant at present. The mixing of the acid and latex must be thorough, whilst uniformity must be preserved in the strength of the coagulant solution. For the preparation of crêpe rubber, any quantity of latex may be coagulated in bulk, but for sheet rubber, not more than 50 gallons of latex should be treated with acid in one batch. In connexion with the treatment of latex, the use of formalin is recommended under certain circumstances.

In the preparation of rubber, the morning following coagulation is adjudged to be the best time for working off the fresh rubber, and the extent to which rubber is worked on the machines must be the minimum necessary. Thickness of the rubber determines the rate of drying: pale crêpe should be thin, but sheet rubber should never be too thick, though always uniform. As regards care of machinery, it is found that defects in crêpe rubber are generally due to lack of attention in this connexion. Machines must be well cleaned and inspected each day before commencing work; worn parts must be replaced at once; trays projecting beyond the end of the rolls must be condemned and narrower trays substituted. Care must be taken as regards lubrication.

In conclusion, sorting and packing must be thorough, and no rubber of varying shades of colour should be put up together. Similarly grading must be done thoroughly in accordance with the lines laid down by the company. As regards boxes for packing, there exists no doubt that these should be constructed of planed wood only. Splinters in the rubber are highly undesirable.

In conversation with Mr. H. C. Pearson (editor of the *India Rubber World* and well known author of several works connected with the rubber industry) the question of rubber interests in the West Indies was brought up. Mr. Pearson attaches some importance to the future prospects of these islands as distributing centres of rubber seed. Mr. Pearson is at present staying in Barbados and is busy writing a new book.

COTTON.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date January 12, with reference to the sales of West Indian Sea Island cotton:—

Since our last report about 300 bales of West Indian Sea Island cotton have been sold, chiefly Nevis 17*d.* to 20*d.*, Montserrat 17*d.* to 19*d.*, St. Kitts 17*d.* to 20*d.*, with a few exceptionally fine small lots at 21*d.* to 22*d.* and Stains 8*d.* to 10*d.*

There is a general demand for all the fine to extra fine lots obtainable, but the coarse cotton, though strong, is neglected owing to the competition of the superior qualities of Egyptian and other growths, and we still recommend planters to cultivate for fineness.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending January 10, is as follows:—

There is still a demand for the odd bags classing Extra Fine and Extra Fine off in class, of which the supply is very limited and does not satisfy the wants of buyers. The stock of odd bags consists largely of cotton classing Fine and Fully Fine, which are not so much in demand, and as Factors are wishing to sell, they are willing to make concessions in price, admitting of our buying to advantage.

The Planters' Crop Lots classing Extra Fine and above are still sought after and have been largely disposed of, the buying being principally on account of French spinners.

We quote, viz:—

Extra Fine	26c.	= $14\frac{3}{4}d.$	c.i.f., & 5 per cent.
Extra Fine off in preparation	23c.	= $13\frac{1}{4}d.$	,, ,, ,, ,,
Fully Fine	23c.	= $13\frac{1}{4}d.$	,, ,, ,, ,,
Fine	20c.	= $11\frac{3}{4}d.$	,, ,, ,, ,,
Fully Fine off in preparation	19c.	= $11\frac{1}{4}d.$	,, ,, ,, ,,

This report shows that the total exports of Sea Island cotton from the United States to Liverpool, Manchester and Havre, up to January 10, 1914, were 2,935 bales, 5,383 bales, and 3,364 bales, respectively.

The latest report of the British Cotton Growing Association shows that information has been received from the Association's manager in Lagos stating that the prospects for the 1914 season are good, and that the crop will be an early one. It is estimated that the Lagos crop this year may possibly amount to 20,000 bales, and it was decided to send out additional ginning plant and stores, which are estimated to cost £20,000, in time for the 1915 crop. It has also been decided to send out an electric lighting installation to enable one of the ginning factories to work at night, if necessary. The purchases of cotton in Lagos to the end of November amounted to 13,601 bales, as compared with 9,083 bales for the same period of last year, and 11,992 bales for 1912. The purchases of cotton in Northern Nigeria to the end of November amounted to 1,569 bales as against 2,627 bales for 1912.

It was stated that there is a considerable demand for cotton in some parts of Northern Nigeria for native weaving, and also that the natives have recently taken up the cultivation of ground nuts on a large scale, and there is some danger of this competing with cotton. It has therefore been decided to increase the buying price of seed-cotton at all stations on the railway from 1*d.* to $1\frac{1}{8}d.$ per lb. This increase in price has been found practicable, as it has been found that Northern Nigeria cotton gives a yield of 30 per cent. to 32 per cent. of lint whereas the seed-cotton grown in Lagos only yields from 27 per cent. to 28 per cent. of lint.

LIVE STOCK NOTES.

USEFUL REFERENCES CONCERNING INDIAN CATTLE.

In answer to certain enquiries which were sent from this Department, the Director of the Imperial Institute has caused to be collected and forwarded a series of notes of a very useful kind on the above subject, from which the following have been taken.

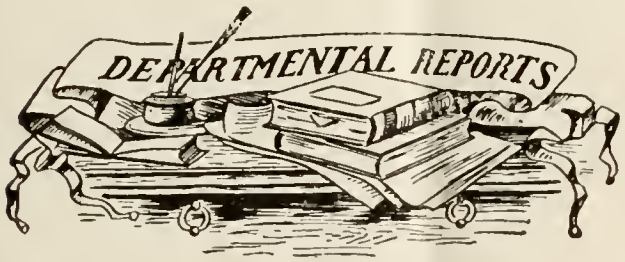
In regard to the application of the name 'Zebu', the term is a general one which is applied to all kinds of Indian hump cattle. The term 'Brahmin' or more correctly 'Brahmini' is occasionally used as synonymous with Zebu, but it is more usually applied to bulls, of any breed, which have been dedicated to the Hindus god Siva, and are allowed to roam freely about the country. In most parts of India 'Brahmini' bulls are the chief breeding animals.

Numerous breeds of cattle occur throughout India, and although those found in many districts have been described by various authors, no one has yet made a critical and comparative examination of all the breeds. It is therefore not possible to say how many distinct breeds exist.

The communication under consideration next provides information concerning publications which deal principally with the description, size, milk production, and working capacity of the cattle. Parenthetically it may be stated here, that it has not been found possible to find in the literature available at the Imperial Institute references to cattle which are bred in India for meat. This aspect of the subject is of considerable interest as regards the West Indies, and any contributions on this point would be acceptable.

As regards the literature referred to above, mention is made to Notes on the Indigenous Breeds of Cattle in the Punjab, by H. T. Pease, probably obtainable from the Superintendent of Printing at Calcutta. A publication which gives a special description of the wild and domesticated cattle of Burma (but no reference to any distinct breeds, and very little to the milk production and working capacity of the cattle) is a Note on the Cattle and Buffaloes of Burma, by Captain G. H. Evans, A.V.D. Another book which should prove interesting reading is Breeds of Indian Cattle: Notes on the Indigenous Cattle of the United Provinces, by E. W. Oliver and C. W. Wilson. This contains illustrations of most of the breeds described, and is written on similar lines to the Cattle of Southern India. It could probably be obtained from the Superintendent of the Government Press, United Provinces of Agar and Oudh, Allahabad.

An article which gives a full account of the cattle of the Rohtak and Hissar districts, is a Note on the Cattle of Harriana and Sirsa, by Veterinary Captain H. T. Pease in the *Agricultural Ledger*, Vol. II, 1895, No. 22 (Veterinary Series) No. 15. Further information on the Harriana breed is given in the *Agricultural Journal of India*, Vol. II, Part 4, p. 369, whilst in Vol. II, Part 3, p. 252 of the same journal, the Montgomery and Sinda breeds of cattle are dealt with. Reference to the Montgomery breed as milch animals is made in the journal just mentioned, Vol. IV, Part IV, p. 391.



ST. KITTS-NEVIS: REPORT ON THE AGRICULTURAL DEPARTMENT, 1912-13.

The weather in St. Kitts during early months of 1912 was generally unfavourable for plant growth, particularly on the Leeward side of the island where the Botanic Station is situated. Great difficulty was experienced, therefore, in maintaining the good appearance of the Gardens and a large amount of effort was required in certain cases to keep the plants alive.

The section of this report dealing with work in the nurseries shows that there has been very little demand for economic plants such as limes or cacao since the cultivation of these crops is not being extended. The principal plants distributed were mulberry trees (*Morus alba*) and various palms and ornamental plants. It is worthy of note that conditions in St. Kitts are probably suitable for the growth of *Aleurites Fordii* the useful and ornamental wood oil tree of the Central Provinces of China.

EXPERIMENTS WITH ECONOMIC PLANTS.

The economic plot experiments at La Guérite have included the usual trials with provision crops, and an important feature of this work has been the large number of cuttings and seed distributed for planting purposes. In connexion with these experiments, special attention may be called to the results obtained with varieties of sweet potatoes and yams. These experiments have been carried on for a number of years, and figures indicate a great variation in the yield of the different varieties. In continuation, it is worthy of notice that the variety of ground nut known as Carolina Running seems best suited to local conditions, and attention may be called to the important demonstration with onions, which showed that even in the face of bad weather conditions, amounts per acre of this produce can be raised worth £37 on the local market. It is hoped that an attempt will be made in St. Kitts to extend onion cultivation in connexion with efforts that are being exerted to establish a West Indian market in Canada for this vegetable. The manurial experiments with pine-apples, which are considered next, seem to indicate that proper nitrogenous manuring will pay. The diseased condition of this fruit known as 'black heart' appears to be a so called 'ripe rot' which develops only after the fruits have reached maturity.

NEW MANURIAL RESULTS WITH COTTON.

The work done with cotton during the year has been interesting. For the first time for nine years are increases recorded from the application of manures, and it would appear that the soil at La Guérite is now arriving at a stage at which fertilizers will exert on cotton a beneficial rather than an adverse effect. Selection work with cotton has been continued along the same lines as in former years, and seed has been raised for planting purposes on the estates. The importance of this work, ensuring, as it does, a requisite degree of uniformity in the lint produced, cannot be overestimated. Hybridization work has been continued, and there are indications that the cross, Barbados × St. Eustatius Native F, will lead to the establishment of a useful type.

PLANT PESTS AND DISEASES.

Work connected with insect pests and plant diseases have been conducted principally by the scientific officers of the Imperial Department, in regard to the sugar-cane. The Entomologist conducted during the year important experiments in regard to soil-inhabiting grubs, and considerable attention was given to the red rot disease of the sugar-cane by Messrs. South and Dunlop.

The results of this work have already been described in detail in the *Agricultural News*.

GENERAL PROGRESS.

Progress in the chief industries depends very largely upon the climatic conditions. Hence it is not surprising to find the exports of sugar some 2,000 tons below the average. In the case of cotton, too, the dry weather affected the yield; but the two circumstances that cotton can be grown as a catch crop with sugar-cane, and can command, by reason of its great fineness, a high price on the market, have helped to counterbalance the general difficulties experienced by estates during the year under review.

In connexion with cotton cultivation in general, appreciation may be expressed in the matter of the good work which continues to be carried out in Anguilla.

AGRICULTURAL AFFAIRS IN NEVIS.

The publication under review includes a report by the Agricultural Instructor, Nevis. Experiments with provision crops continue to be carried on at the Nevis station, but the most important work of this nature is the selection of cotton. As in the case of St. Kitts, Nevis also has suffered from the effects of drought. The trouble was accentuated, unfortunately, by an exhaustion of the supply of Paris green and the consequent inability to control the later attacks of cotton worm. Provision has been made by the Government to prevent any re-occurrence of this untoward circumstance.

In both Nevis and St. Kitts the annual agricultural shows proved a great success, a result which arose principally owing to the activities of the agricultural officers and to the co-operation of the planters.

DEPARTMENT NEWS.

Mr. W. Nowell, D. I. C., returned to Barbados by the S.S. 'Parima' on January 24, 1914, from a visit to St. Lucia where considerable attention was given to the root disease of cacao, which is prevalent in certain districts of that island. Several important observations on minor mycological matters were also made.

The Annual Report on the Forest Administration of Southern Nigeria for the year 1912 shows that the following timber was exported during the year: 15,565 logs of mahogany valued at £78,007; 37 tons of ebony valued at £193; 277 cwt. of camwood valued at £46. This gives a total value of £78,156. The report also shows that useful economic experiments have been made in regard to the tapping of Funtumia and other rubber trees. Three thousand four hundred and thirty-five pounds of first quality sold at 3*s*. 10*d*. per lb., realizing £658 7*s*., whilst 66 lb. of scrap fetched £4 19*s*., giving a total of £663 6*s*. The total cost of the tapping operations, not including supervision, was £200 7*s*. 6*d*., thus showing a net profit on the whole transaction of £462 19*s*.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

Local Agents: Advocate Co., Ltd., Broad St., Bridgetown. *London Agents*: Messrs. Dulau & Co., 37, Soho Square, W.; West India Committee, Seething Lane, E.C. The complete list of Agents will be found on page 3 of the cover.

The *Agricultural News:* Price 1*d.* per number, post free 2*d.* Annual subscription payable to Agents, 22*s. d.* Post free, 4*s.* 4*d.*

Agricultural News

VOL. XIII. SATURDAY, JANUARY 31, 1914. No. 307.

NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number concerns the principles involved in the proper taking of samples. The subject is considered both from the point of view of the investigator in agricultural science, and from the point of view of the estate manufacturer of agricultural produce.

On page 35, information will be found concerning the agricultural side of the essential oil industry in relation to perfumery.

The fruit and fruit trees page contains two interesting articles dealing with variation in the size of cocoanuts, and the profitable manuring of bananas, respectively.

Further notes on the report of the standardization committee appointed by the Rubber Growers' Association, appear on page 37.

On page 38, a list of useful references occurs concerning breeds of Indian cattle. Notes on cotton also appear on this page.

One of the first series of experiments with dynamite in regard to the soil is described briefly on page 40. The trials are being made in Dominica and Antigua.

Insect and Fungus Notes comprise, respectively, a summary of information given in the *Agricultural News* on plant pests and diseases during 1913.

Publications of the Imperial Department of Agriculture.

The Report on the Botanic Station, St. Kitts-Nevis, is just being issued, and of this series there now remains to come only the Antigua and Montserrat publications, both of which are in the hands of the printer The 1912-13 Report on the Leeward Island Sugar-cane experiment is soon to be issued together with the *West Indian Bulletin*, Vol. XIV, No. 1. This latter publication will, it is believed prove interesting. Its contents are confined to economic and social science questions—a phase of West Indian agriculture which has not been attacked as systematically in the past as it might have been. There are other forces at work in agriculture besides purely chemical and physical ones, and as social conditions become more and more intensive and established, it becomes more and more necessary to try and control these economic tendencies to the best advantage scientifically.

In speaking of the first number of Volume XIV of the Bulletin, it may be added that the index to Volume XIII is now ready. The index to the *Agricultural News* is nearing completion and should be ready for distribution in about a month's time. It might have been earlier but at this time of year the publication work connected with Reports causes considerable pressure.

Agricultural Credit Movement in Trinidad.

Co-operative banks have been advocated in Trinidad since 1889, but it would seem now that some definite action is soon to be taken in the colony in regard to their actual establishment. According to an article in the *Bulletin of the Department of Agriculture* (December 1913), the District Agricultural Societies have been asked to consider carefully the regulations drawn up in connexion with the St. Vincent Ordinance, and to suggest any desirable modifications. Doing this, it is thought, will provide the Government with something tangible to go upon.

In the meantime, the Government will examine a great deal of information obtained from India where, as everyone knows, the system of rural and urban credit is very efficient. Residents in Trinidad and other places in the West Indies where the banks movement is on foot, may be glad to know that an extremely interesting and comprehensive account of agricultural co-operation in British India will be found in the *Bulletin of the Bureau of Economic and Social Intelligence*, No. 3 of 1910. This describes the initial difficulties, sources of capital, size, purposes, and uses of loans, legislation, central banks and other matters, supplemented by interesting statistics.

It is somewhat surprising, in view of the large coolie population in Trinidad and British Guiana, that authorities have not earlier followed up co-operative credit activities in the East. Curiously enough, the growth of co-operative credit in India started at the same time that the subject first received definite attention in the West Indies (1905), but it is unfortunately impossible to compare relative progress in the two places.

The essential thing in connexion with mutual credit societies is to have here and there someone who has the confidence and good-will of the people and sufficient energy and enthusiasm to push One meeting of the people themselves is worth many meetings of lukewarm committees.

Experiments with Dynamite in Dominica.

The Curator of the Botanic Gardens, Dominica, (Mr. Joseph Jones) writes to say that interesting experiments with dynamite in connexion with soil improvement have recently been carried out on one of the Government lime cultivations. In the first place fifty-six holes were exploded amongst some old trees on poor soil in order to see what effect it had. An area has been left untreated in the same field as a control.

A second experiment had for its object an investigation of the value of dynamite for preparing holes for planting budded lime plants. Half the holes have been opened up with the explosive; the other half by means of an iron bar and spade, in the usual way. It is hoped to start another experiment of a similar kind with seedling limes.

It is believed that if the cost works out to be reasonable, explosives may be used with great advantage in preparing holes for limes and other citrus plants in Dominica. As regards the opening up of the subsoil on established lime plantations, great care will have to be exercised, since should the experiments be followed by strong winds or heavy rains the effect on the trees, owing to their having lost to some extent their hold on the soil, might be disastrous. Methods which have been found highly satisfactory with deciduous fruit trees in temperate climates may require considerable modification in the case of evergreen fruit trees grown in the Tropics.

From information lately received, it is certain that a considerable number of experiments with dynamite will be undertaken on lime estates in Dominica in the course of the next few months, and the results of these and the ones just described will be awaited during the next year or two with great interest.

Agriculture in West Africa.

The recent visit to the West Indies of Officers in the West African agricultural service is another piece of evidence which points to the usefulness of the West Indies as a centre for the study of established agricultural methods and conditions. The West Indies are commonly regarded as the 'Old Country' of the British tropical possessions, and there can be little doubt that the introduction of good educational facilities—of an agricultural college—to supplement the natural advantages which the islands possess would meet with very general favour and support from those interested in the great tropical possessions undergoing development.

An idea as to what extent conditions are different in West Africa can be got, for instance, from the fact that to extend cotton cultivation in the Northern Territories of the Gold Coast, the representative of the British Cotton Growing Association travelled for 120 days during the year 1912, addressing everywhere meetings of chiefs, headmen and farmers. In the Gambia, to take another more or less half exploited West African territory, the natives do not raise sufficient food even for local requirements and rice has to be imported. In this Colony, ground nuts are the great cultivation just as is the case in the French possession of Senegambia. In both territories, the Governments follow the policy of arranging for the issue of seed nuts to the people under favourable conditions as regards payment.

In Sierra Leone, the Agricultural Department is making strong endeavours to improve general agricultural conditions by the introduction of systems of crop rotations and by altering the present wasteful method of farming, which consists in cutting and burning fresh bush each year to make a new farm.

A great deal of useful information on these West African possessions will be found in *Colonial Reports* —Annual, No. 765 (Northern Territories of the Gold Coast, 1912); No. 767 (Gambia, 1912); and No. 759 (Sierra Leone 1912). A very useful little booklet on the West African possessions is Notes on the West African Colonies, issued by the Emigrant's Information Office, London.

Cacao Estate Valuation.

A letter appears in the *Port-of-Spain Gazette* of November 25, 1913, condemning the prevailing system of valuing cacao estates in Trinidad by affixing a price to each of a number of trees, and including in this figure the value of the buildings, etc. Valuation by means of the crop is advocated. Cacao, it is stated, should be taken at a standard price of $100 per bag. This figure is raised or lowered according to locality, soil, conditions of upkeep, number of trees, age, appearance, injury caused by vermin, price of labour, transport, fermentation facilities and factors of a like kind. Allowances must also be made as regards uncertainty of the weather. The probable average yield being decided upon, the total value is got by multiplication. The valuation of buildings should be kept separate.

The question of valuing cacao estates has been well discussed recently in the *West India Committee Circular* and reported on in the *Agricultural News* (Vol. XII, p. 409). A simple and satisfactory plan seems to be to take the value at ten times the annual net profits plus the value of the uncultivated land and of the buildings. The only disadvantage to this system would appear to be that it involves the ability of the manager—a very variable factor.

Another method is to attach a value to the trees according to their age and condition; but it would seem, on the whole, that no very hard and fast rules can be laid down in the valuation of a cacao estate, since a large number of factors are involved, which for their appreciation demand the application of an experienced mind.

INSECT NOTES.

SUMMARY OF ENTOMOLOGICAL INFORMATION IN THE YEAR 1913.

II.

In the last issue of the *Agricultural News*, information presented during 1913 on insect pests of sugar-cane was summarized. In the following article, those of cotton, citrus fruits, and other pests are dealt with.

COTTON.

The discovery of the leaf-blister mite of cotton in Barbados during 1912 is referred to on page 58. The account of cotton pests in St. Croix (p. 394) is of interest. The principal pest in that island was the boll worm (*Heliothis obsoleta*) with which were associated at least four similar insects, including *Prodenia ornithogalli* and *P. latifascia*. A very considerable degree of success was reported from the use of traps of molasses for catching the moths of the boll worm. The cotton stainer (*Dysdercus andreae*), the leaf-blister mite, and the green stink bug (*Nezara viridula*) were all present in sufficient numbers to be regarded as pests.

In Antigua (see p. 250) the flower-bud maggot appeared in the cotton fields at the end of 1912 (December 29). Boll worm was present on two estates, on one of which it was the cause of a considerable amount of damage, the severity of the attack being increased by the presence of Indian corn in the cotton fields.

The pests of cotton in the United States were mentioned in the account of Mr. Bodkin's visit (see p. 362) where will be found a brief statement of the economic importance of the boll weevil and mention of several other insects which attack the cotton crop. On page 314, a short article on the cotton boll worm in the United States during 1912 deals with the spread of that insect. It is shown that although the boll weevil lost ground in certain parts of the country in 1912, the net increase of infested territory during that year amounted to 7,300 sq. miles.

ORANGES AND LIMES.

The lime twig borer (*Elaphidion mite*, Newm.) was first reported at Antigua toward the end of 1912 (see p. 90). It was thought at that time that this was a serious pest capable of inflicting much injury to the lime trees. This insect is one of the longicorn beetles. The egg is laid in or on the twig, the larva tunnels through this and then penetrates into a larger branch, girdling it in such a manner that it breaks but does not fall to the ground. If the broken branches are collected and burned at frequent intervals, most of the borers will be destroyed in this way. Although a newly recorded pest of limes, this insect is a native of the West Indies, being known to occur in St. Kitts, St. Bartholomew, St. Thomas and Guadeloupe.

The orange moth in Dominica (see p. 378) is also a new pest; it was first reported in 1907. In 1908-9 spraying with arsenate of lead was reported to be a satisfactory means of control, and it was not again brought to the notice of this Department until 1913. Although a considerable amount of injury has resulted from the attacks of this insect, the moth itself is not well known. Only a few specimens have as yet been procured, none of them in sufficiently good condition for study, with the result that up to the present time the identity of the moth has not been determined. It appears, however, to be related to the Codling moth which attacks apples in temperate countries, and to the Natal Codling moth which in that colony attacks oranges, among other fruits.

In Antigua (p. 250), limes suffered severely from attacks of the California red scale (*Chrysomphalus* [Aspidiotus] *aurantii*) which were more severe than usual on account of the long drought which was experienced in that island during the first part of the year 1912.

In California (see p. 346) the principal pests of citrus fruits were the black scale (*Saissetia oleae*), the red scale (*Chrysomphalus aurantii*) and the purple scale (*Lepidosaphes beckii*). Artificial control measures, such as fumigation and spraying, are carried out against these insects, while the natural enemies of certain of them have proved of great value in the matter of natural control.

The corn ear worm (*Laphygma frugiperda*) appeared in British Guiana as a severe pest of rice, and this insect formed the subject of an article in the British Guiana Journal of Agriculture which was abstracted in Insect Notes on p. 234. It is of wide distribution and is known to attack a number of plants, the chief of which in the West Indies are corn and cotton. A curious instance of parasitism was also mentioned in this article.

MISCELLANEOUS.

TICKS. On page 330 an account was given of 'How Ticks are Killed in Dipping', being an abstract of an article which appeared in the *Agricultural Journal of the Union of South Africa*. It is here shown that the poison of the cattle dips is absorbed by the skin of the animals, and afterwards taken up by the ticks by suction, along with their food, that is, the body juices of the cattle.

Ticks in the United States were mentioned at page 362 where reference is made to a demonstration dipping tank built of concrete at the Louisiana Experiment Station. The dipping solution used in this connexion contained white arsenic, washing soda, pine tar and water, but the proportions of the several ingredients were not given.

BLACK WITCH OR TICK BIRD. In the first number of the volume (see p. 10) the insect notes consisted of an article on the tick bird (*Crotophaga ani*), which occurs in several of the West Indian islands, and which, on account of its useful habit of eating many kinds of insects and cattle ticks, it was thought might well be introduced into those where it at present does not exist.

MILLIONS. The small fish known as millions (*Girardinus poeciloides*) which has been used as a destroyer of mosquito larvae under certain conditions was successfully transported from Barbados to Kuala Lumpur, something like 1,000 living fish reaching their destination. (See p. 330.)

FRUIT FLIES. The insects known as fruit flies were dealt with in an article which appeared at page 410. It was based on an article from the *Journal of Economic Entomology* and contained a list of food plants of fruit flies in Hawaii, many of which occur commonly in these islands. It seems certain that if any of the important fruit flies should be introduced into the West Indies they would find suitable food plants in sufficient number to enable them to establish themselves without difficulty.

This account will be continued in the next issue of the *Agricultural News*.

A note appears in the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases* (October 1913), to the effect that a disease of papaw trees was reported from Cleveland in Queensland in May, and was found to be due to a well-known insect pest, *Dichocrocis punctiferalis*. Though primarily a maize pest, this insect appears to be extending its ravages to fruit trees, reports having already been received of its damaging custard apples, oranges, peaches, loquats, cotton and other fruit and seeds.

AGRICULTURAL ENGINEERING.

Steam Tractor Ploughing in Rhodesia.—An interesting summary of the actual working costs of ploughing by means of a steam tractor in Rhodesia, is given in the *Rhodesia Agricultural Journal* (December 1913). In the trial under consideration, the area ploughed was 4 to 5 acres per day. The ground was exceptionally rough, and the engines pulled only five furrows. The cost of labour per month worked out as follows: one engine boy, 40*s*.; one steering boy, 30*s*.; one plough boy, 20*s*.; two boys with cart and water tank at 30*s* and 20*s*, 50*s*.; one boy cutting dry wood, 15*s*.—giving a total of £7 15*s*. The other costs are coal, 8 tons at 30*s*. per ton, £12; oils, packing, etc., £1 10*s*. This makes a total monthly working cost of £21 5*s*. This estimate against, say, 80 acres ploughed per month would mean 5*s*. 6*d*. per acre. The writer of the article under consideration superintended the work referred to, but if a European were employed, the total cost per acre would be increased by about 10*s*. 6*d*. As regards the cost of repairs, £15 to £20 per annum and 10 to 15 per cent. depreciation have to be allowed. It must be remembered, however, that not all this must be charged against ploughing, for the tractor can do other useful work besides.

A Wheel for Rural Transport.—A special feature of the *India Rubber World* is the section devoted to a description of recent patents of rubber goods. For some time considerable attention has been given to the possibilities of manufacturing automobile wheels with the qualities of the pneumatic tyre without its disadvantages. A newly invented wheel is one which has a solid rubber tread consisting of rubber blocks, each attached to a steel plate so that each plate and block is independent of the one adjacent to it. In the centre of each plate is a steel spring which connects the tread with the inner rim. The resiliency is, of course, due to these springs lying between the outer rubber rim and the inner steel one to which the ends of the spokes are attached. A wheel of this type will very probably be found useful in large tropical countries where motor transport is rapidly coming into use since it can stand rough country, whilst at the same time it can afford a requisite degree of comfort.

A comparison is made in the *Experiment Station Record* (October 1913) between the cost and service of motor trucks and horse-drawn vehicles. The results in general are in favour of the motor trucks. 'For low daily mileage up to 18 miles, the three-horse truck is more economical owing to the time required in loading and unloading, but the motor truck has the advantage of being able to operate economically over a daily mileage varying from 15 to 75 miles. In addition, quick loading and unloading devices are being put on the market, which the tests indicate will allow motor trucks to operate at a low daily mileage with an economy equal to or greater than the horse truck.

Those who live in the country without any quick means of communication with a reliable source from which the correct time can be obtained, will be interested in an article entitled A New Sun-dial, written by the Government Astronomer of New South Wales, and published in the *Agricultural Gazette* of that State, for November 1913. Practical details of construction, careful explanations, and two plates of very clear drawings are given.

CHEMICAL NOTES.

The Phospho-Constituent of Maize.—For some time a series of articles has been running in the *Agricultural Journal of the Union of South Africa* on the chemical composition of South African maize and other cereals. The article in the November issue deals with the question of the phosphatic constituents, and brings out several interesting points. In the first place, in comparing the figures representing the average composition of whole maize and mealie maize in South Africa, with the composition given by Primrose McConnel for maize consumed in Great Britain, we notice that the percentage of digestible carbohydrates is much greater for the South African produce (namely about 70 per cent.) than in the case of the grain consumed in Europe (namely 58 per cent. digestible carbohydrate).

But the immediate point at issue is the question of phosphorus as a food constituent of maize. It was found by means of analyses that the phosphoric content of the ash of maize is increased by milling, presumably through the rejection of those parts of the grain which are poor in phosphorus. The same thing occurs in the case of the fat. The percentage of proteins, on the other hand, appears to be scarcely altered at all by milling. It is interesting to note the following differential analysis of maize as regards the phosphoric oxide content: whole seed ·83 per cent.; husk ·23 per cent.; germ 6·16 per cent.; endosperm ·35 per cent.

It is hardly necessary, in conclusion, to point out the great importance of phosphorus in animal nutrition, not merely for the synthetic processes only, but also as a factor for preserving a proper balance between other food constituents during the metabolic changes which occur within the animal body.

Composition of the Baobab Tree.—According to the *Journal of the Chemical Society* (October 1913), the composition of the fruit and seeds of *Adansonia digitata* (the baobab tree) has just been determined. The seeds contain moisture, 12·1; ash, 3·5; oil, 11·6; protein, 11·2; fibre, 22·5; carbodydrates, 39·1. It is worth noting that the ash of the kernels contain as much as 31 per cent. of potash and 34·2 per cent. of phosphoric acid. The seeds are free from alkaloids and cyanogenetic glucosides. The pulp of the fruit contains: moisture 15 to 16 per cent.; ash, 4·76 to 6·10 per cent.; and matter soluble in alcohol, 16·7 to 18·7 per cent. The pulp contains a fair amount of citric acid whilst its ash is composed principally of alkali carbonates.

Endeavours to Cheapen Nitrate Production.—It is stated in *The Board of Trade Journal* (December 18, 1913), that the Chilian Government has decided to carry out a series of extensive experiments on a practical commercial scale, with a view to discovering some method for the treatment of low grade 'caliche' (soil in which nitrate of soda occurs) that is not worth treating by existing methods. If the experiments are commercially successful they will certainly tend to lower the present high cost of this manure.

A note in the *Journal of the Chemical Society* (November 1913) states that chloral hydrate has an antitoxic action on copper sulphate when present in water cultures. Growth goes on best when both substances are present in about equal amounts. The action of chloral hydrate in diminishing the toxicity of copper sulphate is similar, although less marked, to the influence of calcium on magnesium.

GLEANINGS.

The Grenada cacao crop, according to the Superintendent of Agriculture, is exceedingly backward all over the island, owing to seasonal peculiarities. With the early receipt of rainfall, however, the crop should not be short but merely late.

Over 1,000 tons of cotton were sent down to Bangkok this season for export to Japan, principally. The Japanese mills prefer this Siamese short staple cotton for manufacturing cotton crêpe. It is understood that the 1,000 tons refers to unginned cotton.

According to the *Port-of-Spain Gazette* (January 6, 1914) there was a large meeting of peasant proprietors held at Carabichaima, Trinidad, on January 3. The people heard an address on various agricultural matters including the question of co-operation.

The condition of the crops on the small holdings in Grenada is not as good as it was, owing to the dry weather, though the sugar-cane is continuing to grow well. Fair yields from the second corn crop are expected and good quantities of sweet potatoes are already being gathered in.

A rather interesting article entitled Some Notes on a West Indian Coral Island is published in the *Kew Bulletin of Miscellaneous Information*, No. 10 of 1913. The island dealt with is Grand Cayman. Interesting observations are recorded in regard to the introduction of plants by the sea.

At a recent meeting of the Agricultural and Commercial Society of St. Kitts, a discussion took place as to the necessity for introducing a special mark for St. Kitts cotton. Amongst other matters dealt with was the holding of the Annual Agricultural Show. This will be opened early in 1914.

It is satisfactory to notice that Canada is watching the efforts which are being made in connexion with an extension of the area under Indian corn, particularly as regards the Leeward Islands. An article on Sir Hesketh Bell's address in Antigua appears in the *Canada-West India Magazine* (December 1913).

Since salt is now on the free list of the United States Tariff it may perhaps be now found possible for islands like Nevis and the Turks and the Caicos Islands to develop a profitable industry. It appears from *Colonial Reports*—Annual No. 763 that the price is kept low by the keen competition of the Mediterranean salt.

A very interesting article appears in *Nature* (December 25, 1913) on the subject of the origin of climatic changes. It is held that volcanic dust must have been a factor—possibly a very important one—in the production of many, perhaps all, past climatic changes. The different ways in which dust in the atmosphere can affect the weather are considered.

According to *Colonial Reports*—Annual No. 758 (1911-12), Ceylon's chief export products in order of value are as follows: tea, 849; rubber, 283; copra, 131; coco-nut oil, 131; desiccated coco-nuts, 70; plumbago, 66; areca nuts, 24, cacao, 23; coir fibre, 13; coco-nuts, 11; coir yarn, 11; citronella oil, 10; poonac, 9; tobacco, 8; cardamoms, 6.

As has been recently pointed out, Antigua is giving attention to the question of establishing a West Indian market in Canada for onions. Quite recently the idea has been extended by an experimental shipment of tomatoes. The systematic cultivation of Irish potatoes in Antigua is also at the present time being considered by the Agricultural Officers.

According to the *Bulletin de l Association des Planters des Caoutchouc* (November 1913) the German Committee for the commercial development of the colonies has nominated a special commission for the purpose of studying the question of the cultivation of uniform grades of commercial caoutchouc. The commission will work in conjunction with the agricultural authorities at the Amani Institute.

It is stated in *The Board of Trade Journal* (December 24, 1913) that the coffee shrubs on most of the plantations in the São Paulo district of Brazil are in a very backward condition as regards both foliage and flowering, owing to lack of sufficient rain and an unusual prevalence of cold winds which lasted till the end of October. It would appear, therefore, that the next crop will be an exceptionally small quantity.

After service of thirty-five years as Government Head Gardener at the Botanic Gardens of British Guiana, Mr. J. F. Waby has retired on pension. Mr. Waby was made the subject of a presentation, and in recognition of the retiring officer's able services the Governor has been pleased to appoint him a member of the Board of Agriculture. Further information in connexion with the proceedings will be found in the *Daily Argosy* Mail Edition (January 3, 1914).

A copy has just been received of the Ordinance to amend the Plants Protection Ordinance, St. Lucia, 1909. This Act is No. 19 of 1913. Its provisions are stringent, giving the Government power to declare any disease or pest as coming within the meaning of the Act, and providing the Agricultural Superintendent or any Inspector, with power to enter land and inspect. Special provision has been made to check the distribution of Love Vine (*Cuscuta* spp.). The penalty for an offence in this connexion is not exceeding £20.

EXAMINATIONS IN PRACTICAL AGRICULTURE.

QUESTIONS SET FOR 1913.

In the last issue of this journal the information respecting the above examinations concluded with the questions set in the Intermediate Examination on cacao. The following comprises those set in connexion with cotton and limes:—

COTTON.

1. Make an examination of the sample of seed cotton provided, and express the results of the examination in the form of a table.

2. Write an account of the selection and preparation of cotton seed for estate planting. Give reasons for the different operations referred to.

3. What methods and precautions must be taken in picking cotton, and in preparing the lint for ginning?

4. Write a full account of the nature of and damage done by the leaf-blister mite.

5. How is land prepared previous to the planting of cotton? How much seed is required for planting 10 acres, and how many hands will it be necessary to employ in caring for the crop during the first two months of its growth?

6. Describe the use of Paris green or London purple. Add a note as to its composition and cost.

7. Enumerate carefully the characteristics of a desirable type of cotton for cultivation in your own district.

8. Describe the different uses of cotton seed, both direct and indirect.

LIMES.

1. Discuss the subject of wind-breaks and the provision of drainage on a lime estate.

2. Give an account of as many scale insect pests of limes as you can, and indicate methods of control.

3. Give a detailed account of the process of concentrating lime juice.

4. Write what you know concerning the picking and packing of fresh limes.

5. Describe either (a) the manufacture of citrate of lime, or (b) the production of distilled oil of limes.

6. What work is done in a lime nursery?

7. How would you proceed to plant 20 acres of cleared land in limes? Give details as regards distances, number and variety of plants, labour, etc.

8. Describe the root system of a lime tree and indicate the significance of your observations in connexion with interculture and general sanitation.

FINAL EXAMINATION.

The following were the questions set in the General Subjects paper. Six questions only were to be attempted. One of these was to be selected from each of the sections A. B. C. D.:—

A. PRODUCTION OF PLANTS.

1. What do you know concerning the activities of bacteria in the soil? What effect has partial sterilization on bacterial activity?

2. Give an account of any legislation that has been made for the protection of some cultivated plant.

3. Write a short essay on the subject of the methods that may be employed on estates for the purpose of counteracting intermittently unfavourable climatic conditions.

B. PRODUCTION OF ANIMALS.

1. Along what lines do you consider improvement desirable in regard to the breeding of West Indian cattle? How would you suggest carrying these improvements into effect?

2. Describe any contagious disease of live stock. What preventive measures do you recommend?

3. From what sources are foodstuffs fed to West Indian cattle obtained? Discuss the economy of buying foodstuffs as against growing them.

C. CONSTRUCTION ON ESTATES.

1. Discuss the question of the position of buildings on an estate in relation to efficiency of working the estate.

2. Write an account of the annual repairs that are required for buildings and machinery on any estate. How may these repairs be reduced to a minimum?

3. What factors determine the necessity for draining land? Describe the drainage system on an estate you are acquainted with.

D. ECONOMICS OF PLANTING.

1. Give a description of any machinery and simple arrangements you are acquainted with which are essentially labour-saving.

2. How are the by-products of an estate utilized to increase the general revenue?

3. Write a short essay on agricultural co-operation.

The Special Subjects paper contained the following, of which only three questions were to be attempted:—

SUGAR INDUSTRY.

(General.)

1. Discuss broadly the system of cultivation of the soil for sugar-cane which has been found most suitable for the district in which you live.

2. What do you regard as a desirable rotation of crops for your district? Give reasons for your statement.

3. What are the factors determining the practice of ratooning on an estate you are acquainted with? Indicate the extent to which these factors determine the number of years ratooning is carried on.

(Muscovado Method.)

1. The polariscopic test for sugar is of importance in connexion with the manufacture of muscovado sugar. What test should a good sample of muscovado have? Describe the methods of boiling and curing necessary to ensure this.

2. Give an account of the manufacture of syrup. What are the characters of a high class syrup? Discuss the economic aspect of syrup making.

3. Discuss the economic advantages and disadvantages of the muscovado system, and indicate as fully as you can what steps may be taken for its amelioration.

COTTON.*

1. Give the reasons why the district with which you are concerned is suitable for cotton growing. What are the periods for planting and picking? What determines these?

2. Write a general account of the pests and diseases of cotton that have been prevalent in the island in which you live during the last two years. Can you assign any reasons for the prevalence in certain cases? Indicate steps that may be taken in regard to control.

3. Discuss the position of cotton seed in the economy of an estate.

* The remaining questions on cacao and limes will be given in next issue.

FUNGUS NOTES.

SUMMARY OF INFORMATION RESPECTING PLANT DISEASES IN 1913.

II.

In the last issue of the *Agricultural News* a summary was presented of the information concerning the diseases affecting sugar-cane, citrus plants, Hevea, cacao and cotton. In the following article, a digest of the information given during the past year on miscellaneous mycological matters is presented.

BANANA.

The Panama disease of banana has been recently described by S. F. Ashby in Jamaica, and an account of his work may be found on page 206. The results accord very closely with those of Drost in Surinam and it is probable that we are now on fairly sure ground with regard to this long-standing source of contradictions. The disease is described as being due to a fungus with Fusarium and Cephalosporium stages. The effect of its action is the choking of the vessels, thereby curtailing the water-supply of the plant.

ENTOMOGENOUS FUNGI.

The preliminary note published by T. Petch in the *Annals of Botany* and summarized on page 14, deals with an interesting new group of entomogenous fungi, including species of Septobasidium and Thelephora, which occur in patches on stems and branches of trees, and are now announced to be parasitic on the scale insects occurring in those situations. Such fungi are common in some of the West Indian Islands. A new Isaria occurring on the green bug *Nezara viridula* in Grenada is mentioned on page 78, where also occurs a note on Aschersonia on scale insects. In the same article a review is given of work by A. T. Speare in Hawaii on fungi parasitic on insects attacking the sugar-cane. This includes an Aspergillus on mealy-bugs which is apparently the same that is so common in the West Indies. It is described in this paper as *A. parasiticus*. A species of Entomopthora difficult to detect in the field is also recorded as exercising very considerable control of sugar-cane mealy-bugs. The green Muscardine fungus occurs in Hawaii on weevil borer and hard back grubs. Entomogenous fungi on Coccidae in Japan are recorded on page 334. Some of these are the same species which are well known in the West Indies; others have not been recorded here.

MISCELLANEOUS PLANT DISEASES.

A dry rot of tannias in Jamaica investigated by Ashby is described on page 30. An effect is produced on the plant which resembles that caused by drought. The tubers turn brown and decay. Infection takes place through wounds on the tuber and the disease is largely spread by planting infected material. A leaf spot disease of Eucalyptus in Montserrat, apparently due to bacteria, is described on page 94. On page 174, a disease of Agave, which occurs in Antigua and Trinidad, is dealt with in a summary of work by T. J. Shaw in India. From India there comes also an account of a new disease of the Castor Oil plant by J. T. Dastur. The causative fungus is *Phytophthora parasitica*. It destroys seedlings and attacks the leaves of older plants. It is unable to retain its vitality in the soil so long as two months, and does not appear to be able to infect other plants. The information concerning it will be found on pages 238 and 254. In view of the occurrence in the West Indies of various sclerotial diseases, a paper by Shaw on the disease of rice in India caused by *Sclerotium oryzae* is of considerable interest (page 318). The fungus was found to be an active parasite. Tobacco wilt disease in India due to a bacterium is described on page 350 in a summary of a paper by C. M. Hutchinson.

GENERAL MYCOLOGY.

A discussion of recent work on the parasites belonging to the genus Glomerella, described in a bulletin of the United States Department of Agriculture by C. L. Shear and Anna K. Wood appears on page 190. Anthracnoses caused by imperfect forms probably pertaining to this genus are common everywhere. The authors dealt with material from thirty-six host plants, which they refer as a result of their cultural experiments to three species of Glomerella, one of which occurs on thirty-four of the hosts, including such diverse plants as palms, oranges, apples, gooseberries, cacao and arrowroot. The question of internal and external legislation against plant pests and diseases is discussed on page 414, apropos of the issue of a bulletin by T. Petch giving the history of such measures in Ceylon. It is pointed out that Ceylon has taken the lead among tropical countries in providing administrative machinery for dealing with diseases found to exist within the country.

HOW TO MAKE BORDEAUX MIXTURE ADHESIVE.

The following article has been taken from the *Agricultural Gazette of New South Wales*, as being likely to prove interesting in the West Indies:—

At the last March meeting of the Academy of Sciences, Messrs. V. Vermorel and F. Danthony indicated the results of investigations carried out by them at the Viticultural Station of Villefranche-Sur Saône on the processes adopted for the purpose of giving adhesive properties to spraying mixtures used for vines.

The following are the principal conclusions: the addition of gelatine permits of solutions being obtained having great superficial viscosity, and we have advised its addition to the copper mixtures to make them adhesive. Gelatine in doses varying from 3 to 8 oz. per 100 gallons can be used for Paris green and for acid Bordeaux Burgundy mixtures. On the contrary, we have found that in the alkaline mixture the soda present renders the gelatine insoluble, thereby diminishing its superficial viscosity.

We have consequently looked for a substance, costing little, which could take the place of gelatine. Among the substances we tried, casein has given the best results. It is sufficient to add to a Bordeaux mixture prepared in the ordinary way from 3 to 8 oz. casein, first dissolved in a small quantity of milk of lime, to obtain a very adhesive spraying mixture. In an acid mixture casein would become insoluble and consequently inactive.

A few notes may be added to this information. Acid mixtures are those which turn red the blue litmus paper. They are little used here, if at all. Milk of lime can be easily made by mixing some of the slaked lime with water sufficient to make into a milky liquid.

In a further communication Messrs. Vermorel and Danthony suggest that the casein should be dissolved by the following process: mix intimately $3\frac{1}{2}$ oz. of powdered burnt lime with $1\frac{1}{2}$ oz. of powdered casein. Add to the mixture very little water and work it well into a paste. Thin it down with successive small quantities of water till about a quart of liquid is obtained, which is then to be added to the Bordeaux mixture.

WEST INDIAN PRODUCTS.

DRUGS AND SPICES IN THE LONDON MARKET.

Mr. J. R. Jackson writes on January 6, 1914, as follows:—

The month of December opened with but little or no change in the condition of the markets since our last report for November. As the month progressed, however, a better tone prevailed, consequent probably, in some measure, to the fact that the last drug auction was held on December 11, to be resumed on January 8 of the New Year. Changes in the prices realized for individual products may be noted by the advance at the beginning of the month in West Indian tamarinds, and later in that of grey Jamaica Sarsaparilla, while on the other hand kola and citric acid were lower. The spice market has generally been dull, as will be seen by the following details.

GINGER.

At the first spice auction on the 3rd of December the offerings amounted to 650 packages of Cochin and Calicut; 125 of these sold without reserve at the following rates: 62*s.* to 65*s.* for bold wormy selected, and 35*s.* for small cut; rough wormy Formosa realized 16*s.* to 16*s.* 6*d.*, while washed rough Cochin was bought in at 25*s.* to 28*s.* and rough bold brown Calicut at 29*s.* A week later the offerings of ginger were all bought in, and again on the 17th when 198 bags of brown rough Calicut were bought in at 25*s.* per cwt. After this date there were no auctions on account of the holidays.

NUTMEGS, MACE, AND PIMENTO.

Nutmegs were well represented at the first spice auction, as many as 467 packages of West Indian being offered, nearly all of which were sold at the following rates: 62's to 72's. 5*d.* to 9½*d.*, 74's to 84's 5*d.* to 6½*d.*, 85's to 95's 5*d.* to 6*d.*, 96's to 106's 4¼*d.* to 4¾*d.*, 119's to 129's 4*d.* to 4¾*d.*, 156's to 170's 4¼*d.* to 4½*d.* At the second auction on the 10th, 47 packages of West Indian were sold at similar rates. On the 17th, 509 packages of West Indian were brought forward, most of which found buyers at 8½*d.* for 60's to 62's, 5½*d.* to 6½*d.* for 70's to 80's, 4½*d.* to 5½*d.* for 82's to 92's, 4½*d.* to 4¾*d.* for 94's to 104's, and 4¼*d.* to 4¾*d.* for 140's to 142's. A few packages of Eastern were also offered at this auction, part of which sold at 5¼*d.* for 124's to 170's. Of mace, at the first spice auction on December 3, 133 packages of West Indian were offered and sold at 1*s.* 4*d.* to 2*s.* 7*d.* per. lb. A week later, namely, on the 10th, the offerings amounted to 23 packages of West Indian, all of which were disposed of at from 1*s.* 7*d.* to 2*s.* per lb., broken fetching from 1*s.* 3*d.* to 1*s.* 4*d.* Again on the 17th, mace was in steady demand, being represented by 105 packages of West Indian, most of which found buyers, fair pale fetching 2*s.* to 2*s.* 1*d.*, pale and reddish 1*s.* 9*d.* to 1*s.* 10*d.*, and fair red 1*s.* 8*d.* to 1*s.* 9*d.*; 1*s.* to 1*s.* 2*d.* per lb. was paid for broken. Pimento has not occupied on important position during the month, being represented at auction, on the 10th, by 123 bags only, part of which was disposed of at 2*d.* per lb. for fair.

SARSAPARILLA.

As there was only one drug auction held during the month in consequence of the intervension of the Christmas holidays, the offerings of sarsaparilla were confined to the sale on December 11, when they consisted of 26 bales of grey Jamaica, 17 of native Jamaica, and 6 of Lima-Jamaica. The first two were all disposed of, the grey Jamaica at about 2*d.* per lb. advance on previous prices; 1*s.* 8*d.* to 1*s.* 10*d.* being paid for fair, part rough to good fibrous; 1*s.* 6*d.* for inferior, and 1*s.* 7*d.* to 1*s.* 9*d.* for very rough. The native Jamaica fetched 10*d.* per lb. for good red press packed, and 9*d.* to 9½*d.* for dullish to fair; good red, but sea-damaged was disposed of at 9*d.* and dull red at 8*d.* per lb. The Lima-Jamaica was bought in at 1*s.* 8*d.* per lb.

TAMARINDS, CITRIC ACID, ANNATTO, CANELLA ALBA, KOLA, LIME JUICE AND LIME OIL.

At the beginning of December West Indian tamarinds were reported to be in small supply. The prices asked for Barbados, in bond, was 17*s.* 6*d.* per cwt, and for other kinds of West Indian, 16*s.* to 16*s.* 6*d.* The quotation for citric about the middle of the month was 2*s.* 0¾*d.* to 2*s.* 1*d.* per lb.—a falling in price, said to be due to a decreased demand. Prices, however, were expected to advance with the opening of the New Year. Four bags of dullish annatto seeds were brought forward at auction on the 11th, and sold at 3¼*d.* per lb., and at the same auction a single bale of pale thickish quill Canella alba bark was sold at 60*s.* Kola has been cheaper during the month, consequent on increased supplies, 113 packages having arrived. Thirteen bags of West Indian, some slightly wormy, were sold in the middle of the month at 2¼*d.* per lb. others slightly mouldy at 1*d.* per lb, a consignment of 59 bags of fair bright Ceylon were held at 3¼*d.* Raw West Indian lime juice was quoted in the middle of the month at from 1*s.* 4*d.* to 1*s.* 6*d.* per gallon, while West Indian distilled lime oil has been held at 1*s.* 8*d.*, hand-pressed fetching 10*s.*

Diplomatic and Consular Reports, No. 5111, Annual Series, shows that briarwood is an important product of the island of Corsica. The Corsican roots are said to be excellent in quality and very little behind the Sicilian briarwood. During 1912, the United Kingdom took 250 tons of this produce. It would be interesting to know whether the roots of any forest trees growing in the West Indian islands might not provide suitable material for the profitable industry of pipe-making.

Major Holmes of the Indian Civil Veterinary Department has just reported experiments that have been carried out to test the value of serum from bulls, immunized by injection of blood obtained from hill bulls, during the progress of a modified attack of Rinderpest produced by simultaneous injections of serum and virus. The volume of virus used for injections in the process of hyper-immunization has been further reduced to 2·5 c.c. per lb. body weight in the case of plain cattle. For hill bulls and buffaloes a volume at the rate of 3 c.c. per lb body weight is now used. Further, it has been found unnecessary to increase the volume of virus in each successive injection, as was generally practised. Animals reinjected several times with the same volume continue to produce a serum of value to that obtained after the first injection. Further information on the subject will be found in the *Memoirs of the Department of Agriculture in India* (Veterinary Series), Vol. II, No. 2.

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR, January 13, 1914; Messrs. E. A. de PASS & Co., January 2, 1914.

ARROWROOT—3*d.* to 4¾*d.*
BALATA—Sheet, 2/8 to 2/8½; block, 2/- per lb.
BEESWAX—£7 15*s.* to £8 15*s.*
CACAO—Trinidad, 64/- to 71/- per cwt.; Grenada, 58/- to 62/-; Jamaica, 56/- to 61 -.
COFFEE—Jamaica, 53*s.* to 56*s.*
COPRA—West Indian, £31 to £31 5*s.* per ton.
COTTON—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 17*d.* to 22*d.*
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—Quiet, 32*s.* to 60*s.*
ISINGLASS—No quotations.
HONEY—No quotations.
LIME JUICE—Raw, not in request; concentrated, £25 to £28; otto of limes (hand-pressed), 8/3.
LOGWOOD—No quotations.
MACE—1/7 to 2/6.
NUTMEGS—5*d.* to 6½*d.*
PIMENTO—2*d.* to 2 1/16*d.*
RUBBER—Para, fine hard, 3/1½; fine soft, 2/6; Castilloa, 1/8 per lb.
RUM—Jamaica, 2/4½ to 5/- per gallon.

New York.—Messrs. GILLESPIE BROS. & Co., January 9, 1914.

CACAO—Caracas, 13¾c. to 14¾c.; Grenada, 13c. to 13¼c.; Trinidad, 13½c. to 13¾c.; Jamaica, 11½c. to 12½c.
COCO-NUTS—Trinidad and Jamaica, selects, $28·00 to $33·00; culls, $16·00 to $18·00 per M.
COFFEE—Jamaica, 11¾c. to 14½c. per lb.
GINGER—8c. to 11c. per lb.
GOAT SKINS—Jamaica, 50c.; Antigua and Barbados, 45c. to 48c.; St. Thomas and St. Kitts, 42c. to 45c. per lb.
GRAPE FRUIT—Jamaica, $2·50 to $3·00.
LIMES—No quotations.
MACE—50c. to 54c. per lb.
NUTMEGS—110's, 12¼c.
ORANGES—Jamaica, $1·25 to $1·50.
PIMENTO—4c. to 4½c. per lb.
SUGAR—Centrifugals, 96°, 3·20c. to 3·23c. per lb.; Muscovados, 89°, 2·70c. to 2·73c.; Molasses, 89°, 2·45c. to 2·48c. per lb., all duty paid

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Trinidad.—Messrs. GORDON, GRANT & Co., January 19, 1914.

CACAO—Venezuelan, $12·80 to $13·00; Trinidad, $12·50 to $13·00.
COCO-NUT OIL—$1·10 per Imperial gallon.
COFFEE—Venezuelan, 15c. per lb.
COPRA—$5·25 per 100 lb.
DHAL—No quotations.
ONIONS—$3·75 to $4·00 per 100 lb.
PEAS, SPLIT—$5·75 per bag.
POTATOES—English, $1·30 to $1·40 per 100 lb.
RICE—Yellow, $5·10 to $5·30; White, $4·70 to $4·80 per bag.
SUGAR—American crushed, no quotations.

Barbados.—Messrs. JAMES A. LYNCH & Co., Ltd., January 24, 1914; Messrs. T. S. GARRAWAY & Co., January 17, 1914.

ARROWROOT—$4·50 to $5·00 per 100 lb.
CACAO—$12·00 to $12·50 per 100 lb.
COCO-NUTS—$24·00.
HAY—$1·50 to $1·60 per 100 lb.
MANURES—Nitrate of soda, $70·00; Cacao manure, $48·00 to $50·00; Sulphate of ammonia, $82·00 to $85·00 per ton
MOLASSES—No quotations.
ONIONS—$2 87 to $6·00 per 100 lb.
PEAS, SPLIT—$6·00 per bag of 210 lb.; Canada, $3·05 to $4·00 per bag of 120 lb.
POTATOES—Nova Scotia, $1·00 per 160 lb.
RICE—Ballam, $5·20 to $5·35 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
SUGAR—American granulated, $4·00 per 100 lb.

British Guiana.—Messrs. WIETING & RICHTER, January 17, 1914; Messrs. SANDBACH, PARKER & Co., January 16, 1914.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	$9·00 per barrel of 200 lb.	——
BALATA—Venezuela block	No quotation	——
Demerara sheet	65c. per lb.	——
CACAO—Native	14c. per lb.	12½c. per lb.
CASSAVA—	96c.	——
CASSAVA STARCH—	——	——
COCO-NUTS—	$16 to $20 per M.	$26 per M.
COFFEE—Creole	15c. per lb.	15c. per lb.
Jamaica and Rio	15½c. per lb.	16½c. per lb.
Liberian	13c. per lb.	11½c. per lb
DHAL—	$4·75 to $5·00 per bag of 168 lb.	$4·65 to $4·75 per bag of 168 lb.
Green Dhal	$5·75	——
EDDOES—	$1·20	——
MOLASSES—Yellow	None	——
ONIONS—Teneriffe	——	——
Madeira	7c.	8c.
PEAS—Split	$6 00 per bag (210 lb.)	$7·00 per bag (210 lb.)
Marseilles	——	——
PLANTAINS—	16c. to 40c.	——
POTATOES—Nova Scotia	$2·00	$2·40
Lisoon	——	——
POTATOES—Sweet, B'bados	$1·92 per bag	——
RICE—Ballam	No quotation	——
Creole	$4·75 to $5·00	$4·50 to $4·80
TANNIAS—	$2·40	——
YAMS—White	$2·16	——
Buck	$2·16	——
SUGAR—Dark crystals	$2·00	$2·00
Yellow	$2·40 to $2·50	$2·40
White	$3·75 to $4·00	$4·00
Molasses	——	——
TIMBER—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M.
,, Cordwood	$1·80 to $2·00 per ton	——

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PAMPHLET SERIES.

The Pamphlets are written in a simple and popular manner and the information contained in them is especially adapted to West Indian conditions. They contain, amongst other subjects, summaries of the results of the experiment work on sugar-cane and manures, the full official reports of which have only a limited circulation. The number issued up to the present time is seventy. Those mentioned in the following list are still available: the rest are out of print.

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Printed at Office of *Agricultural Reporter*, 4 High Street, Bridgetown, Barbados.

AGRICULTURAL NEWS

Vol. XIII. No. 308.] SATURDAY, FEBRUARY 14, 1914. [One penny.

AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

OF THE

IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

VOL. XIII. No. 308. BARBADOS, FEBRUARY 14, 1914. PRICE 1*d.*

CONTENTS.

The European Planter in the Tropics.

IN the course of reading a book on the planting of cacao, rubber and coffee, which has recently been published for the benefit of intending settlers, our attention was arrested by the following statement: 'The more we apply the principles of gardening to all our operations, the greater our success will be.' It is needless to remark that the authors mean this statement to refer principally to orchard crops such as the book deals with, and within these limitations the advice is undoubtedly sound and opens up several interesting points for discussion.

Beginning with what seems to be the most important point involved, it may be asked—Is the circumstance that tropical planting is horticulture rather than agriculture always appreciated by the European settler? In order to demonstrate the difference between so-called tropical 'agriculture' and the agriculture of temperate countries, we may conveniently imagine what an intending capitalist would have to do in a temperate country in order to fit himself as technically as possible for starting an estate in the Tropics. Those who were familiar with the conditions of both systems of land management would at once perceive the parallelism between fruit farming and market gardening, and tropical plantation work. It would be evident that a knowledge of horticultural rather than agricultural scientific principles is an essential requirement. In considering preliminary experience as regards practical work, a short term of residence on a fruit farm would be suggested as likely to be more useful than working on an arable estate. In tropical planting, an important matter is the study of the plant. This is done in the case of fruit trees wherever they are grown. But on an arable form in temperate countries, crops and systems are studied. It is not to be inferred that intellectually this latter class of agricultural practice is inferior to the former. On the contrary, arable farming in temperate countries, with its complicated rotations, inter-relations between live stock and crops, and the vast amount of judgement needed in handling the soil, is more intricate and less easily learnt quickly. Fruit farming requires a different sort of ability. This arises from the circumstance

that the fewer the number of plants to the acre, the greater is the attention that each must receive individually. Then again, with permanent crops, there is the continual depreciation through age, disease and weather to be contended with. Thus although the field work on a tropical plantation is not agricultural in the generally accepted sense of the term, and does not require the same shrewd judgement, it nevertheless demands very close concentration.

A typical feature of the plantation which is likely to strike the outside capitalist is the question of machinery. There is much less manufacturing done in connexion with farms in temperate countries than there is in the Tropics. The reason why this plantation manufacture is necessary is because produce has to be concentrated and rendered as homogeneous as possible for shipment and sale. It would be to the advantage, then, for the intending settler to study the various kinds of machinery employed in connexion with the industry he proposes to enter. Of recent years, co-operative or central factories have to some extent lessened the necessity for this knowledge. Tropical plantation machinery now demands the services of experts, owing to the tendency towards amalgamation and the running of things on a very large scale.

Closely connected with the matter just discussed are the subjects of grading and packing—both of which are extremely important in tropical agriculture. Here again experience on a fruit farm or market garden would prove more valuable than that obtained on an arable farm. Such experience would prove helpful in the direction of nursery work so essential in the Tropics. Until quite lately the Governments of tropical regions have carried on most of the plant-raising work, but of recent years estates have begun to depend upon themselves in this respect.

It is interesting to observe that school gardens in the Tropics really serve a more practical purpose than they do in temperate countries, because most of the individual operations conducted on a large scale on the plantation can be practised on a small scale in the garden. In temperate countries, pupils who intend to farm have little opportunity for practising in the school garden those operations which they will have to do, or be responsible for, on the farm in later years. Thus school garden work in temperate countries offers more advantage to those who may in after-life take up agricultural work in the Tropics than it does to to those who expect to stay at home.

As regards the scientific equipment of the European planter in the Tropics, we see that a proper realization of the fact that most of the work is of a horticultural nature is of importance as a means of guidance. Obviously a knowledge of plant breeding and physiology is very essential. A certain amount of adverse criticism has lately been levelled against a recent text-book on the cotton plant. The author of this book has studied the plant in all its relations and worked out some of these in great detail. From a scientific point of view this had been criticised, unfairly we think. However, the point of view which the book portrays is what may be encouraged, within moderation, in the planter. That is to say, he should learn to understand his plant and its exact requirements.

It would be far from the aim of the writer of this article to convey the impression that the newly established planter should become a specialist. On the contrary, good business knowledge, ability to handle labour and a conception of the workings of supply and demand in relation to the produce he is immediately interested in is essential. Most of this is what is known as natural ability for which no schools have at present been established for teaching it successfully, though a step in this direction would be made if agricultural colleges were established in the Tropics.

Finally, in concluding this article it is scarcely necessary to point out that the principal aim in presenting the foregoing considerations has been to show by comparison the general nature of land culture in the Tropics. It is believed that an appreciation of the circumstances would be advantageous to many settlers before the truth is learnt by actual experience.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture, who is at present in Jamaica on official duty, is expected to arrive back in Barbados on March 4, 1914.

The activities of the Imperial Institute are described in a general manner by Professor Wyndham Dunstan, C.M.G., F.R.S., in the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases* (December 1913). Reference is made to the collections and exhibits, to the technical investigations, to the work carried on in connexion with agricultural departments in the Tropics, and to the publications of the institution.

SOIL INVESTIGATION.

SETTLEMENT OF THE QUESTION OF SELECTIVE ADSORPTION.

Although the phenomenon known by the term adsorption has been referred to in this journal (see *Agricultural News*, Vol. XI, p. 281) it may be advisable, before proceeding to discuss its relationship to the soil, to explain again in a popular way its general nature. Most porous bodies, like colloids, coagulated albumen, wood charcoal, and starches, on account of their surface energy or 'tension' are able to take up certain dissolved substances in such a manner that the material taken up cannot be removed even by most thorough washing. The phenomenon is explained most logically at present as a concentrating of the solute at the surface of the adsorbing material. As an example of adsorption, it may be noted that starch, if placed in a solution of caustic soda, will take up into itself some of this alkali, which, as already intimated, cannot be removed by washing.

It has been established for sometime now, that the soil is also capable of adsorption*. Indeed it is the adsorptive power of the soil which enables it to retain the soluble salts necessary to plant life in spite of the leaching effect of rain and the movement of the soil solution towards the surface of the soil in dry weather.

But as well as possessing the power to adsorb substances as a whole, porous bodies like colloids, wood charcoal and the like can adsorb selectively. To enable the general reader to understand what this means, a few words of explanation concerning the constitution of salts are necessary. Salts are considered as consisting of two parts or radicles—technically known as ions. This is rendered apparent by the names given to these compounds, as for example nitrate of soda or sulphate of ammonia. The nitrate is one part or ion (which is derived from an acid) and the soda is the other ion (which is derived from a metal). Water itself, although not a salt, is analogous to a substance like slaked lime, for although chemically its formula is represented as H_2O it is often more conveniently regarded as HOH of which H is one ion and OH the other.

Having explained sufficiently for present purposes what an ion is, we may proceed with the subject of selective adsorption. As already stated, colloids and the like possess this selective power. They can not only adsorb a salt from solution as a whole, but *adsorb one ion faster than another*. Now in the adsorption of a salt like potassium chloride by charcoal—to take a simple case—the following occurs: KCl + HOH = KOH + (HCl adsorbed). The chlorine (Cl) cannot leave the solution by itself, but only in company with one of the water ions (namely H). Now in the case under consideration the HCl is adsorbed much faster than the KOH: consequently there is hydrolysis or splitting up of the water, and an accumulation in the solution of caustic potash, the presence of which, can, in an experiment, be indicated by the addition of phenol-phthalein (commonly employed for testing for alkalinity in sugar factories).

We come now to the main point. Formerly the question of selective adsorption in the soil has been disputed, but lately, as a result of careful investigations, E. G. Parker in America has shown (*Journal of Agricultural Research*, Vol. I, No. 3) that soils possess this power of selective adsorption to a marked extent. In the case of the soil, just the opposite occurs to that which takes place between charcoal and potassium chloride. In the case of the soil, the rate of adsorption of the chlorine (Cl) ions from solutions, is much less than of potassium (K) ions. But something further happens besides what has just been stated. The hydrochloric acid, which, as we have shown, must accumulate as the result of the adsorption, reacts with, and renders soluble bases (of the Ca, Mg, etc. type) otherwise unavailable.

Considering this interesting phenomenon in more detail the following results may be noted: (1) selective adsorption of potassium by a soil increases in amount with the concentration up to a certain point and then remains practically constant; (2) in general, the smaller the particles, the greater the selective adsorption; (3) the presence of nitrate of soda at first decreases the adsorption of potassium up to a concentration of 37·5 grams of potassium chloride per litre, and then increases it; (4) the presence of monobasic calcium phosphate does not appreciably affect the adsorption of potassium; (5) the presence of other mineral substances may or may not.

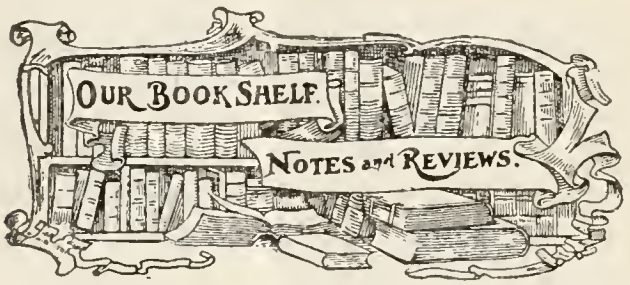
In conclusion we see that when mineral fertilizers are added to the soil and dissolved, they will be adsorbed as a whole or selectively by the vast surface of the soil particles and will be held there by physical force until the plant roots or subsequent leaching removes them.

From the standpoint of the practice of manuring these results are of great importance though more must be known before rules based on this knowledge can be formulated for specific guidance. Apparently, for instance, the retention of a soluble potash manure like kainit, as a weak solution, is discouraged by the presence of nitrate of soda, whereas superphosphate would tend to have no effect upon the retention of kainit in the soil.

Furthermore we might suppose that in a soil containing but a small amount of bases, acidity might be caused by selective adsorption. Again, where a predominence of magnesium occurs, toxicity might be set up through the action of the hydrochloric acid in converting this base into a salt and thereby rendering it available for being absorbed by the roots of cultivated plants.

* Adsorption must not be confused with absorption, which is merely a process of 'soaking up'. It will be observed that the soil has both adsorptive and absorptive powers.

Bacteriological Analysis of Indian Soil.—An abstract of C. M. Hutchinson's work in India appears in the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases* (November 1913). In an investigation of the so-called weathering of soil by repeated ploughing in the hot dry season preceding the spring rains, it was found that the maximum temperature reached by the top ¼ inch was 60° C. Artificial weathering was therefore effected by exposing soil to the heat and light of a Nernst lamp for eight hours daily for a week. The result showed that the number of bacteria was considerably reduced and that all the forms of the *subtilis* group were eliminated from the first inch of soil. It was found that the nitrifying power of the soil was not destroyed or altered by 'weathering', which the writer explained as due to reinfection of the surface soil from the lower layers. The soils were further examined for the presence of protozoa by seeding into hay infusion; two types of protozoa occurred (together in some cases); none were found between November and May. These two types were destroyed at 60°C. but not at 55°C. As however they were found in a soil in May, just after the 'weathering' operation had taken place, it does not seem likely that the effectiveness of this operation can depend on their elimination.



THE BANANA: ITS CULTIVATION, DISTRIBUTION AND COMMERCIAL USES. By William Fawcett, B.Sc., F.L.S. With an introduction by Sir Daniel Morris, K.C.M.G., D.Sc., D.C.L., F.L.S. *Duckworth & Co.*, London, 1913. (Published under the auspices of the West India Committee.) Price 7*s.* 6*d.*

Passers by in a crowded London side street purchase bananas from the hawker's barrow. Some thousands of miles distant, in the green shade of the plantation, majestic foliage-heads are falling, and the figures of the black labourers are moving swiftly and systematically at their work. The two operations proceed automatically and, as far as the agents in the processes themselves are concerned, end with the completion of their acts. But before the 'cutter' in the banana plantation can obtain regular employment, and before the consumer can be regularly supplied, a vast amount of organization, scientific knowledge and capital is requisite, which as has already been intimated, is rarely realized by those at either end of the industrial line. This book brings them into touch.

The most attractive feature of Mr. Fawcett's work is that he takes, metaphorically speaking, a banana, and tells the reader all about it from the soil in which it has grown until it is actually digested physiologically by the consumer in a distant country. We are told of the plant; we learn how it is cultivated in different places; how it is transported and how it is sold. Interesting information is presented, further, in regard to the question of its manufacture into various prepared forms, and statistics are presented relative to the development of the industry—information which will command the attention and give encouragement to both intending capitalists and those who are interested in the progress of tropical agriculture generally.

In the first chapter, the botanical characteristics of the plant are described. Amongst this information we learn, for instance, that the roots of the banana plant, unlike those of most species, do not seem to have the power of adapting themselves to overcoming difficulties; that is to say, they do not respond to the stimulus of obstruction by curving. This clearly emphasizes the necessity of planting on well cultivated soil. Another interesting fact connected with the banana plant is the enormous amount of food produced by it per acre, compared with other plants. The banana, it seems, yields, on an average, 242,000 lb. of food per acre, whilst potatoes provide 4,000 lb. and wheat gives only 2,000 lb. This remarkable circumstance may be accounted for by the fact that almost the whole of the banana plant is composed of leaf structure. In connexion with the leaves, the interesting characteristic may be commented on, that the banana leaf collects the rain drops of a shower and conducts them into the interior of each concentric sheath. Water supplied in this way, and quite independent of the amount at the roots, is important for a proper 'shooting' of the flower stalk; it causes expansion of the trunk and relieves the pressure on the central space. An observant planter noticed that in dry weather a shower of rain seemed to start the plant 'shooting', and when he found this process hanging fire used to spray his bananas with a hose in imitation of the beneficient shower. In the chapter under consideration attention is given to flower formation, this period in the plant's life-history being, from the planter's point of view, the most critical. The size of the resulting bunch of fruit is largely influenced by the store of food in the bulb at the base of the plant at the time when the inflorescence is produced. Perhaps the most interesting, and probably the most important point discussed in this chapter is the fertilization of the banana flower. As everyone knows, the flowers of most cultivated species are sterile as regards self-pollination, or even as regards cross-pollination between two plants of the same variety. But it has been proved in Jamaica that seed can be produced by dusting the stigmas of the Jamaica banana with pollen from the stamens of the red banana. It is stated in the author's preface, also, that experiments made quite recently in Surinam confirm this result, successful crosses having been made by dusting the female flowers of the Gros Michael (the Jamaica banana) with pollen from *Musa basjoo* and *M. ornata Chittagong*. Mr. Fawcett considers there is economic scope ahead of cross pollination between cultivated and wild species of bananas.

The next thirteen chapters concern, almost exclusively, the cultivation of the banana, and deal with the preparation of the land, planting, the care of the crop, harvesting, diseases and manuring. The greater part of this information is extremely practical and should prove invaluable for reference by those who are directly interested in the productive side of the banana industry. In a more detailed way, reference may be made to the discussion of planting distances, and to the selection of suckers. In the management of a banana plantation, perfect drainage is absolutely necessary, whilst where the rainfall is low or irregular, irrigation schemes have also to be employed. As regards cultivation after planting, the author gives considerable attention to the important subject of mulching, explaining why it should be done and how to do it. As a green mulch, Jerusalem pea (*Phaseolus trinervis*) is recommended. Bengal beans cause too much expense in the matter of keeping the vines within bounds. An interesting point of interculture is the ploughing close to the banana and cutting through the roots. This seems stimulating, provided the roots are not cut too close to the stem.

One of the most responsible duties involved in the management of a banana estate is the supervision of pruning and treatment of suckers. On this point again, practical information is given, based on experience obtained in Jamaica. During the growth of the plant, the pruning of the suckers is so important that it may involve, if improperly conducted, the loss of hundreds of pounds to the large cultivator The great object in pruning should be to enable the bulk of the crop to be marketed during the spring months, when the consumer's demand abroad is strongest, and hence when prices are highest.

Banana plants vary, according to local conditions, in the time they take to produce fruit. The usual time is ten months to shoot (from the time of planting), but often longer, and two and a half to four months more to ripen.

After giving a description of the harvesting of the banana, the replanting of estates—a banana walk is replanted after three to six years—and bananas as nurse crops and as a catch crop, financial considerations and prospects in regard to the industry are dealt with next in Chapter IX. One case is given of a Jamaica estate (irrigated) occupying 200 acres, which incurred a total annual expenditure of £2,038 14*s.* 4½*d.*

and obtained a total annual receipt of £3,635 10*s.* 8½*d.* Another estate of 170 acres (growing other fruit-yielding plants besides bananas) incurred a total expenditure of £1,250 with total receipts amounting to £2,668 15*s.* 3*d.* These figures show that banana-growing pays: but a word of caution is necessary. Everyone who has had experience of growing bananas knows how a sudden 'blow' may level several hundreds of acres of stems. To some extent, therefore, the banana crop is a speculative one, and insurance and a reserve fund are necessary in order to prevent being stranded without money to carry on cultivation for another year.

Perusal of the chapters dealing with soil and manuring will impress the reader with the fact that at one time it was possible to classify particular types of soil in Jamaica as 'banana land'. But to-day the advent of irrigation, drainage and manuring has been so effective that it would appear that in Jamaica a 'banana soil' and a 'cultivated soil' will soon be synonymous. As regards manuring, it has been found that organic matter is an essential factor for Jamaica soils, though in Fiji, and also in Queensland, good results have been obtained with artificial fertilizers, especially with nitrogenous and phosphatic manures.

Leaving now the plantation, the author considers the subject of bananas from the more industrial and economic aspect. As food for human consumption the banana has been long recognized as being in its own way ideal. It is nutritious, digestible and germ-proof. But besides the fruit itself, a large amount of attention is now being given to the production of banana flour, and to the drying and preserving of bananas. It is interesting to compare the composition of banana flour with wheat flour. Here are the figures: banana flour contains moisture, 11·10; protein, 3·55; fat, ·83; carbohydrates, 81·7; mineral matters, 2·23. Wheat flour contains moisture, 14·0; protein, 11·4; fat, 1·0; carbohydrates, 75·0; mineral matters, 1·7. Thus we see that banana flour is rather poor in protein and fat, but rich in digestible carbohydrate made specially nutritive on account of the pectin present. As well as for food purposes, bananas have a use in medicine, and in the manufacture of wine, whisky and alcohol. These last three uses are more or less at present in their infancy. Prospects are perhaps brightest in regard to the manufacture of alcohol from bananas. In countries that produce bananas for export there is a very considerable number of bunches that are too small or are otherwise commercially unfit for export. In all the exporting countries put together they are probably as many as 8 million bunches that fail annually to come up to the high standard rightly insisted upon by the shippers. This material is the produce which may be utilized for the manufacture of by-products. Such development would be stimulated by the advent of improvements regarding the superseding of petrol by alcohol for fuel purposes. It can be readily understood that such developments would involve a vast economic change, transferring, as it were, capital and labour from mining industries back to the cultivated land.

This review has been written principally for the benefit and from the point of view of those residing in the Tropics, and space will not allow of attention being given to transport matters—though extremely interesting—to the same extent as has been done in the case of the information dealing with the cultivation of the plant. The attention of the reader may be directed, however, to the wonderful development of the banana trade described in Chapter XX, principally the outcome of the work of the United Fruit Company and of Messrs. Elder and Fyfe. The statement made in this chapter in connexion with prospects in the future may be usefully quoted. 'The growth of the demand for bananas necessitates continued extensive development work.' It is interesting to note, for instance, that France is taking at the present time 2 500 bunches of West Indian bananas weekly via Liverpool, and Dunkirk, and this trade only commenced at the end of the year 1911. The development of the German trade has been phenomenal: the imports into Hamburg rose from some 167,000 bunches in 1909 to over 15 million bunches in 1912.

Having described the transport of bananas by sea and their distribution in the country of consumption, the volume under review concludes with a general survey of the cultivation of species of Musa (bananas and plantains) throughout the Tropics. India and Ceylon are dealt with first, followed by the Malay Archipelago. As regards the Philippine Islands, an interesting fact is that the Bureau of Agriculture has decided to begin a collection of bananas and plantains for the purpose of comparing under the same conditions their useful characteristics. It should be remembered too, that it is in the Philippine Islands that Manila hemp (from *Musa textilis*) is produced. The value of the exports of this banana tree product was in 1911, £3,025,036. Useful information is given of banana cultivation in Queensland and in Fiji. The latter islands are to be looked upon as a growing centre of banana production, and the opening of the Panama Canal may make a difference in this respect to the West Indies. Possibilities also attend banana growing in French Guinea—to come to the chapter dealing with Africa—and this territory is considered by the French colonial authorities to be one of the most promising regions in West Africa for the development of a fruit trade, and it is believed that French Guinea will be able to compete with British importations from the West Indies, and even to replace them on the London market. Lastly, coming to South America, the author refers first of all to Brazil where the 'Massao' or 'maça' is fairly largely grown—a variety of *Musa sapientum*. Mr. Fawcett believes it would be worth while to get suckers of this banana from Brazil and investigate its merits by growing it at experiment stations. It may not be generally known that Brazil principally supplies the Buenos Ayres demand for bananas. With the Central American republics and their position in the banana trade, most of the readers of this journal will be familiar from repeated references which have been made from time to time. It is also unnecessary to review at any length the extent of banana cultivation in the different West Indian islands. For details in relation to these places the book itself is best referred to.

The final chapter in the book—of which there are thirty-four—contains a short description of the species of Musa. This information is of very considerable botanical interest. An appendix is given containing recipes for cooking bananas. This shows that the fruit can be made as palatable and as satisfying dietetically as the author has proved it, or rather its story, to be intellectually pleasing and good.

A book of quite an original kind has recently been published by the Orange Judd Company, New York. It is entitled 'Farm Arithmetic'. The book is intended to serve several very important ends in elementary and higher schools, but principally it should tend to develop in the minds of the pupils an appreciation of and an insight into the quantitative side of farm life. The book may be used at any time after the fundamental principles of arithmetic have been covered. We consider that this book ought to be in the library of all the Grammar Schools in the West Indies which have an agricultural side.

COTTON.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date January 26, with reference to the sales of West Indian Sea Island cotton:—

Since our last report about 70 bales of West Indian Sea Island cotton have been sold; these include St. Kitts 18½*d.* to 19*d.*, Barbados 17½*d.* to 19*d.* and a few St. Vincent 20½*d.* The stock at present is very limited and buyers are only paying attention to the finer sorts.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending January 24, is as follows:—

We have only to confirm our last report of the market. The demand continues for Extra Fine at 26c., Extra Fine off in colour at 23c., of which the offerings are very limited and fail to supply the wants of buyers. The lower grades have been sought after on the basis of our quotations, resulting in large sales, taking all the offerings which the Factors were willing to sell at the prices now current. There is still left in stock unsold about 200 bales odd bags and 500 bales crop lots classing Fine and Fully Fine off in class, which are held at 2c. to 3c. higher. This cotton the Factors may decide to sell in time at some concession.

We quote, viz:—

Extra Fine	26c.	= 14¾*d.*	c.i.f., & 5 per cent.
Extra Fine off in preparation	23c.	= 13½*d.*	,, ,, ,, ,,
Fully Fine	23c.	= 13¼*d.*	,, ,, ,, ,,
Fine	20c.	= 11¾*d.*	,, ,, ,, ,,
Fine & Fully Fine off in preparation	20c.	= 11¾*d.*	,, ,, ,, ,,
Stains	17c.	= 10*d.*	,, ,, ,, ,,

This report shows that the total exports of Sea Island cotton from the United States to Liverpool, Manchester and Havre, up to January 24, 1914, were 3,100 bales, 5,744 bales, and 3,651 bales, respectively.

THE WORLD'S PRODUCTION OF COTTON: THREATENED SOURCES OF SEA ISLAND VARIETY.

Professor John A Todd, who visited the cotton-growing areas of the United States last summer, gave the members of the Royal Philosophical Society of Glasgow, on January 13, some impressions of his visit. Over 60 per cent. of the cotton production of the world was, he said, drawn from the United States, and to that percentage Texas alone contributed one-third. In 1831 the production by the United States amounted to 1,000,000 bales, and in 1911 it had increased to 16,000,000 bales. There was a cotton area of 450,000,000 acres, but the acreage under cultivation was only 35,000,000 acres. Statistics showed that the tendency had been for the price of cotton to rise, and there were two principal reasons why the area of production in the United States was not largely increased. One was that the amount of labour required was very heavy and that the cost of negro labour was going up enormously. Cotton was selling at 12c. per lb., and the cost of picking alone was 2c., or a sixth of the selling price. Mechanical pickers had been introduced, but so far these cost about as much as hand labour.

The other cause limiting the area of production was the ravages of the boll weevil, a plague which had been allowed to spread probably largely owing to the inefficiency of negro labour The weevil was now threatening the area in which Sea Island cotton, the highest quality of cotton, was grown in the United States, and the chances were that this crop might also disappear. In that case there were only two parts of the world which could supply the defect, the West Indies and Egypt. Professor Todd, in conclusion, hazarded the view that there were only two things that the United States could do—either improve the quality and value of its crop, or give it up and let other countries which had cheap labour take up the burden of growing cotton. As it was at present, the cost of labour was so great as to make cotton-growing approach the non-profitable, and if things did not change, the chances were that the great supply of cotton for the world in the future might come from other countries, and these countries mostly British possessions. A large number of lantern views were thrown on the screen, these illustrating among other things the great wastage of cotton by the American method of handling. (*West India Committee Circular*, January 27, 1914.)

COTTON PRODUCTION IN INDIA.

In connexion with the above article on the limitations of cotton production in the United States of America, it may prove interesting to review briefly the present position, or rather the present possibilities of cotton-growing in India. The subject receives attention in a rather interesting manner in the *Wealth of India* (December 1913). Here it is admitted, that although India produces a large quantity of cotton, it is of a comparatively inferior type. Mention is made of the exhortation of the Secretary of the International Federation of Master Cotton Spinners' and Manufacturers' Association, who has expressed the opinion that the subject of cotton improvement in India has not received that attention by the Government which it ought to have received. On the other hand, the writer in the *Wealth of India* points out that however profitable cotton cultivation may be in India, and however important economically it may be to the Mother Country, the industry must not be pursued, nor receive undue attention to the detriment of the food crops. 'In these days of high prices we, in an agricultural country like India, must ensure an adequate supply of food and cannot afford to prosecute the cultivation of commercial crops at the cost of food grains.' It would seem, in conclusion, that there is a good deal to support this view in regard to a large expansion of the area, but not in connexion with activity to improve the quality and yield per acre of the land already under cotton cultivation.

In Uganda, according to the Report of the Department of Agriculture for 1913, the handling of cotton after it leaves the hands of the growers admits of much imporvement. The growers are trained to separate the clean cotton from the stained at the time of picking, and to encourage this, buyers must discriminate in price at the time of purchase, and also gin and bale the different qualities distinct from each other. Unfortunately some of the natives still use fibre for bundling their cotton and tying the mouths of sacks. This fibre must not be permitted on any account to get into ginned cotton as it ruins the carding machinery of the spinner.

SUGAR INDUSTRY.

THE PACKING OF SUGAR IN BAGS.

What appears to be a very important development in the invention of appliances for use in sugar factories are the new machines recently designed by the Singer Sewing Machine Company for closing sugar bags after they have been filled and for other purposes. There are three types of machine; and according to *Sugar* (January 1914) they are giving entire satisfaction where there are in operation, and the demand for them is constantly increasing.

It is stated that, in the manufacture of bags the elastic chain stitch is preferred, and the Singer machines designed for this class of work make either the single or double thread chain stitch as desired. The machines work at the extremely high speed of 3,000 stitches per minute. They are made in two sizes and run with very little vibration in spite of the rapid rate at which they work.

The machines designed for closing bags which have been filled, are made in three sizes for dealing with bags of varying capacities. These machines make the double thread chain stitch. In order to secure convenience, they are usually run electrically so that they can be moved from one place to another. Each machine has a conveyor upon the belt of which the filled bags are placed as they are taken from the weighing machine, and the bags are thus carried to the operator who guides them through the machine. Cutting of the thread is ingeniously provided for and there is no delay as the bags go through. According to the authority from which this information is got, it would appear that an extremely tight seam is made and the produce placed in the bag cannot leak at the seam despite rough-handling in storage or in transit.

Finally it is interesting to learn that the bags can be darned and patched on these machines. This means a great saving in time, and results in a stronger and superior class of mending.

GOVERNMENT CO-OPERATIVE CENTRAL FACTORIES FOR QUEENSLAND.

A well known English firm of sugar engineers has, according to the *International Sugar Journal* (January 1914) secured the contract for the supply, erection and setting to work of two complete central sugar factories for North Queensland. 'Each factory is to have a capacity to work up 1,000 tons of cane per twenty-four hours, and the machinery will be of the most modern description throughout. The canes will be discharged from the railway truck to the cane carrier by electrically driven rakes. The grinding plant will consist in each case of a Kradjewski crusher and 4 three-roller mills arranged in series. A superheat system of clarification, by means of a high velocity flow of juice and subsiders will be employed, and the whole of the auxilliary plant of the factories will be operated electrically, direct coupled alternating current generators of a total capacity of 600 K.W. being provided. The compound engines for driving the generators and the grinding plant will be the only steam engine in the factories, and incidentally, it is claimed, will be the only compound ones in existence to drive the sugar mill.

'One factory will be erected near Cairns and this will be ready for operation in July 1915; the other will be situated on the south arm of the Johnstone river and will grind in July 1916. The value of the contract closely approaches £250,000, and was keenly competed for by sugar machinery makers of the United Kingdom and the continent of Europe.'

The relation of the Government in the matter of the establishment of these big concerns rests upon the Sugar Works Guarantee Act of 1893, and the Amendment thereto of 1895. Under the provisions of this Act any group of farmers may form themselves into a co-operative company, and by mortgaging their lands to the Government obtain sufficient capital to erect a mill. This eventually becomes the property of the investors as soon as the Government has been repaid the money advanced for the factories erection and equipment.

THE IMPORTANCE OF SAMPLING CANES IN REGARD TO THEIR SALE TO CENTRAL FACTORIES.

A leading article in the *Louisiana Planter* (January 3, 1914) discusses in an interesting manner the problems to be solved in the Cuban sugar industry. It is asserted that in Cuba a considerable waste occurs owing to the good facilities which the factories have for getting a large and continuous supply of cane at an early date. The mills, it is stated, frequently start grinding at an early date when the canes are not ripe, a procedure which is obviously extremely extravagant.

For many decades, the Cubans have found that they can get their best results as the season advances, and the purchase price of canes was based upon the advancing season, and the improving quality of the sugar-cane. This method is eminently equitable, although of course the starting point is a matter of bargaining between the interests involved.

Sugar-cane is rather a difficult commodity to buy based upon its test. As is shown by recent work in India, canes in an individual stool, or a bunch of canes will vary greatly in quality. Moreover the whole plot will vary to a large extent with the season. In a large measure, variation seems to be due to seasonal influences, and unless the juice is sampled as it falls from the mill a fair test of quality cannot be made. If maceration or saturation with hot water be used, true sampling becomes still more difficult. It would seem that the most practicable way to proceed in getting definite samples would be by selecting the very best canes and determining the relations between the various canes by these best samples. It is remarked that this course would possibly not be appreciated by the buyers and although the sellers of cane would be quite willing to adopt the method, it must be confessed that it would not be an absolute determination of quality, but might be a true determination of quality of relative fields of cane.

With the immense crop of sugar-cane that Cuba is now developing, the natural ability of the people will finally evolve some satisfactory method of determining any varying value for sugar-cane. The *Louisiana Planter* is rather inclined to the idea that unless there be some exceptional cause for variation in the quality, it will be found that the varying quality of sugar-cane, if it does vary, is the result of climatic conditions, prevailing through a considerable part of the year, and that the whole crop would practically be of the same quality and worth the same percentage per unit of weight.

EDITORIAL NOTICES

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultura News' should be addressed to the Agents and not to the Department.

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The *Agricultural News:* Price 1*d.* per number, post free 2*d.* Annual subscription payable to Agents, 22*s. d.* Post free, 4*s.* 4*d.*

Agricultural News

Vol. XIII. SATURDAY, FEBRUARY 14, 1914. No. 308.

NOTES AND COMMENTS.

Contents of Present Issue.

In the editorial in this number the idea of the horticultural nature of tropical cultivations is dealt with, and a comparsion is made between tillage in the Tropics and the cultivation of the land in temperate countries.

On page 51 is an article which shows that soil particles have a curious property, known technically as the power of selective adsorption.

The information dealing with the sugar industry, on page 55, includes two articles on machines for sewing sugar bags, and on central factories in Queensland, respectively.

Insect Notes, which will be found on page 58, conclude the summary of the miscellaneous information on entomological matters presented during 1913.

On the same page are several interesting notes concerning botanical matters.

Notes on the Rubber Industry, on page 59, deal with the question of variability of plantation Para. The subject is dealt with both from a manufacturing and from a botanical point of view.

The article under the general heading of Agricultural Examinations on page 61, gives a general account to how these are conducted, and presents a general review of the answers to the questions set for 1913.

Some Recent Official Notices in Regard to Grenada.

The Grenada *Government Gazette* for January 3, 1914, is accompanied by a draft of a bill for an ordinance entitled, an Ordinance to provide for the destruction of old cotton plants. The Grenada cotton season means the period between the last day of April in any year and the first day of May in the succeeding year. The Ordinance requires that the holders of land shall destroy by fire in the case of Sea Island cotton the old plants before the beginning of the next cotton season and in the case of any variety of cotton other than Sea Island before the end of the season next after that in which such cotton was planted. It will be lawful for any officer, duly authorized, to enter and destroy the plants where this has not been done, and to recover the cost of such pulling up and destruction from the occupier of the land. Any person guilty of an offence against the ordinance will be liable on summary conviction to a fine not exceeding £10. The Ordinance will apply to the islands of Carriacou, Petit Martinique and the Grenadines lying between Carriacou on the north and the island of Grenada on the south. It shall be lawful for the Governor-in-Council from time to time to extend the operation of the Ordinance to other parts of the Colony.

Another publication recently received from the Government of Grenada contains an unrevised statement showing the quantity and value of the principal articles exported from the Colony during 1913 and 1912. The value of the exports during 1913 has been considerably higher in the case of every class of produce than during 1912. For instance, the total value of the cacao exported during 1913 was £303,073 19*s.* 4*d.*, compared with £225,317 4*s.* 9*d.* for 1912. Again, the value of the raw cotton shipped during 1912 was £9 019 as compared with £10,499 13*s.* 4*d* in 1913. The exports of fruits and spices have shown equally large increases.

Development of German Colonies in 1913.

The southern regions of the Cameroons are to a large extent dependent on the rubber industry; hence the recent crisis has had a very prejudicial effect upon the commercial developments of these parts. As well as regards the markets, some trouble was occasioned in regard to labour, owing to the difficulty of getting families to settle on the plantations. It might be suggested that some improvement would be effected in this direction if settlement was encouraged by the provision of small holdings so that each family would possess its own property adjoining the larger estates.

As regards Togoland, the shipments of palm oil products have fallen off very considerably this year owing, it seems, to the drought at the end of 1912. Rubber has suffered from the prevailing low price, and the exports will be much less than in 1912, though cotton will reach approximately the previous year's yield.

The trade in German West Africa, according to *The Board of Trade Journal* for January 8, 1914, (from which most of these facts have been obtained) suffered greatly by reason of the general shortage of ready money. It will be remembered that a Government agricultural bank has recently been started in German West Africa: this will help the larger farmers to extend operations, especially in respect to irrigation schemes, and it will also provide an opportunity for enabling the small owners to finance themselves by means of co-operative societies. During the year under review, experiments have been made in the exportation of frozen meat and butter, but not much headway is reported to have been made.

The trade of German East Africa has been good. The export trade was satisfactory on account of the good crops and prevailing prices. Growers of sisal hemp have had a very prosperous year, and it has become more and more evident that this variety of hemp can be grown profitably in German East Africa.

Lastly in regard to Samoa Islands, the copra yield was similar to last years in amount, but the production of cacao was larger. Labour conditions were somewhat better but, as *The Board of Trade Journal* points out, the development of the German colonies is closely bound up with the solution of the labour question, inasmuch as there is not yet sufficient native labour to meet existing requirements.

Importation of Sugar into Great Britain, 1913.

The *Chamber of Commerce Journal* (Trade Review for January 1914) points out that in 1912 the imports of raw sugar into Great Britain consisted of cane sugar to the extent of about 70 per cent.; but during 1913 the proportion fell to about 50 per cent. 'A notable feature has been the sudden expansion of the demand for raw cane sugar from eastern markets. This was accentuated by the failure of the crop in Formosa, necessitating imports from Java by Japan, but there appears to be no doubt that the capacity of those markets to absorb cane sugar is steadily increasing and creates a new situation which it may be necessary to reckon with in the future. During the year not a single cargo of Java sugar has been imported into Great Britain, and the failure of this important source of supply has added to the already sufficiently great difficulties of the refining trade. . . . . .

It will be remembered that on September 1, 1913, Great Britain withdrew from the sugar convention. In chronicling the end of this participation the *Chamber of Commerce Journal* points out: 'it should be noted that, while the average price of 88 per cent. beet for the period of ten years prior to the conclusion of the convention in 1902 was 10*s.* 1*d.* per cwt. f. o. b. Hamburg, the average price during the last twelve months of the convention, which expired on September 1, 1913 was only 9*s.* 8¼*d.* per cwt. This fact appears to afford strong support of the position maintained by the Chamber that the abandonment of the artificial economic conditions existing prior to the convention has not increased the cost to the consumer: and that the periods of high values which have taken place since the convention came into force and which are incident to every article of produce, have been occasioned entirely by crop failures.'

Trinidad and Agricultural Banks.

At a recent meeting of the Savanah Grande District Agricultural Society, the acting Director of Agriculture (Mr. Freeman) spoke at some length on the subject of the establishment of co-operative credit societies in Trinidad. After referring to the bright prospects which lie before the movement in St. Vincent (which has been frequently referred to in this journal) the acting Director discussed progress which had been made in Western Europe and in India. It was suggested that the St. Vincent scheme should be carefully studied in relation to social conditions obtaining in Trinidad, and it was pointed out that what the Government wanted to know was what are the difficulties which have for so long prevented a scheme from working in Trinidad.

His Excellency the Governor, in the course of his address, expressed the opinion that he thought a credit scheme was not a Government question, but one for the people of the island: it was a scheme for the people themselves to work out and to make their own special property. In continuation, His Excellency intimated that, provided the people could produce sufficient evidence to show that a practicable scheme was workable, the Government would be quite willing to assist in a practical manner.

The report from which the above information has been abstracted appeared in the Trinidad *Mirror* (January 13, 1914). A further article on the subject appeared in the same paper for January 17. From this, it would appear that the Agricultural Society is getting into close contact with the District Agricultural Societies, and in the course of the next few months it may be expected that a definite scheme will be placed before the Government. As pointed out in the last issue of *Agricultural News*, the action which has now been taken in the form of personal contact between officials and the people is the quickest and undoubtedly the most likely way of attempting to put co-operative credit on a satisfactory footing in Trinidad.

Lime Cultivation in the West Indies.

In reviewing the Imperial Department's Pamphlet bearing the above title, the *Gardener's Chronicle* (January 10, 1914) refers to the useful activities in promoting the welfare of the islands by the regular publication of the *West Indian Bulletin* and the *Agricultural News*. The Lime Pamphlet under consideration is reviewed at considerable length, and is regarded as containing not only much practical matter, but also information that should prove interesting to the general reader.

INSECT NOTES.

SUMMARY OF ENTOMOLOGICAL INFORMATION IN THE YEAR 1913.

III.

In the last issue of the *Agricultural News*, information presented during 1913 on insect pests of cotton and citrus plants, and on miscellaneous matters was summarized. In the following article the summary of the miscellaneous section is concluded.

MISCELLANEOUS.

SPRAY MIXTURES AND POISONS. The occurrence of the West Indian cacao thrips (*Heliothrips* [Physopus] *rubrocinctus*) in Florida as a pest of mango and avocado pear is mentioned on page 266, where is given the recipe for a spray mixture which has been found useful in combating this pest in that State. The mixture consists of black leaf tobacco extract, 1 gallon; whale oil soap, 1 lb.; water, 50 gallons.

Another spraying mixture is mentioned on page 298, in an article entitled the 'Use of Flour Paste in Spraying'. It appears that flour paste has a special value as a spreader and carrier of other insecticides and has given good results when used against red spider both by itself and in connexion with nicotine-sulphate.

A cockroach poison is described on page 314. This consists of a mixture of finely powdered naphthalene, and boric acid in equal parts; it should be sprinkled plentifully in the haunts of the cockroach.

USEFUL BIRDS. Gauldings as destroyers of mole crickets in Porto Rico are mentioned on page 314. As a result of this article, Mr. Austin H. Clark of the U. S. National Museum, who has made extensive studies of West Indian birds, states in a letter to the Imperial Commissioner, that the green heron is, as stated, *Ardea virescens*, but that the blue heron is *Florida Coerulea* instead of *Ardea herodias* and the snowy heron is *Egretta candidissima* instead of *Ardea egretta*.

STABLE FLY. The biting stable fly (*Stomoxys calcitrans*) formed the subject of the Insect Notes on page 218, where a severe outbreak of this insect in the Southern United States in 1912 is described and reference made to its agency, known and suspected, in the transmission of diseases. It is there stated that *Stomoxys calcitrans* was recorded as occurring in the West Indies only in Jamaica and St. Vincent. Since that article appeared the records have been made which include Barbados and Montserrat.

IMPERIAL BUREAU OF ENTOMOLOGY. The Insect Notes on page 74 consisted of an article on the Entomological Research Committee, reviewing its work briefly for the three years of its existence and noting its newly extended scope which should mean greatly increased usefulness.

PLANT IMPORTATION. In Mauritius, a law has been enacted in regard to plant importation (see page 410), which prohibits absolutely the importation of any plants in soil and prescribes the conditions alone under which plants, seeds, cuttings, etc., may be imported. It will be remembered that Mauritius has suffered severely from the importation of the brown hard back *Phytalus smithi*, and the present proclamation, No. 81, of 1913, is a wide step calculated to prevent as far as possible a repetition of such an event.

BOTANICAL NOTES.

Curious Germination in Dioscoreaceae.—In the case of most plants which are propagated vegetatively, a small portion is removed containing a leaf bud or 'eye', the germinative tissue within the bud being necessary for the commencement of growth. However, a few plants are exempt from this rule, and have the peculiar and hitherto inexplicable power of developing germinative tissue from which leaves and stems grow. Thus the leaves of the Sansevierias and Begonias may be cut into pieces, which are inserted in the soil, like cuttings.

The ube (*Dioscorea alata*, L.), according to an article in the *Philippine Agricultural Review* (November 1913), is quite an important root crop in many districts of the Philippines. The proximal end of the tubers are saved for seed as it is commonly believed that the rest of the tuber is incapable of making any growth. Observations have been made however, in Florida, which show that this restriction of germinative area does not exist. The same was proved in the case of six other species of Dioscoreaceae. Every one of the tubers germinated and developed into healthy vigorous plants after being set out in the field. Thus a good size tuber of the ube may be cut into six or more parts for seed, according to size.

In the present connexion it may be of interest to point out that if a tender seedling of *Anona cherimoya*, Mill., *Rollinia orthopetala* A.DC., or *Uvaria rufa*, Bl., is broken off below the cotyledons, germinative tissue will develop from the remaining budless stump if the plant is in good condition. This peculiarity probably holds true in the case of many other plants belonging to the same genera.

The Spreading of Prickly Pear in the United States and Australia.—An article in the *Agricultural Gazette of New South Wales* points out that Cacti have not spread rapidly in the past in the south-west portion of North America owing to: (1) limitation of available moisture, (2) minimum temperatures, (3) grass fires. Cacti are spreading faster to-day in the same area, owing to: (1) scarcity of grass fires, (2) distribution of stock. It is stated in the article (which is written by an official of the United States Department of Agriculture) that there seems no hope that the Queensland Commission will find any natural checks that may be introduced into Australia. A sufficiency of moisture and absence from frost are held to be the great controlling factors in the distribution of these zerophytes. On the other hand, as the result of conversation with the Australian officials above referred to, during their recent visit to the West Indies, it may be stated that the position does not appear to be as hopeless in regard to the introduction of natural enemies, as the writer in the *Agricultural Gazette of New South Wales* apparently makes it out to be.

Selection of the Pigeon Pea.—Attempts at the selection of pigeon pea or Rhar (*Cajanus indicus*) have been made in India. Early plants have a low spreading habit and the foliage and the fruit small. No morphological character appeared to be correlated with wilt resistance. The thick-podded erect forms were generally more resistant to the west winds. Large pods and seeds were associated with the erect habit of growth. In the field trials, the erect form was always found to be superior to the spreading form. (*Monthly Bulletin of Agricultural Intelligence and Plant Diseases* for October 1913.)

RUBBER INDUSTRY.

THE QUESTION OF VARIABILITY OF PLANTATION PARA.

Mr. B. J. Eaton, Government Agricultural Chemist, F.M.S, in discussing this subject recently in the *Agricultural Bulletin of the Federated Malay States* (November 1913), puts forward the opinion that the disparity in price between the plantation and Brazilian product is in all probability due to variability, not amongst the rubber produced from one estate, but amongst the produce from a large number. The principal cause of the estate variability in question is probably due almost entirely to variation in the methods of coagulation and machining. The *Malay Mail*, we are told, has made the suggestion that a general formula should be published which would enable any estate to turn out a standard rubber. Mr. Eaton says that our knowledge at present is not sufficiently advanced to allow of a universal formula being constructed, though in the paper under consideration, a tentative scheme is put forward which is worth the consideration of all those who are interested in the estate production of plantation Para. Mr. Eaton contends, moreover, that the general fall in price between the Brazilian product and that of the Middle East has not probably been due to the increase of the output of the plantation product. The question may be raised, however, that if the fall has not been influenced during the present year by the increased output or by the prospects of increased output in the future, why was there not as much disparity between the two classes of prices in 1912 and previous years? An explanation may lie, of course, in the circumstance that there were fewer estates in bearing in 1912 and previous years, and therefore less variability.

The idea has been advanced that a cause of inferiority of plantation Para has been the possibility that the rubber trees of the Eastern plantations are not the genuine *Hevea brasiliensis*, which in the Amazons produces the best quality of rubber. Mr. E. Bateson, Government Assistant Mycologist, F.M.S., discusses this subject in another article in the same journal referred to above, and as far as evidence is available, shows definitely that the trees of the East and of Brazil are identical species. The whole question, as will be remembered, was investigated by Dr. Huber. This botanist inspected the rubber trees growing in the district from which Wickham originally collected seed for distribution to Ceylon. Two species of Hevea were found, *H. brasiliensis* and *H. collina*. The rubber from *H. collina* is not equal to fine hard Para. The position then was: did Wickham's collection consist entirely of seeds belonging to *H. brasiliensis*, or was some seed of *H. collina* included? An extensive examination of veteran trees in Ceylon showed that there were no specimens of *H. collina* among them. But of the original trees, which numbered about 2,000, only about sixty are now alive, and it is possible that some of the non-survivors belonged to the species Collina. In that case their off-spring would be found in rubber estates, mingled in smaller or greater numbers with trees of *H. brasiliensis*. It was therefore necessary to pursue a more extended search in the different rubber-growing countries of the East. After careful and extensive inspection, no evidence could be obtained in support of the existence of *H. collina* among the trees in cultivation.

Since Wickham's consignment, no seeds or plants of Hevea have been imported into the East from Brazil. Therefore it is evident that there is no foundation for the assumption that the variability of plantation Para is due to the intermixture of different species of Hevea.

WEST INDIAN DEVELOPMENT.

THE TRADE OF BRITISH GUIANA.

The following article has recently appeared in the London *Financial Times* (January 8, 1914). It deals with the export trade of British Guiana during 1913, and makes particular reference to Canadian and British markets:—

From an Imperial point of view the outstanding feature of this colony has been the extraordinary development of trade as between the Dominion of Canada and ourselves. It seems difficult to realize that the sugar shipment to Canada is more than double that to the United Kingdom and more than tenfold that to the United States, the figures being, respectively, 53,430 tons to Canada and 20,310 tons to the United Kingdom, while the United States, our former market, run a bad third with the infinitesimal amount of 2,497 tons. Canada, despite its temperance laws is also holding out the hand of friendship to the colony so far as the market for our famous rum is concerned, 124,537 gallons being the total shipped from this colony to the Dominion during the year.

The coco-nut industry, on which so many hopes are based, unfortunately shows a decrease in the quantity of exports, 714,915 being recorded, as against 1,104,484 for last year. There is, however, a possible explanation for this. There has been first of all a most serious prevalence of a pest attacking the coco-nut palm, which the Board of Agriculture and its professional advisers have found great difficulty in dealing with, and, secondly, more and more local growers of the coco-nut are recognizing the commercial value of the nut and setting to work themselves to derive the profit entailed by the production of copra and oil.

The rice industry continues to hold somewhat more than its own, the export being more than double that for 1912 The actual exports up to date are 15,821,878 lb., as against 5,914,447 lb. for the corresponding twelve months. The importance of this industry to the colony cannot be underestimated. Although it may be said to affect our undoubtedly limited labour supply seriously, still not merely to ourselves but to the entire West Indies and our sister Guianas, this industry is of incalculable value. So far as Surinam and Cayenne are concerned, the exports amount to 1,150,000 lb., while 13,037,720 lb. went to the British West Indies It will thus be seen that from an abstract point of view to the political economist the rice industry constitutes a valuable asset to the colony.

Balata, which had fallen on evil times, has resumed its position with more favourable weather, and the returns exhibit an exportation of 1,172,501 lb. as compared with last year's exports of 639,729 lb. This industry is of special interest to the United Kingdom, as practically all of this forest product finds its way there and is utilized therein.

The demand for Demerara timber, whose commercial value is being universally recognized, is steadily on the increase, the exports reaching 417,612 cubic feet as against 266,392 cubic feet. In the Manchester Ship Canal has been used our famous greenheart, and it is worthy of note that quite recently a representative of the United States visited the colony for the purpose of arranging for supplies of this timber for the construction of lock gates in the Panama Canal. . . . . .

Lumber also shows a steady increase, and it seems likely to increase still further with the manifestation of interest outside the colony in the vast potentialities of the forest. The exports aggregated 507,719 feet, as against 214,336 feet last year.

GLEANINGS.

The weather in Montserrat was dry generally, during January. Routine work at the Botonic Station included the reaping of the provision crops, and the potting of large numbers of bay seedlings.

In St. Vincent, during December, the fine weather of the month was beneficial to the late cotton plantings, and enabled the top bolls on the earlier plantings to mature. The crop will still be much below the average.

The *Journal of the Royal Horticultural Society* for December 1913 contains an interesting article on the coco-nut palm by Sir Everard im Thurn. It is illustrated with very interesting photographs and deals principally with the economic history of the coco-nut.

In Antigua, orders for 3,000 seed coco-nuts at the Botanic Station were received during January. As regards the cane crop, the germination of the plants newly established has been good. In the case of the ratoons, the effects of root disease are noticeable on the heavy lands.

A Circular has just been received from Messrs. Jenkinson, Brinsley and Jenkinson, West Indian and Colonial Land Agents in London, containing a list of estates in the West Indian islands which are for sale. This list shows that a large number are available in Trinidad and Tobago and also in Jamaica.

According to the *Proceedings of the Agricultural Society of Trinidad and Tobago* (December 1913) much disease exists amongst the cacao on the Gold Coast. Instead of the great increase in the exports which were to be expected, it is believed that, on the contrary, it will be difficult to maintain the present out-put.

A copy has just been received of the report by Professor J. B. Harrison, on the geology of the strata traversed by the D'Urban artesian well, 1913. Geological horizons indicated as possibly of importance for guidance during future well drillings are dealt with, together with the composition of the waters and the rate of flow.

In St. Kitts the cane crop in the Bassterre district showed the need of rain in the early part of January, but the good showers received towards the end of the month have brought about much improvement. General crop prospects are about the same as last season, though in the Northern districts they are perhaps better.

A notice appears in *Nature* (January 8, 1914) of a new text-book on the chemistry of rubber, written by Mr. B. D. Poritt It is stated that the author should be complimented on having compressed within narrow limits a very complete and readable account of the chemistry of rubber The work is believed to be of considerable service to those directly interested in the industry.

At a meeting of the Board of Agriculture, Trinidad, in December, the cacao committee announced a warning in regard to excessive claying of cacao. It was pointed out that the reputation of Trinidad cacao in the foreign markets is likely to suffer unless care is exercised. In the advent of neglect to be guided by this warning, the Board intends to approach the Government with a view to the introduction of legislation making excessive claying a punishable offence.

The people of India do not suffer as regards their milk-supply in the same way that the inhabitants of most countries do. Indeed the ordinary buffalo milk is so rich in fat that a moderate mixture of water is not undesirable. The danger lies, of course, in that the source from which this water is taken may not be irreproachable as regards the danger of infection. The subject of the Indian milk-supply is dealt with in an article in the *Journal of the Royal Society of Arts*, January 9, 1914.

From particulars published in the *Port-of-Spain Gazette* (January 20, 1914) coco-nut cultivation in Jamaica has a great future before it. Large areas of land are continually being brought under cultivation. One planter alone has effected insurance to the value of £90,000 on his coco-nut plantation. This means that he is the owner of fully 90,000 bearing trees. On some properties there appears to be a gradual reduction of the area planted in bananas, in order to put in more coco-nut plants.

The advertisement of the pamphlet entitled 'Lime Cultivation in the West Indies' on the cover of this issue shows that the *Clarion* (British Honduras) desires to encourage citrus cultivation in that Colony. Furthermore in the issue of that paper for December 18, 1913, a letter is published intimating that an organization known as the Stann Creek Citrus Planters' Association has just been formed. This should serve a useful purpose in regard to the stimulation of the lime-growing industry in British Honduras.

An interesting account is given in the *Journal of the Department of Agriculture of Victoria* (November 1913) of the central Research Farm, which has been recently established quite close to Melbourne. A large meeting has recently taken place there at the instigation of the Minister of Agriculture. The land is not of the best, which is regarded in one way as an advantage for demonstration purposes, since it will afford scope for science to show the practical man how improvements can be made economically.

As the result of disclosures made last year in the Leeward Islands in regard to the milk-supply, the Government of St. Kitts has taken the necessary steps to enable milk in that island to be analysed each morning at a nominal cost. Any one desiring to have milk tested is requested to send the sample to the Laboratory at the Grammar School not later than 7·30 o'clock on any morning except Sunday. The milk should be secured in a well-corked bottle, which should be labelled with the name and address of the sender.

AGRICULTURAL EXAMINATIONS.

GENERAL REVIEW.

Having presented, in the last three issues of the *Agricultural News*, the results of, and the questions set at, the recent examinations by the Imperial Department of Agriculture, it is proposed to give now a brief account of the way in which these examinations are conducted, and to review in a general way, the opinions of the examiners on the year's papers.

Although known in some quarters as Reading Course Examinations, the tests under consideration have for their object the determination of not only the candidate's knowledge of such facts as may be learnt from books, but also his acquaintance with practical agricultural science and the management of an estate. In order to arrive at a satisfactory decision as to the candidate's ability, oral examinations are held in each island as well as written ones. The oral examiners always include for the intermediate and final examinations at least one planter, and in the correction of the written papers, a provisional marking is made by the local examiners. In the preliminary examination, the *viva voce* consists almost entirely of questions concerning elementary agricultural science, supplemented by the inspection of specimens in connexion with which the extent of the candidate's practical knowledge is brought out.

In the intermediate examination, the purely scientific part consists principally of economic entomology and mycology. Since the greater portion of the examination comprises the special crop subjects, the importance of a *viva voce* examination is rendered very evident for the purpose of arriving at a definite conclusion as to what the candidate can actually do on an estate. At the same time it is appreciated that a written examination is especially useful for testing the candidates intellectual powers and grasp of principles and relationships. The combination therefore enables an opinion to be expressed of a reliable kind which, considering the comparatively high standard of marking, lends to those certificates which are awarded, a very real value.

The final examination, as perusal of the questions will show, is principally intended to test the candidate's ability as a planter; that is to say, his capacity for managing an estate. Academically it is the object of the final examination to discover whether the candidate is really educated agriculturally, and with this aim in view the questions are framed along very broad lines to give the candidate scope for discussion, and for putting forward his own ideas.

In the recent examinations, turning to the report of the examiners, we find that in the intermediate, the answers were, on the whole, below pass standard. Many of the questions were answered too briefly, particularly since instructions were given for the candidates to incorporate their practical knowledge in answer to those questions which allowed of this being done. Again, several of the answers bore evidence of the fact that the information was derived purely and simply by the aid of memory from books. This impression was in many instances confirmed by the local examiners' report, thus showing in this particular way, how useful is the combination of the written and oral test. Generally speaking, the efforts of the candidate, in regard to drawing, were very poor and untidy, and more attention ought to be devoted to this matter.

In the final examination, the general results were more satisfactory than in the case of the intermediate. One paper which obtained a first class certificate was comparatively good, but would not have obtained the distinction it did if it had not been for the eminently satisfactory report of the local examiners. In all the questions there seemed to be a common lack of original thought and many points on which discussion was requested were dealt with in many instances by the writing down of some mere statement of fact. Final students should endeavour to realize that it is the systems and organization of an estate that they are expected to understand together with the general principles of the application of science to agriculture. Their reading, therefore, should be made as wide as possible, and they should endeavour to regard estates in the light of large machines and study the working and the relationships of the various essential parts.

The following is a list of the local examiners, to whom the thanks of the Imperial Department of Agriculture are due for their invaluable help:—

GRENADA.

Mr. G. G. Auchinleck, B.Sc., F.C.S., Superintendent of Agriculture.
Mr. H. Jones, B.A., N.D.A., Headmaster, Boys' Secondary School.

DOMINICA.

Mr. Joseph Jones, Curator, Botanic Station.
Mr. G. A. Jones, Assistant Curator, Botanic Station.
Hon. J. C. Macintyre, Hampstead estate.

ANTIGUA.

Mr. H. A. Tempany, B.Sc, F.I.C., Government Chemist and Superintendent of Agriculture for the Leeward Islands.
Mr. V. M. Wiel, B.Sc., Assistant Government Chemist.
Mr. T. Jackson, Agricultural Superintendent.
Mr. R. S. Goodwin, Collins estate.
Mr. John Roden, Gambles estate.

ST. KITTS-NEVIS.

Mr. F. R. Shepherd, Agricultural Superintendent.
Mr. J. Robothom, N.D.A., Agricultural and Science Master, Grammar School.
Hon. B. S. Davis, Lamberts estate.
Mr. C. Forbes Todd, Molineux estate.

At the Head Office in Barbados, the papers and reports were finally dealt with by Dr. Francis Watts, C.M.G., Imperial Commissioner of Agriculture, and by Mr. W. R. Dunlop, Scientific Assistant.

The remaining questions of the Final paper were the following:—

CACAO.

1. Describe fully the soil and locality suitable for laying out a cacao estate.

2. Discuss in its broad aspects the manuring of a cacao estate (including mulching).

3. Give a full general description of the types of buildings and machines necessary for handling efficiently a cacao crop on an estate of 50 acres.

LIMES.

1. Give a full account of the after-cultivation necessary on a newly established lime estate.

2. Give an account of the manufacture of citrate of lime. What advantages are derived from its manufacture as compared with concentrated juice?

3. What pests and diseases do you consider most formidable in the locality you are acquainted with? State the methods you would adopt for keeping them under control.

FUNGUS NOTES.

SUGAR-CANE DISEASES IN INDIA.

The results of further studies of the red rot of sugar-cane in India caused by *Colletotrichum falcatum* are given by E. J. Butler and Abdul Hafiz Khan in Vol. 6, No. 5, of the *Memoirs of the Department of Agriculture in India* (Botanical Series). Red rot is stated to be the most serious disease to which sugar-cane is subject in that country.

Experiments have been carried out to test the transmission of the disease by the use of infected cuttings, and this subject is treated in detail in view of negative results obtained by Edgerton in Louisiana, and by South and Dunlop in the West Indies. The results of planting healthy and diseased setts in alternate rows show a very much greater proportion of infection in plants from the diseased cuttings, and it was found possible to trace the course of the infection up into the stem and to establish a direct connexion between the mycelium in the cutting and that in the new shoot.

The possibility of reducing the disease to negligible proportions by means of sett selection is discussed in the light of experience accumulated during the last ten years. It is found that where the selected cuttings are taken from a diseased crop the impossibility of detecting the existence of the parasite in its early stages makes the method largely ineffective. Once, however, a healthy stand of canes has been secured by introducing cuttings from a healthy district, it is found possible by rejecting cuttings from canes which appear to be diseased, to prevent the increase of the disease which would otherwise occur.

Other sources of infection are next considered. It was found that cuttings are liable to infection from spores in the soil or in the irrigation water. The form of the fungus occurring on the leaves of the sugar-cane was found to be capable of producing the disease in the stems. The authors have found little or no evidence that infection takes place through holes made by insect borers nor was infection through leaf scars found easy of production. On the other hand, slightly damaged buds (eyes) were found to admit the fungus readily, while the young adventitious roots were found to be very easily infected even when sound and uninjured. The feeding roots of the plant, temporarily uncovered and sprinkled with a suspension of the spores, were found to be susceptible. It is the conclusion of the authors that while injuries to the stem are responsible for a certain amount of infection, the commonest points of entry in new infections in India are undoubtedly the shoot and root eyes at the nodes. For the production of spores which may give rise to new attacks or extend infection already existing, importance is attached to the form occurring on the leaves. Spores from both stems and leaves were found to be capable of infecting uninjured leaves under favourable conditions, though infection takes place much more readily where slight wounds such as are commonly made by insects occur.

Although the upper portion of the cane is richer in glucose, which favours the growth of the fungus in cultures, it was found that it was not when planted more liable to infection. Thus there is no objection from that point of view to the planting of tops—a measure which may be found advisable when healthy setts are required.

A reference to Rind Disease raises the old question as to the parasitism of *Melanconium sacchari*, mention being made of Lewton-Brain, Cobb, and Edgerton as having reverted to the older view that this fungus is the active agent in the disease. The present writer is not aware of the publication of any experimental results at all adequate to support this opinion against the evidence which has accumulated in favour of the view put forward by Went and Howard that *Colletotrichum falcatum* is the real cause. Since the cultivation of seedling canes has become general in the West Indies, rind disease has had little more than historic interest. In Barbados where the affection known by that name was very severe, *Melanconium sacchari* is still universally present on damaged canes, the greater number of which have been severely weakened or killed outright by moth borer; while the periodic attempts made by planters here and there to return to their old love the Bourbon cane are regularly defeated by *Colletotrichum falcatum*, which is extremely rare on the seedling varieties. Published evidence of this may be found in the report of the Local Department of Agriculture, Barbados 1910-11, page 46.

The same authors in No. 6 of the same series describe certain new sugar-cane diseases met with in India. The first is a wilt due to a fungus which receives the name of *Cephalosporium sacchari*. It is very similar in its effects to *Colletotrichum falcatum*, and like that fungus produces a reddening of the cane pith; but instead of bright red patches and streaks broken by transversely expanded white areas, there is a diffuse purple or dirty red colouration in which brighter red vertical lines mark the position of the bundles. The tendency of the colour to become muddy at an early period is its most strongly marked character and serves to distinguish the disease. In old cases the red almost disappears, being replaced by an earthy brown. The pith dries up and becomes hollow.

Inoculation experiments showed that the fungus cannot penetrate the unbroken rind of the internodes, but the adventitious root eyes can be easily infected. It was also found to be capable of entering through the planted setts. Wound infection through borer holes is far more common than with Colletotrichum.

The disease is found over a large part of India and as a rule seems to accompany red rot but may occur unmixed. So far as has been observed, the infection is not virulent; spread within the cane is gradual and communication from one plant to another slow.

It may be noted here that a Cephalosporium has been noticed to occur in the West Indies on pieces cut with the usual precautions from the interior of diseased canes.

The second disease is known as collar rot and described as due to a fungus of a new genus and species of the Sphaerioidaceae. The symptoms outwardly resemble those of red rot so far as the withering of the top is concerned On splitting, the upper part is usually pithy and dry in the centre. Lower down, the pith may be still juicy but has a curious translucent watery appearance; still lower the central portion may be brown while red streaks or patches may often be seen, especially at the nodes. The roots arising from the basal nodes are usually blackened and rotten and the appearance suggests that the disease enters the base of the stem from the roots. The pycnidia develop in the internodes under the epidermis, which becomes raised up and ruptured by the roughly conical deep portion of the fruit body, which is hollowed out into one or several cavities. The spores are variable but fall into two types, the first of which is bicellular and brown, the second filamentous and hyaline, usually without septa. The amount of damag caused by the disease is unknown.

The third fungus described is named *Helminthosporium sacchari*, and is a leaf spot very similar to, and possibly identical with, *Cercospora sacchari*, Br. de Haan.

LIVE STOCK NOTES.

CATTLE BREEDING AND DISEASES IN EAST AFRICA.

An important article on cattle breeding in German East Africa appeared in *Der Tropenflanzer* last year. This has recently been abstracted in the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases*, from which source the following interesting notes have been extracted.

Nearly all the cattle in German East Africa are Zebus. They belong mostly to *Bos zebu Africanis*, but some are *B. z. indicus*. Among the African zebus, distinction has to be drawn between those which have large horns and small humps (Watussi), and those possessing small horns and large humps (Masai). The latter breed comprises animals which characteristically mature late; cows are not bred from, in fact, until they reach the age of two and a half years. The bulls and cows are full-grown between three and a half and four and a half years, but still may go on developing until they are six years old. The Masai zebu is a thrifty animal and very resistent to weather and disease. The Masai cows calve regularly every year and the milk production is normally below 70 gallons per lactation period. The beef production of a three-year-old steer is easily over 220 lb.; steers of five years of age give up to 440 lb. of beef, and those of seven years up to 770 lb. The weight of the hump can attain 24 lb. The meat contains coarse fibres and is less marbled than that of European breeds. The fat accumulates chiefly below the skin and round the viscera. These zebus are satisfactory draft animals.

The Watussi zebus are bred only by the tribe possessing that name, and are a little smaller than the previously mentioned animals, with the head and horns longer. A characteristic economic feature is their large milking capacity, the yield from this breed being twice as great as in the case of the Masai type. On the other hand, meat production is poorer, and the animals are less resistent to epidemics and other forms of disease than the Masai zebus. The Watussi cattle are also less fertile and develop later than the Masai animals.

As regards cattle keeping and breeding by the natives, an improvement in the methods employed is generally necessary. The account from which this information is taken contains several interesting facts regarding native methods; for instance, in some districts where water is scarce, the animals are fed during the dry season on succulent banana stems. One stem daily is considered sufficient for an animal in the cow house.

Turning to cattle keeping and breeding by Europeans, it is thought that it would be best for European graziers to begin by improving the native breeds before trying to introduce European blood. It has been found that European cattle and their crosses have little power of resisting the climate and the diseases peculiar to the country.

A few figures are given concerning the value of cattle. The price of a steer, for example, yielding 440 lb. of beef varies from 25*s.* to 90*s.* according to locality. Cows make a quarter or a half as much again. At Daressalam a gallon of milk costs 2*s.*; at other places its price is from 2½*d.* to 10*d.*

In conclusion it is advised that in the endeavour to improve the native cattle, crossing between them and the European animals should be practised only for the purpose of improving the milk production. Even in this case the crossing should be practised only by European farmers. The great thing which needs attention at present is a general improvement in the management of the animals.

Having given some account of the classes of the animals that are to be found in German East Africa, it may be interesting to add in continuation a few notes on the veterinary conditions obtaining in East Africa. Such information is contained in a recent report on the Department of Agriculture of the Uganda Protectorate for the year ending March 31, 1913. The most serious diseases in the Protectorate are Rinderpest and East Coast fever. In the case of the former, immunization by the 'mixed' method has had satisfactory results, and an outbreak in eastern Busoga was entirely stamped out by means of it. As regards Trypanosomiases, the most serious parasite is *T. Pecorum*. It is a curious fact that the Eastern Province districts are free from these diseases, although the cattle of this district are just as susceptible as those of Buganda. It is not believed that there is anything in the distribution of the various species of biting flies in either Province which would in any way account for the absence of this infection in the Eastern Province herd. One possible explanation is that in the uninfected district there is no big game, whereas, on the other hand, big game, and particularly buffalo, are very numerous and very widely distributed in Buganda.

As regards the diseases of animals other than cattle, mange in goats is responsible for a number of deaths in many parts. Mortality among sheep and goats is also occasioned by parasitic gastritis. Amongst mules, and to some extent amongst horses, lymphangitis is widely prevalent. If treated in the earliest stage, the progress of this disease can often be arrested. British East African jackals have been reported to have died from rabies, and the necessary restrictions on the importation of dogs have been imposed. Piroplasmosis amongst dogs has been successfully treated by the injection of Trypan blue.

In conclusion it may be stated that the principal work of a routine nature that is being carried on in British East Africa is the inoculation of cattle and suppression of rinderpest. It is interesting to add that in the report under consideration no reference is made to tuberculosis; and since in German East Africa we learn that the number of cattle attacked by tuberculosis is under one per thousand, it may be concluded, with a fair degree of certainty, that tuberculosis is not such a serious disease amongst domestic animals in East Africa generally as it is amongst those in temperate countries or even in the more established parts of the Tropics, like the British West Indies.

Banana Meal for Pigs.—An interesting note appears in the *Experiment Station Record* (Vol. XXIX, No. 6) on the nutritive value of banana meal for fattening swine and the influence on the quality of the dressed carcase. These experiments have shown that the food under consideration is highly digestible, especially when prepared from ripe banana. It seems to have a special influence on the muscle fibres, rendering the flesh and the fat of a softer consistency than where the hogs are fed on potatoes. Banana meal as will be found by reference to an article dealing with the banana on another page of this issue, is rich in starch and carbohydrates generally, but low in fibre and fat, and as the protein content is not large, it should be fed in conjunction with protein-rich feed, for instance cotton seed meal. It would be interesting if feeding experiments could be conducted with a ration containing banana meal as the dominant ingredient with a view to the accurate and practical determination of the value as a food stuff of this produce, which on banana plantations is available for being dealt with as a by-product.

MARKET REPORTS.

London.—The West India Committee Circular, January 27, 1914; Messrs. E. A. de Pass & Co., January 16, 1914.

Arrowroot—3½*d.* to 4½*d.*
Balata—Sheet, 2/8½; block, 2/0¾ per lb.
Beeswax—£8 15*s.*
Cacao—Trinidad, 60/- to 71/- per cwt.; Grenada, 58/- to 61/-; Jamaica, 56/- to 61/-.
Coffee—Jamaica, 52*s.* to 82*s.*
Copra—West Indian, £30 10*s.* per ton.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 17½*d.* to 20½*d.*
Fruit—No quotations.
Fustic—No quotations.
Ginger—Quiet, 32/6 to 62/.
Isinglass—No quotations.
Honey—No quotations.
Lime Juice—Raw, 1*s.* 2*d.* to 1*s.* 4*d*; concentrated, £25; otto of limes (hand-pressed), 8/6.
Logwood—No quotations.
Mace—1/7 to 2/6.
Nutmegs—5¼*d.* to 7*d.*
Pimento—2*d.* to 2 1/16*d.*
Rubber—Para, fine hard, 3/2; fine soft, 2/8½; Castilloa, 1/8 per lb.
Rum—Jamaica, 2/4½ to 5/- per gallon.

New York.—Messrs. Gillespie Bros. & Co., January 9, 1914.

Cacao—Caracas, 13¾c. to 14¾c.; Grenada, 13c. to 13½c.; Trinidad, 13½c. to 13¾c.; Jamaica, 11½c. to 12½c.
Cocoo-nuts—Trinidad and Jamaica, selects, $28·00 to $33·00; culls, $16·00 to $18·00 per M.
Coffee—Jamaica, 11¾c. to 14½c. per lb.
Ginger—8c. to 11c. per lb.
Goat Skins—Jamaica, 50c.; Antigua and Barbados, 45c. to 48c.; St. Thomas and St. Kitts, 42c. to 45c. per lb.
Grape Fruit—Jamaica, $2·50 to $3·00.
Limes—No quotations.
Mace—50c. to 54c. per lb.
Nutmegs—110's, 12¼c.
Oranges—Jamaica, $1·25 to $1·50.
Pimento—4c. to 4½c. per lb.
Sugar—Centrifugals, 96°, 3·20c. to 3·23c. per lb.; Muscovados, 89°, 2·70c. to 2·73c.; Molasses, 89°, 2·45c. to 2·48c. per lb., all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., February 2, 1914.

Cacao—Venezuelan, $13·00 to $13·25; Trinidad, $12·75 to $13·00.
Cocoo-nut Oil—$1·06 per Imperial gallon.
Coffee—Venezuelan, 15c. per lb.
Copra—$5·25 per 100 lb.
Dhal—No quotations.
Onions—$3·50 to $3·75 per 100 lb.
Peas, Split—$6·00 per bag.
Potatoes—English $1·00 to $1·20 per 100 lb.
Rice—Yellow, $5·10 to $5·30; White, $4·70 to $4·80 per bag.
Sugar—American crushed, no quotations.

Barbados.—Messrs. James A. Lynch & Co., Ltd., January 24, 1914; Messrs. T. S. Garraway & Co., January 17, 1914.

Arrowroot—$4·50 to $5·00 per 100 lb.
Cacao—$12·00 to $12·50 per 100 lb.
Coco-nuts—$24·00.
Hay—$1·50 to $1·60 per 100 lb.
Manures—Nitrate of soda, $70·00; Cacao manure, $48·00 to $50·00; Sulphate of ammonia, $82·00 to $85·00 per ton
Molasses—No quotations.
Onions—$2·87 to $6·00 per 100 lb.
Peas, Split—$6·00 per bag of 210 lb.: Canada, $3·05 to $4·00 per bag of 120 lb.
Potatoes—Nova Scotia, $1·00 per 160 lb.
Rice—Ballam, $5·20 to $5·35 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
Sugar—American granulated, $4·00 per 100 lb.

British Guiana.—Messrs. Wieting & Richter, January 31, 1914; Messrs. Sandbach, Parker & Co., January 30, 1914.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	$8·50 per barrel of 200 lb.	——
Balata—Venezuelablock	No quotation	——
Demerara sheet	65c. per lb.	——
Cacao—Native	14c. per lb.	12½c. per lb.
Cassava—	96c.	——
Cassava Starch—	——	——
Coco-nuts—	$16 to $20 per M.	$26 per M.
Coffee—Creole	15c. per lb.	16c. per lb.
Jamaica and Rio	15½c. per lb.	17c. per lb.
Liberian	13c. per lb.	12c. per lb
Dhal—	$4·50 to $4·75 per bag of 168 lb.	$4·65 to $4·75 per bag of 168 lb.
Green Dhal	$5·75	——
Eddoes—	$1·20	——
Molasses—Yellow	None	——
Onions—Teneriffe	——	——
Madeira	7c.	8c.
Peas—Split	$6·00 per bag (210 lb.)	$7·00 per bag (210 lb.)
Marseilles	——	——
Plantains—	16c. to 40c.	——
Potatoes—Nova Scotia	$2·00	$2·40
Lisbon	——	——
Potatoes—Sweet, B'bados	$1·92 per bag	——
Rice—Ballam	No quotation	——
Creole	$4·75 to $5·00	$4·50 to $4·80
Tannias—	$2·40	——
Yams—White	$2·16	——
Buck	$2·16	——
Sugar—Dark crystals	$2·10 to $2·15	$2·00 to $2·10
Yellow	$2·40 to $2·50	$2·40
White	$3·75	$4·00
Molasses	——	——
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M.
,, Cordwood	$1·80 to $2·00 per ton	——

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Montserrat: Mr. W. ROBSON, Botanic Station.
Antigua: Mr. S. D. MALONE, St. John's.
St. Kitts: THE BIBLE AND BOOK SUPPLY AGENCY, Basseterre.
Nevis: Messrs. HOWELL, BROS., Charlestown.
Grenada: Messrs. THOS. LAWLOR & Co. St. George.

Printed at Office of *Agricultural Reporter*, 4 High Street, Bridgetown, Barbados.

AGRICULTURAL NEWS

Vol. XIII. No. 309.] SATURDAY, FEBRUARY 28, 1914. [One penny.

AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW
OF THE
IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

VOL. XIII. No. 309. BARBADOS, FEBRUARY 28, 1914. PRICE 1*d*.

CONTENTS.

Wanted: A Tropical Agricultural Note-Book.

IT has been wisely said that the great art in remembering is to make notes, and it is becoming very clear that sooner or later the progressive agriculturist of the Tropics will have to take this saying to heart. The number of facts and figures which are accumulating in tropical agriculture is astounding, and what is even more over-powering, is the circumstance that their recordance is so scattered. This can be appreciated by merely glancing at the different references in italics which appear in nearly every column of this journal. It is evident, therefore, that a useful purpose would be served if all the more important and firmly established results could be grouped together in tabular form within small compass. This is the idea of the tropical agricultural note-book which forms the subject of the present article.

The question might be raised—Is it yet worth while to take action, considering the want of precision in regard to a large number of existing results? How are we to tabulate definite statements of general application about the fermentation of cacao or the preparation of plantation rubber, or about the parasitology of many of our plant diseases? It must be confessed that if one ventured beyond the realms of 'probabilities' and 'local conditions' some of the largest fields of interest would be left behind; but still in the 'certainties' we should find quite enough facts to produce a very respectable compendium of widely applicable information. One essential thing to remember is that in an agricultural note-book there is no room for discussions nor for contradictory results. Another feature of the project which would necessitate careful consideration is the circumstance that a large number of results, though thoroughly established, are applicable only in certain countries. This opens up questions as to whether it would be best to produce a book of general information for a certain part of the Tropics or for the torrid zone as a whole, or again whether a note-book should be compiled relating to one crop alone. It all depends upon whether the utilitarian or the educational aspect is to receive first consideration. Personally it is the opinion of the writer that the educational side should be regarded as paramount. This need not detract from the book's practical value but only limit the extent to which practical details could be entered into. The principal aim would be to focus knowledge, and to bring comparable results side by side. A better idea of the possibility of compiling a book for general

use throughout the Tropics, for which we think there is a great need, can be got best by considering the possible scope and arrangement of the contents.

The first section might be devoted to surveying and mensuration data, including drainage and irrigation formulae obtained under tropical conditions. This could be conveniently followed or preceded by weights, measures and currency tables used in the different tropical countries, including factors for conversion. Data relating to steamship communication within the Tropics would also be useful.

The machinery used on tropical plantations comprises so large a subject as to demand treatment by itself. The more important rules and formulae used in the central sugar factory, and in the preparation of rubber, tea, coffee and citrus products might be presented It would appear to be impossible to avoid, in the arrangement of this data, a geographical classification: indeed in the case of all the other data the names of the countries to which the facts are specially applicable would have to be stated. Closely connected with machinery is labour. A table showing the approximate cost of labour for the more important operations in different parts would be both interesting and generally useful; also notes connected with languages, customs, and management. This might be followed by concise information in regard to estate records.

Leaving now what may be called the economic side of the information, that devoted more especially to natural science may be considered. Tropical soil data is very widely scattered, and the bringing together of tables of analyses would serve a particularly useful purpose. This would naturally be followed by manurial results with different crops, including a short account of the chemical nature and action of fertilizers. It would be necessary to deal with the cultivation of each tropical crop separately. The data given would include the names of the more common species and varieties, soil and climate suitable, planting and harvesting data, and average yields. In the case of a crop like cotton for instance, considerable sub-division would be required for the inclusion of American, Egyptian, Indian and West Indian data. The diseases and insect pests of the different tropical crops might be best dealt with in a separate section, and as far as possible in tabular form, with brief notes in regard to remedies and control.

Live stock does not constitute a very important branch of tropical agriculture compared with the position of domestic animals in the farming systems of temperate countries. This is because it is only in a few places in the Tropics that live stock are raised to make a direct profit on. They generally represent working capital. Still meat and milk have to be provided, and labour has to be performed. A short account of the different native breeds would be useful, together with such results as have so far been obtained in regard to crossing and selection. Data is needed badly too, in connexion with the mechanical power exerted by different animals when carrying out various operations. The subject of feeding, of course, is important, and tables showing the composition of the various food-stuffs used in the Tropics would be required. A few concise veterinary notes on the common diseases and their distribution would not be out of place. There would be scope in the book under consideration for a few short, concise essays on miscellaneous matters. We have in mind subjects like fermentation, the significance of the chemical analysis of tropical products, weeds and weeding, green dressings, chemical control of milk-supply and the like. Finally a section presenting meteorological data would not be irrelevant. In this could be included an account of hurricane warnings and the general rules of rainfall.

We have now sketched in outline the scope and arrangement of the suggested publication. Undoubtedly, from the practical point of view, the chief objection to such a work would be that a portion of the matter would not be of direct use to the planter of any one particular crop. Although tropical agriculture is the calling of specialists, there is at the same time a large number of people interested in more than one tropical crop, and even in the case of the purely rubber or cane grower, for instance, it would be an advantage to have matters of agricultural practice and science compressed into a handy form for reference at any moment.

As regards the use of such a book for educational purposes there can be doubt. In schools and colleges and in the work of Departments it would be invaluable. It should be appreciated also by the general trader, merchant and journalist. How long it would remain sufficiently up-to-date one hardly dares to think about, but one thing is certain, that in tropical agriculture there now exists in wonderful confusion a large number of unalterable truths which, though their significance may be modified by subsequent experience and research, their stability as facts can never be undermined. Let them be gathered together,

WEST INDIAN FRUIT.

CAYENNE PEPPER.

As the result of a letter recently received from the Fresno County Chamber of Commerce enquiring for information with regard to the planting, growing and harvesting of Cayenne pepper in view of the experiments about to be made in California, the following article has been prepared as likely to prove of general interest, and to attract renewed attention to the cultivation of peppers in the West Indies.

Cayenne pods consist of the ripe fruits of various species of Capsicum (N. O. Solanaceae) and cultural varieties of these. The species are believed to be indigenous to Central and South America, but are now commonly cultivated throughout tropical and sub-tropical countries, large quantities being grown for export in India, Nyasaland, Uganda, Sierra Leone, Nigeria, Japan, Turkey in Europe, and elsewhere, whilst considerable quantities are also grown for local consumption in these countries and in Spain and southern France. Three types of these fruits come into commerce, distinguished as large, small, and round, the first two kinds being more common than the third. In the south of England large pods are commonly known as 'Capsicums' and the small ones as 'Chillies', but in some parts of the country these names are used in the reverse sense. (*Bulletin of the Imperial Institute*, Vol. X, 1912, p. 571.)

In considering the different places where Cayenne pepper can be produced, it should be borne in mind that they can be cultivated successfully in temperate countries. In England the annual kinds are sown from March to the middle of April, under a frame. They can be planted out when 2 or 3 inches high, and in June may be transferred to a light, rich soil in the open garden. They flower in July or August, and produce pods from August to the end of September. The perennial and shrubby kind may be wintered in a conservatory. (*Encyclopedia Britannica*, Vol. V, p. 280.)

It is perhaps in East Africa and Zanzibar that the greatest developments have taken place recently in regard to the cultivation of Capsicums. Nyasaland is of course noted for its Chillie experts, though the area under this crop fluctuates very much; but it is a good secondary product, especially when there is ample labour at picking time, as this operation is tedious and expensive. In Nyasaland there is an increasing tendency to cultivate Capsicums in the place of Chillies, as the cost of harvesting the former is lower, and it is an easy matter to dry them in tobacco flue-curing barns. Both crops are hardy in Nyasaland, and require very little care in cultivation; they flourish in almost any kind of soil, and grow especially well on rocky hillocks which cannot be planted with cotton or tobacco. (*Bulletin of the Imperial Institute*, Vol. IX, 1911, p. 386.)

An examination of the reports of many of the Agricultural Departments in East Africa provides very little information on the cultivation and harvesting of this crop; apparently there has not been a great deal of experimental work done in this direction. Most of the information that is available relates to export statistics and market prices.

As regards the West Indies, in August 1904, a $\frac{1}{10}$-acre plot was planted at the Antigua Botanic Station with Natal Capsicums. It was reaped from November to March, and yielded 113¾ lb. undried. Ordinary red peppers and yellow Nepaul were planted at the Nevis Botanic Station on $\frac{1}{10}$-acre. The crop was dried, and 64 lb. of dried Nepaul peppers were sold in London at £2 11*s.* per cwt. A barrel of dried Nepaul peppers sent later sold at £4 per cwt. In the West Indies the cultivation of Capsicums requires only ordinary care. The land should be ploughed, forked, and if necessary manured. The seeds are sown in a seed bed, and the seedlings transplanted readily. They should be set out at about 2 feet by 2 feet. Weeding, watering and moulding up may all be required. The fruit begins to ripen in about four months. (*Agricultural News*, Vol. V, p. 405.)

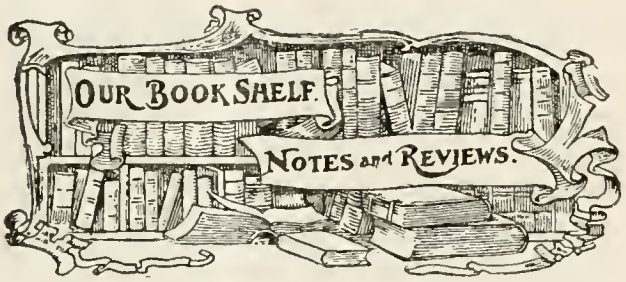
When quite ripe the fruit is picked and dried quickly in trays by sun and wind. They lose about 70 per cent. of their weight on drying, about 2 per cent. by the removal of their stalks before shipping, and 6 or 7 per cent. more by the removal of discoloured specimens. Great care has to be exercised in the matter of picking the fruit; only when they are fully ripe should they be gathered, and it is also necessary to remember that the careful removal of stalks and dirt may make a very great difference to the price obtained. As an example of this, the case may be quoted of a sample of Capsicum fruits grown in Rhodesia which was submitted to brokers in London, who valued the sample at 25*s.* per cwt., adding that if the stalks had been removed before shipment the product would have been worth about 35*s.* per cwt. (June 1912).

MANURIAL EXPERIMENTS WITH COCO-NUTS.

The second year's results of the manurial experiments with coco-nuts under the control of the Board of Agriculture are described in the *Bulletin of the Department of Agriculture*, Trinidad and Tobago (January 1914). After pointing out the inadvisability of drawing conclusions from the results of a single year the author states that in calculating the yield and cost of manuring per acre it was assumed that there were seventy-five trees to the acre; also the price of 'selects' was fixed at $25 and that of culls at $15 per 1,000.

In looking through the tables of figures it would seem that the application of lime and kainit is likely to prove a sound investment, for though the gain on the employment of the manure is small (about $3 per acre on an average) it is nevertheless fairly general throughout the series. In the case of Table VI (Kings Bay estate, Tobago) it is noticed that all the manured plots gave a larger increase than the average of the controlled plots and the pecuniary results were satisfactory. For instance the application of 2 lb. of superphosphate of lime and 1 lb. of sulphate of potash per tree gave a profit on no manure of nearly $28 per acre. Two factors have to be considered, however, when interpreting these results, namely, that the rainfall was much heavier than in the case of the other estates and also the trees were rather younger (twenty-one to twenty-six years old compared with thirty-one to thirty-six years old on the other plantations).

In order to render regular the germination of palm oil seed (*Elaeis guineensis*), the *Journal d'Agriculture Tropicale* (November 1913) quotes the following procedure as useful, from *Pflanzer* (No. 17, 1912): The fruit should be put in a box and left for about a week. In due course the temperature of the seeds will rise and fermentation will set in. These seeds will germinate then very regularly. The result is attributed in part to the disappearance of oil which facilitates the entrance of the water necessary to the development of the grain, and as well to the temperature which seems to exercise a stimulating action on the germination.



ELEMENTARY TROPICAL AGRICULTURE. By W. H. Johnson, F.L.S. London, *Crosby & Sons.* 1912. Price 3*s.* 6*d.*

Realizing the importance of an early agricultural training to youths in the Tropics, the author in this book, has attempted to provide a means of stimulating the teaching of agricultural principles in West African schools, and in the schools of the Tropics generally. The book is therefore almost entirely educational, that is to say, a text-book; at the same time a perusal of many of the chapters should prove interesting and instructive to the practical planter.

The greater part of the subject-matter is not agriculture but rather nature study. This to some extent makes the title of the book misleading. At the same time the cultivation of various crops is not neglected, for the concise information given in Chapter XII should not only be of great assistance in school garden work but also to those who require a few practical details in connexion with work on the estate.

A pleasing feature of the book is the care which has been taken to select easily obtainable material in the way of plants for examination. For instance, in regard to the structure of flowers, the cotton blossom is taken; in dealing with roots, reference is made to the screw pine (Pandanus), which is so common in swampy places in West Africa; and again, in considering germination, the cowpea is selected for demonstration purposes. The chapter dealing with the seed is good, especially the section treating of seed testing, where an ingenious experiment is described showing the germination which results from cotton seeds sown at different depths in a glass case filled with soil. The way and the depth to which seeds should be planted is a matter of more educational importance than is generally recognized. Anyone who has had experience with school garden work will know that the depth and the condition of the soil is one of the first difficulties which the student has to encounter.

The book under review contains a special chapter devoted to the formation of the school garden. This is immediately followed by the section dealing with practical cultivation already referred to. The book is well printed and illustrated, and is to be particularly recommended for educational use in secondary schools.

COCO-NUT CULTIVATION AND PLANTATION MACHINERY. By H. Lake Coghlan and J. W. Hinchley. *Crosby, Lockwood & Son,* London, 1914. Price 3*s.* 6*d.*

The contents of this little book are principally confined to the cultivation of coco-nuts in Malaya. It is a book which is intended to provide information and advice to those about to invest money in the coco-nut industry and should therefore prove useful to intending capitalists at home and to those actually managing land in the East. The author proceeds first of all to show that coco-nuts are an attractive investment and a staple one, evinced principally by the circumstance that coco-nut products have such extremely wide and important uses, the extension of which the present insufficient output appears to be actually limiting. Although the greater part of the book is devoted to estimates in regard to land cultivation and machinery, several chapters deal with cultivation including the preparation of the land, seed nuts, manuring, pests and diseases.

The latter portion of the publication is devoted to the coco-nut industry in the West Indies. The treatment of this part of the subject appears to indicate that the author has not a very wide knowledge of the conditions obtaining in these islands, though the estimates given in this section are interesting, particularly when compared with those presented earlier in the book. It is instructive in this connexion to compare the cost of bringing into bearing a plantation of 500 acres of coco-nuts in Malaya and in the West Indies respectively. In Malaya the first year expenditure is about £4,500; second year, £1,450; third year, £1,450; fourth year, £1,170; fifth year £1,100; sixth year, £930. For the West Indies (Trinidad), we are told the following figures may be taken as representative: first year, £3,300; second year, £1,250; third year, £1,475; fourth year, £2,096; fifth year, £2,000; sixth year, £1,745. Comparing these figures it is seen that the first year's expenses are rather less in Trinidad than in Malaya though in the fourth and fifth years they are rather higher. In the *Agricultural News,* Vol. XII, No. 299, an estimate was given of the expenditure incurred for bringing into bearing a 2,500-acre coco-nut plantation in the Philippines. Although not strictly proportional, some idea of the relative expenditure on a 500-acre plantation there, can be obtained by dividing the figures by five. Doing this, we get for the first year £1,900, and for the succeeding four years respectively, £1,496, £1,354, £982 and £1,380.

PLANTING IN UGANDA. By E. Brown, F.L.S., and H. H. Hunter, LL.D.; with contributions by Professor Dunstan, C.M.G., F.R.S., and George Massee, F.L.S., London: *Longmans, Green & Co.* 1913.

The authors of this book, who are engaged practically in agriculture in Uganda, have realized the necessity for a text-book providing reliable information in connexion with the rapidly extending coffee, Para rubber and cacao industries in the Protectorate. The book, it is believed, will prove of great interest and value to intending settlers and it shows very clearly what is not always appreciated namely, that tropical, planting does not merely consist in establishing young trees and then idly waiting for them to come into bearing. In connexion with this point the remark made in the chapter dealing with weeding and unkeep may be usefully borne in mind: 'the more we apply the principle of gardening to all our operations the greater our success will be.' It is shown that the greatest concentration has to be given to the perennial crops under consideration in order to prevent deterioration and to place the produce when the time comes upon the market in the most attractive condition possible.

In regard to the general contents of the work, the first two chapters describe the physical features and agricultural history of Uganda. Following this is a large amount of matter devoted to the choice of land, nurseries, laying out plantations, clearing and planting and the factory and machinery. A large amount of attention is given to the collection and preparation of the three crops with which the book deals, and the actual business side of plantation management in Uganda is represented by a chapter embracing the various matters of office work including methods of book-keeping.

A special feature of the work under review is its illustrations which are numerous and particularly good. A useful feature in this connexion are the maps of the Protectorate reproduced to different scales.

As remarked by Professor Dunstan in the introduction, there may be many who will have differences of opinion on many of the views advanced by the authors, but those who are attracted by the agricultural promise of Uganda, which, it is hardly necessary to state, is extremely bright, will find much that is of practical guidance in this attractive publication.

THE DISEASES OF TROPICAL PLANTS. By Melville Thurston Cook, Ph. D. 317 pp. +XI *Macmillan & Co.*, 8*s.* 6*d.* net.

This work deals in a general manner with the fungoid diseases of tropical cultivated plants without entering into a description of the causative organisms. There are introductory chapters dealing with the nature of disease, the structure and functions of plants, and the classification of fungi, while concluding chapters deal with prevention and control, and with fungicides and spraying apparatus. The book, to use the words of the author, 'is intended primarily for the planter, but it is hoped it may be of some service to the student.' Since the language, particularly of the introductory chapters, is that of the botanical lecture room, and scientific names are unsparingly used throughout, the planter will himself need to be more than a little of a student to appreciate it. The illustrations depict the general appearance of diseased plants or plant organs. They are from beautiful photographs, well reproduced. The book is capable of supplying to students in or proceeding to the Tropics a good general introduction to the study of tropical plant diseases.

Applied as a manual of the diseases of special crops, it is somewhat less successful. The author quotes with approval in his preface the dictum of a correspondent that the time has not yet come when it is possible for anyone to write a work on the diseases of tropical plants, and the degree of truth in this is illustrated in his own attempt. The present rate of advance of our knowledge of the subject is such that the amount of time required for bringing out a book is quite sufficient to make it already out of date in important matters before it appears. In the section on cacao, for example, the Nectrias are dealt with at some length as the cause of canker, while the discovery (1910) that they are secondary in their nature, the real parasite being *Phytophthora Faberi*, is indicated in a footnote. In dealing with diseases of the banana (in three pages as against six for the 'Irish' potato) no mention is included of the important work on Panama disease by Drost (March 1912) in Surinam—a research which has given us most welcome knowledge of this important subject. Other examples, of more or less importance, might be given, but since the book is rather more than less up to date than is usual in general text-books too much weight should not be given to this criticism.

The book contains, under each crop heading, a summary of the characteristics of the diseases of that crop, gathered from a wide range of literature and apparently omitting little of moment which had appeared at the time when it was compiled. A list of references to the special literature of each crop is given.

Considerable uncertainty is noticeable in the conclusions respecting the causative organisms of sugar-cane diseases. Some of this might have been avoided by an application of the caution noted in the introduction as necessary in accepting results obtained from material shipped to temperate climates and there used for experiment under artificial conditions.

CO-OPERATION.

MUTUAL CREDIT IN INDIA.

The phenomenal success of mutual credit in India can be appreciated from the following account taken from the *Journal of the Board of Agriculture* of England (January 1914). The profits since the commencement of the movement, nine years ago, equal nearly 8 per cent. of the total assets:—

The co-operative credit movement in India, of which some account was given in the Journal for February 1913, continues to make remarkable progress, as will be seen from the following statistics for the year 1912-13. The total number of co-operative societies in India increased in that year from 8,177 to 12,324; the total number of members from 403,318 to 573,536; and the total working capital from £2,238,000 to £3,562,000. Of these societies, 251 are central societies, whose main object is to find capital for the local societies; 691 are non-agricultural societies, most of which have been established for the provision of credit facilities among residents of towns, although a few have now been started for co operative purchase and sale; the remaining societies are agricultural societies formed among the rural population and, as they are by far the most important, attention may be confined to them.

During the year the number of these agricultural societies increased from 7,562 to 11,382, of which 11,296 were co-operative credit societies and sixty-three were societies for the co-operative insurance of live stock. The number of members increased during the year from 325,000 to 467,000, and the working capital from £1,215,000 to £1,935,000. During the year members deposited with the societies £120,000 and repaid loans to the amount of £800,000; deposits were withdrawn to the amount of £64,000; and the new loans made to members amounted to £1,440,000. The amount of interest received by the societies was £148,000, while the interest paid on loans and deposits was £91,000, thus leaving a margin of profit in interest of £57,000, or about 4 per cent. per annum on the average amount out on loan; and as the charges for establishment and contingencies amounted altogether only to £13,000, or a little over £1 per society, there was a substantial profit on the working of the year. During the year the total assets of these rural societies increased from £1,295,000 to £2,040,000, of which £1,720,000 was out on loan to members (as compared with £1,112,000 at the end of the previous year). The liabilities of the societies to persons and bodies outside them amounted to £1,386,000, including £1,110,000 due to central banks and other societies, £210,000 borrowed from non-members and £66,000 lent by the Government in backward parts of the country, so that, after deducting these liabilities to outsiders, the societies and their members between them ended the year with net assets of the value of £654,000 (as compared with £442,000 at the beginning of the year). This represents the amount which the establishment of these credit societies has enabled their members to lay by in the course of the last nine years. Of the £654,000, £487,000 was due to individual members in the form of share capital, deposits, and interest, and after allowing for this amount and for some other small items, the societies as such possessed £159,000, which represents their profits to date from the commencement of the movement, and equals nearly 8 per cent. of their total assets.

COTTON.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date February 9, with reference to the sales of West Indian Sea Island cotton:—

A good business has been done in West Indian Sea Island cotton since our last report. The sales amount to about 350 bales and include St. Kitts and Nevis 17*d.* to 20*d.*, with a few superior lots 21*d.* to 22½*d.*, Montserrat 16½*d.* to 18*d.*, with a few bags at 19*d.*, Barbados 17½*d.* to 18¾*d.* and St. Vincent, 20*d.* to 22*d.*

The demand entirely runs on the better qualities, the medium and lower grades being very unsaleable owing to the low prices at which Carolina Sea Island cotton is offering.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending January 31, is as follows:—

There is still a demand in the market for the odd bags of Extra Fine at 26c. and Extra Fine off in colour at 23c., but sales are restricted by the very small offerings as there is little remaining of these grades unmarketed.

Of the lower grades, say Fine and Fully Fine, there is still left in stock unsold about 200 bales to 300 bales, which Factors are holding at 2c. to 3c. advance.

There have been no further sales of crop lots, of which there are remaining in stock about 500 bales to 600 bales classing chiefly Fine and held at 23c. to 24c.

We quote, viz:—

Extra Fine	26c.	= 14¾*d.*	c.i.f., & 5 per cent.
Extra Fine off in preparation	23c.	= 13¼*d.*	,, ,, ,, ,,
Fully Fine	23c.	= 13¼*d.*	,, ,, ,, ,,
Fine	20c.	= 11¾*d.*	,, ,, ,, ,,
Fine & Fully Fine off in preparation	20c.	= 11¾*d.*	,, ,, ,, ,,
Stains	17c.	= 10*d.*	,, ,, ,, ,,

This report shows that the total exports of Sea Island cotton from the United States to Liverpool, Manchester and Havre, up to January 31, 1914, were 3,100 bales, 6,095 bales, and 3,769 bales, respectively.

British Cotton Growing Association.—The one hundred and twentieth meeting of the Council of the British Cotton Growing Association was held at the Offices, 15 Cross Street, Manchester, on Tuesday, the 3rd February, 1914. The President (The Right Hon. the Earl of Derby, G.C.V.O.) was in the Chair.

WEST AFRICA. The Association's Manager reports that the crop this year will be considerably larger than that of any previous year, and in the Lagos Province alone it is probable that the crop will exceed 16,000 bales. The present ginning capacity which the Association have in Lagos will be quite inadequate to deal with such a large crop, and for this year an electric light installation has been sent out, so that work can be carried on at night in case of need. Arrangements are being made for a new ginning plant to be sent out in time for the 1915 season. A certain amount of damage has been done to the crop by the Harmattan winds, but the bulk of the cotton is grown on forest land, and the early Harmattan winds, unless they are very continuous, have very little effect on the cotton grown in the forest areas, as the soil retains its moisture better than on the grass lands.

A statement was submitted showing the amount of cotton purchased in Lagos and Northern Nigeria during the last four years, as follows:—

Cotton purchases in bales of 400 lb. each.

	1910.	1911.	1912.	1913.	Total.
Lagos	5,626	5,408	9,146	13,694	33,874
Northern Nigeria		179	2,627	1,610	4,416
	5,626	5,587	11,773	15,304,	38,290

NYASALAND. The native cotton crop during the past season has been the largest the Protectorate has yet produced, and it is probable that the total crop will exceed 1,000 tons of seed-cotton, as against 130 tons four years ago. The cotton has all been carefully graded under the Government system, and the Government cotton markets, which have been established in different centres, have proved a very great success.

The Association has purchased considerable quantities both of native cotton and cotton grown by European planters, which has entailed a large lock up of capital, as it has been impossible to transport the cotton for some months owing to the shallowness of the Shire River. The transport facilities will, however, be considerably improved on the completion of the railway from Port Herald to the Zambesi early next year.

FINANCE. It was reported that since the last meeting of the Council new capital had been subscribed amounting to £330, bringing the total capital subscribed to date to £470,500. The authorized capital of the Association is £500,000, and it is hoped that the efforts which are being made to raise the outstanding balance of £29,500 will soon be successful.

DEPARTMENT NEWS.

Mr. H. A. Ballou, M.Sc., returned to Barbados on February 13, 1914, by the S.S. 'Briardene', from Montserrat, after conducting investigations in that island in connexion with insect pests of citrus plants.

At the third annual general meeting of the St. Vincent Arrowroot Growers' and Exporters' Association held late in January, the 1913 committee was re-elected and the Association recorded its high appreciation of their sevices. The attendance at this meeting afforded an illustration of the strength of the Association showing a representation of the ownership of about three-fourths of the cultivable land of the colony and a similar proportion of the arrowroot cultivation. (The St. Vincent *Sentry*, January 30, 1914.)

Particulars have just been received concerning a recent work on the cultivation of the oil palm, published by Crosby, Lockwood & Son, London. The author is Mr. F. M. Milligan, F.R.G.S., plantation expert in the Congolese section of the French West African colony and the Gold Coast. Amongst many other matters, the formation of a palm oil plantation is described.

AGRICULTURAL ENGINEERING.

THE ADVENT OF A CANE HARVESTER.

For many years much consideration has been given to the possibility of devising some mechanical means of economically cutting canes. It would appear that the most promising work in this direction has been conducted by Mr. E. M. Cockrell in Louisiana. According to the *Louisiana Planter*, it is considered probable that the Cockrell machine will be used practically and industrially in harvesting the next cane crop in that State. The history of the machine in question is interesting At least six types have been constructed but each year they have come back with imperfections remedied, and at last it would appear that all that is now required is a simple alteration regarding the gripping of the cut canes. According to the reference quoted, several canes are grasped at the moment of severance by a set of revolving circular wire brushes. Of these brushes there are ten on each side. The wires in the initial pairs are stiffer than those in the subsequent ones, and herein lies what is regarded as the last imperfection of the machine. With stiff wires on all the brushes it was found that the cut canes were carried upwards with a violence which broke a number of them against the overhead apron; so slender wires were put on all the brushes except the lower ones, with the result that in the case of the four upper brushes, which are smaller than the others, there was not sufficient grip or engagement to hold the passing canes tightly and some of them slipped down, this resulting in their being topped too high. It would appear that this can be readily remedied by the placing of stiff wires on the upper brushes, but as there is now no more standing cane left in Louisiana for further experimentation, another year must go by before the improvement can be made and tested.

Whilst being carried upward and backward by the revolving brushes, the cut canes are held perpendicular and drawn into the topping knives—two sharp revolving discs—where the foliage is removed; and since practically all sugar-canes have the first ripe joint at the same distance from the top end, there is little difficulty in regard to setting the topping gauge.

The canes after being topped drop to the ground. But it is believed that it will be a simple matter to arrange for them to fall into a cart or waggon attached to the harvester. Some similar sort of arrangement must be made also in connexion with the collection of the tops.

As regards its general working, the machine drives through the heavy clumps of cane irresistibly, and the 'caterpillar' traction—this year's innovation—is specially useful in making a short turn, the method being to slip one side out of gear, so that it does not move while the other side does, the result being an almost pivotal swing, within a very restricted radius. At the recent 1913 trials carried out at Reserve, the machine cut four rows of cane each about 900 feet long, containing a stand estimated as averaging 26 tons to the acre. The cane was all D.74 variety, which is erect. The machine cut each row in less than fifteen minutes.

A further account dealing with this cane harvester, presented in the *Louisiana Planter* for January 24, gives one to understond that Mr. Cockrell claims that each machine will cut, top and strip somewhere in the neighbourhood of 300 tons of cane a day. A company has been floated for the manufacture of the machines in New Orleans, and it is stated that about October several of these will be ready for work. It is Northern capital almost exclusively that is going into the development of this enterprise. The *Louisiana Planter* thinks that the people of the South, directly interested in sugar production, ought not to disregard, by refraining from investing capital, the rich returns which are bound to result from the production of a successful cane harvester.

No information is given in connexion with what will be the probable initial cost and the running expenses of the machine.

A Cane-Planting Machine.—The South African *Agricultural News* quotes from the *Louisiana Planter* in regard to a cane planting machine, which seems to have been successfully used in Queensland. It consists of a box to hold the plants. The axle is made so that the box is fairly high from the ground, and attached to the axle is another V-shaped axle, on the apex of which is hung an ordinary swing plow, without the handles. The plants are dropped through a leather conduit and fall immediately behind the plough, through a space formed by placing another plate parallel to the plough's original side plate. During the operation of planting, each cutting was placed perfectly in line, and as the machine passed on, the earth fell in and covered them. This work was done with two horses, but with three it enabled a 10-inch furrow to be opened out in one operation, and planting could be carried out on both journeys, without the necessity of marking out. The machine weighs about 2 cwt. without the plough, and it is estimated that it can plant 2 acres a day as against 1 acre by the old method.

New Uses for Rubber.—The rapidly increasing outturn of plantation rubber is necessarily stimulating inventors all over the world to find new uses for this product. Information in regard to progress in this direction is presented in the *India Rubber World* in a special section. In the issue for November 1913, our attention was attracted by an ingenious way of securing window glass by the employment of rubber strips. The principle of the idea is that the rubber takes the place of putty, the use of which has been customary for many years. The sash windows are cut with inwardly bevelled grooves to conform with the edges of the rubber strips which hold the glass in place. When the glass is set in the sash and the retaining strips are forced into position, the parts fit tightly together, keeping out all moisture. One advantage of this method of fastening is that the glass can be removed at any time without the usual trouble and dirt which attend the use of putty.

Another interesting invention of an equally simple but effective kind is a mallet of which the head is made of soft rubber and the handle of hickory. It is capable of standing a powerful blow, and there is no danger of denting or damaging the material which is being worked upon. It will be seen that this rubber mallet can take the place of the ordinary wooden mallet and often of the steel hammer.

The year 1913 has proved the driest during the period of fifty-two years that rainfall returns have been taken at the Botanic Gardens, Trinidad. The total fall for 1913 was only 39·53 inches, nearly 10 inches less than that for 1912, and 25·03 inches below the average for the last fifty-two years. In several parts of the colony, on the other hand, 1913 was a wetter year than 1912, namely in the West Central and San Fernando and Princes Town districts. (*Bulletin of the Department of Agriculture, Trinidad and Tobago*, January 1914.)

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

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The *Agricultural News:* Price 1*d.* per number, post free 2*d.* Annual subscription payable to Agents, 22*s. d.* Post free, 4*s.* 4*d.*

Agricultural News

Vol. XIII. SATURDAY, FEBRUARY 28, 1914. No. 309.

NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number deals with the subject of a tropical agricultural note-book. The possible scope of such a work is described and its uses pointed out.

On page 67 information is given concerning West Indian fruit-producing plants. An interesting article appears on this page dealing with the cultivation of Cayenne pepper plants.

Under the caption Book Shelf, on page 68, several recently published works are reviewed dealing with planting, mycology and educational matters.

The Engineering Notes, on page 71, principally comprise a description of the new American cane harvester, which according to certain authorities is likely to come into general use in Louisiana.

The new and important subject of the conversion of liquid oils into solid fats by means of hydrogen gas is discussed on page 73.

The Insect Notes in this issue (see page 74) contain some new results obtained in regard to West Indian termites or white ants.

The position of the Northern Islands in regard to Mal de Caderas is discussed at some length on page 75 A further note on the subject will be found in the next column.

Fungus Notes, on page 78, comprise articles on the green muscardine fungus in Samoa, and the question of soil sterilization in relation to the control of plant disease.

Further Note on Mal de Caderas.

Since the article presented on page 75 was written, the January number of the *Journal of the Board of Agriculture of British Guiana* has been received, and an article in this publication by Captain A. L. Farrant, F.R.C.V.S., contains important information concerning the mode of propagation and the treatment of Mal de Caderas in South America. It is stated that in the opinion of the writer *Stomoxys calcitrans* is at least the chief means of the spread of the present epidemic in British Guiana, though this has not been definitely established. It is pointed out that in Paraguay and in the Argentine portions of the Chaco, an animal known as the Capybara (*Hydrochœrus capybara*) or Caprincho is a source from which the fly or other carriers of this disease probably obtain the virus. The animals in question are attacked periodically by an epizootic of an unknown nature. They lie about along the banks of of the streams and die there. (Capybara is the waterhass of British Guiana, and is fairly common upon some of the sugar estates at present affected with Mal de Caderas.)

Confidential Advice.

A statement was made by a West Indian planter the other day, to the effect that if he discovered a new disease or even a sudden outbreak of one of the common maladies amongst his canes he would not apply for departmental assistance because he could not be certain that the case would be regarded as strictly confidential. Apparently the risk of injury through publicity would be greater than the risk of material loss by disease. The statement though not levelled at any one in particular touches so important a phase of departmental policy that it cannot be passed by unheeded. As far as the West Indies are concerned the attitude displayed by the remark in question has always constituted a difficulty in the administration of scientific advice and in the progress of research. But it has always been respected and appreciated and in general circumvented to the satisfaction of the average client. In the case of the work of the Imperial Department for instance, particularly the publication work, the avoidance of personalities is so great as to invoke, at times comment on the part of those readers who cannot be satisfied with the unimbellished truth.

As matters stand at present we fear that the scientific adviser has to go to the crop, and he has to go at a time when everything is astir—hence his visits are noticed; if crops could be made to walk, or in any other way rendered locomotive, it might then be possible to invent a mycological Harley Street, where consultations could be made productive of benefit and enacted under conditions of the strictest secrecy.

The Way to Apply Manures for Cotton.

A correspondent to the St. Kitts *Daily Express* calls attention to the statement made in the St. Kitts-Nevis Report on the Botanic Station, 1911-12, as a result of many years' trials, that, 'in regard to manurial experiments with cotton, the results of the

year under review, together with those of former ones, indicate that the addition of artificial manures under conditions existing at La Guérite (the Experiment Station) has not been attended with remunerative returns'. The writer maintains, apparently from practical experience, that the reason for the unbeneficial results lies in nothing more or less than the circumstance that the fertilizers have not been applied in the proper way. The correspondent states that the method employed of sowing the manures in drills which consists in opening the soil around the plant on the side of the cross-hole to the depth of about 1½-inches, and sprinkling the fertilizer around the plant in these drills and then covering them with soil, is wrong. It is maintained that the root system of the cotton plant in St. Kitts is essentially deep rooting, and this circumstance together with the belief that the manure being so near the suface is soon removed by the labourer's hoe at weeding time, are put forward as indicating the inefficiency of the method just described.

As a matter of fact an extensive study of the root system of the cotton plant in St. Kitts has shown that the lateral root system which spreads more or less horizontally in the light, sandy soil is developed to a greater extent than the tap root: hence the plant is to be regarded as comparatively shallow rooting compare with cotton plants growing in stiff soils like those of Antigua. This would appear to be a point in favour of the shallow application of fertilizers or rather a point in favour of broadcasting.

The writer also states that a different procedure is followed in the Southern States of America, but he does not say how this differs from the method adopted in St. Kitts, nor whether it would be practicable to introduce the method.

In looking up several references on the point we find it stated in one of the cotton pamphlets of the Khedivial Agricultural Society that when the manure is large in amount, no advantage is to be gained by spreading in the drill compared with broadcasting, but when the quantity is small there is an advantage in spreading it along the bottoms of the furrows. Again in the United States Department of Agriculture Bulletin No. 33 on the Cotton Plant, the best mode of application of fertilizers is summed up as follows: 'Fertilizers may be indifferently drilled or broadcasted where they are liberally supplied, but drilling is to be preferred where small amounts are employed.' Similar views are expressed in C. H. Birkett's book on cotton. Since large quantities were not used in the St. Kitts experiments there would seem to be something perhaps in the suggestion that the manures ought to be put in more deeply.

In considering the subject broadly it must be confessed that the letter which is responsible for this article has raised a question which ought to receive careful consideration, and it would be interesting if trials could be made with manures supplied to plots in equal quantities but in different ways. It is worth while, in the present connexion, however, to bear in mind that last year for the first time the application of manures at La Guérite gave an increased yield which would seem to show that the unbeneficial action in the past has been due to chemical rather than mechanical causes. Moreover in former years the application of manures at La Guérite to cotton has actually decreased the yield in certain cases. If, as is suggested in the letter, the manure is removed by the weeder's hoe, how is the effect on the crop just described to be accounted for?

Turning Liquid Oils into Solid Fats

The far-reaching importance of any economical method of converting a liquid oil such as cotton-seed oil into a solid fat (of which palm oil is an example) can be readily realized when the prices of the two classes of compounds are compared. The subject has received considerable attention of recent years and lately an article on the subject has appeared in the *Bulletin of the Imperial Institute* (October-December, 1913) which shows that the success which is attending a new process now in vogue is likely to result in the lowering of prices of certain of the harder natural fats, for example palm kernel and coco-nut oils.

Without going into the chemical details of the reaction too closely, it may interest the general reader to know that the essential feature of the process is to convert oleic acid (which is the chief compound in liquid oils) into stearic acid (which is found in solid fats). The change is brought about by the simple process of reduction (i.e. the addition of hydrogen, hence reduction in the percentage of oxygen) according to the following equation:—

$$\underset{\text{Oleic acid.}}{C_{18}H_{34}O_2} + \underset{\text{Hydrogen.}}{H_2} = \underset{\text{Stearic acid.}}{C_{18}H_{36}O_2}$$

It appears that the conversion of 2,000 lb. of oleic acid into stearic acid would require about 14 lb. or 2,500 cubic feet of hydrogen gas. It may be added that in the course of the reaction the presence of a catalytic agent is required to facilitate the change. (The catalyst is not affected by the reaction.)

We may end this brief note by quoting a few of the conclusions arrived at by the Imperial Institute in regard to the subject under consideration. 'A possible effect that at once suggests itself is the lowering of prices of certain of the harder natural fats, e.g. palm kernel and coco-nut oils, which are largely used in the manufacture of edible substances, while the demand for liquid oils which lend themselves readily to the process of hardening may reasonably be expected increase with a corresponding increase in value . . . . . Liquid oils can be purchased at as low a price as £17 per ton for Japanese fish oil. It should therefore be possible to produce from this material a hardened oil which should be at least equal in value to low grade palm oil, namely £26 per ton at a cost of about £22 per ton. The fact that numerous firms of oil manufacturers are interesting themselves in this process is sufficient to show that it is regarded as likely to prove profitable.'

It is yet too early to prognosticate, but an extension in the employment of the process may be reasonably expected to affect favourably West Indian cotton growers.

INSECT NOTES.

TERMITES OR WHITE ANTS.

Although termites, or white ants, as they are often called, are of common occurrence and the cause of a considerable amount of injury throughout the West Indies, yet but little is known of these insects as regards their habits life-histories, and even their identity. The reasons for this are perhaps to be found in the facts that termites are not often serious pests of growing crops and that they usually commit their depredations under concealment.

Nearly every resident in the West Indies is familiar with the injury which these insects cause to furniture, the timber of houses, sheds, palings and all wooden structures, and with the curious tunnels through which certain species pass along the exposed surfaces of walls, the trunks and branches of trees, etc., while in certain localities the characteristic nests of these insects are frequently to be seen.

Readers of the *Agricultural News* will remember references from time to time to the occurrence in St. Kitts of a termite as a pest of growing canes. In 1912, the Entomologist on the Staff of this Department spent a considerable amount of time in St Kitts investigating the insect pests of sugar-cane, chief among which were the termites. At the same time, collections of other termites were made in that island and during short visits in Montserrat and Antigua. The material thus obtained together with other collections by the Entomologist and the Agricultural Officers in other islands was sent to the Imperial Bureau of Entomology for study.

The material submitted for examination was found to represent eleven species, ten of which were from the Lesser Antilles, two being new to science, and one was from Porto Rico. These eleven species are included in five genera.

	Barbados.	Grenada.	St. Vincent.	Montserrat.	Antigua.	St. Kitts.	Porto Rico.
Calotermes balloui		×	×				
,, castaneus	×						
,, incisus	×					×	
,, venezolanus						×	
Eutermes acagutlae						×	×
,, costaricensis							
,, haitiensis				×	×	×	
,, sanctae-luciae			×			×	
Leucotermes tenuis	×						
Mirotermes marshalli						×	
Rhinotermes marginalis	×						
Total recorded from each island	4	1	2	1	1	6	1

The accompanying table will serve to show at a glance the distribution of the several species so far identified, and it also indicates how incomplete is the record of these insects in these islands. For instance, there are no species given for Dominica and St. Lucia, only one each for Grenada, Montserrat and Antigua, while in Barbados and St. Kitts there are records of four and six respectively.

In addition to the material already identified, there are still a few specimens awaiting study at the Laboratory at the Head Office which will give new locality records and may add to the number of species. It is desired to obtain further material and it is hoped that agricultural officers and others who may have the opportunity will forward material for further study.

One of the species mentioned in these notes is known as a pest of growing canes while others attack living trees, and newly planted cane cuttings, while probably all, including these, attack the woodwork of buildings, etc.

Leucotomes tenuis is the species which has often been referred to as a serious pest of canes in St. Kitts, while the species of Eutermes are known to attack cane plants in the field in Antigua and Porto Rico. Two species of Calotermes attack living trees—*C. balloui* being reported from cacao trees in Grenada, and from the heartwood of a Pithecolobium in St. Vincent, and *C. incisus* was found in the wood of a living Avocado pear tree in Barbados.

The name white ants and wood ants as applied to termites is quite misleading since it implies a relationship between these insects and the true ants. Termites are like ants only in the matter of being social insects living in large colonies composed of specially modified individuals representing several castes. The ants are insects of the natural order Hymenoptera: the young when hatched from the eggs are maggot-like grubs, without feet or legs, and when these are full-grown they reach the adult condition after passing through a quiescent pupal stage. In other words, they have a complete metamorphosis.

The termites, on the other hand, are insects with an incomplete metamorphosis, more closely related to the Orthoptera and Neuroptera. The newly hatched young are in general shape something like the adults, they are free-moving and are possessed of three pairs of legs. They do not pass through a quiescent pupal stage. In certain of the islands termites are commonly known as wood lice. This name is also an unfortunate one since in other countries certain crustaceans are referred to by this term.

The different forms or castes in a termite's nest are as follows: (1) The egg-laying female or QUEEN. There are often several of these in a nest and according to the accounts published by several students of these insects each queen is associated with a royal male or KING, although this male has not been found in any of the nests opened in the collecting of the insects on which these notes are based, or it might perhaps be more correct to state that they have not been recognized. The queens are wingless but examination will reveal the presence of wing stumps showing that wings have been present, but have been shed.

(2) WINGED SEXUAL FORMS. These are present in great numbers in the nests of certain species, at least at certain times of the year, and at all times many immature forms of these as indicated by the wing-pads in different degrees of development.

(3) WORKERS. These are wingless forms, generally short and thick-bodied.

(4) SOLDIERS. The soldiers are characterized by an unusual development of the head. In certain species, the head is nearly as large as the rest of the insect. Sometimes the mandibles are extraordinarily developed, while in others the head and mandibles are developed into a cone-shaped structure.

(5) LARVAE. These include the immature individuals which will be developed to form the sexual winged forms, the soldiers and the workers.

(6) EGGS. Careful search of any well-establised nest will generally reveal the presence of enormous numbers of the eggs.

LIVE STOCK NOTES.

THE POSITION OF THE NORTHERN ISLANDS IN REGARD TO MAL DE CADERAS.

The question has arisen as to whether it is desirable for the several West Indian governments of the Windward and Leeward Islands to take steps for the prevention of the introduction of infective sources of the equine disease mal de caderas (disease of the haunches) from British Guiana and other South American countries. Definite enquiry on this point was received some time ago from the Government of Grenada and there can be little doubt that it is urgently necessary to give the matter careful consideration, although since there have been no outbreaks in the islands so far, the position is not to be regarded as alarming.

The points which seem to require decisive opinion are whether it is desirable to prohibit the importation of horses, mules and asses from countries where the disease is known to exist, or whether inspection at the port of entry may be deemed to afford adequate protection; also whether it is necessary in this connexion to regulate the importation of animals other than horses, mules and asses. Before proceeding to put forward the opinions of the Veterinary Officer of this Department on the subject, the attention of the reader may be called to previous information connected with the disease which appeared in the *Agricultural News*, Vol. XI, No. 304 (and former references).

In a memorandum recently forwarded to the Imperial Commissioner of Agriculture, the Veterinary Officer (Mr P. T. Saunders, M.R.C.V.S.) puts forward his views in regard to the points raised in the above paragraph. At the commencement it is observed that, although the disease is recorded as being confined to South America, cases of the disease may have occurred in other places, as for instance Barbados. It is a matter of considerable difficulty to diagnose definitely trypanosome diseases by means of the symptoms alone, and cases which have been looked upon as being surra might possibly have been mal de caderas.

The most important aspect to be considered is the possibility of communication to the West Indian islands from South America. The trade relations in live stock between British Guiana and the West Indian islands are almost negligible. The only example which appears to be more or less constant is the sending of race horses to the various meetings held in the different colonies. The danger here would appear to be greatly minimized it the horses were known not to have been in or near an infected area. Owing to the fact that the causal agent of the disease (*Trypanosoma equina*) is only to be found in the blood in any number, during the febrile stages and is absent in the later stages or is to be found very rarely; and since the disease is probably carried by a biting fly which can only convey the disease when it has sucked blood from an animal in the febrile stage (which is not of long duration though it is remittent)—from these considerations—together with the circumstance that small areas can be mapped out as infected—it would seem that the disease may be more or less easily controlled and that the danger of communication is not great.

A very important matter in regard to the danger of infection rests upon the idea that 'reservoirs' may exist; that is to say, animals other than equines may contract the disease though they may not exhibit its symptoms. It will be remembered that some time ago this was emphasized in the *Agricultural News* and the classical example afforded by Malta fever was referred to. The most susceptible animals in regard to trypanosome diseases are rodents, though many other animals are supposed to be capable of acting as 'reservoirs' in the same way. It would appear therefore that considerable danger exists in Trinidad where cattle are imported from Venezuela for slaughtering for meat. But it is only rarely that animals are imported from British Guiana or from the mainland of South America into the smaller islands. Occasionally an animal is imported from Trinidad, but in this case it is probably from the Government Stock Farm and the animals will therefore have been under close observation for some considerable time. A circumstance of a very pertinent nature, is the fact that in spite of close communication with the mainland no outbreak has yet occurred in Trinidad.

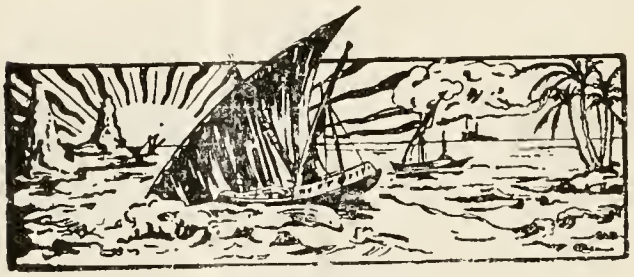
In considering the danger of infection in regard to the duration of the disease it must be borne in mind that the long duration makes an infected animal longer a source of actual danger, and it is conceivable that the disease may pass unnoticed until the paralysis of the hind quarters is evident, whereas the animal is most infected at a period before that symptom is exhibited.

From the point of view of disease prevention the most effective action to take would be to prohibit the importation of horses, mules, asses, cattle and small stock altogether from South America, and, in addition, from those islands like Trinidad and Barbados which are in constant communication with the mainland. But such a course does not appear to be altogether desirable. For one thing the trade in live stock would be completely at a standstill and the slow spread of the disease in confined areas in Berbice would not appear to warrant such stringent measures. Moreover inspection at the port of entry would preclude the importation of any obviously diseased animal. It may be noted that legislation is already in action in the case of Grenada for the prohibition of the importation and slaughter of imported animals should this be necessary.

In conclusion, Mr. Saunders recommends that the importation of live stock should be prohibited from countries known to be infected with mal de caderas, into Trinidad, Barbados and the Windward Islands. Prohibition is unnecessary in the case of the Leeward Islands because the trade in animals between this Colony and South America is negligible. It is not considered necessary to prohibit importation from places where the disease has not occurred though they may be in communication with infected countries. Incidentally, however, in the case of every colony, great care should be exercised in the matter of sending race horses to the various meetings.

Animals other than equines probably act as 'reservoirs' and it would appear to be desirable to prohibit their importation from places where mal de caderas is known to occur, until further study of the disease shows definitely that they are not grave sources of infection.

The fact that no outbreak has occurred in Trinidad, in spite of its close communication with the South American countries, does not tend to lead one to regard the subject under consideration as a very alarming one. Mr. Saunders in fact seems to be rather undecided as to whether any very stringent measures are yet really necessary or advisable if they are going to interfere seriously with trade.



GLEANINGS.

Ten coco-nut trees were damaged in Nevis during October 1913 by lightning: they are now all rotting in the bud.

West Indian botanists will be interested in Part IV of Vol. XVII of the contributions from the United States National Herbarium which comprises studies of tropical American ferns.

Considerable activity is taking place in St. Vincent in regard to the trial shipment of minor industry produce to Canada. Eleven hundredweight of peeled, sliced and dried cassava roots have been prepared for export, whilst ½-ton of local peanuts has already been sent.

The favourable weather in St. Vincent has recently enabled the later planted cotton to yield rather better than was at one time expected. but the average yield per acre will be low. During January, the arrowroot was reported to be ripening up and better returns were expected.

The lime trees began to flower in Dominica during January. An interesting agricultural event of the month was the visit paid by the Curator and Colonial Engineer to certain estates in order to test the effect of dynamite on the 'hard pan' which exists beneath the surface soil of certain lime fields.

The St. Lucia cacao crop is likely to be short owing partly to the dry weather experienced in December and January. As regards the lime crop, which is now practically over, it is interesting to note that the export of lime products for 1913 was approximately £3,072 compared with £1,085 in 1912, and £290 in 1911.

During January in the Virgin Islands, most of the cotton growers were busy picking their crop. A very fair first picking has been obtained, but with dry weather in February the second crop is expected to be a small one. During the month of January rain was measured only on four days and the total fall was only 49 parts.

Owing to the dry season having set in, very little work was done on the Grenada small holdings during January. One or two of the allottees were noticed forking in between the growing canes on their plots. This treatment, they claim, reduces the effects of drought to a minimum and this view appears to be borne out by the better appearance of the crops so treated.

A work entitled The Preparation of Plantation Rubber is reviewed in the *Bulletin of the Imperial Institute* (October-December 1913) where the book is described as the most important contribution which has yet appeared on the practical details of rubber production from cultivated Para trees. The book should be in the hands of every rubber estate manager.

An article appears in the *Gardener's Chronicle* (December 20, 1913) dealing with lemon culture. A large lemon tree in Sicily may produce 3,000 fruits in one year. A local way of keeping lemons in good condition is by means of salt. The fruit is placed in barrels and sea-water poured over it every twenty-four hours for forty days. Thus salted, the fruits are sent abroad.

According to the *Planters' Chronicle*, the exports of rubber from Ceylon during the seven months ended July 1912 and 1913 were as follows: 1912 to the United Kingdom 3,943,655 lb.; to the United States 2,042,505 lb.; and to other countries 975,649 lb.; for 1913, to the United Kingdom, 6,468,257 lb., to the United States, 3,723,904 lb.; to other countries 2,350,546 lb.

In the *India Rubber World* (February 1, 1914) reference is made to the manufacture of synthetic rubber in the east of England. A small plant is now in operation, and it is expected soon to produce sufficient artificial rubber for practical test. So far the quality turned out has not been satisfactory. Before the end of the year, a report on the mechanical tests of synthetic rubber will be issued.

In Nevis, the cane crop has been suffering much from drought, but the young cane crop is germinating fairly well in some places. The cotton produced this season has been favourably reported on, and a fair amount has been sold at prices ranging from 19*d.* to 21*d.* per lb. It is to be regretted that growers are somewhat slow in pulling off the old cotton even in localities where the crop has to be planted early.

A notice appears in the *Chemist and Druggist* (January 3, 1914) on the pamphlet on lime cultivation issued by this Department. The greater portion of this review comprises export statistics in regard to Montserrat. No mention is made of Dominica as by far the chief citrus producing island but it may be of course tbat there is some special object in confining attention to the position of the industry in Montserrat.

An interesting account of the trial of different varieties of sugar cane is contained in the Annual Report of the Bureau of Sugar Experiment Stations of Queensland, 1913. In the experiments with seedling canes from the Acclimatization Society, the Barbados seedlings in competition with Queensland, Demerara and Mauritius plants easily proved the most promising. B 3922 attracted attention from an early stage.

A notice in regard to the newly instituted Leeward Islands Scholarship appears in the *Leeward Islands Gazette* (January 29, 1914). This is a Government scholarship of £150 per annum tenable for three years at an institution to be approved by the Governor. There are eleven compulsory subjects including chemistry, botany and agricultural science. The questions set in the case of the last-named subject will have special bearing on tropical agriculture in the West Indies.

SOIL INVESTIGATION.

STUDIES IN SOIL TEMPERATURE.

The following article constitutes part of a lengthy abstract published in the *Experiment Station Record* (November 1913). It embraces the results obtained by C. J. Bouyouios in America from the systematic study of the factors influencing soil temperature. Readers of the *Agricultural News* who are directly interested in soil chemistry and physics should obtain the author's paper (*Michigan Sta. Tech. Bull. 17*), as several original methods are described therein:—

It was found in general that the specific heat of different types of soil, gravel, sand, loam, clay and peat, in dry condition, did not differ very materially. This was true both by equal weights as well as by equal volumes. The specific heat of peat was about half as great as that given to it by other investigators. The moisture content of these different soils in their natural condition varied very greatly, and since water has such high specific heat it made a tremendous difference in their final specific heat.

'The heat transference in the different soils was measured (1) in their dry condition, (2) in their natural state under laboratory conditions, (3) under field conditions. It was found in all these three states that the order of heat conductivity was the same. Gravel possessed the highest heat-transmitting power, followed in order by sand, clay, loam, and peat respectively. Convectional currents, molecular diffusion, and distillation influenced very greatly the rate of flow of heat, and consequently the values obtained do not represent the true heat-conducting power of these different types of soil.

'In field conditions the solar radiation tended to travel with greater rapidity and facility vertically than horizontally.

'The study on radiation showed that color had no effect upon radiation, which is contrary to the common belief, but it had upon absorption; that the different types of soil tended to radiate differently when dry, about the same and more when well moistened and in their natural condition, and that a dry surface or mulch reduced the radiation. In the dry state, sand exhibited the highest radiating power, followed by gravel, clay, loam, and peat, respectively. The water, however, had by far the highest radiation capacity of any soil either in the dry or moist state.

'When the temperature of the different types of soil (all covered with a thin layer of the same kind of soil in order to eliminate the factor of color and other factors) was studied under field conditions, it was found that they all cooled and froze about the same time in the upper 6 inches, but in the spring they thawed and warmed up at different rates. This was attributed to their different specific heats and to the downward and upward trend of air temperature in the fall and spring respectively. The gravel and sand thawed first, followed by clay one day later, loam two days later, and peat ten days later. The temperature of the first two soils rose very rapidly after thawing, while that of the others rose very slowly. When the lower depths of the latter soils had thawed, however, their temperature rose also quite rapidly and finally reached the same degree of magnitude as in the former or lighter soils, and all continued to have almost the same temperature from then on throughout the summer, autumn, and winter.

'This equal degree of warmth of all the different types of soil during the warm part of the year and especially during the summer season was believed to be due largely to the thin layer of the same kind of soil with which they were all covered. This thin layer of soil tended to equalize the amount of heat that penetrated into these different kinds of soils by eliminating the differences of their colour and by equalizing, to a large extent, the amount and rate of evaporation of their moisture.

'Of all the different types of soil, sand showed the greatest amplitude and was followed by gravel, clay, loam, and peat, respectively. The greatest monthly fluctuation for all soils occurred in June and the least in February.

'The different meteorological elements played a great part in the temperature of the soils, but on account of the complexity of their behaviour it was difficult to trace the direct influence of all of them.

'The results from the investigation on the effect of organic matter on soil temperature showed that the rate of thawing was about proportional to the amount of organic matter present, but that after thawing the temperature of the soils containing 2·01, 3·32, 5·47, and 6·95, per cent. organic matter was higher throughout the summer than the temperature of the white sand and of the peat. The temperature of these last two soils was about the same during the warmer part of the year, but during the cold seasons the peat had a higher temperature. The magnitude of the amplitude of all these soils behaved in the same order as the average temperature.

'The conditions of cultivation, non-cultivation, and sod had a very distinct effect upon the soil temperature. During the winter all three plats had about the same temperature with a small difference in favour of the sod. In the spring the sod and uncultivated plats thawed first and the cultivated plat about one day later, at the 7-inch depth. The temperature of the sod plat rose several degrees above that of the other two plats and continued to be in excess until the plants had made a considerable growth, and then it dropped below that of the two bare plats, and remained so throughout the summer months; but when the cold period came the order was reversed, the temperature of the bare plats fell below that of the sod plat and continued to be lower throughout the second winter. The temperature of the cultivated plat rose slightly higher than that of the uncultivated, after thawing, and continued to be slightly higher than during the early part of the spring season or up to about the middle of May, and then the uncultivated plat became the warmer and remained so throughout the whole summer. During the fall both plats had about the same temperature with a slight difference in favour of the uncultivated plat. The difference in temperature between these two plats was explained upon the following general facts: (1) Different rate of evaporation, (2) different rate of heat conductivity, (3) difference in temperature at the lower depths, and (4) the effect of the dry mulch of the cultivated soil.

'Salt solutions had a very marked influence on the rising and lowering of soil temperature. Different salt solutions of the same density or the same solution of different densities raised the soil temperature considerably. Their influence was also very pronounced on the rate and degree of lowering of temperature, as well as on the rate of thawing.

'The different kinds of manure raised the soil temperature differently—horse manure the most, sheep manure the least, and the cow manure intermediate. In every case the greatest rise took place in the first three or four days. The rise increased with the increase in quantity. The degree of rise is probably insignificant for practical conditions.'

FUNGUS NOTES.

GREEN MUSCARDINE FUNGUS IN SAMOA.

The insect notes published on page 10 of the present volume of this Journal contained a reference to a fungus discovered in Samoa on the Rhinoceros beetle (*Oryctes Rhinoceros*) which is a serious pest of coco-nuts in that island. In the issue of *Der Tropenpflanzer* for December 1913 (Vol. XVII, p. 660) Dr. Friederichs, Government Entomologist of Samoa gives an account of the fungus and of its parasitism on Oryctes. It turns out to be the now well-known fungus *Metarrhizium anisopliae*. From the method of its occurrence, it is believed to be indigenous to Samoa, although first discovered on the introduced beetle in question. It was noticed that a number of the larvae in captivity showed large, round, brown spots, and in about a week the grubs were dead and covered with green spores. Healthy larvae brought into contact with them became without exception infected and also died. The brown spots mark the place of entry of the fungus. They are not very sharply defined and are very variable in size; sometimes they are quite absent, a circumstance which may denote infection with the food. The spots appear if spores are placed on a slight wound produced by pricking the skin of the larva. In most cases the diseased larvae become so full of the mycelium of the fungus that they are converted into solid bodies capable of being broken into pieces. At first the mycelium is not externally visible; later it forms a white covering upon which the spores develop and soon enclose the whole body in a blue-green layer.

When pupae were placed in infected material the beetles emerged but were immediately attacked. Adult beetles could be infected by inoculation under the wing covers, though most of them died from the direct effects of the wound. A large number of beetles kept in a kerosene tin in earth and leaves to which a number of dead beetles bearing the spores had been added all died and were found covered with the fungus. Whether they had been killed by it, or whether it had merely developed on their dead bodies, as experiments showed to be possible, is uncertain. The production of spores on the adults is considerably hindered by the hardness of the outer covering.

The fungus is so virulent that every larva which comes in contact with the spores is infected and dies. The laboratory in which these experiments were carried out became so permeated with spores that it was found impossible by ordinary methods to rear the larvae at all.

Experiments were carried out to determine the possibility of infecting larvae in the open. Earth containing infected material was mixed with a heap of rotted cacao husks and 200 healthy larvae introduced. Seventeen days later the heap was examined and all the larvae were found dead and covered with the green spores. Later observations showed that the beetles readily resorted to the heap to lay their eggs and that the larvae on hatching were immediately killed. The heap retained its full virulence for several months. Parallel experiments in another district have given the same results and it has further been shown that the beetles leaving such heaps after laying their eggs carry the infection to adjacent breeding places. It is recommended that only well rotted cacao husks be used in constructing the heaps, otherwise the heat generated is too great, and further it is recommended that the heaps be covered with a layer of earth in order to prevent distribution of the spores of cacao canker from the husks.

SOIL STERILIZATION IN THE CONTROL OF PLANT DISEASE.

The subject of soil sterilization has received a great deal of attention lately, and although the explanation of some of the effects produced is still the subject of considerable doubt, the effects themselves are already proving of great value in practice. As yet the methods available are too expensive for use except on relatively small quantities of soil, and hence are most adapted to the purposes of the gardener.

Apart from any improvement in the fertility of the soil, the elimination of parasitic organisms by one of these methods may prove to be of great value to planters of those tropical crops for which seed beds are used, whenever trouble is being experienced with damping off or seedling diseases, or where early infection with diseases of later life is suspected. We give below, therefore, an extract from a paper by L. L Harter on Control of the Black Rot and Stem Rot of the Sweet Potato published by the Bureau of Plant Industry, U.S.D.A. (Circular 114), which gives particulars of soil sterilization by two methods, involving the use of steam and of formaldehyde solution respectively.

'Steam sterilization is preferable when possible. When disinfecting by steam, any system can be used that insures the greatest efficiency with the least expenditure of time and money. Efficiency, however, should be the first consideration. It is a useless expenditure of time and money to sterilize if it is not done thoroughly or, if after once being thoroughly sterilized, the soil is allowed to become infested by handling with shovels or by placing it in boxes, etc, that have not been disinfected.

'Some system patterned after the following plan is suggested by W. W. Gilbert and, with such modifications as are necessary to meet local conditions, may be found feasible. A stationary or portable engine must be available which can stand a pressure of 80 to 100 lb. of steam. If a stationary engine is used, the soil must be hauled to the engine for sterilization. In such cases it will be found convenient to construct a strong box which can be tightly covered, sufficiently large to hold 1, 1½ or 2 tons or more of soil, with 1½- to 2-inch perforated iron pipes (the perforations to be about three-sixteenths of an inch in diameter and 6 inches apart on the under side) laid in the bottom about 1 foot apart, which can be attached to the engine by a pipe or steam hose. This is easy to accomplish by connecting the parallel rows of pipes in the box with a header having an outlet connecting with the engine. This box should be loaded on a wagon and hauled to the farm and filled; then brought to the engine and sterilized and again returned. If there is any general demand for soil sterilization, several completely equipped boxes will be needed. The use of portable boxes is advisable merely to protect against reinfestation of the soil after it is sterilized.

'It will be more convenient to have a stationary sterilizing box and haul the soil to and from it in a wagon, if the necessary care is taken to wash out the wagon box with a formaldehyde solution before the sterilized soil is again put in it. This method will save time, labour and expense. The soil can then be brought to the engine, scooped into the box, spread out 8 or 10 inches deep over the pipes, sterilized, and returned to the wagon. Practically the same methods can be employed if a portable engine is used to sterilize the soil on the farm.

'When the pressure is up to about the capacity of the engine, probably 80 to 100 lb., the steam should be turned on by opening the valve about half way. The higher the pressure the drier the steam. The soil should be steril-

ized for about forty minutes after the temperature reaches 100°C. (212°F.). The thermometer should be placed in the soil midway between the pipes.

'If it is impracticable or impossible to sterilize with steam, it may be done by the use of a formaldehyde solution, 1 pint of formaldehyde (40 per cent.) to 24 gallons of water. Formaldehyde is cheap and can be purchased at almost any drug store. When the soil is to be treated with a formaldehyde solution it should be placed in a tight box or other receptacle, and enough of the solution added to soak it thoroughly. The application should be made at least two weeks before the soil is to be used, in order to allow the formaldehyde to evaporate. An occasional stirring of the soil will assist in the escape of the gas. Disinfected soil should be carefully protected to prevent infestation before it is used. All instruments used in handling sterilized soil, such as the wagon box, shovels, etc, should be disinfected.'

A very interesting article appears in the *World's Work* (February 1914) entitled 'The Triumph of "tame" rubber', written by Henry C. Pearson, editor of the *India Rubber World*. It shows how the plantation of cultivated rubber trees has moved the centre of production from Brazil to the Malay States. The question is raised as to whether this concentration of one crop in a limited area of the Tropics may not result in the outbreak of a serious epidemic of disease which will wipe out cultivated Hevea just as introduced coffee plants were devastated in Ceylon.

WEST INDIAN PRODUCTS.

DRUGS AND SPICES IN THE LONDON MARKET.

Mr. J. R. Jackson writes on February 4, 1914, as follows:—

As usual the month of January opened with a small amount of business owing to the holidays and stock taking, and it was not till the 8th of the month that the drug auctions were resumed, after a full month's interval, at this first auction there was but very little demand for the products offered, and prices remained pretty much as they did at the close of the old year, as the month advanced, however, more activity became apparent, and at the close, it may be said there was a decided improvement, both in demand, as well as in the prices generally realized.

The principal changes in West Indian products have been the lowering of the prices, at the beginning of the month, of kola, nutmegs, and citric acid, the last of which recovered itself towards the end, and mace, nutmegs and lime juice all became firmer.

GINGER.

At the spice auction on the 14th, 63 cases of Calicut were offered, and 35 cases sold without reserve at 36*s.* 6*d.* to 37*s.* 6*d.* for small cut; 800 bags of rough washed Cochin were offered and bought in at 24*s.*, to 25*s.* a large number of bales of Formosa were also bought in at 17*s.*, and 50 bags of African at 20*s.* per cwt. At the last auction on the 27th out of nearly 800 bags of Calicut offered, 183 were sold at 23*s.* per cwt. part wormy, another 20 cases of Calicut were brought forward and bought in at 42*s.* 6*d.* for small cut, while 140 bags of brown Bengal were held at 20*s.* per cwt.

NUTMEGS, MACE, PIMENTO AND ARROWROOT.

At auction on the 14th nutmegs were in good supply, 279 packages of West Indian sold at the following rates: 61's to 71's, 7*d.* to 10½*d*, 72's to 81's, 6*d.* to 7*d.*, 83's to 91's, 5¾*d.* to 6½*d.*; 96's to 106's 5½*d.* to 6*d.*, 120's to 128's, 5*d.* to 5¾*d.* and 150's, 5½*d.* These rates were about ¾*d.* per lb. dearer than those of the previous month, at the last auction on the 27th, 481 packages of West Indian were offered, and the whole disposed of at full rates 63's to 66's fetching 9*d.* to 9½*d.* 70's to 78's, 6½*d.* to 7½*d*, 78's to 96's, 5¾ to 6*d.* and 98's to 122's, 5½*d.* to 5¾*d.* Mace was represented at the first auction on the 14th of the month by 45 packages of West Indian all of which were sold at full prices, fair to good pale fetching 1*s.* 10*d.* to 2*s.* 1*d.* per lb, fair to good reddish 1*s.* 9*d.* to 1*s.* 10*d.*, dark red 1*s.* 7*d.* to 1*s.* 8*d.* and ordinary to fair 1*s.* to 1*s.* 4*d.* At the last auction on the 27th, 52 packages of West Indian were brought forward and sold at rates varying from 1*d.* to 2*d.* per lb. dearer. At the same auction 60 bags of Pimento were offered and sold at 2*d.* to 2⅛*d.* per lb. and 58 barrels of St. Vincent arrowroot were offered and bought in at 3¼*d.* per lb. for good manufacturing.

It will be seen from the dates of the foregoing notes that the spice auctions, dating from the beginning of the new year, are now, and henceforth will be held, only fortnightly instead of weekly as heretofore.

SARSAPARILLA.

At the first drug auction on January 8, sarsaparilla was represented by 14 bales of grey Jamaica and 11 bales of Lima-Jamaica. The whole of the former were disposed of at 1*s* 8*d.* to 1*s.* 10*d* per lb. for part coarse to good fibrous. Of the Lima-Jamaica only 5 bales were sold which realized 1*s.* 7*d.* to 1*s.* 8*d.* per lb. for coarse and part chumpy. A fortnight later, namely, on the 22nd, there was no grey Jamaica brought forward, the offerings consisting of 10 bales each of Lima-Jamaica and native Jamaica, none of the former was sold, being firmly held at 1*s.* 9*d.*, an offer of 1*s.* 8*d.* being refused. The whole of the native Jamaica found buyers at 10½*d.* to 11½d. for dullish to fair red, 9½*d.* for dull yellow and fair red, and 6*d.* to 7*d.* for sea damaged.

KOLA, LIME JUICE, LIME OIL, CITRIC ACID AND TAMARINDS.

At the first auction on January 8, kola was in abundant supply, 139 packages being offered and only 58 sold, amongst them being 13 bags of West Indian which realized 2¼*d.* to 2¾*d.* per lb. for darkish to fair, principally in halves. Some 45 bags of good bright Ceylon also in halves brought 3*d.* per lb. Lime juice has been in fair demand during the month, fair pale raw West Indian being sold at 1*s.* 3*d.* to 1*s.* 4*d.* per gallon. Of lime oil 10 cases were offered at the beginning of the month and 4 disposed of. Hand pressed Dominica fetching 8*s.* 3*d.* and West Indian distilled 1*s.* 8*d.* per lb. The month began with a very limited demand for citric acid, 1*s.* 11¾*d.* per lb. being the price quoted and at the end of the month there was a slight advance. At the first auction on the 8th, tamarinds were in good supply, 32 packages being offered but 12 only found buyers at 12*s.* per cwt. for fair dry Montserrat, in bond. On the 22nd 10 barrels of fair bright Barbados and 20 barrels of East Indian were offered, the former were limited at 18*s.* in bond and the latter at 15*s.* 6*d.* per cwt.

MARKET REPORTS.

London.—The West India Committee Circular, February 10, 1914; Messrs. E. A. de Pass & Co., January 30, 1914.

Arrowroot—3*d.* to 4¾*d.*
Balata—Sheet, 3/-; block, 2/0¼ per lb.
Beeswax—£8 5*s.* to £9.
Cacao—Trinidad, 62/- to 67/- per cwt.; Grenada, 56/- to 62/-; Jamaica, 56/- to 61/-.
Coffee—Jamaica, 52*s.* to 82*s.*
Copra—West Indian, £29 10*s.* per ton.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 17*d.* to 22*d.*
Fruit—No quotations.
Fustic—No quotations.
Ginger—Quiet, 34/- to 61/.
Isinglass—No quotations.
Honey—No quotations.
Lime Juice—Raw, 11*d.* to 1*s.* 4*d*; concentrated, £21 10*s.* to £25; otto of limes (hand-pressed), 8/3 to 8/6.
Logwood—No quotations.
Mace—1/7 to 2/6.
Nutmegs—5½*d.* to 7*d.*
Pimento—1 15/16*d.* to 2 1/4*d.*
Rubber—Para, fine hard, 3/1½; fine soft, 2/10½; Castilloa, 1/8 per lb.
Rum—Jamaica, 2/4 to 5/- per gallon.

New York.—Messrs. Gillespie Bros. & Co., February 6, 1914.

Cacao—Caracas, 13½c. to 14½c.; Grenada, 12¾c. to 13c.; Trinidad, 13½c. to 13¾c.; Jamaica, 12c. to 12½c.
Coco-nuts—Jamaica, selects, $28·00 to $29·00; Trinidad selects $29·00 to $30·00; culls, $16·00 to $17·00 per M.
Coffee—Jamaica, 11¼c. to 15½c. per lb.
Ginger—8c. to 11c. per lb.
Goat Skins—Jamaica, 50c.; Antigua and Barbados, 45c. to 48c.; St. Thomas and St. Kitts, 42c. to 45c. per lb.
Grape Fruit—Jamaica, $2·25 to $3·00.
Limes—No quotations.
Mace—52c. to 55c. per lb.
Nutmegs—110's, 12½c.
Oranges—Jamaica, no quotations.
Pimento—2*d.* per lb.
Sugar—Centrifugals, 96°, 3·42c. to 3·48c. per lb.; Muscovados, 89°, 2·92c. to 2·98c.; Molasses, 89°, 2·67c. to 2·73c. per lb., all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., February 16, 1914.

Cacao—Venezuelan, $13·75; Trinidad, $13·00 to $13·25.
Coco-nut Oil—$1·05 per Imperial gallon.
Coffee—Venezuelan, 13c. per lb.
Copra—$5·25 per 100 lb.
Dhal—No quotations.
Onions—$3·50 to $3·75 per 100 lb.
Peas, Split—$6·00 per bag.
Potatoes—English, $1·00 to $1·25 per 100 lb.
Rice—Yellow, $5·10 to $5·30; White, $4·80 to $4·85 per bag.
Sugar—American crushed, no quotations.

Barbados.—Messrs. James A. Lynch & Co., Ltd., January 24, 1914; Messrs. T. S. Garraway & Co., January 17, 1914.

Arrowroot—$4·50 to $5·00 per 100 lb.
Cacao—$12·00 to $12·50 per 100 lb.
Coco-nuts—$24·00.
Hay—$1·50 to $1·60 per 100 lb.
Manures—Nitrate of soda, $70·00; Cacao manure, $48·00 to $50·00; Sulphate of ammonia, $82·00 to $85·00 per ton.
Molasses—No quotations.
Onions—$2·87 to $6·00 per 100 lb.
Peas, Split—$6·00 per bag of 210 lb.; Canada, $3·05 to $4·00 per bag of 120 lb.
Potatoes—Nova Scotia, $1·00 per 160 lb.
Rice—Ballam, $5·20 to $5·35 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
Sugar—American granulated, $4·00 per 100 lb.

British Guiana.—Messrs. Wieting & Richter, February 14, 1914; Messrs. Sandbach, Parker & Co., February 13, 1914.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	$8·50 per barrel of 200 lb.	——
Balata—Venezuela block	No quotation	——
Demerara sheet	65c. per lb.	——
Cacao—Native	12½c. to 13c. per lb.	12½c. per lb.
Cassava—	96c.	——
Cassava Starch—	——	——
Coco-nuts—	$16 to $20 per M.	$26 per M.
Coffee—Creole	15c. per lb.	16c. per lb.
Jamaica and Rio	15½c. per lb.	16c. per lb.
Liberian	13c. per lb.	12c. per lb
Dhal—	$4·50 to $4·75 per bag of 168 lb.	$5·00 to $5·50 per bag of 168 lb.
Green Dhal	$5·75	——
Eddoes—	$1·20	——
Molasses—Yellow	None	——
Onions—Teneriffe	——	——
Madeira	7c.	8c.
Peas—Split	$6·00 per bag (210 lb.)	$7·00 per bag (210 lb.)
Marseilles	——	——
Plantains—	16c. to 40c.	——
Potatoes—Nova Scotia	$2·50	$2·75 to $2·80
Lisbon	——	——
Potatoes—Sweet, B'bados	$1·92 per bag	——
Rice—Ballam	No quotation	——
Creole	$4·75 to $5·00	$4·50 to $4·80
Tannias—	$2·40	——
Yams—White	$2·16	——
Buck	$2·16	——
Sugar—Dark crystals	$2·10 to $2·15	$2·10 to $2·15
Yellow	——	$2·50 to $2·60
White	$3·75	$4·00
Molasses	——	——
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M.
,, Cordwood	$1·80 to $2·00 per ton	——

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(Vol. XIII, No. 4.)

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AGRICULTURAL NEWS

Vol. XIII. No. 310.] SATURDAY, MARCH 14, 1914. [One penny.

AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW
OF THE
IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

VOL. XIII. No. 310. BARBADOS, MARCH 14, 1914. PRICE 1*d.*

CONTENTS

Production of Alcohol for Motor Fuel.

ACCORDING to a recent discussion* it would seem probable that a new field of industry will be very soon opened up in the Colonies to meet the rapidly growing demand for motor fuel. Last year Great Britain alone consumed about 20,000,000 gallons more of petroleum spirit than was used in 1912, whilst it is calculated that American requirements for motor spirit must be somewhere in the neighbourhood of 1,500,000,000 gallons per annum, and this figure is likely to increase each year. It is true that new oil fields are being developed, but it is equally true that old fields are getting exhausted, and the ever-growing price, not only of motor spirit but also of lubricating and lighting oil, makes it fairly evident that production will not be able to keep pace with demand in the near future.

For petrol, the obvious substitute is alcohol; and on this point the mechanical engineer and the planter come into intimate contact. Already we know that the greatest of the manufacturing industries—with the exception of the metal trades—are directly dependent on the soil. It would not be strange if agriculture is now to play an important part in engineering, and to provide the principal source of energy for mechanical locomotion. Of course the principal consideration at present is whether alcohol could really be an efficient substitute. According to Dr. Ormandy, there seems little doubt that it could. Already, we are told, alcohol can be applied with perfect success in specially designed engines in Germany, where thousands of machines working on alcohol are employed for miscellaneous purposes in and about agriculture. But these engines are primarily of the high-compression, slow-running type, and the employment of alcohol for the fast-running, motor-car type of engine has not yet received systematic attention. Nevertheless it has been definitely established that a mixture of alcohol and benzene can be used in fast-running engines of present day construction, and it is further a fact that alcohol, chemically and physically, possesses properties which should enable it, under proper conditions, to yield superior results as a fuel to petrol. A discussion of the relative merits would be out of place in the present article: but we may strengthen the soundness of our contention that a demand for alcohol fuel will spring up, by quoting the following concluding passage from Professor Vivian Lewes'

* See *Journal of the Royal Society of Arts* (February 6, 1914).

book*: 'The world's stores of petroleum, coal, and shale are all being rapidly depleted, and in the not very distant future it will be to alcohol that we shall have to turn, and it will then be found that alcohol, denatured with 10 per cent. of benzol and tinged by a trace of aniline dye, will give a motor spirit at once safer, more pleasant in use, and sweeter in exhaust than the petrol of to-day; and that although the calorific value of such a mixture is only 0·6 of the value of petrol, the smaller amount of air needed for its combustion, the increased explosive range of the mixture, and the higher compression that could be used in the cylinder, all combine to make it the ideal motor spirit, and one about which no doubts can be raised as to the possibility of future supply.'

The passage ends, it will be observed, with a statement of no little interest to the agriculturist. What are the possibilities in the direction of alcohol production for fuel in the Tropics? For local consumption, at all events, the possibilities are very great, and this phase of the question may be considered first. In regard to the utilization of alcohol as a by-product on the cacao estate, credit is due to Mr. Hamel Smith for urging the importance of this matter. He writes†: 'In theory there is no reason why a well organized cacao estate should not produce its own spirit, if not its own vegetable oil as fuel for any power required in the sweating or drying houses, or for tractors transporting the produce.' The same author also quotes at considerable length in the book referred to, passages from several important articles recently published on the utilization of alcohol as a fuel—information which will repay study by those who are interested in the subject under consideration. To Mr. Hamel Smith is also due credit for urging coco-nut planters, instead of losing the milk contained in the fruit, to ferment it, thereby producing alcohol. The same thing applies in the case of estates which have Manila and sisal fibre refuse. On the banana plantation, Mr. Fawcett‡ has recently shown there is great scope before the production of alcohol. 'In all the [banana] exporting countries put together there are probably as many as eight million bunches that annually fail to come up to the high standard rightly insisted upon by the shippers.' This is the material which, in part, at any rate, could be used for the production of alcohol. It would seem that 100 kilogrammes of banana meal washed with malt extract and then fermented with yeast yields 47·8 litres of alcohol.

But it is in the sugar estate that the production of alcohol offers the greatest commercial possibilities. The manufacture of rum is of course one profitable way of using molasses. But it is a question whether molasses might not be used economically in the factory and on neighbouring estates for fuel purposes by its conversion into alcohol. The central sugar-cane factory like the beet factory, possesses special advantages in regard to the production of alcohol, since distillation plants are available together with proper heating arrangements and what is equally important—chemical control. Moreover, it must be remembered that at the present day there are difficulties in the matter of disposing of molasses as such, so that a new and profitable way of utilizing this by-product is really urgently required.

The production of alcohol thus far considered has been for fuel purposes on the estates or in the factory. But it is quite possible that in the large tropical colonies it might pay to manufacture alcohol for transport purposes. This subject has already received definite attention in regard to South Africa for instance, but in the Federated Malay States where the roads are good and in West Africa and in British Guiana where they may be some day, the idea of establishing a definite industry of alcohol manufacture is worthy of consideration. Of course, in Germany which is remarkably deficient in sources of oil fuel, many of the agricultural districts produce abundant crops of potatoes and beets for the production of alcohol for fuel purposes. Proposals are now being made in England for following suit in this matter, and it is estimated that with a remission of the Government duty, alcohol could be retailed to the consumer at 1*s.* per gallon as against about 1*s.* 7*d.* per gallon for petrol.

The question whether it would ever be possible for the Tropics to grow crops systematically for alcohol production, that is to say for export purposes, is difficult to answer at the present time. A great deal would depend upon prices, fiscal arrangements and transport. For the present it is almost sufficient to urge each tropical country to look after itself and to endeavour by utilizing by-products in sugar, cacao, banana and fibre cultivations to provide itself with motor fuel for local consumption. In regard to sugar, in particular

* Oil Fuel. By Professor Vivian B. Lewes, F.I.C., F.C.S. (1913).

† The Fermentation of Cacao. Edited by Harold Hamel Smith (1913).

‡ The Banana: Its Cultivation, Distribution and Commercial Uses. By W. Fawcett, B.Sc. (1913).

emphasis may be given to the possibilities before the utilization of molasses for the production of fuel alcohol.

Having referred to the systematic cultivation of crops for alcohol production, it would be an omission to neglect the chemical aspect of the subject. It has been said that it would be a wrong course to use the land for the production of raw materials for alcohol-making, for fear that humanity might thereby be deprived of food and clothing. There is something to be said in favour of this contention, particularly in connexion with certain districts; but in the production of crops for alcohol-making the soil need not be depleted unduly, for the residuals containing essential mineral elements of plant and animal food can be replaced. It is more a question of occupation than exhaustion, and if it will pay to grow crops for alcohol-making it may be done without any undue violation of chemical ethics. As we have said, the most promising lines of activity lie in the direction of the utilization of by-products; and when the demand for motor tyres begins to wane from the want of petrol to drive them round, then the sugar-growing colonies to some extent those producing other tropical produce, may be able to help a sister industry by producing alcohol for fuel. In doing so they will also confer a great benefit on the general public, and incidentally make a profit out of valuable material which is now, to a large extent, being wasted.

SUGAR INDUSTRY.

EFFECT OF MANURES ON THE TIME OF RIPENING OF SUGAR-CANES.

A considerable amount of work has been done in different places on the influence of manures on the composition of sugar-cane, but it does not seem to have been established that even excessive manuring affects injuriously the quality or quantity of the juice. In Hawaii, for instance, extremely large dressings of manure are used without apparently any harmful effect upon the productivity of the crop. In the Leeward Islands it has been shown that manures exert their influence chiefly in increasing the weight of cane per acre. No profound alteration in the weight of sucrose to the ton of cane was demonstrated. From experiments in general, and from those under consideration in particular, it would appear that any harmful effect resulting from excessive dressings lies principally in a delay in the time of the maturity of the crop.

In order to observe the effect of manures, applied as top dressings to the cane at its most active periods of growth, a series of experiments were laid down at Sabour, India, for the season 1912-13, and the results obtained are summarized in the following paragraphs.

It was found, first of all, that the addition of superphosphate had little or no effect upon the date of maturity of the crop. On the other hand a dressing of sulphate of ammonia delayed the ripening of the cane for about half a month, but the ultimate sugar content of the juice was not affected It has sometimes been stated that the addition of sulphate of ammonia will increase the juice extraction to a considerable extent. This assumption was not substantiated by the experiments under review.

In conclusion it would appear that a top dressing of manure seems to weaken the juice of the sugar-cane at the beginning stages of coming to maturity, and delays its actual ripening for about a fortnight, but it is only a delay, and not a prevention of ripening, as in the case examined, the treated plots appear to have given juice of almost the same richness as the blank plots, the only difference being that the stage of maximum maturity was reached a fortnight earlier in the case of the plots which did not receive a top dressing.

Further details concerning these experiments may be obtained by reference to Bulletin No. 37, Agricultural Research Institute, Pusa.

SELECTION AND TREATMENT OF CANE CUTTINGS.

Some practical advice and recommendations are given to planters by Mr. J. R. Johnston in Bulletin No. 6 of the Experiment Station of the Sugar Producers' Association of Porto Rico, in regard to the selection and treatment of planting material. Many of the points advocated have already from time to time been called attention to by this Department, but in view of the importance of the various points dealt with there would seem to be no harm in reiterating several of the statements.

Where possible several different varieties of cane should be grown on the same estate, and those which prove to be the best should be grown especially for 'seed' with which to supply the plantation. Both immature and mature cane furnish good 'seed', but top 'seed' is better than body 'seed', other things being equal. Cuttings from healthy cane only should be used: especial care should be taken to avoid seed from cane affected by the different common diseases.

The average germination of good seed in good seedlings ranges around 50 per cent. of the eyes. In both wet and dry seasons it is much lower. According to this authority, the presence of diseased leaf sheaths on 'seed' does not affect germination nor subsequent growth. The sheath should be removed when (1) mealy bugs are present, and (2) when the 'seed' is to be treated. The chief advantage in using disinfectants is obtained when infected seed is being used or when good seed is being planted under poor conditions. In these cases the employment of disinfectants improves the germination. Treatment of seed to prevent rapid evaporation, and to hasten germination may be desirable but sufficient data is not yet at hand on which to base recommendations.

In several quarters of late, the introduction of horse and cattle breeding as a side line on tropical plantations has been advocated. As noted on another page in this issue, one author thinks that horse breeding might be profitable and certainly of great Imperial benefit, if carried on in connexion with coco-nut cultivation. In the *Louisiana Planter* (February 21) an account of a discussion is given following a paper that was read before the Louisiana Sugar Planter's Association on the subject of cattle as a side line on the sugar plantation.

VEGETABLE GROWING.

HINTS TO ONION GROWERS.

Copies have just been received of a circular containing a series of hints to onion growers, prepared at the suggestion and request of the Superintendent of Agriculture for the Leeward Islands, by the Curator of the Botanic Station, Antigua. The hints are concise and practical, and should prove of considerable value, particularly to the small growers. The following is a summary of the points dwelt upon in the circular.

As regards seeds, these should not be kept in paper parcels, though they may be stored in air-tight receptacles for a period of a few months. In connexion with the nursery work, beds should be prepared before the arrival of seed in order that the soil may 'cool out': to keep ants away from seed, kerosene should be applied to the bed before germination, not after. As regards watering, a good soaking every three or four days gives better results than daily sprinkling, and the water should not be applied after 8 a.m. In transplanting, the labourers must be carefully watched to prevent their damaging the young plants by careless handling.

Onions are liable to the attacks of caterpillars. To check this, dusting with Paris green and lime should be resorted to, but the grower must not dust with any insecticide when the bulbs are nearing maturity.

Coming to the establishment of the crop in the field, the planter should remember that sowing seed *in situ* will give a crop from three to five weeks earlier in maturing than when the transplanting method is adopted; but it appears that a large proportion of the onions raised in this way may be of indifferent shape. In collecting the crop, the bulbs must not be left in the field for any length of time after pulling, though a few hours in the sun is a good thing. The bulbs must not receive the slightest injury, nor must the necks of the bulbs be twisted to hasten ripening if it is the intention to ship. Onions deep in the soil often rot before they are thoroughly ripe: these should be used to meet local demands; they are unfit for export.

Turning to the subject of shipment, it may be stated that the New York and Canadian markets disapprove of onions with thick necks, though so far, there is no such objection on the intercolonial markets. The bulbs must be shipped in standard crates in a well dried condition and packed tight. On the crate should be put 'keep from frost and boiler', in the case of produce going to the North; and 'keep from boiler', in the case of bulbs bound for the neighbouring colonies.

Lastly, growers in Antigua are requested to bear in mind the existence of the Onion Growers' Association whose object it is to standardize Antigua onions, and of the Officers of the Agricultural Department whose aim it is to assist by giving advice in regard to cultivation and allied matters.

Official information has been received from Antigua to the effect that the Onion Growers' Association is now actively at work handling produce, and the first trial shipment of 10 crates was sent on February 14 to Barbados, each crate shipped by the Association containing a printed handbill with the following notice inscribed:—

'These onions have been graded, packed and exported by the Antigua Onion Growers' Association.

'Address enquiries to the Secretary, St. Johns, Antigua, B.W.I.'

A few notes are given in the *Queensland Agricultural Journal* (New Series, January 1914) on the keeping of onions. It is pointed out that onions when pulled should not be stored away at once but should be left on the ground for a few hours to dry. They require constant looking over to sort out any bad ones for, as in the case of fruit, a single rotting onion will infect all those in its immediate neighbourhood. Reference is made, in continuation, to a very interesting manurial experiment in connexion with the effect of chemical fertilizers upon the tendency to sprout. It was found that the produce from plots deprived of sulphate of potash were exhausted by a too hurried vegetation, whilst that which had received the potash manure was perfectly preserved. The writer advocates the application of 1 cwt. of sulphate of potash per acre.

PLANTING SWEET POTATOES FROM SPROUTED TUBERS AND VINES.

The Curator of the Botanic Station, Montserrat, has sent in the results of an experiment carried out to test the value of sweet potato cuttings taken from sprouted tubers as compared with cuttings taken from the vines in the ordinary way. It may be mentioned that similar experiments were conducted in Cuba some few years ago and reported on in the *Agricultural News*, Vol. VII, p. 120, where it will be found that the plots planted with slips returned a crop three and a half times as great as those planted with cuttings. In this experiment the gain of 350 per cent. fully repaid the extra expense and trouble involved.

In the recent Montserrat trials there has been no such phenomenal difference noticed, though the figures show there was, in the case of some varieties, quite a considerable increase in yield from the tuber cuttings compared with the vine cuttings. It is interesting to observe that no difference in vigour was noticed in the rows planted with the two kinds of material.

The following are a few of the yields which seem to be the most striking: Red Bourbon (ordinary vines) 114 lb., (tuber cuttings) 145 lb.; White Gilkes (ordinary vines) 83 lb., (tuber cuttings) 111 lb. In no case did the tuber cuttings give a lower yield than the ordinary vines, but it is not established that the average increase is sufficiently large to warrant the systematic planting of tuber cuttings instead of ordinary vines. At the same time the matter is worth serious consideration in the case of one or two special varieties.

It should be stated that as regards the size of the plots utilized in the experiments, the length of the row was 81 feet, the rows were 4 feet apart and the plants 2 feet. Each plot was therefore approximately $\frac{1}{134}$-acre in area.

The *Agricultural Journal of the Union of South Africa* (December 1913) contains an interesting account of the history of the wattle industry in Natal. It appears that seeds of the black wattle tree were imported by private enterprise as early as 1864 from Australia. The industry at that time received the full support of the Dutch Government. It is interesting to quote the following figures showing the progress which has been made since 1886: In 1886, thirty-nine packages, value £11 were exported; in 1896, 3,378 tons worth £16,450 was shipped; in 1906, 14,820 tons, value £89,443 was exported; and in 1912, 59,103 tons worth £283,010 was exported.

TROPICAL FODDER CROPS.

RHODES GRASS AND ITS INTRODUCTION INTO THE WEST INDIES.

Rhodes grass is a useful fodder plant known botanically as *Chloris Gayana*. It is a native of tropical Africa, but has been introduced into Australia and various other parts of the world. Towards the end of last year seeds of this fodder plant were imported into Montserrat, where, owing to its drought resisting powers it was thought that the plant would be an acquisition in the matter of providing food for live stock. Shortly afterwards, the question arose as to whether the introduction of a new species might not give rise to difficulties in regard to the control of its spread into places where it was not required. An examination of all the more recent literature dealing with the economic value of this grass leaves little room for doubting its great usefulness, but caution must be exercised to keep it under experimental control at first until its is seen what it behaviour is going to be under a new environment.

Before proceeding to deal with the economic characteristics of the plant, it may prove interesting first of all to say a few words about the distribution of the different species of this interesting genus. According to *Index Kewensis*, there are some species of Chloris which are indigenous to different parts of the Tropics, but chiefly Africa. There are nine species and several varieties of the genus indigenous to Australia. In the West, there are several indigenous to tropical America, whilst *C. breviglume* is a native of Cuba, and what is more interesting, *C. propinqua* is indigenous to Guadeloupe. In the present connexion it is worth noting that the well known West Indian grass *Cynodon Dactylon* has been described on one or two occasions wrongly as *C. maritima*.

According to the *Kew Bulletin* (1908, No. 1) most of the Australian species are excellent forage grasses, having a high reputation with stock owners, who know them as 'Blue star grass' and 'Dog's tooth star grass', as well as by other popular names. But according to the *Queensland Agricultural Journal* (Vol. XXVI, p. 164) it is the introduced species, *Chloris Gayana*, that has given most satisfaction. This grass has not only survived, but has grown luxuriantly through the long dry summer months, and has been regarded in many parts as a sort of nursery crop for any animals lacking in condition. In one place, the seed of this grass was sown at the rate of 2 lb. to the acre together with 2 lb. of *Paspalum dilatatum*—the well-known fodder grass which is gradually being ousted by *C. Gayana*. It is stated that Rhodes grass, unlike other quick-growing ones, is relished at all stages of development by stock, and does not deleteriously affect dairy products. It has proved a wonderful grass for resisting drought, and will grow and remain green when all other grasses, natural and artificial, are burnt up. It requires a less rich soil than *Paspalum dilatatum*. When harvested, it has an aroma that is not easily defined—very strong, but not unpleasant. It is said to make good chaff, especially when mixed with lucerne. In one trial, the yield per acre of hay was at the rate of 5 tons 7 cwt.

The comparative feeding values of the two grasses are discussed in the *Agricultural Gazette of New South Wales*, (Vol. XXII, p. 238) where it is regarded as established that Rhodes grass has a greater nutritive value than Paspalum grass, being richer in protein and poorer in crude fibre. In this account it is mentioned incidentally that *C. Gayana* has a creeping stem which roots at the joints, but in a thick stand the stems are upright This power to perennate must be borne in mind in any considerations bearing upon the danger of this plant in the West Indies as a weed. At the same time the undoubted nutritive value and great drought-resistant powers of the grass are not likely to make its spread undesirable on stock farms.

In Florida and the intermediate region of America a good hay grass has long been a desideratum. It is stated in the *Annual Reports* of the Department of Agriculture of the United States, 1912, that Rhodes grass, secured from Africa, promises practically to solve the hay question for that portion of the south. Field tests of Rhodes grass are being conducted in Florida in order to determine its climatic and soil requirements and the yield of hay which may be expected. One field of 20 acres has been established near Brookesville, from which results on a commercial scale are expected. This plant has also been introduced into Arizona where it promises to give much satisfaction, and it is understood that it is also being tried in Porto Rico. The results of these experiments will be awaited with interest.

Whilst discussing forage crops, it may not be out of place to conclude this article with a few remarks concerning other drought-resisting grasses, which have attracted much attention during the last few years. In the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases* (June 1913) a note says that Teff (*Eragrostis abyssinica*) was introduced into the Transvaal in 1903, and has since proved itself a complete success, and is fast becoming a staple hay crop throughout civilized Africa, its qualities being: palatability, high nutritive value, heavy yield, rapid growth, drought resistance, and ability to smother weeds. Another well-known grass, namely, Soudan grass (*Andropogon halepensis*) is reported in the same journal for July 1913 to have been imported into the United States from Soudan in 1909. This grass yields well, especially in dry seasons, and the fodder is much appreciated by stock.* The last grass to which we invite the reader's attention is known as Elephant grass or Napier's fodder (*Pennisetum purpureum*). The cultivation of this plant is described in the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases* (November 1913). It has proved a very drought-resistant and heavy-yielding fodder crop in Rhodesia. Owing to its succulent character and coarseness of stem it does not make good hay, but as green fodder for stall-fed animals, it can hardly be excelled by any other crop in Rhodesia. In damp situations, where water is liable to stand, it wilts, and is then best replaced by Paspalum, or by Rhodes grass. In dry situations or in cold localities, it is much to be preferred to sugar-cane, and will give better results both in weight of fodder and in food value.

A copy of the rainfall returns for Dominica for 1913 has just been received from the Curator of the Botanic Gardens. The mean rainfall for thirty-three stations was 118·09 inches; for twelve Leeward coast stations 75·49 inches; for three Windward coast stations, 131·94 inches; for twelve inland stations, 161·03; for six La Soye coast stations, 110·47.

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* A word of caution, however, is here necessary. *Andropogon halepensis* is synonymous with *Sorghum halepense* (Johnson grass)—a plant which when introduced into many places has eventually become for a time uncontrollable as a weed, and has only been eradicated after much difficulty and expense. Drought-resisting grasses are not always unmixed blessings.

FIBRE CROPS.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date February 23, with reference to the sales of West Indian Sea Island cotton:—

Since our last report about 150 bales of West Indian Sea Island cotton have been sold; these are chiefly comprised of Nevis 16*d.* to 20*d.*, Barbados and Anguilla 16*d.* to 19*d.*, St. Kitts 19*d.* to 21*d.* and a few St. Vincent at 21*d.*

Fine qualities are eagerly enquired for, but are not plentiful; medium grades are rather neglected and the lower grades are very unsaleable, owing to the low prices at which American Sea Islands are selling.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending February 21, is as follows:—

The receipts (224 bales and sales 257) reported for the week consisted of crops which were sold for export and delivered from the plantations. There is now at ship side and to be included in the exports this coming week 365 bales, reducing the stock on hand to 787 bales, largely held by one Factor at 2c. above the views of buyers, being influenced in doing so by the large sales and advance in the Savannah market.

We quote, viz:—

Extra Fine	26c.	= 14¾*d.*	c.i.f., & 5 per cent.
Extra Fine off in preparation	23c.	= 13¼*d.*	,, ,, ,, ,,
Fully Fine	23c.	= 13¼*d.*	,, ,, ,, ,,
Fine	20c.	= 11¾*d.*	,, ,, ,, ,,
Fine & Fully Fine off in preparation	20c.	= 11¾*d.*	,, ,, ,, ,,
Stains	17c.	= 10*d.*	,, ,, ,, ,,

This report shows that the total exports of Sea Island cotton from the United States to Liverpool, Manchester and Havre, up to February 21, 1914, were 3,282 bales, 6,095 bales, and 3,933 bales, respectively.

SISAL HEMP IN FIJI.

Interesting figures are given in the Annual Report of the Superintendent of Agriculture, Fiji, for 1912, in connexion with the returns obtained per acre and the amount of labour required in sisal hemp cultivation.

The total weight of fibre from three plots occupying altogether 1 acre and obtained during cuttings spread over three years was as follows: 1910, 566 lb; 1911 1,348 lb.; 1912, 1,710 lb. from 635 plants. The rate per acre would thus be each year 607, 1,454 and 1,836 lb. respectively, or allowing off 10 per cent. for misses or poor plants, 546, 1,309, and 1,652 lb.—an average of rather over ½-ton per acre per annum. The poor results for 1910 were due to the effects of storms.

As regards labour, allowing eighty-one men for reaping the leaves from 635 plants, it would require 90 units to reap 1 acre, or an average of 30 units per annum. In other words, one man will take thirty days to reap the leaves off 1 acre. The fact must be taken into consideration that reaping will only go on in fine weather. Allowing 180 days for this work it will be seen that one man would be able to deal with the leaves of 6 acres in the course of the year.

The report states further that certain experiments are in progress for determining the influence of several cuttings on the time of poleing; for comparing the value of bulbils with suckers, for comparing suckers from poled plants with those from plants which have not poled; and finally work has been instituted in regard to the selection of plants.

In the cultivation of Manila hemp one cutting gave the following figures: twenty-eight stems, average length 6 feet, weighing 766 lb. gave 17·5 lb. of dry fibre, at the rate of 25 per cent.

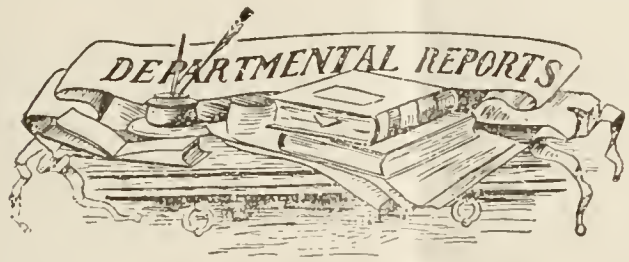
At the Institute of Chemistry of Great Britain and Ireland a series of lectures has been delivered recently on 'The Research Chemist in the Works, with special reference to the Textile Industry'. The lectures reviewed the position of the chemist in relation to the manufacture and the various treatments of textiles. One interesting point dealt with was mercerization. In giving a historical sketch of this process it was pointed out that it was not realized for many years industrially that the essential factor in the production of artificial silk is that the process is partly chemical and partly physical. It was not realized that the fibre during the time that it is immersed in caustic soda must be kept under a condition of strain during at least one part of the process; nor was the fact appreciated that a long-stapled cotton (Egyptian) must be used if the treatment is to have its maximum effect. It would be interesting to know whether the maximum effect has yet been obtained, since West Indian Sea Island cotton has a longer staple than any produced in Egypt.

ESTIMATED COST OF CULTIVATING ONE ACRE OF CASSAVA.

The Department is indebted to the Agricultural Superintendent, St. Vincent (Mr. W. N. Sands, F.L.S.), for obtaining and forwarding the following estimate of the cost of growing 1 acre of cassava in that island:—

	£	s.	d.
Clearing land		5	0
Banking		10	0
Plants		4	0
Planting		1	6
Manuring (not usually specially manured)		10	0
Weeding		10	0
Reaping		5	0
Carting to factory		4	0
Manufacture	1	5	0
Packages for starch, etc.		10	0
Management expenses	1	5	0
Total cost	£5	9	6

The section in the recently issued Report on the Department of Agriculture of the Union of South Africa (1912-13) dealing with the work with cotton at the East London Experiment Station, provides the information that Sea Island cotton has done very well on the fertilizer plot. This variety attained a height of 5 feet and bore a fair number of bolls. Nyasaland and Abassi are also stated to be varieties which have done well.



ANTIGUA: REPORT ON THE BOTANIC STATION AND EXPERIMENT PLOTS, 1912-13.

This report records another year of dry weather, the precipitation during 1912 having been, with the exception of that of 1903, the lowest since 1875. The unfavourable climatic conditions rendered necessary a considerable amount of extra work and attention, both in the Botanic Gardens and on the Experimental plots. As regards the Gardens, dry weather has fully demonstrated the fact that succulents form the most suitable class of vegetable growth in Antigua: this circumstance has now for several years been responsible for the collection of a large number of aloes and similar xerophytes, and it may be stated that the Antigua Gardens now possess a collection of drought-resisting plants which is probably second to none in the West Indies.

EXPERIMENTS WITH PROVISION CROPS AND COTTON.

The work in the nurseries, as measured by the number of economic plants distributed, has increased during the year under review, the number sent out being some 22,000 more than in the previous year. They consisted principally of sugar cane cuttings, lime plants, coco-nut, Eucalyptus seedlings, sweet potato cuttings and onion plants and seeds. The plot experiments for the most part have been intimately connected with the colony's minor industries, being conducted with provision crops and cotton. Reference should be made here, in passing, to the extensive experimentation in the Leeward Islands with varieties of sugar-cane: the results of this work are dealt with in a separate report just issued by the Imperial Department of Agriculture. As regards the trials with provision crops, attention may be called to the result that no advantage accrues from planting sweet potatoes from setts; that continuous cultivation does not sensibly alter the prussic acid content of cassava varieties; that satisfactory yields cannot generally speaking be expected with tannias in Antigua, though with yams the reverse is the case. Further, in connexion with sweet potatos, experiments have indicated that useful results can probably be obtained from selection based on the weight of roots of individual plants. Work along this line, it is understood, is now being carried on.

The routine selection work with cotton has been continued during the year under review, but here again difficulties were experienced on account of the dry weather. Germination was poor and the leaf-blister mite appeared during early stages of development. The results of a large amount of work with cotton is described under the section headed Special Investigation Work. The hybridization results are especially interesting: it is hoped to fix a type having length of lint and resistance to leaf-blister mite (*Eriophyes gossypii*). An examination of the table will show that a great difference is exhibited in the case of one or two of the crosses. The line of work under consideration will be closely followed in other cotton growing islands besides Antigua. For instance, in Barbados, the production of a resistant type like the one referred to above would make the greatest difference to the status of cotton cultivation in that island.

ENTOMOLOGICAL INFORMATION.

Work connected with the control of pests and diseases is described under crop headings in a special section. As usual root disease has shown itself to be the principal enemy of the sugar-cane. Cotton has been rather severely affected by leaf-blister mite and by the cotton worm. It is satisfactory to report that little harm has been done by what has hitherto been regarded as the most serious pest of cotton in Antigua—the flower-bud maggot (*Contarinia gossypii*). Its disappearance has in all probability been occasioned (1) by the discontinuation of cotton growing in certain districts, (2) by systematic efforts to plant as early as possible. Its disappearance has probably not been the result of control by insect parasites as is stated in the report. Scale insects continue to affect limes, and a new pest of this crop has during the year come into prominence—the lime-twig girdler (*Elaphidion mite*). This latter trouble has been satisfactorily dealt with by following the advice given by the Entomologist on the Staff of this Department.

PROGRESS IN THE INDUSTRIES.

Turning to the section dealing with progress in the chief industries, it will be seen that the area under cotton increased by 367 acres, compared with the area under this crop in 1911-12. There was 154,430 lb. of lint reaped, which gives an average return of 197 lb. of lint per acre. The total value of the lint shipped was between £10,000 and £11,000. On the whole it may be said that the cotton season under review was a very satisfactory one. The sugar cane yields were limited through root disease and dry weather. The total quantity of sugar exported from the island for the year was 11,690 tons made up of 7,503 tons of 96° crystals and 4,187 tons of muscovado. This shows an improvement on the output for 1911-12, but it is still over 1,000 tons below the exports for 1907 and 1908.

COCO-NUTS.

In regard to progress in the minor industries the interest in coco-nut cultivation has been maintained as is shown by the fact that during the year 3,739 plants were distributed. This material is sufficient to plant 78 acres. The question is raised in the report as to whether it might not be possible to irrigate some of the coast land with salt water by means of wind power. But the most interesting of the matter incorporated in the section on coco-nuts is the results of measuring husked and unhusked nuts from Antigua, Dominica and Nevis. The figures illustrate in a striking manner the great differences in size which exist between the unhusked Antigua coco-nuts and those grown in other places. They also indicate how deceptive appearances may be, since measurement showed that although the average difference between six unhusked Antigua and Dominica nuts was as much as 2·38 inches in favour of the latter, the husked Antigua nuts were 0·04 inches larger than the others.

After presenting information concerning the developing onion industry, the report concludes with official matters of more local than general interest. A very successful Agricultural Show was held during 1913, and considerable amount of work of a satisfactory nature was done in regard to the Reading Course Examinations conducted by this Department. The Cadet System continues to progress satisfactorily in Antigua.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

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The *Agricultural News:* Price 1*d.* per number, post free 2*d.* Annual subscription payable to Agents, 22*s. d.* Post free, 4*s.* 4*d.*

Agricultural News

Vol. XIII. SATURDAY, MARCH 14, 1914. No. 310.

NOTES AND COMMENTS.

Contents of Present Issue.

Owing to the gradual depletion of the sources of oil fuel, definite attention is now being given to the utilization of alcohol for fuel purposes. In the editorial of this number the different ways are discussed in which this substance might be produced in tropical agriculture.

On page 83, under the general heading Sugar Industry, will be found two notes dealing with the ripening of sugar-cane and the treatment of cane cuttings respectively.

Growers of vegetables will find interesting information of a practical kind on page 84 concerning the cultivation of onions and sweet potatoes.

The important topic of fodder grasses for the West Indies receives attention on page 85 in the form of an article on Rhodes grass, which has just been introduced into the West Indies.

On page 86, figures are presented showing the yield of sisal hemp in Fiji and the cost of cultivating cassava in St. Vincent.

Insect Notes, on page 90, include an important article dealing with ticks in the West Indies. Our present knowledge in regard to the distribution of these organisms is put forward.

A summary of a very interesting report containing much practical advice will be found under Fungus Notes on page 94.

Agricultural Affairs in the West Indies.

The current issue of the *West India Committee Circular* contains a particularly large amount of information which will prove of great interest to the agricultural communities throughout the West Indies. It is proposed in this note to present a brief review of the principal subjects dealt with. First of all reference is made to Major J. A. Burdon's road scheme for Dominica, the principal feature of which is the projected construction of a highway in the shape of an inverted letter S, quartering the whole island from Portsmouth to Grand Bay. The scheme receives the West India Committee's unqualified support. Another matter of a more or less official kind is dealt with in an article on reciprocity with Canada. In this, West Indian views of Canada's action in regard to the admission of Mauritius is discussed.

Of considerable interest both in the West Indies and in Great Britain is an article by Sir Daniel Morris on the subject of bananas and health. It appears that statements have been made recently in a certain medical journal that there is a correlation between the increase in the prevalence of appendicitis in Great Britain, and the increase in the consumption of bananas. Sir Daniel Morris examines critically the facts of the case and shows conclusively that there is no foundation for the statement.

Of a more direct agricultural bearing are the articles in the journal under consideration on the 'Battelle' sugar process, and on the timbers of British Guiana. The battelle process consists of double carbonatation, but differs from the ordinary process in that the juice, after liming and before carbonating, is raised to boiling point with the object of destroying the glucose present. The destruction of the glucose permits the Steffen saccharate process being applied for the extraction of the sugar from the molasses, with the result of improved extraction of sugar generally.

Topics of the Rubber Trade.

The leading articles in the *India Rubber World* (February 1914) involve several interesting topics The first one deals with the automatic increase in rubber production. It shows how the prices of rubber goods—tyres, rubber footwear and golf balls, for instance—have fallen during the past year; it concludes that 'Eastern planters need not be greatly worried about the 300,000 tons of rubber which they expect to have ready for market five years from now, because, entirely apart from new rubber articles for general consumption, the old standard commodities, as their price is lowered, will increase vastly in popularity and come more and more into general use.'

Turning to the subject of another article, that of rubber literature, we are impressed with the invasion of books on the industry, which has been made under the command of a legion of publishers for the past ten years. The following metaphors quoted from the article, are not exaggerative: 'But if the disappointed seekers of those days [speaking of ten years ago] are still interested in the theme, they need not go athirst. The

Sahara of that period is more like a Niagara to-day. There are books on every branch of the rubber business, and, it might be said, every twig of every branch.'

Animals and Plants under Domestication.

During January, Professor Bateson, Director of the John Innes Horticultural Institution, England, gave the first of a series of lectures on the above subject. It is stated in the *Gardeners' Chronicle* (January 31, 1914) that reference was made to the question whether the variation of domesticated animals and plants can be justly compared with that of the wild species. It was considered that one grave difficulty is the fact that under domestication, no new form has been known to arise which is sterile with the parent form. Owing to recent analytical work in connexion with variation, doubts have been thrown on many of the assumptions made by earlier workers. Darwin accepted the evidence that the numerous types of the pigeon came from a single original form. Now it is thought that such variations would only occur after hybridization.

Agricultural Industries in British Guiana, 1912-13.

The long-continued drought of 1911-12 resulted in very material injury to the produce of the cultivations in the year under review. The sugar industry in particular suffered severely, and the immediate monetary loss from the effects of the 1911-12 drought is estimated at not less than £330,000. Cacao also suffered, but coco-nut and coffee apparently withstood the unfavourable conditions though there was some depreciation in quality.

In 1912-13 the area under rice amounted to nearly 42,000 acres, yielding 44,250 tons of paddy last year. The quality of the produce is excellent and will probably improve still further since there is very keen demand amongst planters of rice for the specially selected seed paddy produced on the experimental fields of the Board of Agriculture.

The planting of Para rubber continues to progress. It is estimated that there are now over 2,700 acres in the Colony under this crop. Experimental work continues to be conducted with *Funtumia elastica* and *Castilloa elastica*. During the year a considerable number of balata trees (*Mimusops globosa*) were planted at the North-western station.

The area under coffee was 2,700 acres, and a variety that appears to show great promise is *Coffea robusta*, which seems to be well suited to some of the river lands of the Colony. Satisfactory progress continues to be made also in the matter of coco-nut cultivation, the acreage having increased from 12,240 in 1911-12, to 14,700 acres in 1912-13. There is considerable likelihood of development within the next year or two in connexion with lime cultivation. It is expected that the early erection of machinery for the production of citrate of lime will provide the much desired impetus.

For further information concerning the agricultural industries in British Guiana, 1912-13, reference should be made to *Colonial Reports*, Annual—No. 780.

Meteorological Research.

It is well known that in temperate countries where the climate is largely influenced by sequences of cyclonic and anti-cyclonic conditions, it is possible to issue forecasts with considerable certainty for a day or two in advance. It is interesting to note that *Nature* (February 12, 1914) emphasizes the immense value which seasonal forecasts rather than daily forecasts would be to agriculture; for were the character of an ensuing season known, it would be nearly always possible to plant crops that would thrive under the expected conditions. It is quite possible that if we had a sufficiency of good charts covering the greater part of the earth, seasonal forecasts might be made. The key to the whole situation lies in being able to foretell the distribution of pressure. Being given a chart with the isobars on it, it is possible to fill in a great deal more with fair certainty.

Physicists now recognize that the investigation of the upper air affords vast scope for rendering meteorology a more accurate science. Even to the present time, upper air investigation has entirely altered our ideas as to the cause of pressure changes, and it has shown that the conditions above are far more simple than they are below. It seems that surface changes are a sort of by-product of the changes occurring above, but the outstanding puzzle is what produces and maintains the changes of pressure above.

Agricultural Industries in Trinidad and Tobago, 1912-13.

According to *Colonial Reports*, Annual—No. 790, it is estimated that there are 445,703 acres of land under cultivation in Trinidad and Tobago, and 597,637 acres still available for cultivation, though their sale has been temporarily suspended during the preliminary operations of the oil companies. The areas appropriated for the several industries are as follows: sugar, 45,292 acres; cacao, 325,503 acres; coffee, 4,120 acres; coco-nuts, 24,670 acres; rice, 13,000 acres; other produce, 33,118 acres.

As regards exports, the only agricultural produce which shows an increase on the value shipped in 1911 is copra, the figures for 1911 being £13,264, and for 1912, £28,726. Sugar remained about the same, the value of the exports being about £500,000 for both years. The cacao shipped in 1912 was valued at £1,007,990 as against £1,127,372 in 1911. The falling off in the exports is attributed to the effects of drought. Increases may be looked for in the values for 1513-14

Although not dealt with in the publication from which the above facts were obtained, it may be interesting to note that the area of Trinidad and Tobago is approximately 1,895 sq. miles, with a population of 333,552. This gives a density of 176 people per square mile. It is instructive to compare this figure with the density for the Windward Islands, which is 317, and with that for British Guiana which is 3 people per square mile. Barbados, as is well known, has as many as 1,036 per square mile.

INSECT NOTES.

TICKS IN THE WEST INDIES.

In a previous number of the *Agricultural News* (see Vol. X, p. 314) a short article entitled Information Concerning Ticks gave a brief account of the losses caused in the United States by the cattle tick, and a list of ticks recorded as occurring in the West Indies, with their distribution.

Recently a small collection of these has been submitted to the Imperial Bureau of Entomology for identification. The ticks were collected by Mr. P. T. Saunders, M.R.C.V.S., Veterinary Officer on the Staff of the Imperial Department of Agriculture, and the identifications were made by Dr. Geo. H. F. Nuttall and Mr. C. Warburton, of Cambridge University.

This collection with its notes and identifications is of interest, since it provides definite records of hosts and localities for the species included. The list is as follows:—

The fowl tick, *Argas miniatus*, Wald., on fowls, Antigua. The larvae of a species of Argas were found on a rat at St. Vincent.

The gold tick, *Amblyomma variegatum*, F., on cattle, Antigua.

The cattle tick, *Margaropus australis*, Fuller, on cattle, St. Kitts, Nevis, Antigua, Montserrat, St. Vincent.

Dermacentor nitens, Neum., on horse, St. Kitts, Montserrat, St. Vincent; on donkey, Montserrat.

The brown dog tick, *Rhipicephalus sanguineus*, Latr., on dog, St. Kitts, Antigua, Montserrat, St. Vincent.

This list includes no new species, but it adds to the number of recorded localities in the case of all the species except the fowl tick and the gold tick.

In the following table the new localities have been added to those published in the previous article in the *Agricultural News* already referred to.

It will be seen that there are certain islands for which the records are meagre or wanting altogether. It is probable that collections in those places would confirm the belief that most of these ticks have a general distribution in the Lesser Antilles, and it is also likely that further collections in all the islands will increase the recorded number of species:—

Argas miniatus (the fowl tick). Antigua, Martinique, Barbados, Trinidad.

Argas sp., St. Vincent (on rat).

Margaropus australis (the cattle tick).

St. Kitts, Nevis, Antigua, Montserrat, Guadeloupe, Dominica, Barbados, St. Vincent, Trinidad.

Amblyomma variegatum (the gold tick). St. Kitts, Antigua, Guadeloupe.

Amblyomma hirtum, Guadeloupe.

Amblyomma dissimile, Antigua, Barbados, Trinidad.

Rhipicephalus sanguineus (the brown dog tick). Antigua, Dominica, Barbados, St. Kitts, Montserrat St. Vincent.

Boophilus sp. Barbados (on dog).

Hyalomma aegyptium, Guadeloupe.

Hyalomma longirostre, Trinidad.

Dermacentor nitens, St. Kitts, Montserrat, St. Vincent, Trinidad.

Rhipicephalus sp., Trinidad.

SCARABEE OR JACOBS.

Reference has frequently been made in the publications of the Imperial Department of Agriculture to the occurrence of, and damage done by the small insect known as scarabee or Jacobs (*Cryptorhynchus batatae*), and planters and peasants all know the insect and the results of its attack on sweet potatoes.

Although it does not appear that the amount of the loss resulting from these attacks has ever been calculated in terms of cash per annum or of percentage loss on the total crop of potatoes in an island, yet these figures would be large if they could be obtained, and it should be remembered that the important feature to be considered is that such attacks directly affect the food supply of a very large part of the population, and especially that of the labouring class.

This insect is very difficult of control, for the entire larval and pupal portions of the life-cycle are spent within the tissues of the root or stem of the plant. In the matter of prevention, however, much may be done by planting slips which are free from infestation by eggs or larvae of the beetle. This might be done by selecting slips for planting from a field where no scarabee was known to occur. An even better or safer method is to produce slips in a nursery, where there may be greater certainty of freedom from infestation.

To do this, a spot should be selected where no potatoes have been grown for a long time. The land should then be carefully planted with 'pickings' or small roots, from a field where there has been little or no infestation, and all the roots used for this purpose should be most carefully examined for any signs of the presence of the beetle. The first attack always occurs on the larger roots, then the old hard portions of the stem are invaded, while the small roots are among the last parts to be infested. The careful examination and the selection of only those portions of the plant least likely to be attacked should greatly reduce the chances of carrying the infestation into the nursery with the planting material.

As the nursery beds produce vines of sufficient size and strength, they should be cut and planted, and if the nursery beds are not maintained for more than six to eight months, there should be very little chance of any infested slips being developed. After some six to eight months, the nursery should be forked, and if no signs of scarabee infestation are to be seen, the same plot of land might be used again for the purpose. On the least sign of the presence of these insects, however, a new nursery should be established.

A field of potatoes planted from such a nursery should be quite free from scarabee for some time, and might be used as a source of slips for planting provided these were taken at the earliest date when they were suitable, since as the plants in the field get older, the danger that they may be infested becomes greater and greater.

Errata.—In the article on termites which appeared in the last number of the *Agricultural News*, p. 74, slight errors in the table there given have changed the distribution of two species. Both the errors occur in St. Kitts column. As the table stands *Eutermes acagutlae* occurs in St. Kitts and Porto Rico, while *Eutermes costaricensis* has no stated locality. The fact is that *E. acagutlae* is recorded in Porto Rico and not in St. Kitts, while *E. costaricensis* should appear as occurring in the latter island. Again, *Leucotermes tenuis* should be recorded as occurring in Barbados and St. Kitts, and *Eutermes sanctaeluciae* should be recorded from St. Vincent only. The crosses indicating the distribution of *E. costaricensis* and *L. tenuis* have been moved into line with the name of the species next above them.

RUBBER INDUSTRY.

FRENCH RUBBER TRADE.

A writer in the *India Rubber Journal* (January 17, 1914), whilst admitting the great success of plantation rubber, and the wonderful future which without doubt lies before it, thinks that from a technical point of view the rubber obtained from African vines has still a brilliant future before it, for the reasons that these rubbers possess peculiar properties, for example, exceptional viscosity, a very great stability when they are properly vulcanized. This opinion makes matters look a little more cheerful for the French tropical possessions in West Africa. At the same time, an examination of the statistics showing the import trade in raw rubber leads one to think that a great deal of organization will be required in the future in order to make French African supplies an important feature in the production of raw material for French manufactures. The following table shows the French imports of raw rubber for nine months during 1912 and 1913 respectively, in kilos.:—

From England	2,573 000	3,100,000
,, Brazil	4,051,000	3,100,000
,, French colonies	3,154,000	1,910,000
,, Other countries	3,772,000	4,700,000
	13,550,000	13,110,000

It will be seen that the direct importations from Brazil have fallen off rather heavily (about 25 per per cent.), while the imports from England have increased correspondingly, indicating that French buyers are more and more prone to make their purchases on the London market. However, the most important fact shown by these figures is a reduction of 1,000 tons in the quantity of rubber arriving from the French colonies. It may be noted, in conclusion, that in general the imports of raw rubber into France during the past few years have shown an annual progression rising from 13,239 tons in 1909 to 19,119 tons in 1912. During 1913 there was a slight decrease but this is probably only a temporary fluctuation.

Figures are given in the *India Rubber Journal* (February 7, 1914), showing the Amazon rubber exports from 1898 to 1913. In 1898 some 12 million kilos. were sent to Europe and nearly 10 million to the United States. In 1913 some 22 million were sent to Europe and about 17 million to the United States. In 1912 the United States took almost the same amount of rubber as Europe did, namely, about 22 million kilos. It was during this year (1912) that the maximum output of Para rubber was reached, being, as already intimated, about 44 million kilos.

The stock in Para on December 31, 1913, was put at 1,600 tons as against 1,620 tons at the end of 1912, 2,585 tons at the end of 1911, and 772 tons at the end of 1910.

An interesting article appears in the *Journal d'Agriculture Tropicale* (December 1913) on the origin of the Heveas growing in the French colonies of the West Coast of Africa. After referring to the introduction of seed into Ceylon, and later into British West Africa through the Royal Gardens, Kew, it is stated that the first importation into France of Hevea seed destined to be grown in the French colonies was carried out by private enterprise. It is mentioned that the first plants arrived in French Guinea in 1898 and were planted in the garden at Cayenne. It was only in July 1898 that the Minister for the Colonies took the initiative to distribute Hevea plants throughout the French African possessions.

MANURES AND MANURING.

JAPANESE PRACTICES.

The following is an abstract of one of a series of articles on Japanese agriculture, taken from the *Experiment Station Record* (December 1913):—

It is shown that the use of commercial fertilizers in Japan is of comparatively recent date, but is rapidly assuming large proportions. The estimated total value of fertilizers now used is from $34,860,000 to $39,840,000 annually. The use of commercial fertilizers in supplementing, and to a considerable extent, superseding the older practices depending upon the use of night-soil, straw ashes and similar fertilizing materials. The use of animal manures has played a comparatively insignificant part in Japanese agriculture because the number of animals is small and the manure is usually poor in fertilizing constituents. Green manuring, especially with green grass, *Astragalus sinensis* and *Medicago denticulata*, is practised to some extent. Japanese soils are not naturally very fertile and the system of continuous cropping which prevails is very exhausting to the land, hence the free use of fertilizers has been followed with very profitable results.

The imports of fertilizing materials into Japan are large and include all of the usual fertilizing materials, mixed and unmixed, besides a variety of oil cakes and miscellaneous materials. German potash salts have only been recently introduced and their use is still limited chiefly to a small amount of sulphate of potash. The home-produced fertilizers include various kinds of oil cakes and fish manures, bone, hoofs, horn, hair, rice bran, by-products from the soy, the saké, the beer, and other industries, wastes from silkworm rearing and cocoons, a little sulphate of ammonia from gas works, a small amount of calcium cyanamide, besides superphosphates and mixed fertilizers of different kinds. The principal centres of fertilizer manufactures are Tokio and Osaka.

The Osaka fertilizers were originally made largely for use in aquatic agriculture (rice and rushes) and were compounded chiefly of ammonium sulphate and superphosphate, a mixture which seems best suited to soils in which the transformation of nitrogen does not, as a rule, go beyond the ammonia stage and which does not have the same ultimate acid effect as would the same combination of manures applied to dry land crops. . . . Partly from geological reasons and partly from manuring practices long continued, most soils in Japan have a tendency to become acid and this is more marked. . . in the case of non-irrigated fields. . . . In the manuring of rice, Japan is very far in advance of any other rice-growing country, in the manuring of mulberry Japan has no equal, in the manuring of tea she is behind Ceylon and in advance of China, and in the manuring of sugar-cane considerably behind Hawaii and in advance of the Philippines. Only within recent years has the manuring of the winter cereals, barley, and wheat, received serious attention.

Recent work with phosphoric manures, according to the *Gardeners' Chronicle* (January 31, 1913), seems to show that the effect of superphosphate is greatest during the year in which the fertilizer is added, and that the amounts absorbed decreased markedly in the second year, and yet more in the third year. It would therefore seem good practice, according to conditions under which these results were obtained, to manure with small quantities of phosphates annually, rather than to add larger quantities at longer intervals.

GLEANINGS.

Reference is made in the *Port-of-Spain Gazette* to the success which has attended tobacco growing in Tobago during the past year or two. It is stated that from 100 plants one grower is known to have made $8 (£1 13*s.* 4*d.*) within three months.

A copy has just been received of the new book on maize: its history, cultivation, handling and uses, by Joseph Brutt-Davie, F.L.S., Government Agrostologist and Botanist, Department of Agriculture of the Union of South Africa.

The Antigua *Sun* (February 2, 1914) reports that a meeting of the Antigua Horticultural Society took place on January 30. At this it was decided that the rules of the society should be printed, and in regard to the matter of seed importation, that seed should be obtained under the auspices of the society.

According to the *Journal of the Royal Society of Arts* (January 30, 1914) a committee has just been formed in Paris for the purpose of organizing an International Exhibition of living insects, fish and birds for the aviary. The exhibition will be held this year in the grounds of the Jardin d' Acclimatation, in the Bois de Boulogne.

Considerable activity is being shown in the Virgin Islands in regard to coco-nut demonstration plots and the establishment of coco-nut nurseries. Another useful line of work is that of cotton selection, the idea being to raise high-grade seed so as to obviate the necessity of importing planting material from the neighbouring island of St. Kitts.

Losses to the cotton crop are recorded from Montserrat as the result of boll dropping and a discolouration of lint evidently caused by a fungus. It is to be feared that the second crop of cotton is likely to be unsatisfactory. Some loss from boll dropping has occurred in Antigua also.

It is stated in the *Colonial Reports*—Annual, No. 788, that the weight and value of the Mauritius sugar crop for the last five years in tons and millions of rupees respectively, is as follows: 1908-9, 191,491, value 28·7; 1909-10, 246,560, value, 41·9; 1910-11, 214,372, value, 30·4; 1911-12, 165,806, value, 32·0; 1912-13, 206,677, value, 28·9 (10·78 rupees = £1).

The Zambesia Company in Portuguese East Africa, have, for some years, according to *The Board of Trade Journal* (January 15, 1914) been conducting experiments with cotton, and good results are stated to have been obtained from Nyasaland Upland seed. A great deal of trouble has been caused in the field by a plague of rats, which destroyed nine-tenths of the 1913 crop.

During January, the Assistant Superintendent, St. Vincent, visited the Grenadines to report on the prospects of establishing a lime industry in these places. During the same month in St. Lucia, the Assistant Agricultural Superintendent there was occupied with considerable travelling in connexion with the survey work of the Land Settlement plots and the recent tour of the Mycologist of this Department.

A circular has just been received from the Superintendent of Agriculture for the Leeward Islands, which contains advice in regard to the control of leaf-blister mite, for the benefit of cotton cultivators in the Virgin Islands. The importance of keeping a sharp lookout for the first appearance of the disease and of quickly destroying infested material is emphasized. The information is plainly worded, and the circular should serve a very useful purpose.

From references that have been made in regard to the matter in this journal from time to time, it will be realized that considerable attention is being given by the Agricultural Department in Antigua to the extension of vegetable growing in that island. An interesting feature of the work is that efforts are being made to increase the amount and quality of vegetables of temperate countries, like English potatoes, tomatoes and onions. It has been proposed to grow English potatoes along the banks in the cane fields.

According to *The Board of Trade Journal* (February 5, 1914) the following are the reduced export duties in aid of agriculture in Trinidad and Tobago for 1914. The rates of duty on cacao (100 lb.) has been reduced from 1*d.* to ¾*d.*; sugar (1,000 lb.) from 3½*d.* to 2*d.*; coco-nuts (1,000 nuts) 2½*d.* to 1½*d.*; copra (1,000 lb.) 7½*d.* to 3*d.* Even greater reductions have been made in aid of emigration, on articles produced in Trinidad. For details, reference should be made to the source from which this information has been taken.

Considerable correspondence has taken place recently in the Malaya papers, in regard to the reduction of coolie wages, and the general opinion seems to be that the present rate should be lowered. Already on one estate free Javanese tappers, who were previously paid 50c. per day for a task of 300 trees have had their wages reduced to the rate of 40c. for a task of 400 trees. This reduction will affect 1,000 workmen and mean a saving, even ignoring the gain as regards increased task, of £4,200 per annum. (*Planters' Chronicle*, January 3, 1914.)

An interesting note appears in *Nature* (February 5, 1914) in regard to a method of obtaining permanent preparations of protozoa in the state in which they are found living in the soil. The best fixative for clay soils is: saturated aqueous solution of mercuric chloride, 1 pint; methylated spirit, 1 pint. The soil should be crumbled into this fluid, and mixing is best accomplished by gently shaking the containing vessel, care being taken to avoid making the clay of the soil pass into suspension. A delicate film containing protozoa will appear on the surface of the liquid, and this can be removed by floating covers lips over it and stained by the usual methods.

BOTANICAL NOTES.

A DROUGHT-RESISTING ADAPTATION IN SEEDLINGS OF MAIZE.

The following general description is given by Mr. G. M. Collin in the *Journal of Agricultural Research* (Vol. 1, No. 4), concerning an interesting variety of maize grown by the Indians of New Mexico and Arizona, which possesses an adaptable character that promises to be of economic importance in dry regions where the germination of Indian corn is uncertain:—

'Throughout the western part of the Great Plains area the difficulty of securing uniform germination is a serious obstacle to the growing of maize. With the varieties commonly grown, if the seed is planted at the customary depth, many seeds fail to germinate from insufficient moisture; if planted deep enough to come into contact with moist soil the plants may fail to reach the surface.

'The agricultural Indians of the Southwest have continued from prehistoric times to grow maize successfully in regions where drought, and especially the absence of spring rains, makes it much more difficult to start the crop than in the Great Plains. A study of the varieties grown by the Hopis and other agricultural Indians shows that these varieties possess two special adaptations: (1) a greatly elongated mesocotyl that permits deep planting, and (2) the development of a single large radicle that rapidly descends to the moist subsoil and supplies water during the critical seedling stage.

'This indigenous type of maize seems to have attracted little attention, perhaps because it has been included in the popular mind with a series of inferior varieties commonly known as 'squaw corn'. But the Pueblo Indians of Arizona and New Mexico have strains sufficiently productive to compare favourably with improved varieties, even when grown under irrigation. The peculiar adaptations of this type definitely indicate its value for the semi-arid regions and warrant experiments to determine the possibility of its utilization.'

Those interested in the botanical aspects of the plants under consideration may be interested in a short description of the morphological features of the maize plant, and of a germination test of the Navajo maize with that of Chinese and other varieties.

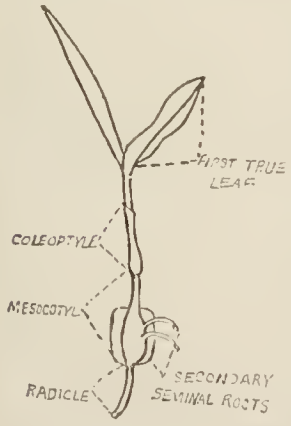


Fig. 1. Seedling Maize.

The accompanying diagram shows the principal parts of a seedling maize plant. The most important from the point of view of the investigation under consideration is the mesocotyl. This portion of the aerial axis is so termed because it lies between the coleoptyle and scutellum, both of which are regarded as parts of a more highly specialized cotyledon. As already stated, it is the remarkable length of this mesocotyl which enables the Hopi maize to be planted at extraordinary low depths in the soil (34 cm.) without any damage being done to the first foliage leaf.

In the germination tests this Indian maize and the ordinary kinds were planted together in series at different depths ranging from 6 cm. down to 34 cm. When planted at 34, the ordinary maize seedlings grew up to within about 18 cm. from the surface of the ground, but could not go any farther and died; whereas the Navajo maize, as already stated, owing to the remarkable elongation of its mesocotyl, safely reached the surface without any damage to the developing bud and became firmly and satisfactorily established

Reference has already been made to the remarkable tap root which these Indian maizes possess, and taking all their characteristics into consideration one is forced to the conclusion that here is a plant of real use which may be taken advantage of with great profit by breeders of Indian corn in different parts of the world.

ABSORPTION OF PLANT FOOD: INFLUENCE OF THE MEDIUM.

The *Experiment Station Record* (December 1913) publishes the following abtract of some recent work done in France on the above subject.

Continuing the above work, the author investigated the influence upon the adsorptive power exerted by living as well as dead roots of wheat and their absorption of nitrogen on the addition of certain salts to the ammonium chlorid nutritive medium.

From these tests it is said that the other salts influence strongly both diffusion into live plants and adsorption by dead ones. It appears also from tabulated results that the rapidity of diffusion, as observed in the series of different salts, varies in nearly the same ratio as does that of adsorption. The results of various further experiments with different concentrations of other salts in connexion with ammonium chlorid are held to show that for each of the former in connexion with the latter a point of concentration exists, corresponding to the maximum of adsorption by the roots. These facts are held to explain, at least in part, some good effects on vegetation obtained by using in addition to ordinary fertilizers, such substances as common salt, gypsum, sulphate of manganese, etc., and to indicate the possibility of obtaining larger crop returns by securing better utilization of nitrogen in the nutritive solution.

It is claimed that the absorption of either organic or mineral nitrogen by young plants does not depend immediately and alone upon the living substance, but that it is in part determined by substances contained in the roots, also that, all other conditions being equal, the adsorption and the activity of diffusion are proportional to the concentration within limits. In solutions of equal concentrations the adsorptive powers or the activity of diffusion is modifiable by changes in the composition of the external medium, and bears a close relation thereto.

A couple of minor points may be noted for correction in Dr. M. T. Cook's book on the diseases of tropical plants, reviewed in the last issue of this journal. Sooty mould of sugar-cane leaves is attributed to *Capnodium* sp. growing in the secretions of mealy-bugs (Aleyrodes). In the Lesser Antilles, at any rate, the insects usually called mealy bugs (*Pseudococcus* spp.) occur only under the leaf sheaths, and sooty mould is associated with *Delphax saccharivora*. Probably owing to ambiguity in the literature, Barbados is several times mentioned in connexion with diseases of cacao, which is not a crop of that island.

FUNGUS NOTES.

REPORT ON A VISIT TO ST. LUCIA.

The following notes are taken from a report submitted to the Imperial Commissioner of Agriculture by the Mycologist on the staff of this Department (Mr. W. Nowell) respecting the observations made by him during his recent visit to St. Lucia.

FUNGUS DISEASES OF INSECTS. During the inspection of Union estate, and on all occasions where the opportunity occurred of examining citrus and other plants susceptible to scale insects, the efficiency of the control exercised upon the latter by their fungus parasites was very striking. Only in the case of certain young trees not well established was there any indication of need for spraying with insecticides. The white-headed fungus (Ophionectria) was most noticeable, closely rivalled by the red-headed fungus (Sphaerostilbe). The black fungus (Myriangium) was fairly abundant, and the buff or shield-scale fungus (Cephalosporium) was present where its hosts occurred. Specimens of *Aschersonia turbinata* parasitizing a scale insect (*Coccus mangiferae*) on Java plum (*Eugenia jambolana*) were noted in the Botanic Station. There also attention was called by the Agricultural Superintendent to a shrub infested with the Fulgorid bug, *Ormenis* sp., many of which were dead and adhering to the twigs; these were found to be parasitized by a species of Isaria.

The fungus *Septobasidium* [Thelephora] *pedicellata* came frequently under observation on lime trees, on the twigs of which it forms a bluish-grey, waxy coating. When this fungus was first submitted for examination it was stated to be frequently associated with the death of the parts affected (*Agricultural News*, Vol. IX, p. 286). Later, in consequence of the announcement by Mr. T. Petch, Mycologist to the Government of Ceylon, that fungi of this genus were parasitic on scale insects, the acceptance of this opinion was revised, a suggestion being made that the death of the parts was due to the scale insects and that the fungus is probably beneficial (*Agricultural News*, Vol XII, p. 14). A careful examination was made during the present visit of a well infested lime, and specimens were collected for further study. The fungus in these examples had enveloped colonies of the purple scale insect (*Lepidosaphes beckii*), and in the case of the older members, the mycelium had grown in under the edge of the actual scale and attacked the body of the insect; but whether this had occurred before or after death was not determined. The young twigs of the tree above referred to were gumming freely from raised swellings where they were covered by the fungus, and in some cases the part of the twig lying beyond the investment was dead. The number of scale insects present was far below what would generally be considered capable of killing the twigs. The damage appears to be due to the fungus, and since no evidence of penetration could be found the conclusion was reached that it is probably brought about by suffocation.

IMMORTEL CANKER. This disease is steadily destroying on all the estates visited a form of Erythrina commonly grown as a shade tree for cacao and locally thought to be *E. Indica*, and seems likely to cause its practical extinction. No fungus fructifications were found associated with it, and from its general appearance it is suspected to be a bacterial disease. In view of the constant wounding to which the tree is subjected through being made to serve as a stand for cutlasses and by the necessary lopping, often involving the cutting of steps in the trunk, there seems little hope of any practical remedy. The substitution of other shade trees is being carried out by planters, and so far, *Erythrina velutina* appears to be immune. In addition to damage caused to the cacao by loss of protection, the epidemic is unfortunate in that it cumbers the ground with large quantities of dead wood, making proper sanitation very difficult. Three apparently distinct species of Rosellinia were found on this material during the visit.

ROSELLINIA ROOT DISEASE OF CACAO. In view of its importance, careful attention was paid to this disease. The conclusions arrived at coincide in all respects with those of Messrs. South and Brooks as published in *Circular No. ?* of this Department. Perithecial fructifications of Rosellinia were again found on the mycelium enveloping a cacao stump killed by the disease, though unfortunately they were not in a condition to permit of the determination of the actual species concerned. Fresh perithecia for this purpose are much to be desired. The presence of the characteristic mycelium on living and dead roots, its clear connexion with conidial fructifications of the Dematophora type, and the subsequent occurrence of perithecia of Rosellinia situated on the same mycelium—viewed in the light of the association of these three characteristics in destructive root diseases in many different parts of the world—afford evidence which is as strong as it can possibly be without the proof of direct infection from pure cultures that Rosellinia is responsible for the disease.

The actual conditions of infection have still to be learned. Attempts to infect plants in tubs and pots by means of material from diseased trees have so far failed, yet in a gap caused by the disease in a pois-doux wind-break living fence posts of white cedar (*Tecoma leucoxylon*) and other wood were found to be strongly attacked, as were self-sown seedlings of pois-doux and annatto at one end of the gap. Further experiments of this nature have been instituted. It should be noted in this connexion that cases were observed where cacao trees included with diseased trees within isolation trenches still remained apparently undamaged after a period of several months Opportunity did not permit of full information being obtained as to the experiments instituted by Messrs. South and Brooks. So far as could be judged, the application of 'Fungal' has had no beneficial effects. Certain of the diseased areas planted with limes had been disturbed; of the plants remaining most were healthy, but some were affected in the characteristic manner: hence there is no doubt that limes are liable to be attacked. Horse beans grown on infested ground were also similarly diseased in part.

The kola tree (*Cola acuminata*) mentioned by Mr. Brooks (St. Lucia Report 1912-13) as having so far proved immune must now be included in the list of trees attacked, an example bearing the characteristic mycelium having been found during the visit.

In view of the very susceptible nature of bread fruit and avocado pear trees, the question arose as to whether it is advisable to cut down these trees even when they appear to be healthy. It would certainly be well to be rid of them, and where the planter is prepared to remove the bulk of the roots from the soil it may be to his advantage; but where this is impracticable it is the opinion of the Mycologist that it is better to leave them alone so long as they remain healthy. The living roots probably have some power of resistance to the disease, while the presence of a large mass of dead material in the soil invites its appearance. A number of cacao stumps left in thinning out the trees were examined

on one estate. They had shown no sign of disease while living, but several were now found to be fully infested with the fungus, which had apparently developed after their death.

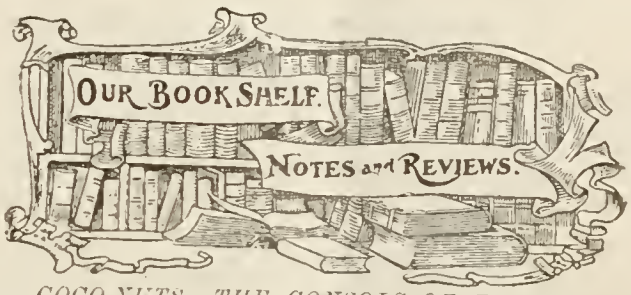
In view of the various facts now well established as to the ability of the fungus to live on dead woody material wherever sufficient moisture is present, great stress must be laid on the importance of removing such material from the cacao plantations. No branches of any thickness should be used as mulch. The ideal condition would be that no stumps or roots should be left to rot in the ground and no branches left to rot upon it. The difficulties of the position are recognized, but the desirability of approaching as near to this state of things as is practically possible should be steadily kept in mind.

There is a general demand among planters engaged in fighting root disease for a soil sterilizing agent more efficient than lime. Very probably much of the evident dissatisfaction with this material is due to the difficulty of obtaining and applying it in a fully caustic condition, failing which it is of little use. One planter is using flowers of sulphur for the purpose. This substance has been tried in French vineyards against the allied *R. necatrix*; good results have been claimed for it, while on the other hand its efficiency has been denied. If it can be obtained cheaply enough to be liberally used it is well worth trial. Perhaps the local sources might be utilized. There is a decided lack of a good and cheap soil fungicide in solid form, at present the best available substances are liquids. Carbon bisulphide, applied by means of a soil injector at the rate of about 6 oz. to the square yard appears to be extensively used in France against the fungus above mentioned. Its cost and inflammability will probably prevent its use in St. Lucia. Carbolic acid 1 oz. to 1 gallon of water has been used for a similar purpose and good results claimed. Probably the most promising liquid is a solution of formaldehyde made by mixing 1 pint of the commercial (40 per cent.) solution with 20 imperial gallons of water. The soil should be thoroughly soaked with this, and covered up as well as possible to prevent rapid escape of the fumes. It must be noted that none of these agents is likely to have much effect on mycelium established in roots or branches, which should be carefully removed, as is the present practice.

OTHER CACAO DISEASES. Other diseases of cacao were studied so far as time permitted and their field characters noted. Many patches of trees with the upper twigs dying or dead were seen, but owing to the precedent dry weather the fructifications of Thyridaria (Lasiodiplodia) were not much in evidence upon them. In every case examined the affection seemed to be correlated with absence of adequate protection for the trees. Pink disease (*Corticium lilacino-fuscum*) was noticed only on one tree.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture returned to Barbados on Wednesday, March 4, by the R.M.S. 'Trent'. Dr. Watts had spent the past month in Jamaica in connexion with official matters pertaining to the agriculture of that Colony.



COCO-NUTS: THE CONSOLS OF THE EAST. By H. Hamel Smith and F. A. G. Pape. Second Edition. *London: 'Tropical Life' Publishing Dept.* 1914. Price 13*s.* 6*d.*

The contents of the first edition of this book were fully outlined in the *Agricultural News* for August 31, 1912. In this, the second edition, there has not been any very radicle changes, though the amount of additional information is considerable. The first edition had 506 pages; this one has 644. Much more information is given on the cost of making copra and in connexion with coco-nut cultivation in Samoa, Fiji and North Borneo; also about the cost of establishing estates, and in regard to the utilization of by-products.

The more novel of the newly introduced sections include a chapter on remounts for the army followed by another equally suggestive of war, namely, farming with dynamite. But when one comes to read the subject-matter there is nothing very alarming—it is only advocated that horse breeding might be profitably conducted with advantage to the Empire on large plantations and that the quickest and cleanest way to clear the land and to improve the subsoil is by means of carefully controlled explosions.

Each section of the book is more or less self-contained, which, as pointed out in the review of the first edition, leads to a certain amount of repetition. But the subject-matter is good since it is based on the work and experience of all the best authorities. Those readers who want to know just how to prepare and plant land in coco-nuts are advised to begin by reading pp. 160 to 215, which strike us as being thoroughly practical and to the point. The intending investor, on the other hand, will probably feel inclined to peruse the sections dealing with coco nut cultivation in different countries He may feel somewhat disappointed in not getting more facts concerning what land is available for planting purposes, but of course such information as this is more easily got by communicating with local authorities in the various centres of production. Lastly it may be said that the large amount of matter concerning pests and diseases will put power into the hands and minds of those whose principal duty it is to check depreciation, just as the interesting matter concerning the utilization of by products will help those who are concerned more directly with appreciation on the estate.

One or two features of a literary nature call for comment. Though presumably compiled in collaboration, much of the subject-matter is written in the first person singular. Again Mr. F. P. Jepson, Government Entomologist, Fiji, is treated in a rather inconsiderate way, being given on page 125 the curious qualifications of B. A. Cant., F.E.C., whilst on page *lii* we find what must be equally curious 'Mr. Frank Jepson on the rhino beetle in Samoa.' These are mere trifles of course, and are quite eclipsed by one or two similes; for example, in connexion with wide planting we are told that the coco-nut palm is like a big bird and wants plenty of room to flap about in. So that whatever small blemishes the book may have, the authors have not failed in their determined efforts to drive home essential points. It is, in fact, the best book of its kind on coco-nuts that there is.

MARKET REPORTS.

London.—The West India Committee Circular, February 24, 1914; Messrs. E. A. de Pass & Co., February 13, 1914.

Arrowroot—3*d.* to 4⅞*d.*
Balata—Sheet, 2/11½; block, 2/1¼ per lb.
Beeswax—£8 5*s.* to £9.
Cacao—Trinidad, 62/- to 67/- per cwt.; Grenada, 58/- to 64/-; Jamaica, 56/- to 62/-.
Coffee—Jamaica, 52/- to 81/6
Copra—West Indian, £29 10*s.* per ton.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 16*d.* to 21*d.*
Fruit—No quotations.
Fustic—No quotations.
Ginger—Quiet, 34/- to 60/.
Isinglass—No quotations.
Honey—20/- to 25/-.
Lime Juice—Raw, 1*s.* to 1*s.* 7*d*; concentrated, £21 10*s.*; otto of limes (hand-pressed), 9/-.
Logwood—No quotations.
Mace—1/7 to 2/6.
Nutmegs—5½*d.* to 7*d.*
Pimento—1 13/16*d.* to 2 1/16*d.*
Rubber—Para, fine hard, 3/-; fine soft, 3/-; Castilloa, 1/8 per lb.
Rum—Jamaica, 2/3½ to 5/- per gallon.

New York.—Messrs Gillespie Bros. & Co., February 20, 1914.

Cacao—Caracas, 13c. to 14¼c.; Grenada, 12½c. to 13c.; Trinidad, 13c. to 13½c.; Jamaica, 12c. to 12½c.
Coco-nuts—Jamaica, selects, $28·00 to $30·00; Trinidad selects $30·00 to $31·00; culls, $15·00 to $17·00 per M.
Coffee—Jamaica, 10½c. to 15c. per lb.
Ginger—9c. to 10¼c. per lb.
Goat Skins—Jamaica, 51c.; Antigua and Barbados, 45c. to 48c.; St. Thomas and St. Kitts, 42c. to 45c. per lb.
Grape Fruit—Jamaica, $1·12½ to $1·75.
Limes—No quotations.
Mace—52c. to 55c. per lb.
Nutmegs—110's, 12½c.
Oranges—Jamaica, $1·25 to $1·50.
Pimento—4c. to 4¼c. per lb.
Sugar—Centrifugals, 96°, 3·45c. per lb.; Muscovados, 89°, 2·90c.; Molasses, 89°, 2·70c. per lb., all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., March 2, 1914.

Cacao—Venezuelan, $13·40 to $13·50; Trinidad, $13·25 to $13·50.
Coco-nut Oil—$1·00 per Imperial gallon.
Coffee—Venezuelan, 13½c. per lb.
Copra—$5·10 per 100 lb.
Dhal—$5·75.
Onions—$2·75 to $3·00 per 100 lb.
Peas, Split—$5·80 per bag.
Potatoes—English, $1·40 to $1·80 per 100 lb.
Rice—Yellow, $5·10 to $5·30; White, $4·80 to $4·85 per bag.
Sugar—American crushed, no quotations.

Barbados.—Messrs. James A. Lynch & Co., Ltd., January 24, 1914; Messrs. T. S. Garraway & Co., February 28, 1914.

Arrowroot—$4·50 per 100 lb.
Cacao—$11·75 to $12·00 per 100 lb.
Coco-nuts—$15·00.
Hay—$1·60 per 100 lb.
Manures—Nitrate of soda, $70·00; Cacao manure, $48·00; Sulphate of ammonia, $85·00 per ton.
Molasses—No quotations.
Onions—$7·00 per 100 lb.
Peas, Split—$6·00 per bag of 210 lb.; Canada, $3·50 per bag of 120 lb.
Potatoes—Nova Scotia, $2·00 per 160 lb.
Rice—Ballam, $5·20 to $5·30 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
Sugar—American granulated, $4·00 per 100 lb.

British Guiana.—Messrs. Wieting & Richter, February 28, 1914; Messrs. Sandbach, Parker & Co., February 27, 1914.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	$8·50 per barrel of 200 lb.	——
Balata—Venezuelablock	No quotation	——
Demerara sheet	65c. per lb.	——
Cacao—Native	12½c. to 13c. per lb.	12½c. per lb.
Cassava—	96c.	——
Cassava Starch—	——	——
Coco-nuts—	$16 to $20 per M.	$26 per M.
Coffee—Creole	15c. per lb.	16c. per lb.
Jamaica and Rio	15½c. per lb.	16c. per lb.
Liberian	13c. per lb.	12c. per lb
Dhal—	$5·50 to $5·75 per bag of 168 lb.	$5·00 to $5·50 per bag of 168 lb.
Green Dhal	$5·75	——
Endoes—	$1·44	——
Molasses—Yellow	None	——
Onions—Teneriffe	——	——
Madeira	7c.	7c. to 8c.
Peas—Split	$6·00 per bag (210 lb.)	$7·00 per bag (210 lb.)
Marseilles	——	——
Plantains—	16c. to 48c.	——
Potatoes—Nova Scotia	$2·75 to $3·00	$2·85
Lisoon	——	——
Potatoes—Sweet, B'bados	$1·20 per bag	——
Rice—Ballam	No quotation	——
Creole	$4·75 to $5·00	$4·80
Tannias—	$2·64	——
Yams—White	$2·16	——
Buck	$1·92	——
Sugar—Dark crystals	$2·10	$2·10 to $2·15
Yellow	$2·50 to $2·60	$2·50 to $2·60
White	$3·75	$4·00
Molasses	——	——
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M.
,, Cordwood	$1·80 to $2·00 per ton	——

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PAMPHLET SERIES.

The Pamphlets are written in a simple and popular manner and the information contained in them is especially adapted to West Indian conditions. They contain, amongst other subjects, summaries of the results of the experiment work on sugar-cane and manures, the full official reports of which have only a limited circulation. The number issued up to the present time is seventy. Those mentioned in the following list are still available: the rest are out of print.

SUGAR INDUSTRY.

Seedling and other Canes at Barbados
in 1900. No, 3, price 2*d.*; in 1901, No. 13, price 4*d.*;
in 1902, No. 19, price 4*d.*; in 1903, No. 26, price 4*d.*;
in 1904, No. 32, price 4*d.*

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Printed at Office of *Agricultural Reporter*, 4 High Street, Bridgetown, Barbados.

Vol. XIII. No. 311.] SATURDAY, MARCH 28, 1914. [One penny

AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW
OF THE
IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

VOL. XIII. No. 311. BARBADOS, MARCH 28, 1914. PRICE 1*d.*

CONTENTS

The Control of Bovine Tuberculosis in the West Indies.

AT the Tuberculosis Conference held in Trinidad during March 1913, it was fully established that bovine tuberculosis exists in the West Indies and that it is urgently necessary to advise and recommend the measures that should be taken to prevent the extension of the disease and the possible infection of human subjects. Up to the present time no definite action has been taken, at least not in the Windward and Leeward Islands, and since it is in these colonies that recent systematic observations have been made principally, it would seem desirable to bring forward in these columns the facts relating to the transmission of tuberculosis from animals to man, and the measures that have been adopted in other countries for the prevention of this transmission.

Largely as the result of the enquiries of successive Royal Commissions, it is now to be regarded as an accepted fact that bovine tuberculosis is communicable to man, and that it is principally transmitted by the agency of milk used for human consumption. It is abundantly clear, then, that any operations aiming at the diminution or eradication of the disease would not only be productive of benefit as regards the improvement of the condition of live stock, but would also comprise a material step forward in the campaign against the disease in man.

At present there are four recognized types of tubercle germs—human, bovine, avian, and a type that infects cold-blooded animals. As already stated, the human and bovine forms are transmissible and it is also important to observe that tuberculosis in fowls can be communicated to pigs and *vice versa*. It is evident, then, in view of the cosmopolitan nature of the disease, that the fate of the bacilli outside the animal body is a most important phase of the problem of prevention. It is the germ living what may be regarded as a saprophytic life which demands our first attention, for this is the material which is a constant source of infection. The tubercle bacillus, although it does not form spores, is one of the most resistant species of bacteria; it can, however, be killed in a few minutes to a few hours when exposed to direct sunlight. In running water, tubercle bacilli can live for more than a year. A watering trough harbouring these germs may therefore be a dangerous source of

infection to cattle. In cow manure, the germ can also survive long periods. Pure cultures of bovine tubercle have been mixed in cow manure and exposed in a 2-inch layer in a pasture field in the sunshine, and have been found to remain alive and virulent for two months. These facts show how necessary it is to destroy infested material.

But from the point of view of human tuberculosis, it is milk that constitutes the most dangerous medium of transmission. In the first place milk provides an ideal cultural medium for reproduction, whilst in the second place it is particularly liable to infection even if it may have been derived originally from a healthy animal. A contaminated water-supply in a place where adulteration is practised provides one source of infection; then, again, uncleanly methods in the operation of milking may also allow the germs to enter. A very dangerous and insidious means of infection is often involved in the mixing of milk in a herd of cows. One tuberculous animal may under these conditions be the means of virtually making every cow a source of infected material.

But no matter how much care be taken to destroy infected material and to prevent the contamination of milk, the real root of the evil lies in the existence of the diseased animal itself.

The means of eliminating tuberculosis from a herd are easier framed than put into operation. This is particularly true of the West Indies. Reference has from time to time been made in this journal to Bang's system of tuberculosis eradication, which consists in principle, in dividing the stock into two herds: those which react to the tuberculin test, and those which do not react. The two herds are kept separate, and of the reactors, as soon as any show clinical symptoms, as for example extreme emaciation, they are got rid of. In Denmark, societies known as tuberculin unions have been formed, all the members of which agree to conform to Bang's system on their respective farms. It is apparent that this not only leads to an improvement in the condition of the various herds, but also protects the market and consequently the consumer.

In England, the Board of Agriculture and Fisheries passed in 1913 a Tuberculosis Order many of the provisions of which may be applicable under West Indian conditions, and it is proposed to describe the provisions of this order at some length. Every person having in his possession or under his charge a cow which is or appears to be suffering from tuberculosis of the udder, indurated udder, or other chronic disease of the same organ, or having any bovine animal which is, or appears to be, suffering from tuberculosis with emaciation, must notify the same to the police. Similarly veterinary surgeons must give notice of the existence of any animals exhibiting the above symptoms that they may be called to examine in the course of private practice. For doing this a small fee is paid. The Order provides further for the inspection of suspected animals. Should an animal be discovered giving tuberculous milk, or suffering from tuberculosis with emaciation, it must by law be slaughtered, though if the value of the animal is above £30, the direct sanction of the Board of Agriculture is necessary as well as that of the Local Authority. Provision is made for valuation for compensation. The amount of compensation which is paid by the Government depends upon the extent to which the animal was suffering from tuberculosis as demonstrated by a post-mortem examination. Should the post-mortem show that the animal was not suffering from tuberculosis, a sum equal to the value of the animal as agreed to in the valuation for compensation must be paid, and a further sum of twenty shillings. If the animal is found to be suffering from tuberculosis, but not advanced tuberculosis, the Local Authority shall give a sum equal to three-fourths of the value of the animal after deducting one-half of the costs of valuation; but if the animal is shown to have been suffering from the advanced stage of the disease, only one-fourth of the value of the animal is paid, deducting from such sum one-half of the costs of valuation and examination.

The Order, the principal provisions of which have just been outlined, concludes with a number of restrictions in regard to the handling of milk, the detention and isolation of suspected animals, and cleansing and disinfection. In these sections the proper measures for the prevention of transmission, as outlined at the commencement of this article, are enforced. In conclusion, it would appear that the Order embraces in a practical manner all the principal measures for the control of tuberculosis, and the adoption of the same, possibly with slight modifications, would appear to be desirable in most of the West Indian islands where a Veterinary Surgeon is available. It would not be sufficient to confine the operation of the legislation to the towns but to extend the operation throughout the Colony, and it is hardly necessary to add that at the same time that the legislation was enacted, it would be expedient to make proper provision for ensuring its thorough execution.

SUGAR INDUSTRY.

SUGAR-CANE EXPERIMENTS IN THE LEEWARD ISLANDS, 1912-13.

The form of this report is virtually the same as that of previous years. The publication is divided into two parts: (1) dealing with variety trials and (2) dealing with manurial experiments. The first twelve pages or so of the report include a description in tabular form of the various Barbados, Demerara and Antigua seedlings at present under trial in the Leeward Islands.

The tables and observations concerning trials with plant canes in Antigua which follow, show that for the year under review the first place in the table of average returns is again occupied by B.4596. The results obtained with B.3922 indicate that this variety is worthy of careful attention and trial by planters. Other promising varieties are B.6450 and B.1528. In regard to the experiments with ratoon canes in Antigua, B.3922 occupies the first place in the table and B.156 second. Third on the list is B.4596, a variety which continues to maintain its position as a plant cane and ratoon in a very satisfactory fashion. It is observed that the returns during the year under review given by all varieties are low—a result attributable to the continued dry weather experienced during the preceding seasons, combined with the effects of root disease (*Marasmius sacchari*).

Turning to the trials with varieties conducted in St. Kitts and Nevis we find that in the mean results for the fifteen varieties grown at all stations as plant canes, the leading place is occupied by B.254. This variety has given an average return of 8,410 lb. of sucrose per acre and 38·4 tons of cane per acre. This variety has come to the front during the past six years in a rather striking fashion. The second and third varieties on the list are B.376 and B.109 respectively, both of which are now recognized as reliable varieties to grow. It is interesting to note that the fourth and fifth places are taken by A.2 and A.3 respectively—two Antigua varieties which have been grown during the past two seasons at La Guérite and Molineux and at those stations have given satisfactory returns. In the trials with ratoon canes in St. Kitts during 1912-13 the list is headed by D.109 with a return of 6,170 lb. of sucrose per acre, followed by B.4596, D.625 and B.1528.

In regard to the trials with the varieties in Nevis it would appear that B.254 is a cane which appears to be well suited to conditions in that island. It would seem also that B.376, D.109, White Transparent and A.3 are worthy of attention and trial.

The numerical results which have just been briefly dealt with above are followed in the report by a note on the area under cultivation in the different cane varieties in Antigua and St. Kitts. The largest area in Antigua is still occupied by White Transparent, though the total acreage under this cane continues to decrease chiefly in view of its decided susceptibility to root disease particularly on the heavy clay lands of the centre portion of the island. The next largest area in Antigua continues to be occupied by Sealy Seedling which has this year increased its area by 347½ acres. D.147 comes next in popularity, closely followed by B.4596. In relation to St. Kitts, the position once again does not evince any very marked change. The area under White Transparent shows an increase of 231 acres, while B.208 has decreased its area by 100 acres. The increase in the area under White Transparent is probably the outcome of the introduction of the Central Factory system into St. Kitts, whereby varieties giving heavier weights of cane to the acre are now preferred to the moderate tonnages and very rich juice characteristic of such varieties as B.208. Although its area has decreased somewhat, B.147 continues to retain the leading position as the standard variety in the northern and north-eastern cane-growing area of St. Kitts.

Part I of the report concludes with some interesting notes on the more important cane varieties already referred to in other connexions above.

The manurial experiments presented in Part II of the report are conducted with ratoon canes, and the general results of the year under review conform to those obtained in previous seasons, namely, that the principal manurial requirements in the Leeward Islands are pen manure for plant canes and a dressing of quick-acting nitrogenous manure for ratoons. In regard to the returns consequent on manuring ratoons, the biggest financial return was got from the plot B which received 40 lb. nitrogen as sulphate of ammonia in one application without potash and phosphate. The profit incidental to manuring this plot was 20*s.* 10*d.* per acre. (Value of canes assumed as 10*s.* 10*d.* per ton.) It has to be remembered that it is now clearly established that the action of manures in the Leeward Islands is greatly limited, speaking generally, by insufficient rainfall. In St. Kitts where the rainfall was more propitious than in Antigua, distinctly profitable results were obtained from the application of artificials to ratoons at nearly every station. It may be mentioned here that the reason why quick-acting nitrogenous manures improve the growth of ratoons is because of their stimulating action after the shock which the plants sustain subsequent to being cut. The general considerations relating to the manuring of sugar-canes under conditions obtaining in Antigua and St. Kitts are discussed in a very interesting manner towards the close of the report and this section will well repay perusal. It is maintained that if it were possible by means of irrigation to counteract the effects of the fluctuations in the level of the water table below the soils in Antigua and St. Kitts, and to obviate the checks to growth thereby engendered, it would seem highly probable that a greater degree of potential productivity would be easily attained. In considering the importance of organic manure it must be remembered that its value lies probably in maintaining that high degree of bacterial activity on which soil fertility, particularly in the Tropics, undoubtedly depends. Soil investigation in the West Indies has fully demonstrated that under favourable conditions the humus contents of tropical soils may be decreased by as much as 25 per cent. in the space of six months. It is clearly apparent then that the application of organic manures must play an important part in the maintenance of soil fertility.

Unfortunately on many estates in the Leeward Islands the conditions are such that it is not always practicable to produce the requisite quantity of pen manure for application to plant canes, and it is in this direction of endeavouring to find suitable substitutes for, or supplements to, pen manure, in the form of green dressings, naturally occurring material in the shape of weeds, grass and bush, combined with artificial manures, that will receive the special attention of the Agricultural Department for the Leeward Islands during the next few seasons.

The report concludes with a section dealing with the residual action of fertilizers applied to cane lands, and molasses as a fertilizer for cane lands. The application of molasses in Antigua has not been productive of beneficial results. It has been urged that molasses is likely to exert a more beneficial action if applied to fields destined to bear plant canes some time before the canes are planted.

FRUIT AND FRUIT TREES.

COLD STORAGE OF FRUIT AND VEGETABLES.*

I.

The storage of fruit is a matter of some commercial importance, and a thorough knowledge of the best conditions for keeping ripe or unripe fruit of different kinds will be of great value in relation to the conveyance of fruit to a distance, and for other purposes. The methods at present in use, including refrigeration, have made it possible to carry many kinds of fruit for long sea voyages. The partial spoiling of a cargo of fruit is, however, a not uncommon occurrence, and attention is therefore called to the possibility of effecting improvements in method. The finding of such improvements will be greatly helped by a good knowledge of the physiological processes going on in fruits at different stages of ripening and at different temperatures, and it appears that much still remains to be learnt on this subject.

A paper recently published† records a number of experiments on the respiration of fruits, made with the object of gaining fresh data, which might be useful in connexion with fruit storage. The paper also contains a summary of literature dealing with different matters relating to the process of respiration.

In the experiments described in this paper, the respiration of different fruits when kept in air, in nitrogen, and in hydrogen was measured, and the keeping power of fruits in these gases and in carbonic acid gas was also tested.

An experiment with ripe cherries was carried on for about sixty hours at 30°C., and gave the following result. The average hourly production of carbonic acid reckoned in milligrammes (mg.) per hundred grammes (grm.) of cherries was 14·2 in air, 12·0 in nitrogen, and 11·3 in hydrogen. In this case the fruit was kept in a continuous current of the respective gases. Another experiment was differently arranged, the gases being left undisturbed, except for half an hour twice a day, when they were drawn through the vessels containing the fruit as in the first experiment. Here the amounts of carbonic acid given off are represented by the figures 12·2 in air, 9·9 in nitrogen, and 10·9 in hydrogen. It is seen that in these two experiments the production of carbonic acid in an atmosphere of nitrogen or hydrogen, i.e., in the absence of oxygen, is not far behind that in air, or in other words anaerobic respiration is not much less than aerobic.

Experiments were made with two varieties of ripe grapes and gave the result that respiration was as active in nitrogen and hydrogen as in air, more so in fact in some cases. One of the experiments carried on for 114 hours at 30°C. gave 5·2 mg. of carbonic acid per 100 grammes of fruit per hour in air, 6·2 in nitrogen, and 7·3 in hydrogen. The other experiment (thirty-four hours at 37°C.) gave 9·9 in air, 9·5 in nitrogen, and 10·2 in hydrogen.

The above experiments show that in ripe fruits at 30°C. anaerobic respiration may be as rapid as aerobic, or not much less so.

An experiment was also made with unripe fruit, and this showed a different behaviour. Green peaches, about half grown, gave off 13·4 mg. of carbonic acid per 100 grm. of fruit per hour in air, 6·4 in nitrogen, and 6·1 in hydrogen. Here the anaerobic is only about half the aerobic respiration. The difference between this ratio and those in the previous experiments may be attributed to the presence of growing tissues in the unripe fruit.

Germinating wheat was chosen as another example of actively growing tissue, and gave a similar result to the green peaches in one case namely, 12·8 mg. in air, 6·0 in nitrogen, and 6·5 in hydrogen. In a second experiment there was a much greater difference between the amount of carbonic acid produced in the presence and absence of oxygen, the values being 33·5 mg. in air, 7·8 in nitrogen, and 6·4 in hydrogen.

It appears then from the different experiments that ripe fruit differs from unripe fruit in its respiratory processes, respiration in the former being to a great extent independent of an external supply of oxygen, while in the latter about half the respiration is stopped in the absence of oxygen. This is regarded as indicating that respiration in ripe fruit is probably maintained for the most part by enzymes which work independently of oxygen, while in unripe fruit the respiration is partly of the same nature, but is as much due to processes dependent on the presence of oxygen. The latter processes may be enzymatic, but it is probable that the direct metabolism of the protoplasm plays a considerable part in them.

A calculation has been made in order to give an idea of the volume of carbonic acid given off in these experiments. The amount produced per hour by 100 grammes of ripe grapes at 30° C. was 5·2 mg. This would measure about 2·9 cubic centimetres, and the grapes at this rate would give off a volume of carbonic acid equal to their own bulk in about 32·6 hours, while the cherries in the first experiment would produce a corresponding amount in 11·8 hours.

Other experiments were made on the keeping quality of fruits in air and in other gases. In one case apples of one variety were placed in jars of air, nitrogen and hydrogen, and left for thirteen days. In each jar some apples were fairly ripe, and others somewhat green. At the end of the experiment the apples in air were in very good condition, while those in nitrogen and hydrogen had lost their red colour, and had turned brown, both their appearance and flavour being much as in half-baked apples. This effect in nitrogen and hydrogen was shown not to be due to micro-organisms, but to the anaerobic respiration of the fruit. This shows the necessity of aeration when apples are kept for a considerable time at the temperature of the experiment, which was 21° to 23° C.

Another experiment was made with peaches, and it was found that they became brownish and acquired a bad flavour in the absence of oxygen, and that the softening of hard, unripe specimens was greatly decreased in carbonic acid, and to a considerable extent in nitrogen and hydrogen, as compared with air.

In two experiments referred to above it was found that ripe cherries respired much more rapidly than ripe grapes in the ratio of 14·2 to 5·2. In view of the better keeping properties of grapes as compared with cherries, it is suggested that the rate of evolution of carbonic acid may be more or less proportional to the rate of spoiling of ripe fruit, and this may also be proportional to the enzyme content of the fruit, since the processes concerned are probably chiefly due to the action of enzymes. Hence, if the factors controlling the production of enzymes were sufficiently understood, additional means might perhaps be found for improving the keeping quality of fruit.

*The footnotes in the original (see *Kew Bulletin of Miscellaneous Information*, No. 1, 1914) have been omitted.—Ed.

†See Bulletin 330, Cornell University Agricultural Experiment Station.

GREEN DRESSINGS.

EXPERIENCE IN JAVA.

Trials with green dressings have been conducted in Buitenzorg, Java, during the past four years, and the following extracts from a translation appearing in the *Kew Bulletin of Miscellaneous Information* (No. 1, 1914) should prove of particular interest to readers who are connected with orchard cultivation in the Tropics:—

Leucaena glauca, Benth. This is one of the oldest manurial plants under trial: it has been used about six years in the gardens and it still gives great satisfaction. The Leucaena or Lamotoro can be used in different ways, the growth should be kept in check according to the plants cultivated. In young coffee plantations it should be kept down, but it may be grown higher underneath Hevea, Ficus, and Cocoa-nut palms. Lamotoro requires fairly good soil: it does not grow much more than 6 inches and looks very sickly in poor soil.

In West Java the growth is not as vigorous as it is in the East and in Middle-Java. Lamotoro may be planted from sea-level up to 3,500 feet. It was noticed that seeds germinated better and grew more quickly, when they were sown at the end of the East monsoon, than did those which were sown in the full rainy season. Lamotoro produces plenty of seed, but it soon loses its capacity for germination. One cannot count upon more than 50 per cent. germination after the seed has been kept for four or five months. The seed may be sown in lines as well as scattered in the plantation. In Coffee and Hevea plantations it is advisable to sow the seed at once in broad bands between the trees. The seed will germinate in about a week's time. As long as the soil remains uncovered, weeding about every three or four weeks will be needed. Pruning can be done at intervals of three or five months. The Leucaena is not much attacked by blight or fungi, and will also grow fairly well in half shade. One of the faults of this plant is that the leaves do not last long; the fine leaflets decay after a few days and only the branches and leaf stems remain.

For this reason the Lamotoro is not very effective as a covering for the soil, and it does not protect the plants among which it may be growing against drought as well as does *Clitoria cajanifolia*, the next plant to be described.

Clitoria cajanifolia, Barth. This plant grows best below 2,000 feet and is one of the best for covering the soil; it is also much used to plant on terraces to prevent the soil from washing away. It lives long and stands cutting very well. In plantations, where it has been sown for three years, it does not seem to die away or lose its vitality. One great advantage of this plant is, that when it has been cut down, it spreads itself over the ground. The sowing is rather troublesome, as the seeds are very sticky and adhere to the fingers. The seed should be sown in lines, half a pod in each hole, and they should not be washed before sowing, because they do not germinate very well after washing. The quickest way in which a piece of ground may be covered is by sowing the seed in lines from 6 to 12 inches apart; after about four months the soil will be covered and the plants can then be cut over every four or five months.

Clitoria is recommended for planting in Hevea and Coffee Plantations. One great advantage of this plant is, that the leaves are tough and last a long time. If the leaves be cut in the dry season and laid round the Coffee plants and Hevea trees, they will last a long time and the plants will not suffer much from drought; the plants also frequently put out a crop of fresh leaves when they have been cut over.

Clitoria like Lamotoro does not suffer from insect pests or fungal diseases.

A further point in favour of this plant is that neither the leaves nor seeds are eaten by human beings or animals.

Before proceeding to a description of the results obtained with the species dealt with below, a few notes are presented in the article with regard to *Tephrosia* spp. It is stated that the great value of the Tephrosias, apart from their other good qualities, is that they do better in soil of poor quality than Leucaena or Clitoria. Although *T. Hookeriana*, Wight and Arn., var. *amoena*, Prain (often wrongly called *T. purpurea*) has given good results at high altitudes, the most useful species has been found to be *T. candida*, which agrees with West Indian experience. To continue with the extracts we come to—

Desmodium gyroides, D.C. This plant is the most valuable of the many species of Desmodium known to us at present. It grows in bushy form and produces many leaves; it can also be cut to any height, and lives a long time. *D. gyroides* is to be found in the neighbourhood of Plaboeanratoe, up to 2,500 feet. It produces a quantity of seed, which is very small, and is therefore advisable to sow it in lines. The seed will germinate in about a fortnight. One drawback to the use of this plant, however, is that often many of the young plants die shortly after they appear above the ground for some reason which has not yet been satisfactorily explained.

This Desmodium is considered to be a very good manurial plant for coffee and Hevea plantations, since it produces numerous leaves, which form a fairly thick humus layer. It does not suffer from any disease; the only fault to be found with it is, that some of the plants, after being pruned a couple of times, may be attacked by *Corticium salmonicolor*. If the injured plants be removed immediately, however, there is no fear of any harm being done to the cultivated plants.

Indigofera Anil, Linn. This plant is of a bushy habit. The seed is very small, and is sown in lines 18 inches to 2 feet apart; it will germinate in about seven to nine days. When first the seedlings show above ground it is almost impossible to weed amongst them, but after a month to a month and a half the difference between plants and weeds becomes sufficiently distinct for the weeds to be identified. The plantation will be covered with a dense growth after three or four months, and the plants can be cut back after six or seven months.

The plant lives about two and a half years.

Another Indigofera (*I. hirsuta*) has also been tried, but it does not live so long as *I. Anil*, and as it can only be cut once, it has not proved as useful as that species.

It is stated in Bulletin No. 18 of the Department of Agriculture, Federated Malay States, that considerable interest was aroused lately as to the possibility of growing indigo (*Indigifera arrecta*) as a catch crop among rubber. On some areas the plant has grown satisfactorily. In view of the quite recent revival of the demand for indigo, the idea of growing the plant as a cover crop seems to be worth consideration in the Tropics generally.

COTTON.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liv ·ol, write as follows, under date March 10, with re nce to the sales of West Indian Sea Island cotton

Since our last report about 260 bales of West Indian Sea Island cotton have been sold; these include St. Kitts 19*d.* to 20*d.*, Nevis 16¼*d.* to 21*d.*, Montserrat 16*d.* to 17*d.* Barbados, 19*d.* to 20*d.*, and Antigua, 18½*d.* to 21*d.*

These sales have been confined to the higher prices, Extra Fine being in good demand, whereas the coarser varieties are very unsaleable, particularly anything below 17*d.*, owing to the competition of the finer Egyptians.

The report of Messrs. Henry W. Frost & Co. on Sea Island cotton in the Southern States, for the week ending March 7, is as follows:—

There was some demand this week resulting in sales of 167 bales. With these 167 bales and two crop lots sold but not yet shipped there are about 250 bales awaiting shipment, and when included in the exports will leave a stock of about 450 bales, of which about 200 bales class Fine to Fully Fine, the reminder being crop lots held at 30c. and upwards

We quote, viz:—

Extra Fine	26c.	= 14¾*d.*	c.i.f., & 5 per cent.
Fully Fine	24c.	= 13¾*d.*	,, ,, ,, ,,
Fine	23c.	= 13¼*d.*	,, ,, ,, ,,

This report shows that the total exports of Sea Island cotton from the United States to Liverpool, Manchester and Havre, up to March 7, 1914, were 3,328 bales, 6,435 bales, and 4,026 bales, respectively.

WEST AFRICAN COTTON.

The British Cotton Growing Association states that the most recent reports from Lagos indicate that, whilst there is a larger acreage under cotton than last year, the crop seems to have suffered a set-back in some districts through severe harmattan winds, but it is still considered probable that the crop will show an increase over last year. The purchases of cotton in Lagos to the end of February were 2,480 bales, as compared with 3,016 bales for the same period of last year and 2,072 bales for 1912.

In Northern Nigeria large quantities of cotton have been grown in the Zaria District, but the demand for the native manufacturing industry is considerable, and it is estimated that 40 to 50 bales per day are being purchased for transport to Kano for the local spinning and weaving industry. It is a well-known fact that for centuries past a large local manufacturing industry has been established in Northern Nigeria, but there is reason to believe that as the railway advances and the country is opened up to trade, imported goods will replace those which are now being made in such primitive fashion locally. The prospects in the Lokoja and Bassa Provinces of Northern Nigeria are, however, exceedingly good, and these districts will, it is anticipated, make up for any decrease which may be experienced elsewhere.

It is reported in the *South Wales Daily News* (February 21, 1914) that the cotton cultivation experiments recently made in Sierra Leone have given satisfactory results. Two varieties were tried: West Indian Sea Island cotton and Cambodia from Southern India. It is stated that the Sea Island cotton has grown well, but before this can be accepted as true, reference should be made to the official publications of the department. It is pointed out that the Director of Agriculture is of opinion that the possibilities of cotton growing in Sierra Leone will be greatly enhanced by a more general practice of early sowing.

LIVE STOCK NOTES.

THE TICK PROBLEM IN NEW SOUTH WALES.

The object of the work against the cattle tick is to eradicate it from New South Wales, or, failing that, to confine it to its present areas, and to prevent the introduction of tick fever into the State. The tick concerned is *Boophilus* (Margaropus) *australis*. Its natural hosts are cattle, on which it thrives best, but it also attaches itself to horses, sheep and other animals. The life-history of the tick is given in a pamphlet published by the Chief Inspector of Stock. The eggs are extremely resistant to cold; they are laid on the ground in summer or winter. The larval ticks attach themselves to blades of grass and lie in wait for passing cattle. Having gained its host, in a week the larva casts its skin and emerges as an eight-legged nymph; a week later it moults again and emerges as a sexually mature adult.

The result of tick-bites upon the animal is what is known as tick worry, which must be distinguished from tick fever, the former being due to the mechanical irritation caused by the ticks, and to loss of blood. Tick fever is caused by minute parasites, *Piroplasma bigeminum*, which destroy the red blood corpuscles. They are taken up by the tick when it sucks blood, and when the egg laid by such a tick hatches out, the tick arising from it is capable of transmitting the parasite to any cattle to which it may fix itself.

The methods which have been used to combat the tick consist of dipping and spraying with arsenical dips. Regarding the risk of dipping cattle in such poisonous dips, it is stated that fatalities amongst stock dipped in properly prepared solutions, under good management, seldom exceed 1 in 1,000. Cattle may be safely dipped in or sprayed with an arsenical dip containing an equivalent of 0·24 per cent. arsenic trioxide or less; this is according to experiments made in America. Inoculation against tick fever is not at present practised in New South Wales, as the disease is unknown there.

Figures are given to show the cost of combating the tick in New South Wales. It is stated that £20,000 is spent annually on the erection of dips, establishment of salting stations, appointment of inspectors, maintaining dips, etc. (*The Review of Applied Entomology* [Veterinary] Vol. I, Ser. B. Part 12.)

AGRICULTURAL ENGINEERING.

SUBSOILING IN SOUTHERN INDIA.

The employment of dynamite for soil improvement purposes is becoming more and more general. The following is an account of an interesting demonstration carried out in Southern India and described in the *Planters' Chronicle*, of January 31, 1914:—

Three plots of ½-acre each were treated. In the first two plots a piece of coffee twelve years old was treated. The surface soil was hard, with gravel. A pit dug at the bottom of the plot showed a layer of boulders about 2 feet deep, below this a layer of quartz, while at 4 feet the red clay was reached.

In another pit about half the way up, the red clay was reached at 3 feet. A cutting further along shows the bed of clay for 10 feet and it had not then reached the bottom. During the drilling of the holes this clay was reached at various points at varying depths, the shallowest being about 1 foot.

The third plot in another place was in a somewhat typical heavy red clay. The coffee here was very bad. This type of land occurs in patches all along these hills. The shade grows, but the coffee will not.

In plot 1 the charges were placed 10 feet × 10 feet two rows full cartridges, three rows half cartridges. Depth of hole 2 feet. In plot 2, the charges were placed 15 feet × 15 feet two rows half cartridges and three rows full cartridges. Depth of hole 2 feet. In plot 3, the cartridges were placed 12 feet × 12 feet all full cartridges, and the holes 3 feet deep. The explosive used was Nobel's Gelignite, slightly more powerful and more expensive than the Farmer's dynamite which is now being imported especially for this work.

Before lighting the fuse, the end of the fuse was opened to the powder and a small piece of Gelignite inserted, this enabled the fuse to be fired by merely touching it with a lighted cigarette. After the charges had all been fired Mr. McQueen pointed out that with the half cartridge at 2 feet depth the surface soil was not much displaced. This was as it should be, the force of the explosion was all expended in the soil. The full cartridges at 2 feet deep displaced the surface soil to some extent, showing a waste of force above ground. The full cartridge at 3 feet deep appeared very effective. The shock could be felt 30 and 40 yards away, but the surface soil was not displaced.

To demonstrate the fallacy that dynamite strikes downwards, whereas it really takes the line of least resistance, Mr. McQueen placed a cartridge on the road and covered it with a kerosene oil tin. The road was hardly marked but the tin has not been seen again. A trial hole was also bored in a road, 2 feet deep. A full cartridge inserted and fired. The cracks could be traced on this hard surface for 3 feet 6 in.

A tree stump was also blasted. Owing to coolies having used the wood augurs as earth augurs at a previous demonstration it was impossible to bore into the tap-root to a sufficient depth. The tree was a dead gall nut, and very hard. Holes were bored as nearly below the tap-root as could be guessed and the charge fired by electricity. One side of the tree was torn out and a piece weighing over 1 cwt. thrown clear over the coffee on to a road about 15 yards away.

Later in the evening nine and a half cartridges were placed on a block of ironstone measuring about 3 feet × 4 feet × 6 feet, total 72 cubic feet. These were covered with wet clay and the whole fired off together. The stone was cracked from top to bottom and several transverse cracks also made.

STEAM PLOUGHING IN BOMBAY.

A paper on the above subject, which appeared in Bulletin No. 54, Bombay Department of Agriculture, is abstracted in the *Experiment Station Record* as follows:—

This bulletin deals with mechanical ploughing outfits as regards their adoption in the Bombay Presidency. Detailed descriptions and sketches are given of five general systems, viz., (1) the direct traction system; (2) direct cable-drawn implements on the double engine system; (3) indirect cable-drawn implements on the roundabout system with a traction engine fitted with winding drums; (4) indirect cable-drawn implements but with a portable engine driving a separate windlass; and (5) direct cable-drawn implements worked with bullock geared windlasses. The various conditions of soil, vegetation, and atmosphere in the Bombay Presidency are described as favourable to the profitable application of mechanical cultivation, particularly for the eradication of hariali grass, for which it is necessary to turn up the soil to a depth of at least 16 inches. A badly infested area of 14 acres was ploughed 14 to 16 inches deep. The work was started in January and finished in April, and by August the crop was looking remarkably well and the hariali grass was practically extinct.

From various service tests and operations statements of the advantages and disadvantages of each system are made with estimates of the capital outlay, the annual working expenses, and the cost per acre ploughed for each system. The total capital outlay for an outfit of the first class, consisting of an 80 h.p. engine, balance plough, cultivator, and harrow, is estimated at 21,300 rupees (about $6,900 . and the annual working expenses at 8,650 rupees. With this outfit ploughing by direct traction it is not possible to plough to a depth of more than 8 or 9 inches in black cotton soil, but it is estimated that with two shifts of men this engine will plough 8 acres per day of fourteen hours to a depth of 8 inches at an average cost per acre of 8 rupees and 5 annas (about $2·60).

The total capital outlay for an outfit of the second type, consisting of two 80 h.p. engines, plough, cultivator, and harrow, is estimated at 40,500 rupees, and the annual working expenses at 15,125 rupees. It is estimated that this outfit with two shifts of men will plough in black cotton soil 8 acres per day to a depth of from 16 to 18 inches at an average cost per acre of 14 rupees and 8 annas. When ploughing at a depth of 8 or 9 inches with this outfit the cost per acre is estimated at 5 rupees and 13 annas (about $1·90).

For an outfit of the third type, consisting of one 80 h.p. engine and other equipment, the total capital outlay is estimated at 28,800 rupees, and the annual working expenses at 9,986 rupees. It is estimated that with two shifts of men this outfit will plough 6 acres per day to a depth of from 16 to 18 inches at an average cost per acre of 14 rupees.

The total capital outlay for a small outfit of the fourth type of the cheapest possible construction, consisting of one 18 h.p. engine and other equipment, is estimated at 12,150 rupees, and the annual expenses at 3,867 rupees. It is estimated that with two shifts of men this outfit will plough 1 to 1½ acres per day, to a depth of from 16 to 18 inches at an average cost per acre of 28 rupees and 4 annas.

For an outfit of the fifth type the total capital outlay is estimated at 3,196 rupees and the annual working expenses at 1,452 rupees. It is estimated that this outfit will plough ¼-acre per day of black cotton soil to a depth of from 16 to 18 inches and can be worked 150 days in one year, ploughing 37¼ acres at an average of 39 rupees per acre.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

Local Agents: Advocate Co., Ltd., Broad St., Bridgetown. *London Agents*: Messrs. Dulau & Co., 37, Soho Square, W.; West India Committee, Seething Lane, E.C. The complete list of Agents will be found on page 3 of the cover.

The *Agricultural News:* Price 1*d.* per number, post free 2*d.* Annual subscription payable to Agents, 22*s. d.* Post free, 4*s.* 4*d.*

Agricultural News

Vol. XIII. SATURDAY, MARCH 28, 1914. No. 311.

NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number deals with the control of bovine tuberculosis in the West Indies with special reference to safeguarding the public milk supply.

On page 99, a review is presented of the results of the sugar-cane experiments in the Leeward Islands, 1912-13.

The first instalment of an article on cold storage of fruits and vegetables appears on page 100.

On page 101 an account is given of several kinds of green dressings that have been tried with success amongst orchard crops in Java.

Agricultural engineering notes deal with subsoiling by dynamite in Southern India, and steam ploughing in Bombay.

The eradication of mosquitoes by the cultivation of bats is treated under the caption Insect Notes, on page 106.

The Annual Report on the Botanic Station, Montserrat, 1912-13, is reviewed on page 107.

Several important books bearing upon tropical agriculture receive notices on page 109.

Under Fungus Notes will be found a concise account of different diseases of the sweet potato.

Agricultural Show, Montserrat, 1914.

The Curator of the Botanic Station, Montserrat, has just forwarded a report to the effect that the annual Agricultural Show was held on March 11, and was decidedly successful. At this show there was an increase in the number of exhibits over those shown the previous year, in every class excepting cotton. The figures as regards number of exhibits for the past four years are as follows: 1911, 370; 1912, 890; 1913, 546; 1914, 803.

The most marked improvement this year was seen in the class for stock. Of other classes, the vegetables were somewhat poor, but it has to be remembered that the quality of these exhibits depends to a large extent upon the state of the weather previous to the opening of the exhibition. This year it was not very favourable.

The show was opened by His Honour the Commissioner, Montserrat (Colonel Davidson-Houston, C.M.G.), and prizes were distributed by Mrs. Davidson Houston.

Density of Population in the Tropics.

The agricultural development of tropical countries is so very closely associated with labour supply that it has been considered instructive to publish the following population statistics* which have been compiled from various sources, chiefly the most recent *Colonial Reports*. The Colonies are arranged in order of the density of population per square mile:—

Colony.	Area in sq. miles.	Population.	Population per sq. mile.
(1) Barbados	166	171;893	1,036
(2) Mauritius	720	368,791	512
(3) Windward Islands	497	157,700	317
(4) Jamaica	4,450	831,383	187
(5) Trinidad and Tobago	1,895	333,552	176
(6) Leeward Islands	729	127,050	175
(7) Ceylon	25,481	4,110,367	161
(8) Nigeria (Southern Provinces)	80,800	8,000,000	100
(9) F. M. S.	27,506	1,036,999	38
(10) Nigeria (Northern Provinces)	256,000	9,000,000	35
(11) Uganda	121,437	2,893,494	24
(12) Fiji	7,435	148,891	20
(13) British Honduras	8,598	40,458	5
(14) British Guiana	90,277	299,044	3

It is interesting to observe the high position occupied in the table of the West Indian islands. Although as pointed out recently in a Colonial Report, the area of Fiji is greater than that of Jamaica, Trinidad and Tobago, the Windward and Leeward Islands and Barbados put together, it has to be borne in mind that the density of population in these two groups of Pacific and Atlantic islands is respectively 20 and 378.

* These figures are only approximately comparable as they are not all based upon the same year's census.

West Indian Fibres and Rubber.

The Report on the work of the Imperial Institute, 1912, contains information of considerable interest in the West Indies. A few facts are herewith abstracted. During the year a sample of *Agave americana* fibre from Antigua exhibited remarkable elasticity, elongating 30 to 40 per cent. of its original length before breaking, and for this reason, commercial experts stated that it would be of special value for the manufacture of towing ropes.

The investigation of the constituents of West Indian satin wood (*Zanthoxylum flavum*) was completed. Two crystalline substances and a number of resins were obtained by extracting the sawdust successively with light petroleum and alcohol.

From the Bahamas a consignment of two-year-old stems of *Cryptostegia grandiflora* were received and found to contain only 0·6 per cent. caoutchouc, and it was considered very doubtful if extraction of the rubber by solvents would pay. Para rubber from Dominica contained 93·9 per cent. caoutchouc and was valued at 4*s.* 10*d.* per lb. with fine hard Para at 4*s.* 4½*d.* A sample of *Hevea confusa* from British Guiana contained 92·3 per cent. of caoutchouc and only 1·8 per cent. of resin, but was deficient in physical properties. It was valued at 4*s.* per lb. in London with fine hard Para at 4*s.* 8*d.* per lb.

Agricultural Progress in Dominica.

A copy has just been received of an address by the Acting Administrator at a meeting of the Legislative Council, Dominica, held on March 9, 1914. Those portions of the address which concern agricultural development are herewith abstracted.

The value of the imports into Dominica has risen from £148,977 in 1912 to £157,121 in 1913, whilst the exports have risen from £142,373 to £174,305. To some extent the increase is due to the adoption of a new method of assessing values: but the main cause is the increase in the production of limes and lime products, combined with the high prices which ruled for these commodities. Calculated in barrels of fruit, the crop for 1913 amounted to 391,157 barrels—an increase of 21,157 barrels over the crop of 1912. The trade in green limes continues to expand. The number of barrels of fruit shipped was 43,832—an increase of the shipments during 1912 of 6,794 barrels. The satisfactory returns per acre have been almost as great as the prices, and the steady planting of lime seedlings continues, it being estimated that about 300 acres are established each year.

Whereas the exports of cacao have shown a decrease, there is every indication that the production of coco-nuts, vanilla and grape fruit for export will rapidly expand. In general, agricultural progress in Dominica during 1913 may be said to have been eminently satisfactory, principally on account of the high prices ruling for lime products; and in future years, even though these prices may not always retain their present high level, the development of important minor industries is bound to ensure a continuation of the Colony's advancement.

Selection of Lands for Plantations in the Tropics.

A German writer has recently endeavoured to arrange and classify the various factors which should be considered in selecting land for planting purposes in the Tropics. It is pointed out first that the capability of land as regards cultivation is determined in the first place by climatic conditions: within the limit set by climate, the soil with its ecological and geological factors becomes the decisive consideration.

As regards the analysis of soils with a view to an aid to selection, the writer gives a form for presenting the results of mechanical analysis together with the depth to which samples should be taken. The results when expressed by the arrangement referred to present a thorough description not only of the nature but the extent and the economic value of the soil. For instance, such matters as the depth at which rubble is met with, the level of the water table and the price or rent of the land are included.

In the chemical analysis of the soil, the first step is the investigation of the lime content. In general, the writer believes that a tropical soil may be considered good and suitable for a plantation from the point of view of its capital in fertilizing substances, when it contains: (soluble in cold hydrochloric acid) lime + magnesia, 0·2 to 0·5 per cent.; potash, phosphorous oxide, nitrogen, 0·1 per cent. respectively. A form for chemical analysis of tropical soils is given. This together with the one already referred to in connexion with the mechanical analysis is reproduced in the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases* (January 1914) from which the information in this note has been abstracted.

The determination of the absorbent power of the soil is important, especially in connexion with the prevalence in the Tropics of red and yellow soils possessing a marked power of absorbing ammoniacal nitrogen, and with the abundance of nitrogen in the rainfall of the Tropics; thus a yearly rainfall of 120 inches brings down about 72 lb. of nitrogen to the acre. The amount of nitrogen therefore brought down in certain parts of Assam, for instance, which is the wettest part in the world, and where the rainfall is over 900 inches per annum, would be very considerable.

Turning to special crops, the kind of soils best suited to the various tropical plants are described; with this information most planters will be familiar, though those who are not acquainted with the general soil requirements of the principal tropical crops will do well to examine carefully the paper from which this information has been obtained.

The following are among some of the chief crops dealt with: cacao, coffee, nutmegs, vanilla, sisal hemp, cotton, coco-nuts, oil and other palms, bananas, tobacco, and provision crops. The employment of manures in relation to the soils suited to the above crops is discussed.

INSECT NOTES.

THE ERADICATION OF MOSQUITOES BY THE CULTIVATION OF BATS.

A very brief reference to this article was made in a recent number of the *Agricultural News* (see page 31 of the current volume) under the heading Economic Value of the Bat. The subject of mosquito control seems to be of sufficient importance for a more extended account, which is presented herewith. The conditions which exist in certain of the West Indian islands are such that it is likely that artificial bat roosts would not be of any great value, but in others they might be found useful in increasing the numbers of an enemy of mosquitoes that does not appear to have been taken into account to any great extent in these colonies. The value of the guano which must be thus obtained would seem to be sufficient to cover the expense involved; if not indeed to yield a substantial profit.

An interesting communication under the title which appears above was reviewed in the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases*, August 1913. The author of the article is Dr. Chas. A. R. Campbell, San Antonio, Texas, U.S.A. The following notes are abstracted from the review.

The writer refers to the general nature of the relationship of the mosquito to the development of the malarial parasite and its dissemination in man, and to the estimate of Dr. L. O. Howard, Chief Entomologist of the United States Department of Agriculture, which is considered a conservative one, that the United States pays an annual tribute to malaria amounting to one hundred million dollars.

The bat is stated to be the greatest natural enemy of mosquitoes. In order to ascertain what proportion of the food of bats, mosquitoes formed, the writer utilized a small hunter's cabin where the bats congregated. He spread a white sheet on the floor, after stuffing with rags all roosting places except directly above the sheet. The bats were counted as they came in the morning, checked by counting after they were at roost, and again as they went out in the evening. This was repeated three times on consecutive days, and the guano carefully collected and examined with the result that it was found that each bat dropped twenty-six pieces of guano each day, from morning to evening at a time of year (November) when mosquitoes were comparatively scarce: the number of droppings per day of twenty-four hours was estimated at fifty. Careful examination of the droppings resulted in the opinion being formed that in each of these they were the remains of ten mosquitoes, thus indicating that the food of one bat for the day included some 500 mosquitoes and these comprised, on an average, 90 per cent. of the food of the bat.

The author after extended observation estimated that the natural bat roosts contain a population of at least 500,000 bats per roost.

The commercial value of the guano produced in such a roost is estimated at $600 per year.

Dr. Campbell, believing that from a hygienic point of view alone it would be profitable to afford protection to bats in any mosquito infested district, experimented with different styles of structures to provide artificial roosting places for these animals, and realizing at the same time that such a practice would be more likely to be adopted if it were financially profitable, he made the estimate given above, and in addition found that an artificial roost with accommodation for 500,000 bats would cost, at the very outside, $1,200.

As a result of these experiments 'Dr. Campbell's Hygiostatic Guano-Producing Bat Roost' was built. The structure described in the article under consideration was intended as a model, but it has proved to be much more than that.

The structure itself is 20 feet high, 12 feet square at the bottom and 6 feet square at the top, erected on four posts which raise it 10 feet from the ground. On the posts are contrivances for preventing enemies of the bats from gaining access to the roost. The bottom of the structure is built as a large hopper under which a waggon can be placed, to facilitate the collection of the guano.

The principal enemies of the bats are the racoon (*Procyon lotor*), opossums, skunks, wild cats, civet cats (*Viverra civetta*), and chicken snakes (*Coluber quadrivittatus*).

The inner construction of the roost (which is of course the most vital) is based on lines, after long and careful study, entirely in harmony with the most singular habits of the bats. When finished the inside was sprayed with a chemical solution possessing an odour identical with that of the bats and 25lb. *fresh* guano was placed in the hopper at the bottom.

The roost was completed in April, 1911. It was situated on the shore of a large body of fresh water, estimated at 900 acres in area, which receives an influx of about 10,000,000 gallons per day from the sewerage system of the city of San Antonio.

The lake never overflows, the water being used for irrigation. The huge amount of organic matter in the water, the large pools formed by irrigation on the land, the water left in the laterals, the receding water left in the lake when used largely, and the large pools formed by seepage outside the earthern dams are the conditions which tend to make this an ideal breeding place for mosquitoes and one where the conditions of mosquito control are extremely difficult.

The bat roost was completed, as already stated, in April 1911. In August of the same year it was found to be tenanted by a colony of bats estimated to number several hundred from the fact that it took them, flying in a constant stream, fully twenty minutes to come out. During 1912, the colony had so increased in numbers that several hours were required for the bats to emerge from the roost in the evening

In 1913, a careful and extended investigation into the mosquito conditions in the vicinity of the lake revealed the fact that these insects were much less abundant than formerly.

The following is the conclusion and summary of the paper:—

'1. That the mosquito is unquestionably one of man's most formidable enemies, not only *per se* but also by the subtle role he plays in transmitting disease-producing bacteria.

2. That the mosquito may be considered as a good food for the bat.

3. That we can build a home for the bat where it will be protected from his enemies, and propagate in countless numbers, at the same time protecting us, by improving our hygienic conditions.

4. That the commercial feature in the propagation of bats will ensure its adoption, the hygienic benefits that follow will protect the community in which they are erected, especially the poorer classes who know nothing of the dangers of mosquitoes or the use of screens, and amongst whom we find the most sickness.

5. That when we propagate this most useful creature, he not only destroys the disease-producing mosquito that serves it as food, but it actually converts that most malevolent of insects into a high grade fertilizer.'

THE PRESERVATION OF WOOD.

This subject has been discussed from the industrial aspect recently at a meeting of the Royal Society of Arts. A paper on the subject was published in the journal of the society for February 20, 1914. It is explained that wood consists essentially of vessels and cells, the only solid parts being the coats which form them. In the vessel is the sap circulating during life, but on the death of the tree the sap decomposes and is likely to cause decomposition of the hard structure. The most common causes of decay are alternating conditions of wetness and dryness, heat and cold and the absence of ventilation. There are two kinds of decay distinguished as wet rot and dry rot. The former occurs while the tree is standing; the latter takes place only in dead wood and is principally caused by fungi and boring insects.

After giving an interesting account of the different views which are held in regard to the manner in which timber is able to absorb preservatives, the author proceeds to discuss the various processes employed for preserving wood. First of all the bichloride of mercury process or 'kianizing' is described, which consists in steeping or soaking the wood in a solution of bichloride of mercury or corrosive sublimate-the solution generally used, consisting of 1 lb. of the salt to 99 lb. of water. The next process described is the zinc chloride treatment. This consists in principle, in the destruction of the tendency possessed by certain vegetable and animal substances to decay. by subjecting them to the action of chloride of zinc. As in the case of creasoting, to be described later, this treatment is generally carried on under pressure. The zinc tannin process, dealt with next, is described as a treatment of the wood with steam sufficient to open the pores and expel the natural sap followed by a vacuum requisite for the withdrawal of the vapours and condensed steam. The antiseptic agent used in this process consists of a solution of zinc chloride and tannin. Perhaps the most common way of treating wood with a view to prolonging its life is by means of the dead oil of tar process, or, as it is more commonly called, creasoting. In this process the wood for treatment having been carefully dried, is steamed and subjected in a retort to the action of a heated vacuum. The creasote oil is then admitted and the temperature raised slightly above the boiling point of the sap at the pressure in the retort at the time. An important matter during the course of this process seems to be the amount of pressure to which the wood is subjected during impregnation. The reader is referred to the paper acknowledged above for further information in connexion with this process, which, in the paper, is treated at great length.

Of some special interest in the West Indies is the saccharine solution process. The exact composition of the solution used is a secret, but it is stated to consist mainly of sugar with a small percentage of arsenic added, and probably several other ingredients. The value of saccharine solutions for the preservation of wood is said to have been discovered from the fact that the timber of sugar vats is found to be, to all intents and purposes, everlasting. It would seem that a great advantage attending this process is the circumstance that green wood may be satisfactorily treated by it.

Space will not permit reference to the numerous other processes dealt with in the paper, though in concluding this abstract the attention of those particularly interested in the subject may de directed to the section of the paper dealing with natural oils as preservative agents, and to the tables showing absorption capacities and the cost of carrying out the various processes.

MONTSERRAT: REPORT ON THE BOTANIC STATION, 1912-13.

During the year under review the weather was some what dry in Montserrat which limited to a considerabl extent the yields of the principal crops, particularly cotton. The amount of lint shipped during the 1912-13 season was 290,390 lb valued at £18,478. This shows a falling off from the 1911-12 figures which were 544,607 lb., value £38,692. The average yield of cotton for the island was approximately 142 lb. of lint per acre. In regard to limes, 231,700 gallons of raw juice were exported during the year compared with an average output of 237,028 gallons for the previous seven years. Muscovado sugar was shipped to the value of about £2,000. As regards the minor industries progress has been made in regard to the exports of papain, bay oil and onions.

Turning to the experimental work conducted at the Botanic Station, the report shows that this has consisted principally of selection work with cotton, miscellaneous investigations in regard to the bay tree and provision crops, together with the numerous observations concerning insect pests and their control. The selection work with cotton has been continued and has again been productive of benefit to the growers of this crop in the island. Heaton No. 9 can now be recommended as a variety suitable for general cultivation. In connexion with the quality of lint, some tests were made to find out whether any definite differences occurred between the quality of first crop lint and the quality of the second. A commercial valuation of samples in London showed that the second crop lint was undoubtedly inferior to the first. Of much interest among the observations dealing with cotton is the explanation of what has been called gin cutting. This effect has been found to be due to an imperfect stationary knife in the Montserrat ginneries, and there should be no reason now for preventing the occurrence of this defect in future.

Considerable attention has been given in Montserrat, in an experimental way, to Egyptian varieties of cotton. Sakellarides has again been found to grow vigorously but a disadvantage attaching to its cultivation in the island is the readiness with which the bolls are shed, thereby necessitating a large number of pickings. The Egyptian varieties, Abassi and Mitafifi, were for the first time tried during the year under review. They gave a rather lower yield than Sakellarides. Work with cotton hybrids has been continued, the object in this work being to produce a desirable cross between St. Eustatius native and Sea Island stains. Cotton manurial experiments were continued during the year.

In regard to the experimental work with crops other than cotton, reference may be made to the cultivation experiments with lime trees; to the study of bay trees in regard to the yield of oil, the time of reaping and differences in oil from selected trees; and to the experiments with sweet potatoes in connexion with early maturity and planting from vines *versus* setts. As usual trials with ground nuts have been continued and the Gambia variety has been found best suited to conditions obtaining in Montserrat.

GLEANINGS.

In Montserrat 3,000 lime plants were planted during February, and more seeds sown. Lime plants to the number of 16,000 are on order. Two thousand more bay plants were set out in boxes.

The cacao crop of St. Lucia is this year likely to be short. The lime trees are flowering and setting fruit, but the high winds early in the month were somewhat unfavourable. The crushing of cane is in course of operation.

Der Tropenpflanzer for February 1914 contains a history of the growth in size and influence of the United Fruit Company, especially in relation to Costa Rica, and statistics are given as to the growth of the company's holdings in land.

The Board of Trade Journal (February 19, 1914) states that the exports of cacao from the Gold Coast in 1913 amounted to 113,007,823 lb. valued at £2,489,208, as compared with 86,568,481 lb. valued at £1,642,734. in 1912.

In Antigua, the reaping of the cane crop commenced during February, and during the month the reaping of the cotton crop was fairly general throughout the island. It is expected that the return per acre from the cotton crop will fall short of that obtained last year.

Work in the Botanic Gardens, Dominica, during February, consisted principally in the tapping and preparation of Para rubber, together with the usual transplanting and other nursery work. A further series of experiments in the use of dynamite for soil improvement was carried out on Government land on February 6.

According to *The Board of Trade Journal* (February 19, 1914), the total exports of palm oil from Southern Nigeria in 1913 amounted to 1,661,781 cwt., as compared with 1,539,883 cwt. in 1912. The exports of palm kernels in 1913 amounted to 174,661 tons as against 184,625 tons in the previous year.

The Basseterre Central Sugar Factory began operations on March 2. The prospects are about the same as last season. In the northern district reaping has begun on the muscovado estates. The young cane crop, where planted early, looks well and healthy; but on fields where cotton was planted previously the canes are not as yet established.

The condition of the lime industry in Dominica is reported to be satisfactory. The limes are flowering heavily and the green lime crop is commencing. The prices unpacked in Roseau are as high as 20s. per barrel. Writing at the end of February, the Curator of the Botanic Gardens stated that already 975 barrels were recently shipped to New York.

As evidence of the way in which inseticides may be misbranded, it may be pointed out that a recent Circular of the United States Department of Agriculture, issued in connexion with the Insecticides Act of 1901, mentions that a package which bore the statement, strictly pure arsenic of lead containing arsenic oxide (As_2O_5), 17·36 per cent., was found, on analysis, to contain only 12·35 per cent. of arsenic oxide. A fine of $25 was inflicted.

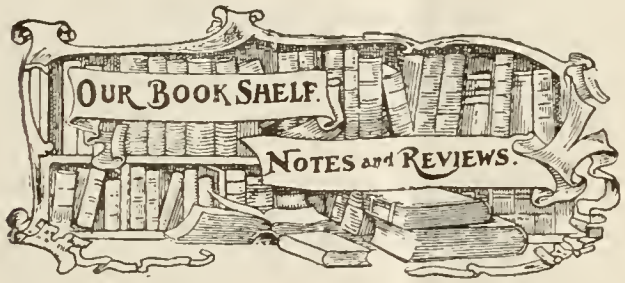
Increased interest is being taken in Antigua in the growing of onions, and some attention has been given by planters to the production of tomatoes for export, and to the production of papain. Work on the extension of the onion drying house has been commenced, and when completed, about 120 crates weekly will be handled. Labourers are being trained in the matter of packing, grading, etc., and a circular of hints has been issued on onion cultivation.

The Board of Trade Journal (February 12, 1914) contains a note on the silk market of Lyons and the world's production and consumption of silk from 1890 to 1913. There has been a steady increase in the annual production during this period: the production in the Far East is still increasing, but the European output is on the down grade. The most interesting fact in regard to consumption is the enormous increase in the United States demand, which is at present about 10,700,000 kilogs. annually, as compared only 2,800,000 kilogs. in 1890.

A copy has just been received of the Flora of Curaçao, Oruba and Bonaire by I. Boldingh. The work has been published in Leiden and is the result of a second voyage to the island of Curaçao, Oruba and Bonaire following a previous one to St. Eustatius, Saba and St. Martin. The subject-matter is in English, and the numerous notes are, from a West Indian point of view, extremely interesting. The book has a list of vernacular names, several plates, including maps of the three islands showing the distribution of the various soil formations.

The Report on the Operations of the Department of Agriculture of the Madras Presidency, 1912-13, contains the administration report of the Government Sugar cane Expert (Dr. C. A. Barber). Readers may be aware of the fact that that in 1912 a special sugar cane station was started in the Presidency. Previous to taking charge Dr. Barber made two extended tours in Northern India. Seedlings to the number of 12,000 to 15,000 were produced in 1912-13; some 2,000 had been selected for further study. The result of the work at this station will be watched with great interest.

The work with sugar-cane varieties in Madras dealt with in the report on the operations of the Department of Agriculture, 1912-13, has included trials with B.147, B.208, Java 247 and Red Mauritius. There are indications that B.147 may prove superior to Red Mauritius. This point will be decided after further trial. It is said that both Java 247 and B.147 require somewhat more attention and care than Red Mauritius canes. It seems that the ryots in the Delta are not particularly given to bestow the necessary attention.



DATE GROWING IN THE OLD AND NEW WORLDS. By Paul B. Popenoe. West India Gardens, California, 1913.

The author of this book of 316 pages has travelled extensively in the Orient with the object of collecting information concerning the culture of the date with the idea of introducing new varieties and the best practices into California.

From the commercial aspect, one of the principal features of date cultivation is the reproduction of the plants by offshoots, it being well recognized that the planting of seedling dates gives rise to results of too uncertain a nature to make the practice advisable. The reader will realize the reason for this when the fact is mentioned that the date palm in North Africa has been subject to natural hybridization for thousands of years. A considerable amount of information is given concerning propagation by offshoots and in regard to the importation into California of this planting material.

It may be said that the culture of the date palm requires less pains and less skill than that of most fruits and that the expense, as will be shown later, of growing it is correspondingly less. It appears that pollination is the only delicate operation to be performed, and the way that this is done in the Orient by climbing the female trees and tying the staminate flowers to the male ones is described in a clear and interesting manner.

Chapters are devoted in the book to the handling of the crop, artificial ripening by means of carbon dioxide, and the diseases and pests of the date palm. In the chapter treating of the last mentioned subject, it is interesting to note that the well known enemy of the coco-nut, the palm borer (*Rhynchoporus ferrugineus*) is a serious enemy of the date palm in India; but it does not yet seem to have been introduced into the United States. The list of the insects which attack the stored fruit are given in this chapter.

One naturally turns with some interest to the chapter on the profits of date growing. In this we are told that taking the average price at 20c. a pound to the grower, with the conservative estimate of 100 lb. per tree and fifty palms to the acre we may calculate on a gross annual return from a well-managed plantation of $1,000 per acre. The last few pages of this chapter comprise a discussion of the relative profits of citrus and date cultivation and the author comes to the conclusion 'that the date grower has the advantage of the citrus grower so far as cost of production is concerned, while his profits on the sale of fruit are much greater.' These remarks of course refer to the irrigated lands of California. For the semi-arid regions it must undoubtedly be the case that a well-organized date plantation must be productive of very remunerative returns. Moreover the great advantage of cultivating the date palm in the semi-tropics is that it is not injured, as citrus plants are, by frost.

A short chapter is given in the book on the food value of the date, and it may be useful to put on record in these columns the following figures of the United States Department of Agriculture, which represent the percentage composition of the dried date: carbohydrates: 70·6 per cent.; protein, 1·9; fat, 2·5; water, 13·8; ash, 1·2; fibre, 10·0.

The longest chapter in the book is reserved to the subject of varieties. This section of the book seems to represent a great deal of labour and should prove of great service and interest to those connected with the establishment or development of date growing in different parts of the world. It will also be interesting to economic botanists generally.

The volume is well printed and remarkably well illustrated with original photographs showing the different characters of the trees and features of cultivation in the Orient and America. In regard to the presentation of the subject-matter, the style might with advantage have been made more concise, and in places the continual reference to oriental superstitions in regard to the date palm become rather wearisome when one is examining the volume for practical information with which it professes to provide.

EVAPORATION IN THE CANE AND THE BEET SUGAR FACTORY. By Edward Koppeschaar. London. Norman Rodger. 1914.

It is stated by the author that the special requirements of those connected with the cane sugar industry in regard to evaporation have been somewhat overlooked by writers on the subject, and an effort has been made in the present volume to discuss the subject in a simpler manner than has hitherto been attempted. The hope is expressed that this will bring the principles of evaporation within the easy reach of a wider circle of those interested.

The book commences with a study of steam and its application to evaporation in general, and to multiple effect evaporation in particular. The historical development of evaporation in the cane and the beet sugar factory are then discussed, including the introduction of evaporation. This is followed by a comparative study of evaporation in the cane and beet sugar factory. The next chapter deals with multiple effect evaporating apparatus including a design of a 1,200 metric tons plant, beet and cane. After treating the subject of the fundamental parts of evaporating apparatus the author goes on to consider the control of the apparatus, and concludes with information concerning special designs and an interesting final chapter on evaporation and crystallization in vacuum pans.

Tables of steam, thermometers and the metric system are given at the end of the book. There is no index, but the subject matter is clearly arranged in short paragraphs which should not make reference difficult. The illustrations and diagrams are exceedingly good, and particularly interesting are the illustrations of old time sugar mills and factory scenes in Brazil, from which country, it will be remembered, the sugar industry was introduced into the West Indies.

Three books of some interest in Tropical Agriculture are advertised in *Current Literature* (February 1914)—All About Coco-nuts, by Messrs. Balfour and Hoyer; A Text Book of Indian Botany, by Lawson adapted by M. Willis; and the Cultivation of the Oil Palm by F. M. Millington.

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An article appears in the *Louisiana Planter and Sugar Manufacturer* (February 14, 1914), which describes with illustrations the central sugar factories in Antigua and St. Kitts.

FUNGUS NOTES.

DISEASES OF SWEET POTATO.

The sweet potato seems to be little troubled by fungus diseases in the West Indies. It is possible that some may have escaped notice or have had their results ascribed to insects, but so far as the writer is aware only the white rust of the leaves due to one or more species of Cystopus, and a certain amount of white mycelium occurring on the roots and attributed to *Marasmius* sp. have attracted attention.

In the United States, the list of diseases appears to be a formidable one, and a number of papers on the subject have lately appeared. In view of the desirability of collecting more information as to sweet potato diseases in these islands, the following summary, compiled from various American sources, of the characteristics of the diseases occurring in that country is given.

FOOT ROT. (*Plenodomus destruens*. Harter).

This disease occurs in Virginia.

Inquiries among farmers make it appear probable that it has increased in severity in the past few years, so that it is likely to prove a serious handicap to the industry.

The first visible sign of the disease is a blackening of the lower part of the stem followed by the yellowing and dying of the lower leaves. The cortex of the stem is turned black from a little below the soil line to 3 to 5 inches above it. Shortly after this has occurred the plant wilts and gradually dies. Pycnidia appear previous to this time on the blackened area, and continue to appear for some time afterwards if sufficient moisture is present. The disease does not occur on the leaves, but it is able to invade and rot the potatoes. It has also been occasionally found, in low wet fields, on the vines several feet from their point of origin.

The disease is due to a fungus described as new under the name of *Plenodomus destruens*; it is closely related to *Diaporthe* [Phomopsis, Phoma] *batatis*, which causes the dry rot of the sweet potato, but differs from it in some morphological characters and has an entirely different habit of growth and parasitism. The pycnidia are at first buried in the substratum, but later break through the epidermis, appearing as black dots scattered over the surface. They are irregular in form and vary greatly in size.

Inoculation experiments from pure cultures were successful with spores and with hyphae when introduced into wounds or smeared on the uninjured stems. Spores suspended in sterile water were poured about ten plants, seven of which died of the disease. Plants at all ages were about equally susceptible.

No ascogenous stage of the disease was found, but it was proved that the disease can persist through the winter on dead vines and that stored potatoes can carry the disease. It would appear that the control of the disease will depend upon careful sanitation and the rotation of crops, combined with strict precautions against the planting of diseased material.

DRY ROT (*Diaporthe batatis*, (E. & H.) Hart. & Fld.).

This disease has been known since 1890 under the name of *Phoma batatae*, but recently the ascogenous stage has been found to belong to Diaporthe, while the pycnidial stage is assigned to Phomopsis. According to the same account the disease is more destructive than is generally supposed, its effects in the field being often attributed to other causes. It causes a rotting of the stems of the vines, but is chiefly known as an affection of the stored tubers. These commence to shrivel from the stem end, and eventually become quite dried up. The pycnidia appear in little pustules over the surface. The disease is mainly distributed by the 'seed' and by the presence of decayed potatoes in manure.

BLACK ROT (*Sphaeronema fimbriatum*, Sacc. [*Ceratocystis fimbriata*, E. & H.]).

This disease produces sunken greenish-black spots or blotches, with olive green tissue below them, on the stems and roots. On the full-grown root these may come to cover practically the whole surface. When uncomplicated by other organisms it remains superficial, but unless the spots are cut out before the potato is cooked they impart a bitter taste to the vegetable. There are several kinds of spores produced: one kind formed similarly to the endoconidia of the pine-apple disease of sugar-cane, another kind which consists of thick-walled unicellular conidia—borne singly, by twos, or in chains—and finally, long-necked pycnidia occur in the diseased spots and extrude minute globular spores in a gelatinous mass.

CHARCOAL ROT (*Sclerotium bataticola*, Taubenhaus).

Until recently this fungus was considered to be a stage of the black rot fungus just described, but has now been determined as distinct. It does not seem to produce surface spots but invades the entire contents of the root, altering the tissue to a charcoal-like mass. The blackening is due to the formation of numerous very minute jet-black sclerotia. The fungus is parasitic in its nature.

JAVA BLACK ROT (*Lasiodiplodia tubericola*, E. & E.).

This fungus appears to have been introduced into the United States from Java. It is an active parasite and causes dark shrivelled patches on the potatoes. Numerous pycnidia are produced, which emit one-septate dark spores, heaped together, or white strings of unincellular hyaline spores. The fungus attacks the interior tissues from the point and turns them jet-black. Infected roots dry and shrivel and become brittle.

SOIL ROT (*Acrocystis batatae*, E. & H.).

This is reported to be one of the most serious of the diseases of sweet potato, sometimes causing almost total loss of crop. It is strictly a field disease, affecting the roots at an early stage. Growth ceases at the points of attack, resulting in the production of constrictions, between which the potato swells ont, so that it comes to have the appearance of an hour glass or of a string of small potatoes. The spores of the fungus contaminate the soil, and long rotation, or treatment with kainit and sulphur, 300 to 400lb. of each per acre, is recommended.

SOFT ROT (*Rhizopus nigricans*, Ehr.).

This fungus is one of the cosmopolitan species of moulds, and is liable to cause a soft and putrid decay of the stored roots, especially when they are sweating.

SCURF (*Moniliochaetes infuscans*, E & H.).

A brown and rusty coating is produced on the surface of potatoes in the field by this fungus, and it continues to spread on the stored roots. It causes shrinking, but does not result in decay.

STEM ROT (*Nectria ipomoeae*, Hals.).

This appears to have a general resemblance to the foot rot described above. The vine near the surface of the ground turns first yellow and then black, and dies while still young. The rot also spreads to the upper part of the root. It is a field disease and does not attack stored potatoes. A creamy white mycelium is found near the surface of the ground, producing a Fusarium type of spore. Later the perithecia appear in clusters at the base of the stem. The same fungus attacks the egg plant.

WHITE ROT (*Penicillium* sp.).

This is a dry rot which causes the root to assume an almost chalky colour and consistency. The first external sign is a depression at the base of a fine rootlet. The spores are produced in enormous numbers and are blue-green in colour, like those of the familiar blue mould on fruit, bread, etc.

OTHER DISEASES.

The sweet potato is included in the list of plants whose roots are susceptible to the attacks of *Ozonium omnivorum*, Shear, and Rhizoctonia. The leaves are subject to spotting due to *Phyllosticta bataticola*, E. & M. For a note on the white rust of the leaves, mentioned in the first paragraph as occurring in the West Indies, see the *Agricultural News*, Vol. X, p. 222.

Halsted, B. D. & Fairchild, D. G.: *Journal Mycol.* VII, 1894.
Duggar, J. F. *Farmer's Bulletin* No. 26, U.S.D.A., 1897.
,, ,, *Fungus Diseases of Plants*, 1909.
Wilcox, E. M. *Alabama Experiment Station Bulletin* 135, 1906.
Taubenhaus, J. J.: *Phytopathology* III, 1913.
Harter, L. L. & Field, Ethel C.: *Bur. Pl. Industry U.S.D.A. Bull.* 281, 1913.
Harter, L. L.: *Journal Agric. Res.* I, No. 3, U.S.D.A, 1913.

WEST INDIAN PRODUCTS.

DRUGS AND SPICES IN THE LONDON MARKET.

Mr. J. R. Jackson writes on March 9, 1914, as follows:—

The general tone in the Mincing Lane markets in produce affecting the West Indies during the month of February has been quite of an ordinary character. Very few changes, either in supply, demand or value have taken place since our report for January. The products most noticeable for change have been nutmegs, mace and grey Jamaica sarsaparilla, which were marked by a slight advance in the early part of the month.

The following are some of the chief details:—

GINGER.

At the beginning of the month the quotations for washed cochin was 24*s.* 6*d*, and 18*s.* for new crop Sierra Leone. On February 11, at auction, the offerings amounted to 700 bags and 25 cases of Cochin and Calicut, all of which were bought in, small cut Calicut at 50*s.*, good brown rough Calicut at 30*s.* and wormy, washed rough Cochin at from 23*s.* to 25*s.* per cwt.; 95 bags of fair common Jamaica were also offered and bought in at 42*s.* A fortnight later, namely on the 25th, there was a good supply, but very little demand. Of 919 bags of Calicut offered, only 187 were sold without reserve, brown rough wormy fetching 20*s.* and D. rough 21*s.* to 21*s.*: 6*d.* 102 cases of Calicut consisting of good small cut, and bright brown rough, were bought in, the former at 40*s.* and the latter at 30*s.* per cwt.: 24 bags of Japan were also bought in at 25*s.* per cwt.

NUTMEGS, MACE, AND PIMENTO.

At auction on the 25th, nutmegs were represented by 330 packages of West Indian all of which sold at the following rates: 57's 11½*d.*, 63's to 72's 6½*d.* to 8½*d.*, 74's to 84's 5½*d.* to 6½*d.*, 85's to 95's 5¼*d.* to 5¾*d.*, 96's to 116's, 4¾*d.* to 5¾*d.*, and 118's to 127's 4¾*d.* to 5*d.* At the same auction 68 packages of West Indian mace were offered, and all sold, good fetching 2*s.* 4*d* to 2*s.* 5*d.* per lb.: fair 2*s.* to 2*s.* 2*d.*, ordinary 1*s.* 10*d.* to 1*s.* 11*d.*, common 1*s.* 9*d.*, and broken 1*s.* 5*d.* to 1*s.* 8*d.* These prices were advances of from 1*d* to 2*d.* per lb. on previous rates. At the beginning of the month the price quoted for Pimento was 2*d.* per lb., and at auction on the 11th, 188 bags of fair were offered and bought in at 2⅛*d.* per lb.

SARSAPARILLA.

At the first drug auction on the 5th, sarsaparilla was represented by 7 bales of grey Jamaica, 7 bales of Lima-Jamaica, and 10 bales of native Jamaica. The whole were disposed of, the grey Jamaica fetching 2*s.* per lb. for fair, part roughish; the Lima-Jamaica realized 1*s.* 8*d.* per lb. for fair, part rough; while for the 10 bales of native Jamaica 10*d.* to 11*d.* per lb. was paid for fair to good red. On the 19th of the month, the offerings were 25 bales of grey Jamaica and two of Lima Jamaica. The first-named found ready purchasers at 2*s.* to 2*s.* 1*d.* per lb., which represented an advance of fully 1*d.* per lb. on previous prices. The 2 bales of Lima Jamaica were disposed of privately.

CITRIC ACID, LIME JUICE, LIME OIL, KOLA, AND TAMARINDS.

Citric acid was reported at the beginning of the month as being dull of sale, the quotation being 1*s.* 11¼*d.* per lb., which price was asked at the close of the month, though it was reported that supplies on the spot were extremely small. Three cases of lime oil were offered in the first week af the month, only one of which was disposed of at 1*s.* 9*d.* per lb. without reserve, for fair West Indian distilled: at the same auction 6 puncheons of good raw Jamaica lime juice found buyers at 1*s.* 5*d.* per gallon, which was the price quoted at the end of the month. Kola was reported somewhat firmer at the beginning of the month. At auction on the 5th, 41 packages were offered, and 34 sold, 3¼*d.* per lb. being paid for good bright dried West Indian halves and whole nuts, while for fair slightly dark 2¾*d.* was paid. At auction on the 19th, a further consignment of fair dried halves and whole West Indian were sold at the same rates. A consignment of 165 barrels of Barbados tamarinds was offered without reserve on the 26th, and sold at from 15*s.* to 15*s.* 6*d.* per cwt. in bond.

DEPARTMENT NEWS.

Mr. W. R. Dunlop, Scientific Assistant on the Staff of the Imperial Department of Agriculture, is expected to leave Barbados on April 8, 1914, for the purpose of paying an official visit to St. Vincent and St. Lucia in connexion with agricultural matters. Mr. Dunlop will probably arrive back in Barbados on April 29.

Mr. J. E. T. Hartley, B.A., Dip. Agr. (Cantab.), arrived in Barbados from England by the R.M.S. 'Magdalena' on March 14, 1914, for the purpose of studying tropical agriculture in the West Indies, under the direction of the Imperial Department.

MARKET REPORTS.

London.—The West India Committee Circular, March 10, 1914; Messrs. E. A. de Pass & Co., February 27, 1914.

Arrowroot—3*d.* to 4¾*d.*
Balata—Sheet, 2/11; block, 1/11¾ per lb.
Beeswax—£8 5*s.* to £9.
Cacao—Trinidad, 62/- to 67/- per cwt.; Grenada, 57/- to 64/6; Jamaica, 57/- to 63/-.
Coffee—Jamaica, 51/- to 68/-
Copra—West Indian, £29 per ton.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 16*d.* to 22*d.*
Fruit—No quotations.
Fustic—No quotations.
Ginger—Quiet, 34/- to 60/.
Isinglass—No quotations.
Honey—20/- to 25/-.
Lime Juice—Raw, 1*s.* to 1*s.* 10*d*; concentrated, £28 5*s.*; otto of limes (hand-pressed), 9/6.
Logwood—No quotations.
Mace—1/3 to 2/6.
Nutmegs—4¾*d.* to 6½*d.*
Pimento—1 13/16*d.* to 2 1/16*d.*
Rubber—Para, fine hard, 3/-; fine soft, 2/11½; Castilloa, 1/9 per lb.
Rum—Jamaica, 2/3½ to 5/- per gallon.

New York.—Messrs. Gillespie Bros. & Co., March 6, 1914.

Cacao—Caracas, 13c. to 14¼c.; Grenada, 12½c. to 13c.; Trinidad, 13c. to 13½c.; Jamaica, 12c. to 12½c.
Coco-nuts—Jamaica, selects, $26·00 to $27·00; Trinidad selects $27·00 to $28·00; culls, $16·00.
Coffee—Jamaica, 10¼c. to 15c. per lb.
Ginger—8½c. to 10c. per lb.
Goat Skins—Jamaica, no quotations; Antigua and Barbados, 45c. to 48c.; St. Thomas and St. Kitts, 42c. to 45c. per lb
Grape Fruit—Jamaica, $1·50 to $2·25.
Limes—No quotations.
Mace—52c. to 56c. per lb.
Nutmegs—110's, 12½c. to 12¾c.
Oranges—Jamaica, $1·25 to $2·00.
Pimento—4c. to 4¼c. per lb.
Sugar—Centrifugals, 96°, 3·04c. per lb.; Muscovados, 89°, 2·00c.; Molasses, 89°, 2·39c. per lb., all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., March 16, 1914.

Cacao—Venezuelan, $12·80 to $13·00; Trinidad, $12·50 to $13·50.
Coco-nut Oil—$1·01 per Imperial gallon.
Coffee—Venezuelan, 12c. to 14½c. per lb.
Copra—$5·10 per 100 lb.
Dhal—$5·75.
Onions—$2·50 to $2·75 per 100 lb.
Peas, Split—$5·80 per bag.
Potatoes—English, $2·00 to $2·35 per 100 lb.
Rice—Yellow, $5·10 to $5·30; White, $4·85 to $4·90 per bag.
Sugar—American crushed, no quotations.

Barbados.—Messrs. James A. Lynch & Co., Ltd., March 7, 1914; Messrs. T. S. Garraway & Co., March 12, 1914.

Arrowroot—$4·00 to $5·00 per 100 lb.
Cacao—$11·75 to $12·00 per 100 lb.
Coco-nuts—$15·00.
Hay—$1·50 to $1·60 per 100 lb.
Manures—Nitrate of soda, $70·00; Cacao manure, $48·00 to $50·00; Sulphate of ammonia, $82·00 to $85·00 per ton.
Molasses—No quotations.
Onions—$2·50 to $4·50 per 100 lb.
Peas, Split—$5·75 to $6·00 per bag of 210 lb.: Canada, no quotations.
Potatoes—Nova Scotia, $2·00 to $3·00 per 160 lb.
Rice—Ballam, $5·20 to $5·30 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
Sugar—American granulated, $3·50 per 100 lb.

British Guiana.—Messrs. Wieting & Richter, March 14, 1914; Messrs. Sandbach, Parker & Co., March 13, 1914.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	$8·50 per barrel of 200 lb.	—·—
Balata—Venezuela block	No quotation	——
Demerara sheet	65c. per lb.	——
Cacao—Native	12½c. to 13c. per lb	13½c. per lb.
Cassava—	96c.	——
Cassava Starch—	——	——
Coco-nuts—	$16 to $20 per M.	$26 per M.
Coffee—Creole	15c. per lb.	16c. per lb.
Jamaica and Rio	15½c. per lb.	16c. per lb.
Liberian	13c. per lb.	12c. per lb
Dhal—	$5·00 to $5·75 per bag of 168 lb.	$5·00 to $5·50 per bag of 168 lb.
Green Dhal	$5·75	—·—
Eddoes—	$1·44	—·—
Molasses—Yellow	None	—·—
Onions—Teneriffe	4½c. to 5c.	——
Madeira	6c.	5c. to 6c.
Peas—Split	$6·00 to $6·25 per bag (210 lb.)	$7·00 per bag (210 lb.)
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AGRICULTURAL NEWS

Vol. XIII. No. 312.] SATURDAY, APRIL 11, 1914. [One penny

AGRICULTURAL NEWS

A FORTNIGHTLY REVIEW
OF THE
IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

VOL. XIII. No. 312. BARBADOS, APRIL 11, 1914. PRICE 1d.

CONTENTS

Seasonal Climatic Changes.

IN the last issue but one of this journal a short note was published dealing with the importance of the systematic study of climatic changes. Whilst the usefulness of being able to prognosticate the weather a few days in advance was fully recognized, the value of being able to foretell the general nature of the ensuing season was held to be far more important, since it would indicate the advisability or otherwise of attempting to grow, for the time being, particular crops. The consideration just put forward, however, must be regarded as being principally applicable to agriculture in temperate countries. In the Tropics, where most of the cultivations are of the perennial kind, it is not likely that prognostication in regard to seasons would serve a useful purpose to the same degree as in northern latitudes where systems of cropping are more readily adaptable to conditions of environment. The utility of such forecasting in the Tropics would lie rather in an economic direction, since foretelling the general nature of the coming season would enable reliable estimates to be made of crop yields, thereby putting valuable information into the hands of buyers. At the same time, the influence of seasonal forecasts would not be entirely unfelt in tropical agricultural practice, for it would no doubt lead to the adoption of systematic rotation of annual crops with perennial ones.

The possibility of forecasting the general nature of an ensuing season is not quite so remote as some readers may believe it to be. The investigation of the upper air is working vast changes in meteorology; and the science which was formerly regarded by physicists as a rather poor sort of study is now attracting some of the best mathematicians. It is now clearly appreciated that meteorology cannot be advanced by the mere sordid accumulation of local statistics. For the enunciation of general laws, and for the establishment of correlations, accurate observations must be taken systematically; but they must be world-wide and extend above as well as around. The atmosphere is an ocean of gas; and just as a correct idea of the movements of the seas can be obtained only by their study at the surface and below, so a stratigraphic as well as a geographical survey is required for a proper comprehension of the movements of the air.

The useful results that may accrue from the study of meteorological statistics broadly, as the outcome of co-operation, is seen in the correlations established by Mr. R. C. Mossman of the Argentine Meteorological Office. He has found that whatever may be the causes that determine the general character of the rainy season at Trinidad (B.W.I.), i.e. whether the rain will be above or below the normal, the character of the season is usually impressed on the records as early as April or May. In the twenty years, 1876-1895, there is only one year (1878) in which the April and May rainfall at Trinidad was not a direct index of that of the four succeeding months. This is a result of some importance. Again the same observer has found that the physical processes that produced a given precipitation at Trinidad 11 N. of the equator in April to September during 1876-1894, were associated during the six months following (October-March) by an opposite effect at Azo in the south temperate zone, some 2,850 geographical miles distant. Furthermore it was discovered that the rainfall of Java for the six months (October-March) was in general the reverse of that at Trinidad during the six months following. This latter correlation is of considerable significance in regard to crop production.

Another example of an important generalization in meteorology is afforded by Binnie's Law, * which says that there is universally a cycle in rainfall, and that this cycle (which refers not to individual rainfalls but to the average of three or four consecutive years) seems to have a period approximately equal to thirty-six years. The mean annual rainfall may therefore be defined as the average taken over a sufficiently lengthy term of years to ensure a fairly constant value, and we may assume that thirty to forty years is generally an adequate period. From this it will be seen that five or ten years' records cannot by themselves give us a correct idea of the average rainfall to expect: but if the conditions in a new district are very similar to those occurring in a place near-by where records have been kept for thirty-five years, it is possible, by means of simple proportion and Binnie's Law, to say what the rainfall conditions of the new locality really are.

Mossman's work and Binnie's generalization have merely been cited to show the kind of research that is needed in regard to meteorology. It cannot be gainsaid that they do not help us to standardize the climatic conditions under which crops are cultivated, and it will probably be admitted that the establishment of such correlations as the Azo, Trinidad and Java relationships is likely to be of considerable economic value in agriculture.

With a more extended investigation of the air as an ocean instead of as a shallow stream, and with more complete international co-operation in meteorological matters, it is to be expected that many useful correlations will be brought out and many general laws established which will help us if we wish it, to humour weather conditions that are likely to occur by growing suitable crops, rather than expect the weather to suit the demands of those crops we have decided to cultivate as the result of other considerations.

*See *Agricultural News*, Vol. XII, p. 354.

SUGAR INDUSTRY.

A REVIEW OF THE PAST SUGAR CROP OF PORTO RICO.

During the past sugar crop in Porto Rico there were grinding in all ninety nine sugar mills, which produced a total of 398,003 tons of sugar, the product of approximately 200,000 acres and 4,000,000 tons of cane.

Supposing that the sugar were sold in New York at an average price of 3½c. per lb., then the farmers must have received about $14,000,000 for their cane and the factories about $28,000,000 for their sugar, and the American housewife should have purchased her refined sugar at 4½c. per lb.; and meanwhile the United States Government would continue collecting fifty-five to sixty million dollars per annum from the import duty on foreign sugars.

This very satisfactory state of things is, however, very unlikely to continue much longer, in view of the impending reduction and final abolishment of the sugar duties, and already six important sugar companies are in the hands of receivers, while many have but very little profit, certainly not enough to induce any new capital to come into the business.

Of the total of 398,003 tons of sugar produced, 181,804 tons were produced in factories having an output of 12,000 tons and over, of which there are eight in all, from Guanica Centrale, with 51,366, to Central Vannina, with 12,006 tons.

In factories of less than 12,000 tons and more than 6,000, of which there are seventeen, from San Vicente, with 11,875, to Central Eureka, with 6,061, there were produced 145,437 tons. And in factories of from 3,000 to 6,000 tons of which there are nine in all, there were produced 43,077 tons, the largest being Central Cortado, with 5,739, and the smallest Central Ejemplo, with 3,683 tons

While several small mills have been installed during the past year, there have been none of any importance, as the following figures will show :—

(1) Central Pallejas, the property of the Pallejas Sugar and Coffee Co., is a little mill in the mountainous district of Adjuntas, which turned out 562 tons of very pretty yellow sugar for local consumption. This is a similar installation to that of the Jayuya Development Co , which has now made two crops of 375 and 490 tons, respectively, while another

and slightly larger installation is just completed for Don Arturo Lluveras on his hacienda in Guayanilla.

(2) In the Adjuntas district we find three new sugar producers, Eduardo Abreu, who has been too modest to give his mill a name, but nevertheless added 3·75 tons to the island's production, while the new Ingenios 'Recurso' and 'Esperanza' produced 10 tons and 20 tons, respectively.

(3) In the Juana Diaz district we find two new mills with a total output of 5·75 tons, and in San Sebastian one with 7·5.

One of the latest new factories, Central Camuy, which has made but two crops, of 2,257 and 1,977 tons, respectively, has now closed up, and many rumours have been afloat of its having been sold to parties in Venezuela.

At least two other Centrals are for sale, and several parties from Venezuela and elsewhere have been in the island looking them over, and there is really no reason why these factories, which cannot be made to pay in Porto Rico, where cane costs anywhere from $3 to $5 per ton, when sugar is being sold in New York at from $3 to $5 per 100 lb. should not pay well in countries like Venezuela, where cane costs about $1 per ton and sugar sells for $10 or more per 100 lb.

In Venezuela, and also in most of the other South American countries, sugar is sold locally at from 8 to 10 cents per pound, so that small mills with even the most antiquated machinery pay well, and there will be handsome profits for the first modern central which will be established It is, however, a great pity to see sugar mills being dismantled in Porto Rico for removal to foreign countries, as it is significant of a serious check to the island's wonderful progress, and it will only be a question of time until conditions become as bad as they are, and have been for thirty years or more, in the neighbouring British and French sugar-producing islands.

Already most of the public works have been stopped, new roads have been left unfinished, and finished ones are not being kept in proper repair, and, as taxes will have to be reduced, it is probable that even some of the schools will have to be closed. There already has been one serious strike consequent to an attempted reduction of wages, and labour only requires to be better organized to become a very serious menace to the existence of the sugar industry.

With very few exceptions, the sugar mills of Porto Rico are modern in every way, and under competent, scientific management; all have at least nine-roller mills with crushers, some have twelve rollers and a few have fifteen, with full complements of other machinery, such as quadruple effects, vacuum pans, crystallizers, filter presses, etc.

A few attempts have been made to produce white sugar direct from the cane by means of sulfitation and filtration, and very pretty sugar has been the result. But while this sugar is white enough for all practical purposes, it cannot stand comparison with the snow white granulated sugar which results when bone charcoal filtration is employed, as in the refineries, and it would be a long and expensive campaign to introduce it to the American consumer. This whole question, of course, has been thoroughly threshed out in the other islands years ago, and one may be sure that it was not without a big struggle that sugar estates were abandoned where it was found impossible to compete in the open markets of the world. One of the first moves in the British colonies was the combination of small estates under one management to grind their cane at central factories, but this already has been done in Porto Rico. Another move was the introduction of East Indian coolies from India and Java, but the immigration laws of the United States would not allow of such action in Porto Rico, nor would the governments of India or Java permit them to leave.

Of course it is quite possible that even after the duty on sugar has been reduced or removed entirely in the United States that the price may remain at 3½c. or more, in which case there will always be a margin of profit for the producer sufficient to keep him alive, and those who are favourably situated financially and otherwise will weather the bad times till the natural increase in consumption will cause a shortage in the world's supply and the price will again go up to 4c. or more.

In the meantime what we want in Porto Rico is an immediate reduction of our property taxes to correspond with the new conditions, and if new roads, new schools, new harbour works, etc, have to be suspended meanwhile, we had better face the new conditions now than later. (*Sugar*, February 1914.)

DETERIORATION OF SEEDLING CANES IN HAWAII.

The tendency of varieties of sugar-cane to 'run out' as a consequence of continuous cultivation is now generally recognized. Considerable attention has been given to this phenomenon in British Guiana (see *West Indian Bulletin*, Vol. XIII, No. 2). It now appears that the subject is receiving definite notice in Hawaii.

Considerable interest has been attracted to the question of cane varieties in the Hawaiian Islands, on account of the fact that one of the staple varieties, *Lahaina*, is reported from many sections as deteriorating, thus bringing to the attention of the planters the fact that a substitute will have to be found within the not distant future.

The so-called running out of this cane variety is especially noticeable on Hawaii, and of late has been showing quite extensively on Oahu at the Ewa plantation, and also, on the Oahu Sugar Company's property. This condition has been known to the Experiment Station Staff of the Hawaiian Sugar Planters' Association for some time, but as yet nothing has been discovered that would cause the running out to cease. For a number of years the main cane varieties planted in these islands have been the Rose Bamboo, the Yellow Caledonia and the Lahaina. But of late the D. 1135 has been planted quite extensively, and the Rose Bamboo gradually discontinued.

The yellow Caledonia is the most popular, the 1914 and 1915 crops will show an acreage of approximately 116,000 sown to this variety, the next in line being Lahaina with a total acreage of perhaps 75,000 for the two crops above mentioned, both of which are already in the ground. As an instance of the decrease in the cultivation of Lahaina might be mentioned the acreage of this variety on Oahu. In 1913, 16,568 acres of this cane were harvested, while the 1915 crop has only 12,664 acres, a falling off of about 4,000 acres. On the other hand Yellow Caledonia gained 2,200 acres.

The variety that is probably attracting the most attention is the Demerara 1135 or D.1135, while only 2,709 acres all told are planted to this variety for the 1915 crop, this is an increase of 1,300 acres over 1914 and 2,000 over the 1913 acreage of this variety. This kind seems to do well on all the Islands, and at present is more widely distributed than any other variety grown in the group.

FRUIT AND FRUIT TREES.

COLD STORAGE OF FRUIT AND VEGETABLES.

II.

The following is the second and final part of the article on the above subject of which Part I appeared in the last issue of this journal:—

It is desirable that further experiments should be made, in the same manner as those referred to above, on the production of carbonic acid by various kinds of fruit at different temperatures much lower than 30° C. Definite and comprehensive information on respiration at rather low temperatures would no doubt be very useful in relation to cold storage.

Feeble respiration takes place at 0° C., and even at 2° to 4° C, and it continually increases as the temperature rises, until injury from high temperature begins. Within a few degrees above freezing point respiration is no doubt very slight, and it is owing to this fact that fruit can be kept for a considerable time in refrigerating chambers. Suitable temperatures for different purposes have been found by experience, but more precise knowledge of the behaviour of fruit at these temperatures is required.

A matter requiring special attention in the storage of fruit is aeration. Air should have as free access to the fruit as possible, and therefore large masses of fruit should not be closely crowded together. Good circulation of the air should also be kept up, and for this the current of cold air from the refrigerating machine may often be sufficient, but in some cases ventilating fans have been used. The amount of care necessary in the matter of aeration depends, of course, largely on the temperature chosen for the storage chamber, as well as on the kind and condition of the fruit.

In the case of the transport of peaches in America in refrigerator cars, injury to the fruit is stated to be common, and the injury has been found to be most frequent in the central part of the top tiers of boxes. Cold air is led along the bottom of the car, and, though diffusion and circulation equalize the temperature to some extent, it may be assumed that the upper strata of air have a somewhat higher temperature than the lower, and therefore that the fruit in the upper boxes respire more actively than the rest. The explanation is therefore suggested that the injury is 'due to insufficient oxygen and to an accumulation of carbon dioxide within the paper wrappers in which peaches are so often shipped.' The preventive would no doubt be more uniform cooling, with better aeration if necessary.

It must be remembered that active respiration means an appreciable evolution of heat by the respiring tissues. Hence, in the case of large masses of fruit, if this heat is not rapidly conducted away, the temperature of the fruit (and of the air adjoining it) will rise, whereby the respiration will be further increased, and so on. Such heating at 'compound interest' will be liable to occur locally, wherever aeration is insufficient, and may continue until the local temperature is considerably higher than the general air temperature in the refrigerating chamber, and may lead to the loss of portions of the fruit.

Should the temperature in the cold storage chamber be allowed to rise until respiration is very active, it may be found that the refrigerating apparatus will be unable to reduce the temperature of the fruit again, and this has been experienced, e.g, in shipments of bananas. The fruit then ripens rapidly and spoils.

The difficulties to be contended with in arranging for the cold storage of vegetables may be illustrated by the following case.

An insulated storage room of about 6,000 cubic feet capacity was fitted with a refrigerating machine, which easily reduced the air in the room, when empty, to a temperature of 27°F. (−3°C.). A temperature of 35°F. (2°C.) was required, and it was expected that the arrangements would be satisfactory. A trial was then made as to storage. Six tons of vegetables were put into the room, and the temperature started at 59°F. (15°C.), but the machine was only able to reduce this to 50°F. (10°C.) in ten hours. The refrigerator was then stopped, and in twelve hours the temperature was 59°F. and after fifteen hours more it stood at 66°F. (19°C.). The air, moreover, was found to be badly vitiated by carbonic acid. The final rise of temperature was due to the respiration of the vegetables and not to conduction through the walls, since the outside temperature during the last twenty-four hours had not been higher than 52° F. (11° C.), having varied between this and 45° F. (7°C.).

In another trial the machine was started first, and the temperature was reduced to 38°F. Then 2½ tons of cabbage and spinach were put into the store. The temperature was raised by this to 48°F., and after an hour with the machine still running it rose to 49°F. After five hours' run it stood at 45°F., and refused to go lower.

In this case the free air in the storage chamber was well circulated. The unsuccessful result indicates that the vegetables required to be less crowded, or to be cooled in small batches before being brought into the store. The air must have been a good deal entangled among the vegetables, so that convection currents in the interior of the mass in each box would be slow, and consequently the loss of heat in this way was not rapid enough to out balance the heating due to respiration Had the vegetables been cooled before being placed in the store-room, their respiration and self-heating would have been slow, and the refrigerating arrangements might perhaps have been able to deal with them efficiently, though unable to cope with the combined task of cooling the substance of the vegetables, and also removing the heat generated by respiration at or near the starting temperature. The entanglement of air and consequent difficulty of cooling would probably be much greater in a box spinach, for instance than in a box of the same dimensions containing fair-sized rounded fruit such as apples or oranges.

It can be readily understood that the matter of cold storage of fruit and vegetables is not a simple one. The treatment required by different kinds of fruit or vegetables may vary considerably as to spacing out, packing, aeration and temperature. Much information has been gained by practical experience, but further knowledge is required, so that any failure causing loss of produce may be attributed to its precise cause, and, if possible, prevented for the future.

In conclusion reference should be made to another important point in connexion with the cold storage of vegetables and fruit, namely, the cost of the refrigerating plant and the running expenses. For although it may be quite possible to keep a chamber at a desired temperature when filled with vegetables or fruit, yet the outlay involved in connexion with the packing and unpacking and the laying out of the material on shelves, in addition to the cost of running the special refrigerating plant, may be so great as to render the undertaking impossible from the commercial point of view. (*Kew Bulletin of Miscellaneous Information*, No. 1, 1914.)

BOTANICAL NOTES.

THE 'FRUITING MALE' OF THE DATE PALM.

A recently published book on date cultivation was reviewed lately in the *Agricultural News*, and the following note on the fruiting of this palm, taken from the *New Phytologist* (January-February 1914), will prove an interesting continuation of the subject:—

The date palm, *P. dactylifera*, L., is normally dioecious. The occurrence of so-called 'fruiting males' is not, however, unknown. One such instance, occurring in Portugal, is recorded in *Gardeners' Chronicle* 87,11, p. 530; in this case the male plant is stated to have produced a female inflorescence. Other cases are recorded by Tonmey, *Bull.* 29, Arizona Experiment Station; Charlet, *Bull.* Soc. Geog. d'Alger, 1905; Kearney, U.S. Dept. of Agric. Bur. of Plant Industry, No. 92; and Bois, *Rev. Hort.*, 82 (19), p. 492.

Kearney writes: 'The writer saw in February a palm which had all the characters of a male . . . . Nevertheless it bore clusters of small seedless dates . . . . . Although the only case observed by him, this is apparently a rather well-known phenomenon.' Bois cites an instance of a plant in which a certain number of flowers, or an inflorescence, in other respects typically male, develop fruits.

In all cases it is assumed that the change is from a dioecious, to a monoecious habit. The observations have apparently been made on the plant when in fruit, and there appears to be no record in the details of the flower-structure in such a plant. It may, therefore, be of interest to give in greater detail a further instance of this phenomenon.

Attached to the Government Botanic Gardens, Saharanpur, Northern India, is a date plantation in which different varieties of date palms, imported from various sources, are under cultivation. Among these occurs a single plant to which the description given by Kearney would apply if the plant were seen in fruit only. Unfortunately the source and history of the plants there growing are not now traceable and it is impossible, therefore, to say whence this particular plant originally came. The attached figures* are of different flowers all taken from this single plant. It will be seen that the change does not consist strictly in the substitution of a monoecious for a dioecious habit, but that a whole series of intermediate and hermaphrodite flowers are produced. The exact development of these has not been traced, but it is probable that the few fruits which reach maturity are derived from those female flowers in which the stamens have completely aborted. The condition of the hermaphrodite, intermediate between those of the diclinous flowers is not confined to the stamens and pistil; a correlated change in the form of the perianth segments occurs. This is shown in Fig. 4. Here the segment opposite the single developed stamen retains the character of the male flower, the remaining two segments having a form approximating to that characterteristic of the female flower.

PAPER PULP FROM GRASSES.

Attention is being directed in the Federated Malay States to the production of paper pulp from grasses. Special regard is being given also to the possibilities of utilizing *Hedychium colonarium*, a wild ginger which yields fibre of greater tensile strength than Manila hemp. This plant was described in the *Agricultural News*, Vol. XII, p. 30. The conclusions drawn, up to the present, by Mr. B. J. Eaton, are as follows:—

From the results obtained it is concluded that out of ten species of major importance and eight species of minor importance two of the former and three of the latter are of doubtful value owing to the inferior quality, or unsuitable because they do not yield clean pulps under the standard conditions applicable to the majority of the grasses of major importance. These species are therefore unsuitable as mixtures.

It is disappointing, however, to find *Imperata arundinacea* (lal-lang) included in this list as inferior, especially since in this country, as in India, it would certainly be a grass of major importance in respect to quantity available and predominance over large areas.

This inferiority is due principally to weakness and shortness of fibre and difficulty of bleaching. Since lal-lang grass as a raw material for the production of paper pulp has been favourably reported on in this country, it may possess different qualities, depending on soil, moisture conditions, etc.

A sample of normal air-dried lal-lang, containing 11·6 per cent. of moisture, prepared in this country, was found by the writer of this review to contain 57·1 per cent. of cellulose, which is higher than that given for the Indian material. The material examined by me had undergone preliminary treatment. Suggestions for improving the methods of extraction by first crushing the more resistent nodes of the grasses between rollers and economizing soda by preliminary treatment of the material in water to remove starch and other soluble constituents, which increase the soda consumption, are also given. Finally, the cost per ton of unbleached pulp at the factory is estimated in each case, although certain items of expenditure are uncertain.

The order in which the grasses of major importance are placed as regards commercial value is as follows:—

(1) *Anthistiria gigantea*, sub-sp. *arundinacea*, and (2) *villosa*; (3) *Saccharum munja*; (4) *Ischaemum angustifolium*; (5) *Phragmites karka*; (6) *Succharum arundinaceum*; (7) *S. paernga*; (8) *S. spontaneum*; (9) *Arundo donax*.

It will be seen that Baib (*Ischaemum angustifolium*), which is already used commercially takes fourth place on this list.

The figures given, show that the cost of production is less than the delivered cost of European wood pulp imported into India to make up for the shortage of Baib.

An instructive preface is written to the pamphlet by Mr. R. S. Hole, Botanist at the Forest Research Institute Dehra Dun, dealing with the growth of the different grasses, flowering periods, and probable crops, together with the rotation necessary to allow seeding to take place. One species, *Saccharum arundinaceum*, appears to be outstanding with regard to yield, as it produces 44·3 tons of dry grass per acre in one cutting, or an estimated annual yield of 14·8 tons, calculated on a suggested three-year rotation.

It is interesting to compare this yield with that of *Hedychium colonarium*, which is 6 to 10 tons of dry material per acre, and which is said to be greater than that of any other product for paper pulp; this latter is thus seen to be considerably less than the grass. This large yield is however due to the habit and growth of the plant, as this species attains a height of 25 feet and the culms have a diameter of ¾-inch, thus resembling sugar-canes or bamboos in its general growth.

*These figures are not reproduced.

COTTON.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date March 23, with reference to the sales of West Indian Sea Island cotton:—

A fair business has been done in West Indian Sea Island cotton since our last report, comprising principally extra fine qualities, and medium grades; the low qualities are still quite neglected, Egyptian being cheaper.

The sales include Barbados at 19*d*., St. Kitts 17½*d*. to 22d., Nevis 17*d*. to 18*d*., Montserrat 16½*d*. to 18*d*., St. Vincent 20*d*. to 22*d*., with a few superfine bags at 26*d*.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending March 21, is as follows:—

The buying this week was limited to 26 bales of Extra Fine off in preparation at 23*d*. Factors continue to hold very firmly at previous prices, thinking the limited supply left of this crop will be wanted in time. The Planters' crop lots remain as last reported.

We quote, viz:—

Extra Fine	26c.	= 14¾*d*.	c.i.f., & 5 per cent.
Fully Fine	24c.	= 13¾*d*.	„ „ „ „
Fine	23c.	= 13¼*d*.	„ „ „ „

This report shows that the total exports of Sea Island cotton from the United States to Liverpool, Manchester and Havre, up to March 21, 1914, were 4,328 bales, 6,545 bales, and 4,026 bales, respectively.

A notice appears in the Antigua *Sun* (February 17, 1914) to the effect that the Board of Management of the Antigua Onion Growers' Association has appointed representatives in Barbados and Trinidad who will furnish periodical advices as to the market prices for onions. The firms are willing to handle consignments at the charge of 5 per cent. commission. As to the Association's representatives, they will use their best endeavours to promote the sale of Antigua produce in the colonies in question. It might be mentioned that there is said to be a scarcity of onions at present in Barbados.

An account appears in the Trinidad *Mirror*, February 18, 1914, of an address by the acting Director of Agriculture, Trinidad, at Naparima, on agricultural banks. At this meeting a visitor from St. Vincent spoke and suggested that there should be separate banks for different races. It is satisfactory to note the activity which continues to exist in Trinidad as regards rural credit; and the fact that the Government has promised £100 as a help towards capitalizing any practical scheme should be concrete encouragement for the early materialization of the proposals which have now been put forward for thirteen years.

AGRICULTURAL EDUCATION.

AN INDIAN REPORT.

The following notes are taken from a Report on Agricultural Education, compiled by Dr. Coleman, Director of Agriculture, Mysore, as a result of an extended tour through Europe, America and Japan. It will be observed that Dr. Coleman is of opinion that educational improvements are needed most in the Indian primary and secondary schools, where the agricultural instruction should be made practical and empirical. Progress in this special direction has now for some years been made in the West Indies.

It will be seen that a great many different agencies are employed and a great many different methods used in the furtherance of agricultural education. It is for us now to consider which of these various agencies and which of the methods, if any, with of course modifications to suit our conditions, would in Mysore, be most likely to yield the greatest results with the least expenditure of money.

We find commonly, if not universally, that agricultural education has started at the top with some form of agricultural college to train departmental workers and the sons of the more influential and better educated agricultural classes. This has been the case in India also. The hope and expectation has been that, from the few so trained, educative influences would gradually filter down through the lower strata of agricultural society. This, however, must be, at the best, a very slow process, chiefly because of the relatively very small number that can be trained in an agricultural college. The result has been that, sooner or later, the question of educating the agricultural masses with special reference to their occupation, in a more direct manner, has been taken up.

Before proceeding to this question, it will be well to examine what is at present being done in India in the way of agricultural education. First of all we have, in practically every province and presidency, an agricultural college giving a three years' course in agriculture and the related sciences. Some of these colleges have, in addition, short (usually one year) practical courses for the sons of farmers and landowners.

The most of these agricultural colleges have been in existence only a few years and it is still doubtful whether they are really going to fulfil the hopes and expectations with which they were started. In the Report on the Progress of Agriculture in India 1910 11, p. 49, we find the following:—

'A perusal of the reports of the provincial Departments leads inevitably to the conclusion that, while the agricultural colleges are patronized to a large extent by candidates for Government employment, the number of agriculturists who value a scientific education as a preparation for an independent career for their sons is very small. Moreover, the number of passed students who can find employment in the Agricultural Department on a scale of pay commensurate with the standard of education provided must always be strictly limited and the colleges must, therefore, look to the Revenue Department to provide a demand if they are to become popular. This means that until agriculturists begin to put a higher value on scientific training, the colleges will merely be providing a substitute for a general education.'

In this connexion, however, there is a feeling among some of those engaged in work connected with agricultural education that the type of instruction being given in the agricultural colleges is not exactly suited to the needs or

capacities of those among the educated agricultural classes who are most likely to return to the land In other words, it is just possible that, in modelling the course of instruction here too closely on the lines of European and American agricultural colleges, the sons of those who are actively interested in agriculture have thereby been, to a large extent, shut out. It is a question, therefore, whether instruction, such as that given in the American high schools, the German agricultural schools and the Japanese agricultural middle schools, would not be more suitable for our conditions.

This would mean the reduction of the more strictly scientific instruction to a minimum with a corresponding increase in practical and empirical instruction. I understand that a change in this direction is desired by those engaged in agricultural education in the Madras Presidency and that proposals have already been sent up for an entire recasting of the curriculum along the lines indicated.

With regard to lower agricultural training in the vernacular, a most interesting experiment is under way in Bombay Presidency where, through the energy of Dr. Harold Mann, a vernacular agricultural school was opened at Poona in 1910 for boys of thirteen years or over. The course is a two years' one and about half the time is spent in practical work divided up about as follows:—

1. Conducting work on farm and students' plots	9 hours per week.
2. Experiments in connexion with nature study	3 „ „ „
3. Mensuration, field and building measurement, levelling	1 hour „ „
4. Horticulture, including layering, budding, grafting, etc.	1 „ „ „
5. Milk, care of milk, etc.	1 „ „ „
6. Subsidiary work, such as care of poultry, etc.	1 „ „ „

The class work consists of arithmetic, reading and writing, geography including physical geography, nature study, village life and sanitation, citizenship and agriculture. This class-room work is given with special reference to agriculture. Thus, the arithmetic has to do chiefly with money, weights and measures, calculating of values, interest and discount, etc.

This school is to be moved to Loni where special buildings are to be erected for it. A second school of a similar character is to be opened at Devi Hosur, Dharwar District, where the school buildings and lands are being furnished by private persons and the scholarships will be largely supplied by the Lingayat and Reddi communities.

At the Poona school, where there are about forty students in the two years, no fees are charged and the boys are being fed at Government expense. Thus, although the work done is reported as very satisfactory, it is, according to Mr. Smart, Acting Director of Agriculture, impossible to say whether the school is a practical success or not.

Mr. Smart further calculates in his Annual Report for 1911-12, that in the new Loni school the cost to the Government for educating a boy for two years will be Rs. 400. He, therefore, concludes, that 'it is obvious that Government cannot increase largely the number of such schools as the cost would be prohibitive; and the question is whether the number of scholars turned out can ever be sufficiently large to effect an improvement in the agriculture of the Decan.' Mr. Smart anticipates more satisfactory results from the Devi Hosur school as the expense to Government there will be small and the demand for the school is spontaneous.

In addition to the above, short courses of practical instruction are being given in various provinces and presidencies in connexion with the experimental farms. In some cases, notably in the Central Provinces, these courses appear to be successful and to be filling a real need. In other cases, they have not been successful.

In various parts of India attempts are being made to introduce some form of nature study in the curricula of primary and secondary schools, but, as far as I am aware, this work has been carried on neither for a sufficient length of time nor systematically enough to yield any appreciable results. The same feeling which we find in other parts of the world seems to be growing here in India also that a decided improvement could be made in the existing primary and secondary education in rural communities.

PRIZE-HOLDINGS COMPETITION IN JAMAICA.

The report of the judges on the St. Catherine prize-holdings competition is published in the *Journal of the Jamaica Agricultural Society* for February 1914. In this is stated that in spite of the set-back, and in many instances actual loss of crops through dry weather and high winds, the competition was kept in view and determined efforts made to effect on the holdings useful improvements. It is pointed out by the judges that the true value of the prize-holdings competition is not only what it actually accomplishes but also what it prevents. It is essentially progressive in its influence and decidedly antagonistic to all forms of retrogression.

The results of the competition under report were distinctly satisfactory and a considerable amount of credit for the good results is due to the work of the agricultural instructors. The general conditions of the permanent and staple crops were well maintained since the last competition, and a great deal of progressive work has been done in the matter of pruning, trenching and manuring. Particularly was this so in the case of coffee and cacao; though in the case of cacao many of the pruning operations lacked neatness and finish. The importance of pruning neatly is emphasized. Rough, jagged cuts only provide additional inroads for pests and disease. It would appear that much of the pruning complained of was done by itinerant pruners who had been employed by the competitors on what would appear to be false recommendations or at any rate useless recommendations.

There is still scope for better methods of cultivation in bananas and sugar-cane. While the question of fencing in most of the districts still requires attention, yet considerable improvement has taken place. The general condition of the holdings visited was good, and quite a number were exceptionally neat and tidy, giving evidence that they were so kept all the time. This latter matter of general appearance is a new item for which marks have been awarded in this competition for the first time.

DEPARTMENT NEWS.

Mr. W. R. Dunlop, Scientific Assistant on the Staff of the Imperial Department of Agriculture for the West Indies, left Barbados on April 8, by the R.M.S. 'Chignecto' for an official visit to St. Vincent and St. Lucia. Mr. Dunlop returns to Barbados on April 29.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

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The *Agricultural News:* Price 1*d.* per number, post free 2*d.* Annual subscription payable to Agents, 22*s.* *d.* Post free, 4*s.* 4*d.*

Agricultural News

Vol. XIII. SATURDAY, APRIL 11, 1914. No. 312.

NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number treats of the subject of seasonal climatic changes. The importance of world-wide research in meteorology and of upper air investigations is emphasized, and several instances are given showing the useful generalizations which have already arisen from such investigations.

On page 114, under the heading Sugar Industry, appear a review of the past sugar-cane crop in Porto Rico, and an article concerning deterioration of seedling canes in Hawaii.

Under the heading Fruit, on page 116, is presented the second and final article on cold storage of fruit and vegetables.

On page 117, will be found interesting information concerning the fruiting of the date palm and the preparation of paper pulp from grasses.

Considerable space is devoted in this issue, and will be allowed in the succeeding one, to the subject of agricultural education. An important Indian report is reproduced and commented on, whilst the position in the West Indies will also be dealt with editorially.

Insect Notes, on page 122 comprise two articles entitled, A Useful Garden Syringe (illustrated), and the Mediterranean Fruit Fly, respectively.

Fungus Notes, on page 126, comprise an article on leaf-cut or tomosis of cotton. This disease occurs in the United States but has also apparently been discovered to exist in the West Indian island, St. Croix.

Report on the Botanic Station, British Honduras, 1912.

The limited amount of information which this publication contains refers entirely to such routine work as has been carried out in the Botanic Station. It is noted that a few plants of what is said to be a useful indigenous fodder grass were successfully established at the Station from material brought in by the Superintendent from the bush. The plant has been identified at Kew as *Panicum elephantipes*, locally known as 'dum cane'. It is stated that cattle feed on it regularlarly and thrive well. During the year 1,329 coco-nut plants were distributed and 800 rubber seedlings sent out. There is very little else of interest to record.

Although the contents of this report conform to the title which it bears, the view may be expressed that it would be a useful improvement if a section could be included dealing with external agricultural affairs under a heading corresponding to 'Progress in the Industries' of the West Indian islands reports. As the publication exists at present, no facts are provided to show the economic value of the Botanic Station to the agricultural community beyond the statements concerning the distribution of plants.

Attention may be called to several bad printer's errors, particularly in the case of the so-called 'scientific' names; for instance, *Hevea brasiliensis* appears as Hevia braziliensis, and *Elaeis guineensis* as Eloeisquinceusis.

A Weather Map for the World.

With further reference to the subject of the editorial in the present issue of this journal, attention may be called to some important remarks appearing in *Nature* (February 26, 1914), presumably from the pen of Dr. W. N. Shaw. Many readers will be familiar with the fact that Dr. Shaw has been, and is one of the strongest promoters of cosmic research in meteorology. In the article referred to, the usefulness of a daily map of the main features of the distribution of pressure and temperature over the entire globe is pointed out as a continuation of the announcement that the United States Weather Bureau is now publishing synoptic charts daily for the northern hemisphere.

Practically no lines are drawn on these maps for latitudes lower than 25°, and Dr. Shaw suggests it is interesting to speculate as to what sort of characteristics a synoptic chart of the equatorial regions would show if it could be drawn. In the Tropics there is no room for 'parallel' isobars because the influence of the rotation of the earth is too feeble. Consequently a pressure distribution sufficiently permanent to be mapped could only be made up of 'circular' isobars, and therefore a chart of isobars for part of the equatorial region ought to be a collection of small circles with whatever may be necessary to represent the diurnal variation.

The translation of a collection of barograms for the Tropics, into synoptic charts would be an attractive problem. It would presumably tell us what the

meteorological conditions would be if the earth were fixed and the sun went round it in twenty-four hours as the ancients used to suppose.

A New Tropical African Genus allied to Citrus.

In the *Journal of Agricultural Research* (Vol. 1, No. 5), Swingle and Kellerman, of the United States Department of Agriculture, show that the African species of Limonia constituting the section Citropsis of Engler are related to Citrus rather than to the Asiatic species of Limonia. This conclusion, based on a study of herbarium and living material, has been confirmed by the results of experiments in grafting, which show that the African species belonging to the section Citropsis can be budded easily and grows well on all the commonly cultivated species of Citrus. The genus Citropsis resembles Citrus in the general structure and appearance of the flowers and fruit as well as in the texture, venation and general type of the leaves. It differs from citrus in having 4- or rarely 5-merous ovaries, with only a single ovule in each cell, and in several other floral and vegetative characters.

The African cherry oranges—as the species of Citropsis are called popularly—are likely to prove of some economic value because of the high flavour of many of the fruits and the large assimilation area of the foliage. Grafting experiments have been conducted and *C. Schweinfurthii* will grow vigorously and rapidly on sweet orange, sour orange, grape fruit, and lemon stocks. This species is also adapted for growing independently on rather poor soils and seems to be resistent to disease.

Attempts to raise hybrids between Citrus and Citropsis are in progress. So far flowers of the common lime (*Citrus aurantifolia*) pollinated with *Citropsis Schweinfurthii* set fruit and produced seed. This seed was not fertile: but further crossing, and with other species, will no doubt lead to the successful production of a very interesting and possibly valuable group of hybrids.

St. Kitts Agricultural and Industrial Show, 1914.

The Eighth Agricultural and Industrial Show was held under the auspices of the Imperial Department of Agriculture and the St. Kitts Agricultural Society at the Grammar School, Basseterre, on February 20, 1914. The exhibition was formally opened by His Honour the Administrator. The President of the Society (Mr. C. Forbes Todd), the Superintendent of Agriculture for the Leeward Islands (Mr. H. A. Tempany, B.Sc.), and the Agricultural Superintendent, St. Kitts (Mr. F. R. Shepherd), were amongst those who were also present. In the course of the proceedings, regret was expressed at the absence of His Excellency the Governor and the Imperial Commissioner of Agriculture. An incident of considerable interest and significance was the presentation of the first class final certificate of the Imperial Department Examinations in Practical Agriculture to Mr. W. Owen, and the important announcement that Major Montgomery, the owner of Molineux estate, who was present at the exhibition, had promoted the successful candidate from the position of overseer to that of manager of the property.

In regard to the exhibition itself, the display of exhibits compared favourably with that of previous years, except in the live stock classes. Planters should make a definite attempt to improve their working stock. Concerning crops, the sugar-cane exhibits provided in several cases very fine specimens, one lot of twenty-four cut canes weighing 250 lb. The cotton shown was of a very high standard. There were the usual flowers and fancy work exhibits. Outside, the driving and riding attracted much attention, but the competition was not as keen as usual.

The total number of exhibits this year was 723 as against 811 in 1913 and 736 in 1912.

West Indian Bulletin.

The *West Indian Bulletin*, Vol. XIV, No. 1, is just being distributed. This number is devoted to the subject of peasant agriculture in the West Indies, and contains a more or less continuous story of the establishment and results achieved by Land Settlements, Credit Societies, and other forms of co-operation in the West Indies. A useful feature of the number is the introductory article, which outlines in a general manner the efforts made in aid of peasant agriculture in the Windward and Leeward Islands.

Agricultural Position in St. Vincent.

In his address before the Legislative Council, His Honour the Administrator, St. Vincent, referred with regret to the abnormal climatic conditions experienced during 1913, but remarked upon the ameliorating influences of more favourable weather since November, which has to a considerable extent improved the general outlook for Sea Island cotton. During the 1912-13 season, the area under Sea Island cotton underwent a reduction of some 600 acres, but this has to a large extent been put under other crops so compensating in other ways the deficiencies involved through a lesser acreage under cotton.

His Honour referred, in continuation, to the depression of the intercolonial arrowroot market, which was possibly due to the increased production for cassava starch, for which, it is interesting to note, the St. Vincent Agricultural Department is attempting to find a market in North America.

Facilities will be available during the 1914-15 cotton season for having cotton seed crushed at the Government cotton ginnery by the new oil-expressing plant which is about to be installed. This will enable planters to return to the soil as manure, the chief mineral ingredients which cotton takes from the land.

This review of the agricultural position of the Colony was concluded with a brief reference to the purchase of the estate of Belair for Land Settlement purposes, and to the putting into action of the Agricultural Credit Societies movement which is or should be closely connected with the Land Settlement Scheme.

INSECT NOTES.

A USEFUL GARDEN SYRINGE.

Information has from time to time appeared in the *Agricultural News* relating to sprayers for the application of insecticides, but this has generally dealt with barrel and knapsack sprayers to be used in connexion with insect and fungus pests and diseases of orchard and field crops. It is the object of the present note to give an account of a garden syringe of moderate cost, which is especially useful in dealing with garden and potted plants, small ornamental and fruit trees. In the Pamphlet No. 71, issued by this Department entitled *Insect Pests of the Lesser Antilles*, there appears on page 184 a short note on the Abol syringe.

The Abol syringe is manufactured by the E. A. White Co., Ltd., England, who have kindly supplied the blocks used for reproducing the figures shown herewith.

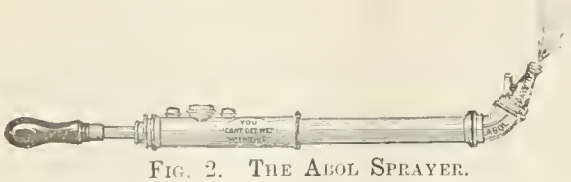


Fig. 2. The Abol Sprayer.

The agricultural officers in the several islands have made trials of this syringe and it has been found to be well adapted for use, especially in dealing with scale insects on small plants. The Abol sprayer is shown in Fig. 2 complete with bend to allow of easier spraying of the under side of leaves. It is of durable construction, being made of brass, and there is very little about it that can get out of order.

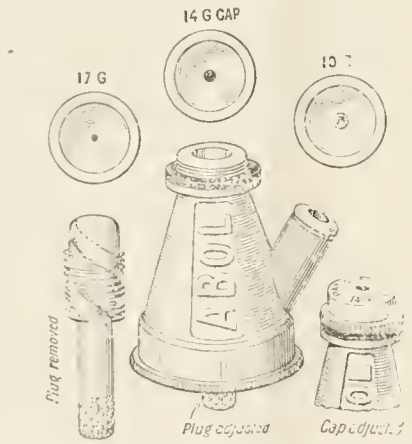


Fig. 3. Details of Construction of the Abol Nozzel.

In Fig. 3, the construction of the nozzle is shown. The plug, which can easily be removed for clearing in case of an obstruction, has two spiral grooves on its surface which give the spray mixture a rotary motion inside the nozzle, with the result that it passes through the aperture of the cap as a fine spray in the form of an inverted cone. There are three caps with apertures of 10, 14 and 17 gauge, respectively, the 17 gauge opening producing a fine mist-like spray; the others, being larger, do not break up the solution so finely.

Another feature of this instrument is the drip preventer, which is in the form of an enveloping cylinder extending about half the length of the barrel of the syringe open towards the nozzle and closed at the other end. Any drip or leakage from the nozzle running down the barrel is caught in the jacket thus formed and prevented from passing down to the hands and arms of the operator when reaching up in spraying. When the syringe is to be filled again the contents of the drip preventer are turned back into the bucket containing the supply of the insecticide.

In spraying, it should constantly be borne in mind that the best results are to be obtained from a very fine mist like spray, which strikes the leaves and stems of the plant with as much force as possible. Coarser spray is only to be used in order to enable the insecticide to be thrown to a greater distance.

The Abol syringe is now carried in stock by a firm of hardware dealers in Barbados, by whom it is sold at a moderate advance on the retail price in England.

MEDITERRANEAN FRUIT-FLY.

This pest, which is known scientifically as *Ceratitis capitata*, Wied., breeds throughout the year in Uganda, provided that there is suitable food available; and there seems to be no lack of food of some kind, cultivated or wild, always available. The following account of the life-history of this insect has been worked out by Mr. Gowdey and published in the Annual Report of the Department of Agriculture, Uganda, 1912-13:—

The life-history of the March brood of this insect has been worked out. It is hoped later to have the opportunity of working out the life-histories of the broods throughout the year. In all probability the length of the several stages of the other broods will prove to be somewhat longer, as at the time of the March brood, food, at any rate cultivated food, is more plentiful.

The female uses her extensile ovipositor to pierce the berry and to lay the eggs under the skins. The eggs are usually laid in varying numbers, sometimes singly. The eggs apparently will not hatch when deposited in green berries: at any rate, a great many perish that are laid in green berries. The maggots on hatching immediately begin to feed, and in the case of coffee berries, make for the pulp between the beans in most cases. Here the maggots feed for from fourteen to twenty days. At the end of this period, the maggots leave the berries and bury themselves in the soil to a depth of about 2 inches. The insect remains in the puparial stage from twelve to twenty days. When the flies emerge from the puparia, they work their way through the soil and as soon as their wings have dried, fly in search of food and mates.

The ripeness of the berries appears to be a big determining factor in the rapidity of the development of the insect. The development is also influenced by heat, as evidenced by keeping a case in a room the temperature of which was about 5 degree F. higher than that in which the other cages were kept. This cage was consistently twenty-four hours ahead of any of the others.

Food plants. The maggots of this insect have been bred on *Anona muricata*, banana, coffee berries, guava, lemon, orange, pine apple and papaya.

Parasites. Although several parasites have been reared from this fly in different parts of the world, none seems to be capable of holding it in subjection. Experiments to find any parasites locally have failed, except in a single instance, but, as this parasite is evidently very scarce, it is of negligible value in keeping the pest under control.

WATER-SUPPLY.

REPORT ON SAMPLES OF WATER FROM ELEVEN WELLS IN THE VIRGIN ISLANDS.

In this report it is stated that the samples were taken by Mr. W. C. Fishlock, Curator of the Experiment Station, Tortola, during the year 1913. They represent wells sunk at different points in the Virgin Islands Presidency for the purpose of affording local sources of water-supply.

In all eleven samples have been taken. The point of origin and the analytical character of the waters are shown in the accompanying table.

SAMPLES OF WATER FROM THE VIRGIN ISLANDS.

	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
	Grains per gallon.				
Total solids	37·7	36·0	27·3	42·0	99·0
Chlorine	7·9	8·5	5·5	7·5	33·1
Equivalent to sodium chloride	13·0	14·1	9·1	12·3	55·0
Temporary hardness	5·3	7·8	7·4	14·1	13·0
Sodium carbonate	10·9	7·0	6·0	10·3	8·2

	No. 6.	No. 7.	No. 8.	No. 9.	No. 10.	No. 11.
	Grains per gallon.					
Total solids	93·1	40·3	99·4	108·1	83·3	114·2
Chlorine	28·3	15·2	36·0	36·8	24·1	47·4
Equivalent to sodium chloride	46·5	25·1	59·3	60·6	39·7	78·1
Temporary hardness	18·1	9·5	9·2	25·5	21·4	7·6
Sodium carbonate	16·1	4·1	6·7	17·2	11·1	4·3

KEY.

No. 1 Well at Works Yard, Experiment Station, Tortola.
No. 2 ,, ,, Curator's house, Tortola.
No. 3 ,, ,, 'Sunday Morning', Tamarind Tree, Lower Estate, Tortola.
No. 4 Newly dug well at Sea Cow Bay, Tortola.
No. 5 Well at East End, Tortola.
No. 6 ,, ,, 'Towers', West End, Tortola.
No. 7 ,, ,, South end of road at Valley Settlement, Virgin Gorda.
No. 8 ,, ,, north end of road.
No. 9 ,, ,, Great Harbour, Jost van Dykes.
No. 10 ,, ,, East end, Jost van Dykes.
No. 11 ,, ,, Anegada.

Of the total samples six are from Tortola, two from Virgin Gorda, two from Jost van Dykes and one from Anegada.

With the exception of that at Anegada, all the wells are sunk in alluvial sands of the valley bottoms and derive their supply from the subsoil water seeping from the slopes of the different catchment areas.

In most cases the waters are well adapted for drinking purposes as judged by the mineral salt content. The best samples are from wells Nos. 1, 2, 3, which are associated with the catchment area of the large valley to the north-east of Roadtown, No. 4 from the similar valley at Sea Cow Bay on the South Coast, and No. 5 from the well at the south end of the road at Valley, Virgin Gorda. The samples of water from other places have somewhat higher saline contents but none are so high as absolutely to preclude their use for drinking purposes. The most saline water of all is that from Anegada, which is sunk through the rock or shelf and as is to be expected shows quite a high saline content relatively.

It is an interesting feature of all these samples that without exception they show the presence of small but varying amounts of sodium carbonate.

In conclusion this series of wells indicates in a very clear and interesting way the manner in which the local needs of different districts for a water supply can be easily met at relatively small expense under conditions favourable to well sinking.

A STEAM ENGINE FOR SUN POWER PLANTS.

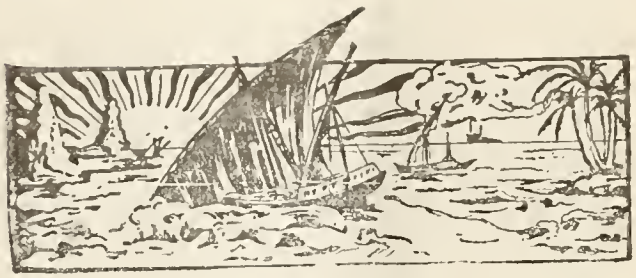
A short account of the general construction of a sun power plant has already been given in the *Agricultural News*. The following note from the *Experiment Station Record* (December 1913) describes a new low-power steam engine, which seems to work very satisfactorily with the plant, particularly for purposes of irrigation pumping.

Inasmuch as the success of a sun power plant for irrigation pumping and other power purposes depends largely on the use of an efficient small power steam engine, using steam practically at atmospheric pressure, the inventor of this system of pumping power development produced in conjunction with another engineer a low pressure, slow-speed reciprocating steam engine adapted to the particular needs of the sun power plant. The economy claimed to be obtained by this engine is attributed to the combined effect of certain modifications and improvements in construction, which bring about a reduction of losses due to friction, valve and piston leakage, and initial condensation and clearance.

In further developments of small power steam engines these modifications were applied to a small high-pressure and a small low-pressure engine having practically the same essential details. The high-pressure engine having a cylinder diameter of 16 inches and an 18-inch stroke was tested, both condensing and non-condensing, and the resulting steam consumption per brake horse power hour compared very favourably with the results obtained under under similar conditions from tests of several compound condensing and non condensing engines of both higher and lower power. Tests of the low-pressure engine having a cylinder diameter of 36 inches and a 36-inch stroke showed a steam consumption per brake horse power hour which compared very favourably with the results obtained from tests of several higher and lower power exhaust steam turbines under similar conditions.

It is stated that the whole success of the small low-pressure engine depends on the availability and maintenance of a high vacuum, for which purpose specially designed air and hot well pumps are employed.

The great difference which results between the effects of artificial watering of soil and watering through rainfall, seems worthy of scientific investigation. The greater efficiency of rainfall is no doubt due to its greater penetrating force, wider distribution and to the circumstance that the air is at the time of the precipitation sufficiently humid to arrest surface evaporation. Possibly nitric acid and dust brought down in rainfall may exert some fertilizing action.



GLEANINGS.

The question of an Agricultural College for the West Indies is again discussed in *Tropical Life*, for February 1914. Consideration is given the relative positions of India, Ceylon, Federated Malay States, and the West Indies, as regards agricultural education.

A series of articles has commenced in the *Journal of the Jamaica Agricultural Society*, on banana cultivation. The subject-matter of the first instalment is of a very practical kind and should receive the attention of those who intend to enter the industry.

The *Revue Agricole* (January 1914) reproduces a lengthy article from the *Journal la Sucrerie Indigène et Coloniale* describing the history and work of the Imperial Department of Agriculture in the West Indies. Reference is made to the *West Indian Bulletin*, Vol. XI, No. 4, which is devoted to the same subject.

It is stated in the Annual Report of the Department of Agricultnre, Uganda Protectorate, 1912-13, that the price of lands in that country has risen enormously due to the large influx of European planters anxious to take up land, so that land valued at Rs. 4*s*. per acre last year easily finds a purchaser now at Rs. 20*s*. per acre or even more.

Manurial experiments conducted with rubber at Kuala Lumpur Experiment Plantation, Federated Malay States, have shown that on the soil there, lime has had a marked influence in accelerating the growth of rubber trees. The addition of phosphate (and lime) also produced a marked beneficial effect. (*Bulletin No. 18, Department of Agriculture*, F.M.S.)

The need for good manuring of pepper has been further emphasized in Madras. A plot which received lime and leaf mould has continued to improve. In 1907 this plot yielded 5¾ Madras measures of pepper which, in 1912, had risen to 113½ Madras measures, and in last year, was 140 Madras measures. Fish manure also gave good results. (Report on the Operations of the Department of Agriculture, Madras Presidency, 1912-13.)

A correspondent to the South African *Agricultural News* (January 15, 1914) says that in observing the arrowing of canes he has found that those which arrow most frequently are the ones growing on the crowns of ridges and where the ground is usually of a hard nature, and difficult to reduce to a fine tilth. Further, the cane generally arrows on the same places every season it is in flower, and it is uncommon to find canes arrowing in low moist lands.

An interesting feature of the coco-nut industry in the Federated Malay States, is the introduction, on a large scale, of the dwarf or 'King' coco-nut (Nyor gading) which is being tried in the coast district of Negri Sembilan. It is stated that the palms should come into bearing in about four years. It remains to be seen whether the probable higher yields of nuts per acre, and early maturity, will compensate for the expected increased rate of expense in husking, etc. per lb. of copra obtained. (*Bulletin No. 18, Department of Agriculture*, F.M.S.)

In continuation of the editorial in the *Agricultural News* on the subject of alcohol for motor fuel, reference may be made to an article in the *Chamber of Commerce Journal* (February 1914) dealing with the existing fiscal conditions in Great Britain, which at present form a great obstacle to the utilization of alcohol for fuel purposes. A resolution was unanimously adopted and forwarded to the Chancellor of the Exchequer, who referred the Association to the Chairman of the Board of Customs Excise. Presumably the matter is being followed up.

Reference is made in the *Demerara Daily Chronicle* (Mail Edition) for February 27, 1914, to the report of the Director of Agriculture, British Guiana, on the fertility of the Rupununi Savannah Lands. It would seem that the soils may lend themselves with proper treatment to great improvement. A sample referred to as No. 3 is believed to be capable of producing almost any tropical crop with the addition of phosphatic and potassic manures. Samples referred to as Nos. 2 and 5 are stated to be particularly well suited for tobacco growing.

The Government of British Guiana would seem to have succeeded in putting a stop to milk adulteration successfully by raising the fines inflicted upon persons convicted for this criminal offence. The *Daily Argosy* (Mail Edition) for February 28, 1914, says that in cases in which 5 per cent. adulteration has been proved, a fine of $5 with an additional $3 is imposed; 7 per cent. $10; 12 per cent. $15; 15 per cent. $20; and 20 per cent. $25. A defendant convicted of adulterating his milk to the extent of 25 per cent. would be met with a fine of $35 to $40, or $1 per pint, with $10 or $15 added according to the circumstances of the case.

An article appears in the *Journal of the Board of Agriculture* of England (February 1914) on the subject of sale of manures in small quantities at excessive prices. Emphasis is laid upon the importance of ascertaining the unit values. The following mixture for general use in the garden, and on the land of the small grower is given in this article: sulphate of ammonia, 1 part by weight; superphosphates, 6 parts; bone meal, 1½ parts; sulphate of potash, 1½ parts. If stored in a dry place the mixture will keep for years without material deterioration. For garden work in particular, it is handy to keep a mixture like this in stock. It is also cheaper to prepare the mixture at home, and certainly more reliable, than buying it.

THE SOIL.

INVESTIGATION WORK IN THE FEDERATED MALAY STATES.

On the completion of the programme outlined in the *Agricultural Bulletin*, Federated Malay States (January 1914), a knowledge will have been acquired of the types of soil best suited for the staple cultivations of that country, and the belief may be expressed that it will then be possible to afford to possessors of capital reliable information as to where, in planting pursuits, it may be most profitably employed.

During 1913, 121 samples were accepted for full analysis, and it is expected that during 1914, 150 to 250 samples will be dealt with. An important line of soil investigation has been the examination of coco nut soils. Whereas rubber grows well and affords satisfactory yields on almost any class of soil, the coco-nut tree is much more fastidious. In some places a yield of twenty nuts per tree each year may be taken as the average; in others, it reaches eighty or even 100. Work on coco-nut soils is at present confined to districts of noted fertility, but will subsequently be extended to others in which the yields are low.

A considerable amount of work was done during the year on padi soils, and also in regard to the question as to whether land suitable for cultivation was to be found at high altitudes. In the latter case the result was disappointing, for although at a height of 4,500 feet surrounding a hill station there is a very large area (probably 3 sq. miles) that is covered with a characteristic growth and might therefore be expected to be of value, the soil is almost entirely composed of peat and therefore unsuitable for cultivated crops.

AN ARTIFICIAL SOIL.

An account in the *Queensland Agricultural Journal* (February 1914) deals with the somewhat remarkable substance known as Jadoo fibre. The foundation of this material is absorbent peat moss. In a large boiler, partly filled with water, the following ingredients are put in, in various proportions: soot, pink gypsum, bone meal, phosphoric acid, potash, nitrate of soda and sugar. The boiler is then filled up with peat moss in a dry state, and the whole is kept at boiling point for thirty minutes.

The moss is then taken out and stacked. To it is added yeast, and the moss is fermented and kept in that state and at a certain temperature for a month or five weeks, when it is then fit for use.

The Queensland Department of Agriculture has supplied a quantity of this material to the Agricultural College for experimental purposes and the results of the trial will be awaited with interest. Analysis has already shown that the material is very rich in plant food, a fair amount of which is readily available for absorption Jadoo fibre must be considered highly fertile artificial peaty soil.

The opinion is expressed in the article under consideration that the manufacture of this product could be successfully started in Queensland by utilizing as a foundation material, finely crushed megass from the sugar mills. Megass by itself has only a very slight manurial value (about 6s. per ton), but megass possesses great absorptive power, and retains water just as well as jadoo fibre, and, again, does not rot quickly in the ground. It is suggested that perhaps finely chopped trash or, again, dried filter-press cake, might be added with advantage to the megass.

ALKALI SOIL AND THE GROWTH OF THE RICE PLANT.

Rice plants were grown in water cultures of varying concentrations of salts of sodium, potassium, magnesium and calcium, separately and in combination.

The growth of the plants under the different conditions was noted and the following results obtained:—

A. Single salts of the above metals.

(1) The salts act as stimulating or toxic agents according to the concentration.

(2) The toxic concentrations of magnesium sulphate and chloride, calcium chloride and sodium chloride and carbonate are greater than $\frac{N}{100}$ while those of sodium sulphate and bicarbonate are greater than $\frac{N}{50}$.

(3) The concentrations of greatest stimulation were for magnesium sulphate $\frac{N}{500}$, for magnesium chloride and calcium chloride $\frac{N}{1000}$ to $\frac{N}{5000}$, for sodium chloride $\frac{N}{50}$ to $\frac{N}{100}$, for sodium carbonate and bicarbonate $\frac{N}{100}$ to $\frac{N}{100}$.

B. Two salts in combination.

(4) Different kations are mutually antagonistic; the same effect occurs between different anions, but in a less degree. Thus the limit of concentration producing toxic effects is higher in mixtures of salts.

(5) The curve for concentration and antagonism between sodium and potassium salts shows two maxima.

(6) The antagonism between potassium and magnesium or calcium is almost complete, so that at certain proportions the toxic effect completely disappears.

(7) The antagonistic action of calcium cannot be replaced by barium or strontium.

These results have considerable bearing on soil fertility, especially in alkaline soils. (*Monthly Bulletin of Agricultural Intelligence and Plant Diseases*, January 1914.)

A note on the classification of Egyptian soils according to permeability appears in the *Experiment Station Record*, Vol. XXIX, No. 9, in which it is stated that these soils have been classed as permeable soils, soils of average or only slight permeability, permeable soils with impermeable subsoils, soils more or less impermeable at the surface overlying permeable subsoils in underground communication with irrigation canals, and impermeable soils. Consequent on their permeability, only a considerable development of drainage and the use of mechanical means for elevating water will permit the rapid reclamation of the uncultivated lands in the north of Lower Egypt. Concerning the south and centre of Lower Egypt and also Upper and Central Egypt, it is suggested that systems of drainage canals should be situated lower than and bordering on the lands irrigated, and that the lands be irrigated by means of mechanical lifting devices throughout the greater part of the year.

In the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases* (January 1914) appears an article on cultural experiments on sick soils. The solution of sick soils contains substances injurious to plants which may be eliminated by filtering through charcoal. Boiling only eliminates these injurious substances from some soils. The solutions of soils not previously sown to cereals do not contain injurious substances. It does not appear that the soil solution exerts an injurious action for only one plant, but on vegetative development in general.

FUNGUS NOTES.

LEAF-CUT, OR TOMOSIS, A DISORDER OF COTTON SEEDLINGS.

In view of the occurrence in St. Croix (*Agricultural News*, Vol. XII, p. 302) of a serious affection of cotton closely resembling that which has recently been described in the United States as Tomosis, we reprint in full below an article on the subject by Mr. O. F. Cook, published in Circular 120 of the Bureau of Plant Industry, United States Department of Agriculture.

Seedlings and young cotton plants are subject to a peculiar disorder that results in extensive injnry to the leaves and frequent abortion of the terminal bud. While these injuries are seldom fatal, they undoubtedly impede the growth of the plants, delay the period of production, and reduce the crop. Though not taken into account hitherto, the losses occasioned by the leaf-cut disorder, though most severe in the South-western States, seem to be very general and must amount to millions of dollars every year. With the advance of the boll weevil this form of injury to the young plants acquires a more serious aspect, because it is of the utmost importance to shorten the period of production in order to avoid damage by the weevil. The leaf-cut handicap can be reduced by improved cultural methods, as stated in previous publications of the Bureau of Plant Industry.

Leaf-cut is suggested as a popular name because mutilations of the leaves are the most characteristic symptom of the disorder. The name 'juvenile leaf-curl' has been applied in previous publications, but is inconveniently long and not sufficiently distinctive. Moreover, the leaves of cotton seedlings are subject to another malformation, induced by plant lice, for which the name 'leaf-curl' is more appropriate.

Leaf-cut is very widely distributed and familiar to planters, though generally confused with the leaf-curl caused by plant lice. Though both forms of injury are likely to be found in the same field, or even on the same individual plant, they are easily distinguished. The leaf-curl is a crumpling or arching up of the leaf between the veins, but without perforations or rents. Even in cases of great distortion by leaf-curl the tissues of the leaf are left entire, without being punctured or torn. Leaf-cut injuries, on the other hand, represent an actual destruction of some of the tissues of the leaf, leaving irregular holes or marginal incisions. In single words, leaf-curl may be described as distortion of the leaves, leaf-cut as mutilation. In allusion to this distinction the word 'tomosis' is proposed as a technical name for the leaf-cut disorder, while the distortion caused by the plant lice may be called 'hybosis'. The insects inhabiting the badly distorted upper leaves were identified by Mr. Th. Pergande, of the Bureau of Entomology, as *Aphis gossypii*, Glover.

And in addition to the open wounds that result from leaf-cut there are usually some that have healed, giving a characteristic torn-and mended appearance. Such scars, like other leaf-cut wounds, often lie in a somewhat radiating position between the principal veins. Healing of wounds and regeneration of lost parts show that the injuries are liable to occur at a very early stage in the development of the leaf. Sometimes an extensive new growth or regeneration takes place, resulting in a curious doubling or overlapping of lobes of injured leaves. The power of the injured tissues to heal is also responsible for adhesions between parts that lie folded together in the bud. These adhesions are usually responsible for failure of normal expansions of the blade. None of these secondary symptoms occur with the leaf curl induced by plant lice.

Leaf-cut is hardly to be reckoned as a disease unless the word is used in its most general application that includes any departure from normal structure or function. Neither of the two general classes into which diseases are usually divided, constitutional and parasitic, will include the leaf-cut. Though some of the cells are destroyed, the remaining tissues of the plant do not become abnormal in any way, and there is no indication that parasitic organisms of any kind—bacteria, fungi, insects, mites, or worms—are involved. Another class of ecological disorders may need to be recognized, intermediate between physiological diseases and mechanical injuries or traumatisms. Leaf-cut is a disease only in the sense that frostbite, snow blindness, and other environmental injuries are to be considered as diseases.

Young cotton plants are often subjected to extreme conditions during the early stages of growth, when the leaf-cut injuries occur. The leaves and roots are still close to the surface soil, where they can be chilled at night and scorched in the daytime. Cold nights are sometimes looked upon as the cause of the injury, and may be an intensifying factor, but the sudden heat of a bright morning sun seems more likely to kill the cells of the young leaves than low temperatures during the night. Leaf-cut often affects late plantings long after the night temperatures have ceased to approach the freezing point. It has been noticed that exposure to a bright morning sun after a cold night will throw cotton seedlings temporarily into a wilted state, doubtless because the leaves lose water by transpiration faster than it can be absorbed by the chilled roots. Leaf-cut seems to be especially prevalent under such conditions.

That leaf-cut is in some way connected with exposure or wilting of the delicate tissues is also shown by the fact that the injuries are most severe and occur most frequently along radiating lines midway between the principal veins. These lines of greater susceptibility represent the most exposed parts of the upper surface of the young leaf as it lies folded in the bud. The only suggestion for explaining the very irregular manner in which the cells are killed is that some of them may be unable to complete their divisions and nuclear readjustment during the night and may thus be left in an unusually susceptible condition. Sections of injured leaves prepared by Dr. Albert Mann, of the Bureau of Plant Industry, show that nuclear and protoplasmic disintegration are the earliest symptoms. The damage often begins with the death of a single cell, which results, of course, in increased exposure for the neighbouring cells.

Plants protected by partial shade suffer less than those that are fully exposed, but, on the other hand, full exposnre does not induce leaf-cut when the plants are growing on wet lands where the surface remains moist and is kept cool by evaporation. The moist atmosphere and partial shade afforded by ordinary green-house conditions also afford complete protection from leaf-cut.

Even in parts of the same field there may be obvious differences in the extent of leaf-cnt injury. Plants that stand close together often show much less injury than more scattering plants in the same rows. Where the soil is too dry to germinate all the seed the leaf-cut injuries are more extensive. Such differences indicate the possibility of avoiding or reducing the damage from leaf-cut by giving better attention to the seed bed and to method and times of planting and thinning.

Though mutilation of the leaves is the most frequent and familiar symptom of the leaf-cut disorder, abortion of terminal buds is a more serious injury. In severe cases of leaf-cut, from 30 to 60 per cent of the plants have been found with their terminal buds aborted. When the leaf-cut injuries are confined to the individual leaves the effect is

merely to retard the growth of the plant, but when the terminal bud is lost the plants are permanently deformed and usually produce a much smaller and later crop than normal individuals in the same field.

In the most severe form of the disorder the young seedlings lose the buds in the axils of the cotyledons as well as the terminal bud. Such plants are unable to form any true leaves, but the cotyledons increase in size and the hypocotyl becomes much thickened. In some cases the root begins to form a subterranean shoot, like those that develop vegetative buds when plants have been killed to the ground in the winter. When abortion of the bud takes place higher up, so that the plants have one or two true leaves, the blades grow much larger than usual and the petioles become greatly elongated. If thinning be deferred until the normal plants are 10 inches or a foot high it is easy to distinguish and remove the deformed individuals and leave only the healthy and vigorous ones. Under the usual plan of thinning the cotton early it is much more difficult to recognize and remove the injured plants.

Susceptibility to leaf cut is usually limited to the seedling and young plants less than 10 inches high. Sometimes the change from susceptibility to immunity is very abrupt. Plants that have had every leaf injured up to the sixth or eighth may then begin to put out entirely uninjured leaves. These abrupt changes may affect whole rows or fields of cotton, as if the later uninjured vegetation had grown out after a hailstorm. Whether the plants become immune to leaf-cut simply because larger stature carries the new growth farther away from the overheated soil, or because a deeper root system affords a more regular supply of moisture, or because the weather conditions become more uniform as the season advances has not been determined. All these factors may co-operate, or there may be others as yet unsuspected.

A few cases of abnormal individuals have been observed where injuries very similar to leaf cut continued during the whole life of the plant. Some of these plants were hybrids and others were mutations, but all of them were abnormal in other ways, as well as in the irregular texture of the foliage. It seems not unreasonable to suppose that abnormal plants should remain more susceptible to any external conditions that have adverse effects upon the activities of the cells.

Though all the different types and varieties of cotton seem to be susceptible to leaf-cut injuries, certain differences have been noticed. The leaves of the Durango cotton and other Upland varieties are often injured much more seriously than those of Egyptian cotton in adjacent rows, but at the same time the Egyptian cotton may show a larger percentage of abortion of terminal and axillary buds. The immunity may lie in the improvement of conditions rather than in an increased resistance on the part of the plant. With the plant lice injuries there is a gradual reduction of the amount of distortion that the insects are able to produce, which may indicate the development of a different kind of immunity in this disorder. It is true that the plant lice usually disappear as the season advances, but even when the insects remain abundant the distortion becomes less as the plants grow larger.

CONCLUSIONS.

Leaf-cut is a disorder of cotton seedlings characterized by mutilation of the leaves and abortion of the terminal buds. Leaf-cut has been confused with the distortion of the leaves by plant lice, but the two malformations are readily distinguished.

Leaf-cut is in the nature of an environmental injury, not due to parasitic organisms or to constitutional weakness, but apparently connected with exposure to heat and dryness. All varieties of cotton are susceptible during the early stages of growth.

Though leaf cut is not fatal, it is responsible for much damage by retarding the growth of the young plants. The loss of the terminal buds interferes with normal habits of branching, and the plants are permanently deformed. Damage from leaf-cut can be avoided or reduced by improved cultural methods, and the deformed plants can be removed by later thinning.

LIVE STOCK NOTES.

BOVINE TUBERCULOSIS INVESTIGATIONS.

In the Report of the College of Agriculture and the Agricultural Experiment Station of the University of California (1912-13), the following summary is published, describing the results of an investigation to test the value of 'Bovovaccine' in immunizing cattle to tuberculosis:—

Bischoff and Company, American agents for the products of the Marburg Institute, Germany, have been active in selling von Behring's bovovaccine to dairymen in this State. In 1907 it seemed desirable to undertake some experiments to determine its efficiency under California conditions.

Forty-five calves were secured for the purpose of this experiment, measures being taken to obtain animals free from tuberculous infection. Twenty-two of the calves were treated with bivovaccine after the manner of von Behring and twenty three were kept as controls. For a year the calves were reared with precautions against tuberculous infection. At the end of eight months all of the calves were tested with tuberculin and none reacted. Even in the bovovaccinated calves the hyper sensitiveness which usually exists for a time in such animals had disappeared.

After having satisfied ourselves that the herd was free from tuberculosis, the forty-five animals were subjected to infection by placing in their pasture cattle having open tuberculosis. These were associated with the calves in a 20 acre pasture and in corrals where they came to be fed. The first lot of tuberculous cows brought into contact with the calves were five in number. Within six months these cows had all died of tuberculosis.

The following spring, ten more reacting cows, having evidence of open tuberculosis, were introduced and the infection experiment carried through until the young vaccinated cattle and the controls were between two and a half and three years old. Details of the tests need not be given other than to summarize the final results. They were all autopsied, most of them were killed for beef at about three years of age, under federal inspection.

Of the twenty-two vaccinated cattle, ten were tuberculous. Of the twenty-three non vaccinated cattle, fourteen were tuberculous. Bischoff and Company wrote us that if another vaccination had been made when the animals were about a year old, their immunity would doubtless have been increased sufficiently to protect them from infection. And there is reason to believe that this might have been the case. However, even if frequent injection of bovovaccine would keep cows immune, it would be impracticable to vaccinate mature dairy cows with virulent human tubercle bacilli. Our conclusions are that some immunity was produced by the use of bovovaccine, but that this immunity did not remain to any appreciable extent after the third year. We cannot recommend the use of bovovaccine to stock owners.

MARKET REPORTS.

London—The West India Committee Circular, March 24, 1914

Arrowroot—3*d.* to 4¾*d.*
Balata—Sheet, 2/7; block, 1/11 per lb.
Beeswax—No quotations.
Cacao—Trinidad, 62/- to 67/- per cwt.; Grenada, 56/- to 63/6; Jamaica, no quotations.
Coffee—Jamaica, no quotations.
Copra—West Indian, £27 per ton.
Cotton—Fully Fine, no quotations: Floridas, no quotations; West Indian Sea Island, 16½*d.* to 22*d.*
Fruit—No quotations.
Fustic—No quotations.
Ginger—Very quiet.
Isinglass—No quotations.
Honey—No quotations.
Lime Juice—Raw, 1*s.* 8*d*; concentrated, £31: otto of limes (hand-pressed), 9/6.
Logwood—No quotations.
Mace—1/3 to 2/11.
Nutmegs—4½*d.* to 6*d.*
Pimento—Dull.
Rubber—Para, fine hard, 3/0¼; fine soft, 2/11¾; Castilloa, 1/8 per lb.
Rum—Jamaica, no quotations.

New York.—Messrs Gillespie Bros. & Co., March 20, 1914.

Cacao—Caracas, 12c. to 14¼c.; Grenada, 12½c. to 13c.; Trinidad, 12½c. to 13c.; Jamaica, 12c. to 12½c.
Coco-nuts—Jamaica, selects, $27·00 to $29·00; Trinidad selects $31·00 to $32·00; culls, $15·00 to $16·00.
Coffee—Jamaica, 10c. to 14½c. per lb.
Ginger—8½c. to 10½c. per lb.
Goat Skins—Jamaica, 48c. to 50c.; Antigua and Barbados, 45c. to 48c.; St. Thomas and St. Kitts, 42c. to 45c. per lb
Grape Fruit—Jamaica, $1·50 to $2 25
Limes—No quotations.
Mace—50c. to 53c. per lb.
Nutmegs—110's, 12½c.
Oranges—Jamaica, $1·25 to $1·75.
Pimento—4c. to 4¼c. per lb.
Sugar—Centrifugals, 96°, 2·98c. per lb.; Muscovados, 89°, 2·54c.; Molasses, 89°, 2·33c. per lb., all duty paid

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Trinidad.—Messrs. Gordon, Grant & Co., March 30, 1914.

Cacao—Venezuelan, $12·50 to $12·75; Trinidad, $12·25 to $12·65.
Coco-nut Oil—$1·00 per Imperial gallon.
Coffee—Venezuelan, 13c. to 13½c. per lb.
Copra—$4·80 per 100 lb.
Dhal—$5·75.
Onions—$2·75 to $3·00 per 100 lb.
Peas, Split—$5·80 per bag.
Potatoes—English, $2·25 to $2·50 per 100 lb.
Rice—Yellow, $5·10 to $5·30; White, $4·85 to $4·90 per bag.
Sugar—American crushed, no quotations.

Barbados.—Messrs. James A. Lynch & Co., Ltd., April 4, 1914; Messrs. T. S. Garraway & Co., March 28, 1914.

Arrowroot—$4·00 to $5·50 per 100 lb.
Cacao—$11·75 to $12·00 per 100 lb.
Coco-nuts—$15·00.
Hay—$1·50 to $1·60 per 100 lb.
Manures—Nitrate of soda, $70·00; Cacao manure, $48·00 to $50·00; Sulphate of ammonia, $82·00 to $85·00 per ton.
Molasses—No quotations.
Onions—$2·60 to $4·50 per 100 lb.
Peas, Split—$5·75 to $6·00 per bag of 210 lb.: Canada, $4·15.
Potatoes—Nova Scotia, $2·00 to $3·30 per 160 lb.
Rice—Ballam, $5·20 to $5·55 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
Sugar—American granulated, $3·50 per 100 lb.

British Guiana.—Messrs. Wieting & Richter, March 28, 1914; Messrs. Sandbach, Parker & Co., March 27, 1914.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	$8·50 per barrel of 200 lb.	——
Balata—Venezuela block	No quotation	——
Demerara sheet	65c. per lb.	——
Cacao—Native	12½c. to 13c. per lb.	13½c. per lb.
Cassava—	96c.	——
Cassava Starch—	——	——
Coco-nuts—	$16 to $20 per M.	$26 per M.
Coffee—Creole	15c. per lb.	16c. per lb.
Jamaica and Rio	15½c. per lb.	16c. per lb.
Liberian	13c. per lb.	12c. per lb.
Dhal—	$5·00 to $5·75 per bag of 168 lb.	$5·80 per bag of 168 lb.
Green Dhal	$5·75	——
Eddoes—	$1·44	——
Molasses—Yellow	None	——
Onions—Teneriffe	4½c. to 5c.	——
Madeira	6c.	5c. to 6c.
Peas—Split	$6·00 to $6·25 per bag (210 lb.)	$7·00 per bag (210 lb.)
Marseilles	——	——
Plantains—	16c. to 48c.	——
Potatoes—Nova Scotia	$2·75 to $3·00	$2·75 to $3·25
Lisbon	——	——
Potatoes—Sweet, B'bados	$1·20 per bag	——
Rice—Ballam	No quotation	——
Creole	$5·25 to $5·50	$5·50
Tannias—	$2·64	——
Yams—White	$2·16	——
Buck	$1·92	——
Sugar—Dark crystals	$2·05	$2·00
Yellow	$2·65 to $2·70	$2·50 to $2·60
White	$3·40	$4·00
Molasses	——	——
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M.
,, Cordwood	$1·80 to $2·00 per ton	——

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FOR THE WEST INDIES.

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WEST INDIAN BULLETIN.

(Vol. XIV, No. 1.)

Containing papers on PEASANT AGRICULTURE IN THE WEST INDIES: (1) Introductory paper—Efforts in Aid of Peasant Agriculture in the West Indies, by Francis Watts, C.M.G., D.Sc., F.I.C., F.C.S; (2) Government Schemes of Land Settlement in Grenada and the Grenadines, by Gilbert Auchinleck, B.Sc., F.C.S.; G. Whitfield Smith, F.L.S., and Walter Bertrand; (3) Method of Working Small Holdings under the Land Settlement Scheme in St. Vincent, by W. N. Sands, F.L.S., (4) Agricultural Credit in the West Indies, by W. R. Dunlop; together with the St. Vincent Credit Ordinance, 1913, and Report on working of the same, by Robert M. Anderson.

Printed at Office of *Agricultural Reporter*, 4 High Street, Bridgetown, Barbados.

AGRICULTURAL NEWS

Vol. XIII. No. 313.] SATURDAY, APRIL 25, 1914. [One penny

AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW
OF THE
IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES

VOL. XIII. No. 313. BARBADOS, APRIL 25, 1914. PRICE 1*d*.

CONTENTS.

The Imperial Department and Agricultural Education.

THERE are various educational systems operating in the West Indies for the promotion and diffusion of knowledge in relation to agriculture: taking the elementary schools first, we find in the official curriculum of practically every colony suitable provisions for encouraging, if not enforcing, the study of the principles and practice of horticulture; and although in some places natural disadvantages have militated against rapid progress in this useful line of educational work, in others, for instance, in St. Lucia and in Trinidad, a great deal of permanent success has been attained. In the secondary West Indian schools of the colonies, progress in the direction of agricultural education has been a matter for very general satisfaction. Most of the existing institutions now possess a definite agricultural side under the charge of a scientific officer, and in many cases, by means of Government scholarships, pupils may take advantage of opportunities of acquiring information *gratis* in practical and theoretical agricultural science and horticulture. After the time has come for leaving school, the agricultural pupil may, in many instances, be granted the opportunity to proceed with technical training under the direction of the local department of agriculture. The way in which this is arranged varies somewhat in the different colonies, but is virtually the same in each, and consists principally in the carrying out of practical work in the Botanic Gardens and Experiment Stations and Farms. In several of the islands a special arrangement known as the Cadet System prevails, which possesses certain features that have been proved by experience to answer satisfactorily under the conditions obtaining in the Leeward and Windward Islands. But as well as this practical training, provision is made in the West Indian Colonies for Reading Courses and Examinations, whereby the rising agriculturist can train his intellectual faculties simultaneously with his practical powers. In Trinidad and Barbados, the system of examinations in agriculture which follows this work possesses several features that are different from those which characterize the system obtaining in the Windward and Leeward Islands. The relative merits of the different systems it is not our present object to discuss, and the reader may be referred for this comparison to the official publications that have been issued. The point is, that there exists

in the West Indies a more or less continuous course of instruction in agriculture, from the lowest standards in the primary schools up to the time when the student is actually earning his living on the estate as an overseer. As regards the material benefit resulting from this study, it is only necessary to refer to cases which have been cited in this journal, and in the Reports of the Local Agricultural Departments, where successful students have obtained promotion on estates, and received appointments in the Agricultural Service, in Central Factories and similar establishments. Considering that the whole system depends upon organization and advisory control, and lacks that personal contact and supervision of a special education department which is generally recognized as essential for the execution of an educational policy, there is every cause for the West Indies to feel satisfied with results as far as they have gone at present.

Intimately associated during the past ten years with the development of the state of affairs outlined above, the Imperial Department continues to give particular attention to the furtherance of agricultural education in these Colonies. During the last year or two it is interesting to place on record the fact that the educational value of the Department itself (in contradistinction to its educational influence) has been prominently demonstrated. During this period there have been attached to the Head Office several students interested in various lines of study involved in the Department's work. Two of these students have come out direct from English Universities. In considering the advantages attending this study, the experience obtained in regard to the administrative side of tropical agricultural work must not be forgotten—experience which cannot be obtained at any existing institution of a purely educational kind. As well as arrivals who have come for academical work, official visitors from the great developing possessions in West Africa have chosen to survey the Department's activities; and these have been impressed with the wonderful diversity and contrast existing within a space of some few hundred miles, by the geographical and social conditions in the West Indies, and with what can be done in tropical agriculture by the application of science and proper organization, even in spite of the great handicap through the separation of the numerous establishments by the sea.

There is one educational influence of the Department not yet referred to on which favourable comment is often expressed by those in other tropical countries who are without the same advantages, that is, the publication work. It may be explained that many other agricultural departments and institutions confine themselves to the publication of scientific papers and reports. This Department endeavours to supply literature of four classes and primarily for, though not by any means restricted to, four classes of readers: scientific and philosophical papers in the *West Indian Bulletin*, which are principally studied by workers in agricultural science, though valuable for reference to the general reader; practical instruction in the Pamphlets for the cultivator: records of local progress in the Botanic Station Reports for the local readers; and in this journal, a popular review of the above information, and a digest of what is happening in tropical agriculture and research all over the world for the general reader, whether he be student, planter, scientist, teacher or merchant. In the future it will be the policy of the Department to give more than usual care to the grading of the literature which it issues, in order that the different demands referred to above may be met more definitely.

But however satisfactorily the Government, with the limited amount of funds available for the purpose, may be considered to provide for agricultural education in the West Indies, it must not be forgotten that credit for success which has been achieved is also due to students who have taken initiative and profited by the opportunities afforded. It cannot be too often repeated that there are two parties to be considered in any educational programme—the teachers and the learners. In the West Indies, where unfortunately no central educational institution is yet in existence, ambition on the part of the rising generation is an essential factor for future progress. Appreciation of such educational facilities as exist has, as already stated, been frequently demonstrated by the agricultural communities: but the opinion may be expressed that there is still room for a keener request for agricultural knowledge, and it is hoped that this short review of the Department's attitude and power may do something to engender a more widespread desire amongst the younger generation, to make the most of what is at present gratuitously available for their personal advancement.

An important bulletin (No. 36 of the Agricultural Research Institute, Pusa) has just been received, containing a note on the M'Fadyean Staining Reaction for anthrax bacilli, by Major J. E. E. Holmes, Imperial Bacteriologist, India. This publication will be of great interest to veterinary surgeons concerned with tropical medicine.

SUGAR INDUSTRY.

CANE CULTIVATION IN SOUTH AFRICA.

Many persons may not be fully aware of the rapid strides the sugar industry has made in Natal. The extent of the development can be realized from the fact that the output has risen from 19,369 long tons in 1894, to 100,000 tons in 1912.

The South African *Agricultural News* (February 15, 1914) shows that there is still further room for development.

UNDEVELOPED CANE LANDS.

Between the Zululand border and the lower portions of the Province of Mozambique, there is a vast stretch of territory which has generally been regarded as of no practical value, and truth to tell, it has certainly not been attractive to the ordinary man, for the simple reason that it has been judged from the standpoint of an ordinary agricultural country, whereas a glance at the map will show that by its locality alone, and proximity to shores washed by the Mozambique current, it is really a sub-tropical country, and must be considered as such. Up to quite a few years ago the coast of Zululand was regarded as a wilderness, entirely unsuited to development, but as soon as portions were cut up for sugar-cane, it was found at once that the land increased considerably in value, while the returns from the cane fields were greater than the coast lands of Natal. It is therefore only reasonable to suppose that in the next few years, as development proceeds northward, there will be a large strip of country placed under cultivation, in what has hitherto been recognized as a 'no man's land'. Already some progressive spirits have taken up slices of territory lying between the Swaziland border and the seashore, and although malaria, and other diseases incidental to newly developed tropical countries have to be faced at the outset, those who are enterprising enough to secure land in these out-of-the-way places will one day find themselves in possession of very valuable properties. No doubt, as time goes on, large areas of this little-known country will be planted with sugar-cane, and the time is within measurable distance when the whole coast from the Umzimkulu to Mozambique, or even as far north as the 5th degree of latitude, will be one unbroken line of sugar plantations.

Regarding the position of South Africa in relation to varieties of seedling canes, the same journal publishes the following account:—

HISTORY OF THE INTRODUCTION OF SEEDLINGS.

The Green Natal cane, which is probably indigenous to the country, furnished the planters' crop for two decades: 1850-70, though small quantities of Purple Mauritius, or Pa-a-ole, a large red cane with faint black stripes, and of Purple Barrel cane from the same source, were to be found on some plantations.

In 1870, a variety known as the China cane was introduced and soon generally adopted. This cane resembled in many respects the current Uba type, particularly in its yellow colouration, deeply rooting habit and large content of fibre, but differed in its density of foliage and the resulting heaviness of trash. At the end of ten years, and almost without warning, the China cane succumbed to a species of smut (*Ustilago sacchari*) and had to be discarded.

Happily, however, for the immediate future of the industry, other varieties had been introduced about the year 1873, and were available to replace the former staple. They included three types from Mauritius: Poudre d'or, a yellow cane of considerable value; Bois Rouge, a red cane; and Iscambine, a claret coloured, long-jointed variety; Horne, a ribbon cane which has been re-introduced within the past few years from the West Indies, the Purple Queen, and the Giraffe, a huge cane with very low sugar content.

About 1880 a further introduction was arranged, and included the Louisier, Port Mackay, Gold Dust, Rose Bamboo, White Queen and White Tanna, a bud variation from the Striped Tanna or Red Ribbon cane of Mauritius. Some of the latter, together with the Green Natal, still exist on a small scale on certain plantations, but are likely to disappear altogether in the near future in favour of the Uba cane and some excellent new seedling types.

The Louisier, or Golden Cuba cane now shows a marked tendency to unprofitable tonnage returns, and its juice is high in solids not sugars. The leaves, moreover, are covered with prickles, which render harvesting a matter of great discomfort to the labourers. The Rose Bamboo, distinguished by parallel streaks of a brownish colour on the older joints, is a fine large erect cane, withstanding storms well and yielding a heavy tonnage. The immense leaves fall off in maturity of their own weight, leaving a tall erect stalk of rose colour. Like the White Queen it is, however, low in sugar, and both types for this reason have been extirpated from several plantations during the past few years.

Of the earlier introductions of the Uba cane, none continues to hold any important place in modern planting; and they have almost everywhere been supplanted by a variety, the correct name of which is unknown, but which is here called the Uba—a name, it is said, formed of the only letters remaining legible on a damaged label attached to the variety on its first arrival in the country.

About ten years ago several varieties were introduced from the West Indies, British Guiana, Mauritius, Queensland and Honolulu, the Department of Agriculture having co-operated with the planters for their importation. Members of the Inanda Association have taken a leading part in this movement, and several of the canes have been propagated for distribution on their behalf by Mr. H. W. James, of Verulam. These new canes include Antigua* B.95, B.109, Demerara D.74, D. 95, D.109, D.145, D 625; Queensland No. 2, No. 3; Honolulu Rose Bamboo, Honolulu Lahaina and Horne.

In March 1900, three types of Java cane, viz, No. 105, No. 147, and Cheribon were obtained by the Government from La Société Générale des Sucreries et de la Raffinerie d'Egypte, as representing the most profitable and satisfactory crops raised for milling in that country. Later in the same year, the Director of the Andebon Sugar Experiment Station, Louisiana, kindly acceded to a request for a small supply of the Zwinga or Japanese cane, which had been very favourably reported upon by the local sugar press in that State. Finally, in March 1911, nine types, selected from the canes under cultivation in the United Provinces of Agra and Oudh, were received from the Inspector-General of Agriculture in India, including Kewalu from Benares, Medrasi from Lucknow, Matua from Cawnpore, Mango from Shanganj, Dhaura from Azangarch, Chin from Rudanti, Kuswar from Partabgarch, Saranti from Basti, and Agaul from Sultanpur.

*[Probably B. 95, B. 109 cuttings imported from Antigua. —Ed. *A.N.*]

CO-OPERATION.

PROGRESS REPORT ON THE ANTIGUA ONION GROWERS' ASSOCIATION.

During the past year or two, agricultural progress in the West Indies has been characterized by the institution of what may be termed commercial experiments, in contradistinction to experiments immediately related to the cultivation of crops. One example of this type was the St. Lucia lime juice factory, another of somewhat older origin, the Arrowroot Growers' Association of St. Vincent, whilst most recent of all has been the formation of a co-operative society in Antigua, for the collection, grading and selling of onions.

Several references have appeared in this journal during the last few months to the progress made by the Association. A report recently received makes it very evident that the Association has now reached the stage when its activities are definitely making themselves felt. It is proposed in the following paragraphs to give extracts from the contents of the interesting report just referred to, which will demonstrate the truth of this remark.

The possession of a drying house by the Association has rendered possible the investigation of a number of important points The ordinary course of work in the drying house consists in the weighing of the onions, their grading, curing and packing. It is worthy of note, that in regard to packing, it has been found possible by careful manipulation, to increase the actual amount of onions in each crate; thus the average weight of a crate packed in the Association's house is from 58 to 60 lb —a figure in excess of the average of former years.

Owing to the heavy demand for accommodation, the drying house has recently been increased in size to enable 30,000 lb. of onions to be handled. Up to the present time, 419 crates of onions have been cured, graded and packed and exported by the Association, and it is hoped that before the end of the season about 900 crates will have been handled in this way.

Account sales have as yet been received in respect of 57 crates only. It is proposed that distribution of the proceeds should be made on each lot of 100 crates shipped.

It is satisfactory to be able to record that very favourable reports have been received on the produce exported so far by the Association, particularly from Barbados; while the first shipment to Canada produced a cable 'repeat order for 200 crates', which would appear to augur well for the success of the operations. Up to the present, shipments have been made to Barbados, St. Lucia, Dominica, Martinique and St. John, N.B. In each of these places the Association has been in communication with firms of merchants who have agreed to act as special agents, and to these agents produce is consigned. Shipments are made every week, alternately south and north. The destination is decided by a sub-committee of the Board which is guided by the fortnightly reports of which the Association are in regular receipt from different sources as to the price of onions.

In the West Indian markets, smaller sized onions are preferred, while the reverse is the case in Canada. Accordingly, the larger grades are sent to Canada and the smaller grades disposed of locally. A matter of some importance is the intimation received from Barbados that onions plaited into strings are likely to get higher prices in the intercolonial markets. In consequence, experiments were made in Antigua, and it has been found possible to turn out what may be regarded as satisfactorily plaited onions. The results of this form of treatment on prices will be watched with interest.

The results at the drying house appear to indicate that by careful handling and proper curing, the keeping qualities of onions can be greatly enhanced; but it is a matter for regret that growers occasionally send in damaged onions mixed with good ones. The attention of members is directed to the necessity, in their own interests, for preventing the occurrence of this undesirable admixture. A further important point in relation to the conditions attaching to the delivery of onions, is that they must be packed in standard crates, which, it is added, should be complete and not omitted; if this condition is not complied with, no alternative will be left but to refuse delivery of onions coming in this way.

With regard to the projected service of fortnightly advices as to the prices in intercolonial markets, the Board are happy to report that this service has been satisfactorily brought into existence. Cable advices are received from Barbados and Trinidad on the Monday following the departure of the mail, and these are combined with written information from the smaller islands to form a fortnightly circular of prices, which goes into the hands of members usually speaking early on Tuesday following the departure of the mail. In being able to carry this into effect the Board have to express their thanks to Messrs. C. S. Pitcher and T. Geddes Grant in Barbados and Trinidad, respectively. It may be added, in passing, that the timely receipt of a cable despatch from Mr. Geddes Grant advising a heavy drop in the price of onions in Trinidad was the means of diverting considerable shipments from that island, and thereby preventing serious loss to more than one member of the Association No charge has been made by either of the firms mentioned above for their advice, and the Board of Management would point out that the advantage of such a service has never before been placed at the disposal of onion growers in this Pressdency.

The Board regrets to report that no response has as yet been made to the proposals for inspecting onions before shipment; circumstances, however, appear to show that it is doubtful how far such a system is feasible, and it would rather seem to be a sounder line of policy to extend the packing operations as at present in progress in subsequent seasons.

It would appear to be an established fact that the most important point in connexion wich the intercolonial onion trade is to keep in touch with the small markets and to ship as opportunity occurs. In this connexion it seems clear that falling prices may be anticipated towards the end of February, and if the best results are to be realized, the onions must be got on the market early; at the same time, if the quality of the produce and its keeping power can be improved and maintained, there appears to be every reason to hope that a sound reputation for Antigua onions can be built up throughout the West Indies; whilst by dint of judicious pushing and advertisement, there appears to be no reason why a similar reputation should not be firmly established in Canada The important point is uniformity, and this has, up to the present, been the watchword in the work of the Association.

The report concludes with a reference to certain changes which have been made in the organization of the society. It is suggested that provision should be made for the election of members of the Association by the Board of Management and not by a general meeting. This step is rendered desirable in view of the fact that the Association is a business undertaking and not a society.

CHEMICAL NOTES.

REPORT ON AGRICULTURAL CHEMISTRY FOR 1913.

The annual review of the progress made in agricultural chemistry and vegetable physiology during 1913, is contained in Volume X of the reports issued by the Chemical Society of London.

Whilst nothing of very exceptional importance has to be recorded for the year, activity in research has been well maintained and much useful work has been accomplished, especially in connexion with soil chemistry and bacteriology.

In connexion with the atmosphere, the amount of combined nitrogen present has received attention, and it has been shown that in regard to this source of supply for the plant the rain is of no great importance Various interesting analyses of rain-water for other substances has been made.

Chemical work on the soil has, as already stated, been very considerable. Reference may be made to the mineralogical work of the United States Bureau of Soils, and to the study of the plasticity of clay and effects of frost on soil colloids. Considerable further progress has been made in isolating the organic constituents of the soil, a subject which has been referred to from time to time in this journal. The question of the existence of humic acids has been investigated and seems now to be definitely settled in favour of the old idea.

A typical line of research during 1913 has been the effects of partial sterilization of soil both by heat and by antiseptics. This subject has also been dealt with in the *Agricultural News*. In connexion with the partial sterilization of soils, some interesting results have been obtained which throw light on the action of lime on soil organisms. It has been shown that lime has an antiseptic action intermediate between the effects produced by heating soil and by volatile antiseptics, respectively. Lastly, work has been done on heating soils to high temperatures and in connexion with losses of ammonia from soils.

Ammonification, nitrification and denitrification have received attention. A new denitrifying organism has been obtained from the soil. An interesting series of experiments has been described on the ammonification of dried blood in soils, as affected by antagonism between anions. The results are of considerable interest and suggest possibilities in reclaiming the large areas of alkaline soils. In the course of investigation on the production of nitrates in soils, an interesting result has been that the rotation of crops increases the number of bacteria as compared with continuous cropping. Work has been conducted on the production of ammonia from amino acids in the soils. Fixation of elementary nitrogen by *Azotobacter crococcum* was found to be increased when air was actuated by pitch blende, somewhat better results being obtained with weak than with stronger radio-active intensity.

In regard to investigation work on plant nutrition, the Rothamsted experiments during the year have appeared to negative the soil toxin theory which received considerable support in America. In general, results on plant nutrition have tended to show clearly that the composition of soil solution is by no means constant but varies according to the manures applied. The growth of crops depends not merely on the amount of plant food but within wide limits on the concentration of the solution. The continuous growth of the same crop for sixty or seventy years does not leave behind a specific toxin having an injurious effect on the same or other crops.

Whilst the question of the direct assimilation of ammonium salts by plants may be considered to have been decided during the year under review beyond doubt, a good deal remains to be done in connexion with the behaviour of different plants towards ammonium salts and the effect of the compounds as compared with nitrates. An important point in this problem is the question of preference for nitrate or ammonium during different stages of growth, and also the question as to whether the ammonium salts are assimilated as a whole. An interesting line of work has been that conducted on the assimilation of nitrites.

The report under review concludes with a summary of the work done with plant stimulants and manures. The prevailing idea now is that most poisonous substances will act as stimulants to plant growth in certain states of dilution. Reference is made to the pot experiments conducted with rice and vines, also to the experiments in England which consisted in the application of lithium during germination, the effect of zinc salts on wheat, ammonium sulphate on barley, etc. Experimental work has been done on the effect of ammonium sulphite as a manure, together with the manurial value of cyanamide and molasses.

Effect of Carbon Bisulphide and Toluene on Nitrification.—It is stated in the *Journal of the Chemical Society* (February 1914) that nitrification in the soil is not affected by 0·1c.c. of toluene in 100 grammes of soil. A large amount of toluene generally has an inhibitory effect for a short time. Carbon bisulphide at the rate of less than about 1c.c. to 100 grammes of soil has no appreciable effect; more than 1c.c. generally retards nitrification for a time; even with as much as 5c.c. the retarding effect is soon overcome. The conclusion is drawn that toluene or carbon bisulphide applied to fields will not materially affect nitrification if applied at the rate of 0·1c.c. per 100 grammes of soil.

Effect of Arsenic on Soil Processes.—The arsenic of 'insoluble' insecticides is not completely insoluble according to the publication mentioned in the previous note—the greatest amount is soluble when Paris green has been used and the least with lead arsenate. The trisulphide seems to become more soluble after remaining in soils. Ammonification and nitrification are not decreased by the presence of 100 per million of sodium arsenate in soils rich in calcium and iron; smaller amounts may have a considerable stimulating action. Zinc arsenite, lead arsenate and arsenate trisulphide stimulate ammonification and are only toxic when comparatively large amounts are present. All the arsenic compounds stimulate nitrification which, however, is checked by large amounts of Paris green and arsenic trisulphide. The only substance which is likely to be injurious to soil bacteria in practice is Paris green, and the quantity added will have to be large. The beneficial action of arsenic on ammonification and specially nitrification, is attributed partly to stimulation and partly to its influence on injurious species of bacteria.

FIBRES.

CULTIVATION OF SISAL HEMP IN THE WEST INDIES.

This article has been prepared as the result of the discovery, by the Department of Agriculture, Jamaica, that there is a correlation between the time of 'poling' of the sisal hemp plant and the lime content of the soil. It would appear that the presence of lime in the soil retards the time of 'poling'. This fact is of some importance in regard to the cultivation of sisal hemp in many of the drier West Indian islands which are entirely of volcanic formation, and consequently lack lime in their soils.

A sisal hemp industry in the West Indies was definitely advocated in 1904 by the Imperial Department of Agriculture, and an editorial article appeared on the subject in the issue of this journal for October 8, 1904. In it, reference was made to the successful cultivation of the plant on a commercial scale in the Caicos Islands, in Hawaii, in the Bahamas, Yucatan and Mexico. Two years before a plot had been established in Montserrat, and in 1904 the results of the first year were published in the report on the Botanic Station. The actual yield of leaves from the plot ($\frac{1}{6}$-acre) during the first year was 5,053 lb., estimated at 20,212 lb. per acre. The cost of cultivation of the plot came to £1 4*s.* 3*d.* In the next year's report (1905-6), it is stated that at the second reaping September 1905, the yield of green leaves was 5,950 lb. The cost of cultivation of the plot, which was $\frac{1}{6}$-acre in area was, for 1905, 11*s.* 9*d.* The fibre was extracted from 66 lb. of leaves by maceration, and weighed $2\frac{1}{2}$ lb. This works out at the rate of 12 cwt. per acre—a yield which compares favourably with that obtained in Yucatan and the Bahamas In the succeeding reports on the Botanic Station no further reference is made to sisal hemp experiments, and it is understood that the trials were later discontinued owing to the early 'poling' of the plants. It is interesting to note, that it was recorded in the last report on the experiments that the soil of the Station where the plot was situated contains a lower percentage of lime than that in most places in the island. It is a question now whether the application of lime might not prolong the plant's vegetative period, thereby rendering the cultivation permanently profitable.

That the cultivation of sisal hemp at the present day actually pays in the West Indies, is clearly shown by the following information received by the Imperial Commissioner of Agriculture from Jamaica, in reference to an area which is now in bearing in a limestone district of that Colony.

The oldest plants on this property are now about five years old. The plants are true *Agave sisalana*, and the fibre commands higher prices than does Henequen fibre, and is in considerable demand. The present price is £30 per ton, but has been as low as £18 a ton. The demand is largely for good reaper and binder twine fibre. Henequen takes rather longer to come into bearing than sisal, but bears for a longer period. Sisal, however, will continue to bear for at least ten years, and then a strong root sucker can always be allowed to grow up from the parent root so as to take the place of the old plant when this polls. No replanting is therefore necessary on account of plants polling. On the estate in question plants have been put in 100 to the acre, but this is believed to be too wide, and it is intended to put in instead, 1,000 plants to the acre.

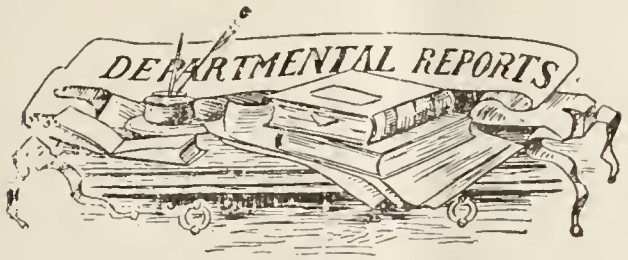
On this Jamaica estate no leaves are taken off the plants until they are four years old, which it will be seen is a different practice to that followed in the case of the Montserrat trials. The plants give from sixty to as much as 100 leaves a piece. After that, about twenty-five leaves are taken from each plant every six months. The leaves are cut at any time of year, but it is in very dry weather that the percentage of fibre is high. The fibre runs from 5 per cent. to as much as 9 per cent. of the weight of the leaf, the latter in very dry weather. Generally speaking, from twenty to twenty-five leaves give 1 lb. of fibre, and $\frac{1}{2}$-ton of fibre per acre per year can be safely looked for. The leaves when cut are about 3 feet 6 inches to 4 feet long. They are cut and tied in bundles, loaded into carts and delivered to the mill, which is the best at present on the market. The makers are Finnigan Zebriske & Co., Patterson, N.J., U.S.A. The machine takes 4,000 leaves per hour and cleans the leaf without any handling. One man feeds in the leaves as fast as they can be handled, and one girl takes off the clean fibre at the other end of the machine, which is a large affair and requires 12 to 14 h.p. to drive it. The fibre is carried by women out to the drying yard, where it is hung on lines of galvanized wire to dry and bleach. After this it is baled for shipment.

The best land for sisal in Jamaica is undoubtedly a good dry limestone land—land that would be good for other crops if the rainfall were heavier. But sisal land must be thoroughly well drained. The writer is of opinion that there are extensive areas of good sisal land round the south coast of Antigua where the soil is not clayey; but the present state of land tenure in this district might make it difficult for the big capitalist to step in.

Reverting to the question of 'poling' as a factor in the cultivation of sisal hemp, particularly in the Leeward Islands, it may be of interest to readers who are concerned with the subject to know that certain experiments of a useful kind are now in progress in Fiji (where the soil is calcareous): (1) to determine the influence of severe cutting on the time of poling; (2) to compare the value of bulbils with suckers; and (3) to compare suckers from polled plants with those from plants that have not polled.

The results which have been obtained during 1912 in Fiji in connexion with the cultivation of sisal hemp where abstracted in the *Agricultural News* for March 14, 1914, from the Report of the Department of Agriculture, Fiji, 1913. This information, in the light of the present article, the reader will no doubt refer back to, for the purpose of comparing the figures given there for yield and cost of cultivation in Fiji, with those given in the present article in connexion with sisal hemp growing in Montserrat and Jamaica.

It is stated in *The Board of Trade Journal* for January 8, that owing to the desire to prevent the disappearance of the trees, a local regulation has been issued in Madagascar prohibiting the gathering of fibre from the Raffia palm and the Travellers' tree (Ravenalia) throughout the north-east coast of Madacascar during a period of three years from the first October last.



TRINIDAD: ADMINISTRATIVE REPORT ON THE DEPARTMENT OF AGRICULTURE, 1913.

This publication is principally composed of details of administration and financial statements. In the letter of transmittal, reference is made first to the Botanical Department, the vote for the maintenance of which has been reduced owing to the introduction of a better system of organization. The work carried on at the Government Farm and at St. Augustine estate is briefly reviewed: this information is followed by a section on agricultural education which is of some general interest. Several officers of the Department take a share in education work. The home reading courses are now conducted by the Assistant Director. The student apprentices at the gardens at St. Clair and Tobago, and at the Government Farm and River estate, work under the direction of the officers in charge. The recent formation of district branches of the Agricultural Society enables field demonstrations and short addresses to be given by officers of the department. The course in higher agricultural education connected with the two colleges has been continued at the Laboratory, and with continued success.

ASSAM: REPORT ON THE AGRICULTURAL DEPARTMENT, FOR THE YEAR ENDED JUNE 1913.

The most interesting feature of this report from the West Indian point of view will probably be the variety tests with sugar-cane. The year's results for plant canes far surpass any hitherto obtained. One plot of B.147 yielded practically 4 tons of total sugar per acre. The results obtained this year fully justify the adoption of the following rotation: first year, plant canes (500 maunds of pen manure); second year, ratoon canes (20 maunds of oil cake); third year, paddy; fourth year, green manure (cowpeas) and fallow.

The results emphasized the remarkable effects on the soil of green manuring in conjunction with liming.

The report provides information on a large number of different matters concerning the work of the department, including education, aid to the public in combating outbreaks of insect pests and fungus diseases, sericulture, agricultural shows and exhibitions, and improvement of live stock. The last section of the report contains what is perhaps the most interesting suggestion in the entire publication: it is that the Director of Agriculture should also be appointed registrar of the co-operative credit societies.

UGANDA PROTECTORATE: ANNUAL REPORT ON THE BOTANICAL, FORESTRY AND SCIENTIFIC DEPARTMENTS, FOR THE YEAR ENDING MARCH 1913.

In the last issue of the *Agricultural News* an article was published on the utilization in the Federated Malay States of grasses for paper making. This report contains some information on the same subject, with particular reference to Elephant grass (*Pennisetum purpureum.*) Two bundles were forwarded to the Imperial Institute for the purpose of ascertaining their suitability for paper making. The samples consisted of two bundles of yellow bamboo-like stems measuring to 11 feet in length, with a diameter at the base of about 1 inch. The air-dried stems were examined and figures showing the percentage of unbleached pulp expressed, moisture on drying, ash, etc., together with the length of ultimate fibres (which average about 0·08 inch) are given in the report.

On account of the light and bulky nature of the grass, it is very unlikely that the stems could be profitable shipped to Europe for paper making, as they would probably only realize about the same price as Esparta grass of average quality, namely £3 17*s.* 6*d.* per ton. If, however, the stems were converted into pulp in Uganda by treatment with caustic soda, it is possible that a remunerative industry might be carried on.

The report contains a large amount of information on forestry matters, including rubber; also on entomological and mycological matters, of which any interesting details will receive attention in a future issue of the *Agricultural News.*

GOLD COAST: REPORT ON THE AGRICULTURAL DEPARTMENT, 1912.

As is well known, the principal agricultural industry on the Gold Coast is cacao. In spite of the enormous growth of the industry, there appears to be considerable danger that its prosperity may be checked through neglect or inability on the part of the natives to maintain the plantations in a cleanly and healthy condition. The Director comments on the necessity for legislation.

Whereas the state of the rubber industry is somewhat depressed, considerable hopes are entertained for a bright future in regard to cotton growing. The exports of cotton during the year under review were fully double those of the previous year. The area is rapidly extending in the northern territories.

A useful line of activity in the Department's work would seem to be the organization of agricultural shows. One of these held during the year received over 5,000 exhibits, and practically every chief in the district attended the show in person accompanied by a large concourse of their people.

Appended to the Director's report are the reports of the entomologist and the travelling inspector, and of officers in charge of the various agricultural stations.

SIERRA LEONE: REPORT ON THE AGRICULTURAL DEPARTMENT, 1912.

The section in this report dealing with cotton states that trials with West Indian Sea Island cotton and Cambodia from South India were made. The Sea Island cotton grew well and withstood the heavy showers of rain. The plants flowered well and produced large bolls, but when the cotton was beginning to appear in November, the crop was badly attacked by the cotton stainer bug (*Dysdercus superstitiosus*).

A large number of lime seedlings are in the nursery garden. It is intended to make a lime plantation to see whether lime cultivation can be conducted on commercial lines in Seirra Leone, similar to what is being done in the West Indies. It is stated that limes survive and grow luxuriantly in Sierra Leone, and with a little attention large fruits can be obtained well filled with juice.

Other crops experimented with by the department were maize, castor oil plants, ginger, yams, ground nuts, rices, coffee and cacao. Government cacao plantations have been established at Kennemia and Mano.

The report concludes with an account of the work of the veterinary officer, and a report on the crops of the Protectorate during the year under review.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

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The *Agricultural News:* Price 1*d.* per number, post free 2*d.* Annual subscription payable to Agents, 22*s. d.* Post free, 4*s.* 4*d.*

Agricultural News

Vol. XIII. SATURDAY, APRIL 25, 1914. No. 313.

NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number reviews the attitude and position of the Imperial Department of Agriculture in relation to agricultural education in the West Indies.

On page 131, the condition of cane cultivation in South Africa is dealt with. Information is given concerning undeveloped lands and the history of the introduction of seedling canes.

A recent progress report on the Antigua Onion Growers' Association is abstracted on page 132.

An important article on the cultivation of sisal hemp in the West Indies appears on page 134.

On page 135, several departmental reports are briefly reviewed, and matters contained in them of interest in the West Indies are brought forward in a concise manner.

Insect Notes, on page 138, describe an entomologist's visit to Demerara, Trinidad and Barbados.

Under Book Shelf, on page 141, an important work on maize is reviewed at some length.

On page 142, the subject of agricultural education in India is continued from the last issue of this journal.

Three Interesting Organic Compounds in the Soil.

The presence of three benzene derivatives in soils is described in the *Journal of Agricultural Research* for February 1914. They are benzoic acid, metaoxytoluic acid and vanillin. The occurrence of these compounds, which are closely related, is of interest since there is some evidence that they may be produced in the decomposition of vegetable matter in the soil—a point which is worthy of consideration in regard to the changes which take place consequent on mulching in the Tropics.

The isolation of these compounds may also have an interest other than that of a purely scientific nature attached to any increase in our knowledge of the composition of soils. This is true not only when compounds may be known to be readily reactive with other compounds, but also when their constitution may indicate that they may have such an effect. The three organic compounds referred to seem to be of this nature.

Index to the Agricultural News

With this number is issued the Index and Title Page to Volume XII of the *Agricultural News*. The publication of the index will now enable readers to have their copies for 1913 bound. The Department would emphasize the desirability of having this done, owing to the value of the journal as a source of reference.

Agricultural Affairs in Jamaica, 1912-13.

According to *Colonial Reports*—Annual, 1912-13, the value of the exports from Jamaica last year showed a slight reduction on that for 1911-12, but was still above the figures for the previous three years. The principal increases in the value of articles of export are shown by the following figures: cacao, 1912, £139,833; average of four years, £91,357: coffee, 1912, £274,730; average of four years, £141,207: coco-nuts, 1912, £108,627: average of four years, £69,216. A reduction is shown in the value of oranges, sugar, and rum exported, but bananas have remained in about the same position.

As regards the cultivation of crops, useful progress has been made in the matter of growing fodder for ensilage purposes. Several newly introduced seedling sugar-canes from Demerara (chiefly D.625) are being found to answer very satisfactorily, and it is stated that the area under Sea Island cotton is increasing now that the small holders have taken up the crop.

The heads of expenditure at the beginning of the publication show that the Government spent £16,146 for agricultural services during 1912-13. The expenditure on agricultural services is increasing in Jamaica: in 1911-12 it was £15,223—nearly £1,200 less than in 1912-13. It is understood, however, that this expenditure includes other items than those directly bearing upon the upkeep of the Agricultural Department.

Rotation of Crops.

The considerations which determine the order of cropping land in any locality are many. There are, first of all, factors pertaining to soil and climate to be studied, the requirements of live stock, and the limitations imposed by existing transport facilities and the demand of the market. Then again labour conditions may render impracticable certain systems of cultivation, as may also the prevalence of certain pests and diseases Though in some instances not easily planned, it is well recognized that a systematic alternation of crops is an essential feature of intensive agriculture, particularly where annual crops are grown principally. There is of course, on the other hand, no logical objection to confining the land to a single crop provided the climate, the provision of plant food, labour conditions, demand and the like can be rendered constant.

We find in the Tropics very few systems of rotation compared with what are seen to exist in temperate countries, and it may be interesting to enquire into this circumstance. In the first place there are very few crops, with the exception of cotton and provision crops, that will lend themselves to any system of alternation. Hence the growing of the same crop on the same land year after year is not a matter of choice but of necessity Since this is so, it is well to appreciate the fact that one must endeavour to provide in other ways for these crops the advantages which annual ones receive from a system of rotation. Permanent plants being confined to the same land have not the same chance of resisting disease, or rather of avoiding infection as those crops whose position is constantly being changed. Permanent crops may therefore reasonably demand the grower's special attention in this respect. Then again, plant food in the soil is likely to get unbalanced, and possibly also the bacterial activity, on which soil fertility largely depends. The soil conditions and manurial requirements should therefore be carefully studied.

It is well known that in many places mixed plantations of coffee and rubber and the like have been established, and in a way this constitutes a kind of rotation; though it should, more strictly speaking, be termed a crop community. Such a community can be augmented beneficially by the growing of green dressings and cover crops. Although not always recognized as such, a permanent pasture is a plant community, and if properly constituted, there should not be any inordinate struggle for existence. Grasses with different habits make different demands, and leguminous plants have entirely a life of their own.

But in the case of a pasture, continuity is more apparent than real, since the herbage on the pasture is constantly undergoing a change in its flora. A slight excess of phosphate in the soil will cause the leguminous plants to develop in excess; a slight rise in the nitrogen content will be followed by a flush of the coarser feeding Gramineae.

It is evident that annual crops, or rather crops which are not permanent, can by rotation be moved to advantage both biologically and economically, so as to maintain in a natural way a proper balance of the factors determining successful production. The preservation of this balance in the case of permanent crops depends upon an intimate knowledge of the plants' requirements, and upon ability to see exactly to what extent conditions of environment are changing from time to time.

Rubber Position in Brazil.

Mr. G. B. Mitchell, H.M. Consul at Para, has reported recently on the depressed condition of affairs in the Amazon States as regards rubber growing. Part of this report appears in *The Board of Trade Journal* for March 5, 1914. It seems that the present position, which is really a desperate one, is ascribed to many causes—to Eastern competition, to 'corners' on the European rubber market, to high freight, and excessively high cost of living and therefore of production. The principal explanation seems to be that the local product is burdened with taxes and charges which it cannot bear against the rivalry of increasing quantities of other rubber more cheaply produced, though it may possess slightly inferior qualities.

Although wild rubber costs nothing in the first instance, and the utensils for its preparation are of the most primitive description, whilst the smoking also costs nothing, nevertheless the product has to supply an expensive living to many hands before it reaches the consumer. It is generally believed that a kilog. of rubber costs 5 milreis (6*s.* 8*d.*) to deliver at Para. The price at present paid in the Para market for a kilog. of the best up-river fine hard Para is 3·6 milreis (about 4*s.* 10*d.*). Then the State levies an export duty of 22 per cent. of the value, or 20 per cent. if exported in boxes of native wood. Add to these costs the freight to Liverpool, Hamburg or New York, and the various commission charges, and it will be seen that rubber is overburdened to an impossible extent. But that is not all. On the top of all these charges has recently been levied a super-tax of 100 reis (1·6*d.*) on every kilog. exported, the proceeds of which are to be devoted to the formation of a fund for the proposed 'co-operativa'. The question is now being asked—How is this money to be raised? And if the Association, which it is desired to finance, does succeed in getting all the Amazon rubber into its hands, will it be able to withstand the law of supply and demand in face of the competition of rubber from other places?

The only remedy against the collapse of the Brazilian rubber trade would seem to be a complete removal of all artificial hindrances, thereby giving the product a chance of standing for its existence on its own merits.

INSECT NOTES.

ENTOMOLOGIST'S VISIT TO DEMERARA, TRINIDAD AND BARBADOS.

During February and March 1913, Mr. Geo. N. Wolcott, Assistant Entomologist on the staff of the Porto Rico Board of Agriculture, paid a visit to Demerara, Trinidad and Barbados, for the purpose of observing the conditions of sugar-cane cultivation, the pests attacking the sugar-cane plant, and to make observations on any natural enemies of sugar-cane pests which might usefully be imported into Porto Rico. Accounts of this visit have been published in the *Third Annual Report* of the Sugar Producers' Association of Porto Rico, issued as Bulletin No. 5, August 1913, and in the *Journal of Economic Entomology*, for December 1913.

Mr. Wolcott reported on the conditions under which cane is grown in the colonies visited, with reference to the soil, climate and labour, and the bearing that these have on general field practice and the abundance of insect pests.

The report seems in the main to present a fairly accurate account of the insect pests as these would be observed by a visitor, but lack of familiarity with local conditions has led to certain statements being made, bearing on subjects other than entomological, which should receive some qualification; as, for instance, the statement that the coral rock in Barbados soaks up water from the sea and that this makes agriculture possible in that island.

In Demerara, the moth borer [including under this term the ordinary form *Diatraea saccharalis*, and the related species *D. lineolata* and *D. canella*] is the most serious pest of sugar cane. The importance of the injury caused by the moth borer is recognized by planters, and energetic measures are adopted for its control; and while this is not complete, the loss from the pest's depredations is probably considerably reduced. The measures adopted include (a) the cutting out of dead-hearts, and (b) the collection of the caterpillars and pupae, which are paid for at the rate of 6c. per hundred, 700 being considered, by the boys who do the collecting, a day's work. The cutting out of dead-hearts is continuous on account of the constant re-infestation caused by the moths flying from the older ripening canes into the fields of young canes and depositing their eggs there.

The moth borer is attacked by two species of egg parasites (*Trichogramma minutum* [pretiosa], and *Telenomus* sp.), and the boys who collect the caterpillars and pupae are also paid for egg clusters which have not turned black, that is, for those eggs which are not parasitized. There is also a larger hymenopterous parasite, *Iphiaulax* sp, the adult of which is conspicuous from its red, yellow and black colouring. Its larvae are found attacking above 1 per cent. of the caterpillars of the moth borer that are collected. Tachinid flies have also been bred from moth borer pupae.

Mr. Wolcott emphasizes the fact that the moth borer is not controlled by its natural enemies and the artificial control measures combined, the insect being, in spite of these, the most serious pest which the Demerara sugar planters have to contend with.

The only other serious pest of canes observed in Demerara was the giant moth borer, *Castnia licus*. This insect is much less abundant and injurious than it was a few years ago. The capture of the adult moths by gangs of boys armed with nets; the collection of grubs and pupae from the stalks and from the stumps when the canes are cut; and the flooding of the fields for several days in case of very severe infestation, are practical control measures that give good results. The control thus obtained can only be maintained by persistent efforts along these lines.

The weevil borer (*Metamasius hemipterus*), termites, and the sugar-cane mealy-bug (*Pseudococcus calceolariae*), were all observed but were not considered serious pests, especially when compared with the destructive moth borer.

In Trinidad, the froghopper (*Tomaspis varia*) was the most important pest observed. Mr. Wolcott found it not at all surprising that the froghopper should be abundant in Trinidad, in view of the common agricultural practice of allowing grass and weeds to grow in abundance in the fields and traces, and of abandoning diseased and infested fields, allowing them to remain as breeding places for this and other insects. The following paragraph is quoted:—

'The whole environment is ideal and could not be better for the propagation of large numbers of froghoppers and other pests of cane. When the managers of the estates come to realize the importance of cleaning up the grass and weeds in the cane fields, there will be a most noticeable reduction in the injury to cane by insects and more particularly in the injury caused by the froghopper. Because of the lack of sanitation in the fields the froghopper is a difficult pest to control and is rendered all the more difficult because of the lack of vulnerable places in its life-history.'

The young froghoppers live on the roots of cane, grasses and other plants, beyond the reach of insecticides. The eggs are laid on the ground in the lower layers of trash where many would escape if the trash were burned. The adults are stated to be too small and active to be captured by collecting with the net. The work with the green Muscardine fungus (*Metarrhizium anisopliae*) was observed and the methods of producing the spores in culture cabinets and applying them in the field are described.

On several estates, culture cabinets are in operation, in which the fungus is grown in trays containing layers of cooked rice. The application of spores in a field on a large scale is made from blowers mounted on a railroad flat car. On one estate over 500 acres have been dusted with spores of the fungus. The results of these large scale applications have not been reported upon, but in examinations already made as to the effect of the fungus on the froghoppers very high percentages killed have been found, and in one instance at least 95 per cent. of the nymphs (larvae) in the stool of cane were found dead and covered with the characteristic green spore masses of Metarrhizium.

The predaceous bug (*Castolus plagiaticollis*) from Mexico, and the two native egg parasites are mentioned as being more or less efficient as natural enemies.

The giant moth borer (*Castnia licus*) was observed, and considered to be next in importance to the froghopper of all the pests of sugar-cane in Trinidad, and as being probably more abundant than in Demerara. The only control measure practised was the collection of the adults by means of nets. 'It is impracticable to flood the fields from which cane has recently been cut, no attempt is made to collect the full-grown larvae and pupae from the stools of cane, and the young larvae are not cut out of young cane.'

Other cane pests of minor importance observed in Trinidad were the weevil borer (*Metamasius hemipterus*, var. *decolorotus*), the gru gru worm (*Rhyncophorus palmarum*) the sugar-cane mealy-bug, (*Pseudococcus calceolariae*), and termites.

In Barbados, the moth borer (*Diatraea saccharalis*) was the pest of canes observed in greatest abundance, and the opinion is expressed that in Barbados the injury to canes by this pest is as great as, if not greater than, in Demerara.

Mr. Wolcott was much impressed by the severity of the attacks of borer (*Diaprepes abbreviatus*), which he ranked as the most serious pest of sugar canes in the island, stating that the injuries caused by it are more serious than those caused by the white grub larvae of *Lachnosterna* sp., in Porto Rico. The other sugar-cane pests observed in Barbados were the weevil borer (*Metamasius hemipterus* [Sphenophorus sericeus]), the cane fly (*Delphax saccharivora*), and two species of sugar-cane mealy-bug (*P. calceolariae* and *P. sacchari*).

The occurrence of the brown hard back (*Phytalus smithi*) and its control by the parasitic wasp, *Tiphia parallela*, is mentioned as being of special interest, because of the injury to canes in Porto Rico by a related insect, *Lachnosterna* sp., which is not adequately controlled by parasites; it is stated that arrangements were made for a trial shipment of Tiphia cocoons to be sent from Barbados to Porto Rico, in the hope that the wasp would become an efficient parasite of the Lachnosterna in that island.

COTTON.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date April 6, with reference to the sales of West Indian Sea Island cotton:—

Since our last report, the demand for West Indian Sea Island cotton has been restricted, and the sales are confined to about 50 bales, of which half are Montserrat 17½*d.* to 18*d.*, and the remainder St. Vincent at 21*d.*

Spinners are not in immediate want, but we think they are prepared to continue purchasing at present rates, though they will take their own time in doing so.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending March 28, is as follows:—

There was some demand this week for the Planters' crops classing Extra Fine, resulting in sale of 15 bales Hunting Island and 40 bales Hylda at 30c., and a small cargo of Extra Fine off in preparation at 30c. There has been no demand for odd bags classing fine, held at 23c., of which there are remaining unsold about 200 bales.

We quote, viz:—

Extra Fine	26c.	= 14¾*d.*	c.i.f., & 5 per cent.
Fully Fine	24c	= 13¾*d.*	,, ,, ,, ,,
Fine	23c.	= 13¼*d.*	,, ,, ,, ,,

This report shows that the total exports of Sea Island cotton from the United States to Liverpool, Manchester and Havre, up to March 28, 1914, were 4,328 bales, 6,595 bales, and 4,026 bales, respectively.

AGRICULTURAL ACTIVITIES IN MAURITIUS.

The preliminary report issued by the newly established Department of Agriculture, in Mauritius, has just been received from the Director. It contains much that is of interest and indicates that a good start has been made in connexion with the Department.

As regards the sugar-cane industry in the colony, more knowledge of soils is required, and on the economic value of manures. Although molasses has apparently had good effects on young canes, it is pointed out that figures should be obtained by means of careful experiments to elucidate if possible the causes of the increases in yields after molasses, in view of negative results which have been obtained in the West Indies and elsewhere.

In connexion with experimental plots, the necessity for these being laid out in triplicate or quadruplicate for the purpose of reducing the experimental error is pointed out.

With implemental tillage there is much work to be done. The trials of various forms of implements will be carefully watched and such assistance as can be given will be offered. It is proposed to hold a field day with a ploughing competition. Organized efforts will be made to improve the condition of the draft animals by the importation of bulls, selection of stock cows, and the commencement of a stock farm. Special work will be done in connexion with surrah.

Turning to the various crops of minor importance in the colony, trials with sisal hemp are to be made, and new varieties of maize are to be introduced. The growth of camphor in Mauritius has been attended with gratifying results, and it is proposed to lay down an area with camphor on plantation lines. The position as regards rubber is not very encouraging, but with coffee the state of affairs is different, and it is expected that *Coffea robusta* will be soon extensively planted. Attention is being given to cacao, tobacco, coco-nuts, ground nuts, vanilla, black wattle and fruits.

The department hopes to engage in agricultural educational work, and to train students in elementary rural science at the laboratories at headquarters. The establishment of a small sugar school at these laboratories, for training some of the rising generation of agriculturists should be of value to those who cannot afford to go farther afield. It is suggested that a museum of economic products, insect and fungoid diseases of economic plants might be established.

Appended to the report are various entomological and mycological papers of interest.

It is reported in the *Experiment Station Record* for January 1914, that Dr. P. J. S. Cramer has been studying in Dutch East Indies the varieties of coffee commonly grown there, including also observations on recently introduced forms. Dr. C. J. J. van Hall has also been working on the coffee plant chiefly in connexion with *Coffea robusta*. With the view of securing an improved form of this species, a large number of plants were studied with reference to variations in productivity, disease resistance, yields and quality. The results of this test are presented in tabular form and discussed.

It may prove of interest to add that *Coffea robusta* is a native of the Belgian Congo and the first plants imported into the Lesser Antilles came apparently to Dominica in 1904 from Belgium. The cultivation of *Coffea robusta* in the West Indies is deserving of consideration.

GLEANINGS.

According to the *Queensland Agricultural Journal* (February 1914), the estimate of the sugar crop for the year 1913 shows a total yield of 241,496 tons or some 30,000 tons in excess of the highest previous returns.

Explosives for the Farm is the title of a pamphlet issued by Nobel's Explosive Co., Ltd., of Glasgow. This publication gives a useful account of the necessary tools and apparatus, and presents in great detail directions for using the explosives.

Published in the *Trinidad and Tobago Bulletin* for February 1914, will be found the Farmers' Advance Ordinance, No. 28 of 1913. Particulars are given of the information which every advance note must contain, together with other matters involved in the legislation.

A maximum moisture content of 12 per cent. is what may be safely allowed in maize at the time of shipment. But according to the *Rhodesia Agricultural Journal*, during the wetter months of the year the moisture in some of the consignments dispatched from that country is considerably above this figure.

A copy has been received of the papers read and the discussions which took place at the International Forestry Congress held in Paris during June 1913, under the Presidency of M. Henry Defert, Vice President of the Touring Club De France. This publication runs into 950 pages, but contains very little information that is of direct importance to the West Indies.

In the *Journal of Agricultural Science*, Vol. VI, Part I, figures are given which show that in some cases soils may contain something like 30,000 lb. of ferrous iron per acre. If ferrous iron is as toxic to plants as it is commonly supposed to be, this large quantity must be present in the soil in a highly insoluble form.

Mr. J. A. DaCosta, of Rio de Janeiro, has invented a machine for coagulating rubber. The use of the machine will enable the manufacturer (according to the *India Rubber World* for March 1, 1914) to avoid the process of cutting, steeping in hot water, and maceration, and relieve the tapper from doing what has now to be laboriously carried out by hand.

The Hawaiian pine-apple trade is referred to in *The Times* of February 16, 1914. The exports of canned pine-apples from Hawaii has grown from 186,700 cases in 1907 to 1,318,336 cases in 1912. While sugar is the staple industry of the territory, representing a value of £7,637,964 out of a total export trade of £9,056,650 in 1912-13, the export of pine-apples was valued at £743,000.

An account of an interview with Dr. Francis Watts, C.M.G., on the subject of agricultural banks, appears in a recent issue of the *Port-of-Spain Gazette*. The importance of beginning operations in a small way is emphasized, together with the necessity for discreet inspection. Reference was made during the interview to the movements which are now taking place in St. Vincent, St Lucia and Trinidad.

It is stated in the *Dominica Chronicle* for March 1914, that competition in the matter of buying fresh limes is becoming keener. To supply the increasing demand, an effort was made recently to import limes from St. Lucia, the neighbouring island, and quite recently 16 barrels were imported. Whether this experiment is likely to prove a benefit ultimately, is a matter for consideration.

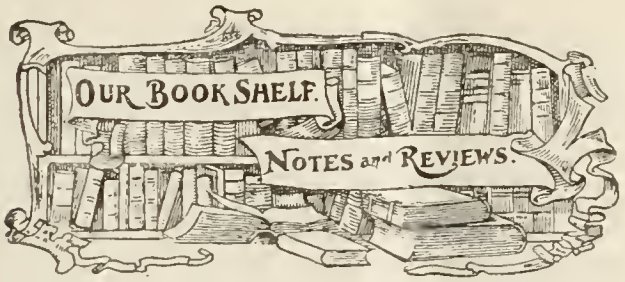
The attention of the Government of Trinidad and Tobago has been called to the occurrence of several instances, in Canada, of the adulteration of lime juice by the addition of water. It may be pointed out that this adulteration was not done in the West Indies but in Canada. On a recurrence of this offence it is understood that the Canadian and West India League intends to take further action.

A few experiments have been made in India (according to the *Agricultural Journal of India* for January 1914) with Australian fodder grasses, such as *Paspalum dilatatum* and *Chloris virgata*. The first-named species was a failure; the second, which is referred to as Rhodes grass (? Rhodes grass = *Chloris guyana*) is now being tried, though not especially on account of its drought-resisting qualities.

The difficulty involved in getting the fruit tree known as the Japanese persimmon to bear fruit is explained in the *Journal of Heredity* for March 1914. It appears to be necessary to have in the neighbourhood varieties which produce staminate flowers at regular intervals. The ensuring of pollination, however, is said not to be an infallible cure, since any unhealthy condition of the tree will seriously affect fertile flower production.

Information has been received from the British South Africa Company showing the rapid development of tobacco-growing in Rhodesia. The production of tobacco for the last three years was: 1910-11, 132,310 lb., 1911-12, 450,000 lb., 1912-13, 1,397,000 lb. This year's crop, it is estimated, will reach from 2,500,000 to 3,000,000 lb. The average price realized for Rhodesian grown tobacco at auction sales held last year was $10\frac{3}{4}d.$ per lb.

The St. Croix *Avis* (February 4, 1914) reproduces an article from the *International Sugar Journal*, which says that weeds can be satisfactorily kept down in cane fields by employing the following stock spray solution: white arsenic 5 lb., caustic soda 1 lb., water 3 gallons. This is boiled for fifteen minutes and diluted to 200 gallons before being applied. It in no way injures the growing canes, provided the spray is kept away from the young leaves at the top of each stalk. It is shown that the spraying is much cheaper than hoeing, but at the same time the benefit from hoeing is not entirely confined to the removal of weeds.



MAIZE: ITS HISTORY, CULTIVATION, HANDLING AND USES. By Joseph Burtt-Davy, F.L.S., F.R.C.S. *Longmans, Green & Co.*, London, 1914. Price 25*s*.

At the present time there seems to be a general trend in the direction of the compilation of text-books devoted to individual crops. Already standard works have appeared on cotton, coco-nuts, and other tropical crops. In the present volume we have what is undoubtedly a standard work on Indian corn. In view of the fact that maize is strictly speaking a sub-tropical crop, capable of being successfully cultivated in both the Tropics and parts of the temperate zone, the range of readers to whom this volume will be of interest must be very great. It will however be in South Africa that its appearance will be welcomed most, since the author writes with special reference to this Dominion.

Strictly speaking the book is an encyclopaedia, the maize plant being treated from all points of view and the subject-matter arranged in short sections numbering no less than 772. The author begins by discussing the importance and history of the crop, its climatic requirements and geographical distribution. The amount of attention given to the botanical characters of the plant is very great, occupying, in fact, a third of the volume. All this information should prove of the greatest value, particularly that in the chapters dealing with the subject of inheritance and improvement by breeding. Much of this information is apparently the outcome of an examination of material at Cambridge in conjunction with the authorities on genetics at that University. Even the general reader will appreciate from the illustrations alone the great interest and possibilities which lie before the application of the principles of gametic segregation to the maize plant. For purposes of reference the chapter dealing with varieties will be found useful, whilst that confined to judging and selection should be stimulating in regard to educational movements in connexion with the improvement of this crop.

Coming to the soil requirements of the maize crop, the reference to rotations appears interesting, particularly the rotation being tried by the Division of Tobacco and Cotton of the South African Department of Agriculture, which is as follows: First year, tobacco; second year, cotton; third year, a leguminous crop such as velvet beans, cowpeas or soy beans; fourth year, maize. The question of utilization of artificial manures is discussed, and then the author proceeds to tillage, planting and cultivation. In the great countries where maize is the staple crop—the United States, South Africa and the Argentine—not fields but huge tracts of land are planted in this crop and this, in the face of labour difficulties at the present day, renders steam cultivation in most cases necessary. This subject of mechanical cultivation is well described, and still better illustrated, in the chapter under consideration. Indeed the subject of engineering in relation to the maize crop is one of the most useful features of the book. In the chapter on harvesting and storage, clear accounts are given of the various picking, husking and shelling machines, and appliances which have been invented for drying the grain previous to storage. This latter subject, by the way, is of considerable interest in connexion with the maize industry in the West Indies.

Proceeding, we come to the big question of commerce in maize grain. It would be impossible in the space of this brief review to refer in more than a general manner to the various considerations involved in this, the commercial side of the maize industry. Of interest will be the methods of elevating and transhipping, and the economics of supply and demand.

The latter part of the book deals with maize as food. In the chapter on the chemical composition of the maize grain, the attention of chemists and plant breeders may be called to the interesting figures showing the physical composition of maize grains of high and low protein content. Perusal of the last few pages of this volume will show that not only the preservation and storage of the grain, but also that of the green stuff for ensilage purposes, is quite an important branch of the industry; whilst the various uses to which the crop can be put, other than for food, as, for instance, for making starch, glycerine, paper, mats, charcoal, gun powder and medicine will engender in the mind of the reader a fuller appreciation of the crop's economic importance.

In the course of the above review it already has been intimated that the illustrations in this valuable volume leave little to be desired. It may be added that the arrangement of the subject-matter is excellent; whilst the book is provided with a lengthy bibliography, and a fairly exhaustive index.

A PARASITE ON COFFEE.

The following note has been taken from the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases* (January 1914):—

Stilbum flavidum, Cooke, is well known throughout tropical and sub-tropical America as the cause of roundish dry spots on the leaves of coffee. The writers have recently studied this fungus in the neighbourhood of Rio de Janeiro on coffee and other plants (*Eriobotrya japonica* and various Melastomaceae, Compositae and Rubiacae). There is little doubt that *S. flavidum* occurs naturally in the forests on various shrubs. This origin explains the local distribution of the fungus, which in Brazil occurs chiefly in the coastal regions, where it finds the heat and moisture necessary for its development.

All attempts at further classification had been unsuccessful owing to the sterility of the fungus. In moist chambers the writers have at last obtained fructifications of a typical Agaric, the characters of which refer it to the genus Omphalia; it apparently constitutes a new species (*O. flavida*); the resemblance in colour and position of the Basidiomycete on the edge of the spots as well as the occurrence in some of the spots of all intermediate stages between Stilbum and Omphalia lead the writers to consider that the former is merely an abortive and sterile stage of the latter. The absence of reproductive organs in the sterile form is compensated by the vegetative growth of the cells of the atrophied pileus, which becomes loose and may attach itself to other plants. This is their ordinary method of reproduction: the Omphalia forms always require very damp conditions such as must be rare even in forests during the rainy season. The persistence of great humidity is not the only condition requisite for the development of the Omphalia fruits: it seems that they only develop on the edges of fresh spots, that is to say, in parts in which the mycelium is young and well nourished.

AGRICULTURAL EDUCATION.

AN INDIAN REPORT.

II.

The following general conclusions arrived at by Dr. Coleman as regards agricultural education in Mysore are a continuation of those which were published in the last issue of this journal. The view put forward in the following discussion is, in the main, that for a successful system of education in the elementary schools there must be co-operation between Educational and Agricultural Departments. It is perhaps of sufficient interest to record the fact, that this has been appreciated for some years in the West Indies. In St. Lucia, for instance, the primary schools are examined in agriculture by the Agricultural Department; and in Antigua, a system of lectures to elementary school teachers has been provided by the agricultural side of the Grammar School. In St. Kitts, the supervision of nature study work in the elementary schools by the Agricultural and Science Master attached to the Grammar School, was advocated in 1911, but although it received the support of the Governor, the scheme, for financial reasons, did not materialize.

If we now consider the conditions prevailing in Mysore, we can, I think, with safety say, that as regards higher agricultural education, we should guard against too ambitious a scheme in the beginning. With that object in view, plans have been sanctioned by Government for the opening of an agricultural school at Bangalore, for which the present buildings with a few additions are to be utilized. Futhermore, an attempt will be made to model the course on those being given in the American agricultural high schools or the German agricultural high schools rather than on that of an agricultural college. Especial stress will be laid on the practical side of instruction, and no attempt will be made to turn out men trained in biology, chemistry, etc., only so much instruction in these being given as appears necessary for an intelligent understanding of the various agricultural processes. In addition to the regular course, short courses in the vernacular on special practical subjects will also be provided.

This, however, should, in my opinion, be only a beginning, and plans must be made for a great extension of training in rural science if we are to make any real impression on the agricultural population. Furthermore, some system of vernacular instruction must be worked out. Before this can be done, however, we must have a body of trained men to carry on the work, and the training of such men should be one of the functions of the central agricultural school. It is, of course, perfectly evident that nature study or agricultural training must depend upon and follow the development of rural education as a whole. However, the present—when the question of the extension of primary education is receiving such sympathetic and practical consideration at the hands of His Highness' Government, seems to me an opportune moment for considering the possibilities of rural education with reference to agriculture. It would be well, therefore, to define carefully what is and what is not feasible in this connexion.

In the first place it is perfectly clear that the introduction of a vernacular course in agriculture into the primary schools is quite out of the question, for the simple reason that, even were the teachers fitted to give the requisite instruction, the children would be unable to assimilate it. But as has already been pointed out, much can be done without giving actual instruction in agriculture. It seems rather unfortunate that the only term we have for elementary instruction in the natural sciences is 'nature study' for, in the minds of many, the expression calls up the thought of a mass of scientific twaddle and sentiment rolled into one sickening whole. Personally, I can see no reason why such instruction as is suitable for the higher forms of a rural primary school or the classes of a middle school should not be designated as elementary rural science.

It is interesting to note, in this connexion, that wherever we find such instruction in rural science making real headway there is the most cordial co-operation between the Educational and Agricultural Departments in the work. We find this to be the case in Germany, in Canada, in the United States and also in Japan. In India, where of all countries it seems most eminently necessary, such co-operation has been, in most cases, conspicuous by its absence.

Any scheme for the introduction of the teaching of elementary rural sciences into the higher classes of primary schools, and into middle schools, should possess the following features to ensure a reasonable chance for its success:—

(a) The teachers should have a special training in agriculture, preferably in the agricultural school of the State.

(b) Facilities should be supplied in the way of a suitable plot of ground for practical work.

(c) Frequent (if possible, weekly) supervision of the work by competent inspectors or supervisors should be provided.

Such supervising officers should, in my opinion, be members of the staff of the Agricultural Department selected from among the agricultural inspectors, for their knowledge of the agricultural conditions and needs of those parts of the State in which the schools are situated. In other words, the work done by the Agricultural Department in educating the adult agricultural population, and that done by the Educational Department in educating the rising generation should be as closely co-ordinated as possible. In this way, I believe, would the effectiveness of the work of both departments be immensely increased.

The suggestion with regard to the use of supervising officers in the way described is by no means new. We find in Germany that the itinerant teachers working under the Agricultural Department are expected to give advice and assistance to the teachers of rural continuation classes who are working under the Educational Department. The same idea is contained in the view expressed by Dean Bailey with regard to the peripatetic teachers quoted on page 38 of this report. I find also that a somewhat similar suggestion has been made by a special committee of the Board of Agriculture in India (see Proceedings of the Board of Agriculture in India, 1910, Appendix F, page 65). This committee, among other things, suggested that the Agricultural Department might offer its services to the Education Department to take part in supervising the courses of instruction given at the training institutions to primary teachers, and might be invited to make periodical inspections of the teaching in nature study.

I would not confine the work of these itinerant officers entirely to supervising elementary science classes in rural schools. Their services might also be utilized for the holding of evening classes in farm accounts, etc., for adults and, in fact, I would have them employed very much as the itinerant teachers in Germany are, except that, instead of actually carrying on the work of a school,

they would simply supervise the work in elementary rural science in some of the higher classes in existing schools. I think that the time may very well come when schools somewhat similar to the winter schools of Germany may find a useful place in India also, but the time is, in my opinion, not yet ripe. Rural education, as a whole, has first to be developed. It is a question, however, whether continuation classes similar to those which are proving so popular in parts of Germany and in Japan might not be experimented with. Here again careful supervision by competent officers would be required. In connexion with this work, the question of clubs among the boys for the growing of selected crops according to improved methods on their parents' lands, should also be considered.

The idea of using megass as a source of carbon for the removal of the dark-coloured substances from sugar liquids is explained in *Sugar*, for March 1914 All forms of carbon are not of equal use for decolorization purposes, but megass carbon has a very considerable value, and when the sugar turnout is large, its use may be economical and result in enabling a product to be made with non-sweating properties and incidentally lessening the sulphur account.

CACAO IN THE PHILIPPINES.

Situated in precisely the proper geographical region for successful cacao culture, the world has been puzzling over the non-production of cacao in the Philippine Archipelago. There are three or four good reasons for this apparent lack of interest, or, to put it more harshly, the failure of the Filipino planters thus far to take their stand as they could and should among cacao-producing countries.

Cacao is by no means an easily managed crop. Again, drought and typhoons do not go well with high production in cacao plantations. Moreover, any crop left for the most part uncared for, so that fungus diseases and insect pests are allowed to do their worst upon the branches, leaves, flowers and fruits, is almost certain to develop a very large number of enemies, which militate against anything like financial success in its culture.

There is certainly a good market for all the cacao the Filipino planters can produce, for, being one of the staple crops of the world, and having comparatively few fluctuations in price in the wholesale market, the planter runs no risks in the way of overproduction, or dangers from long storage of the raw product before the sale thereof. In other words, the Filipino planter has a hungry market to be fed; the local market is keen but practically beneath his notice; both America and Europe can swallow up a few thousand tons without in any way affecting the demand, or the average wholesale price.

Just recently a simple and rapid method of propagating cacao by buddage has been worked out by the horticulturist of this Bureau. While shield budding will not revolutionize cacao culture, it will do more than any other method has ever done toward standardizing the varieties of cacao, i.e., it will make possible the *regulation of the varieties* grown on any given plantation in any country. At present three to five types with numerous modifications and hybrids between them are found on every large cacao estate; the seeds from these different varieties naturally have different requirements as to fermentation, drying, etc , and therefore, standardization of output has been almost impossible. By following the new method now placed before the public in this number of the Review, the planter can select his variety, and at the same time propagate from his most prolific trees of that variety, so that within two years from placing of the buds he will have changed his plantation from a haphazard mixture of several varieties, and from a collection of good, bad, and indifferent trees to a regulated plantation having one, two or three varieties, all the trees of which are known to be heavy producers. This means that the planter can not only assure himself of heavy crops, other things being equal, but he can be a producer of the best Criollo, for instance, and put upon the market only cacao of recognized merit, entirely free from admixture of indifferent or low-grade 'beans'.

In the fiscal year 1912, 982,937 kilos. of crude cacao were imported into the Philippine Islands for local manufacture, or rather *use*; besides this, some 21,370 kilos. of prepared or manufactured cacao and chocolate were imported here; the total value of cacao and cacao products (not including cacao butter) was P646,834, as against P523,870, in 1911; and on top of these rather large figures we should place a good portion of the 1,000 tons of peanuts (mostly from China) imported in 1912, for in local practice the crude 'bean' is adulterated rather heavily with peanuts. This means that P800,000 worth of cacao with its 'mixtures' was consumed here that year—a very good opening for the local producer, even without considering the excellent export opportunities.

The Philippine planter now has an opportunity to acquire not only an enviable reputation as a cacao producer, but with careful attention to the details of modern cacao culture he can have a large income with little outlay; and once familiar with the characteristics and whims of the plant, he will probably forsake a number of heretofore more or less popular crops for one which is now coming to be recognized as one of the most interesting and highly profitable crops of the Tropics. (The *Philippine Agricultural Review*, Vol. VII, No. 1.)

Agricultural Industries in the Straits Settlements, 1912.—The following particulars respecting the agricultural industries in the Straits Settlements in 1912, are abstracted from Colonial Reports—Annual, No. 789:—

The area under Para rubber increased very considerably in Malacca, and also to some extent in the island of Singapore: in Malacca it was 80,424 acres in 1911, and it is now 115,000 acres. By the side of this increase, there has in Malacca been also an increase in land under tapioca amounting to no less than 52·3 per cent.; for the 10,926 acres of 1911 have become 16,643 acres. Formerly the cultivation of tapioca in Malacca was on the decrease, and old tapioca land in 1909 was being put under rubber; but the need of a catch crop to young rubber began in 1911 to cause a recovery of the lost area. In spite of the fall in prices, rubber continued highly remunerative both to proprietors and labourers. Nutmeg and clove cultivation has in many allotments in the Northern Settlement been abandoned on account of the higher rates for labour and the fall of the prices of these products. The extension of pine apple cultivation in the Singapore island continues, the crop being a catch crop to rubber, and the fruits finding a ready sale at the canning factories at Singapore. These canning factories also draw pines to some extent from outside the colony. Coconut plantations have increased slightly in Singapore island and in Province Wellesley. The Manchurian soy bean, tried in Singapore, proved useless for the country.

MARKET REPORTS.

London.—The West India Committee Circular, April 7. 1914; Messrs. E. A. de Pass & Co., March 27, 1914.

Arrowroot—2¾*d.* to 4¾*d.*
Balata—Sheet, 2/10; block, 1/10¾ per lb.
Beeswax—£9 5*s.*
Cacao—Trinidad, 61/- to 67/- per cwt.; Grenada, 54/- to 61/-; Jamaica, 55/- to 62/-.
Coffee—Jamaica, 53/6 to 78/-.
Copra—West Indian, £28 per ton.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 17½*d.* to 21*d.*
Fruit—No quotations.
Fustic—No quotations.
Ginger—Very quiet, 33/- to 60/-.
Isinglass—No quotations.
Honey—No quotations.
Lime Juice—Raw, 1/2 to 1/9; concentrated, £31 to £32 10*s.*; otto of limes (hand-pressed), 9/.
Logwood—No quotations.
Mace—1/5 to 2/6.
Nutmegs—4½*d.* to 6*d.*
Pimento—1⅞*d.* to 2*d.*
Rubber—Para, fine hard, 2/11¾; fine soft, 2/11½; Castilloa, 1/9 per lb.
Rum—Jamaica, 2/3 to 5/-.

New York.—Messrs. Gillespie Bros. & Co., March 20, 1914.

Cacao—Caracas, 12c. to 14¼c.; Grenada, 12½c. to 13c.; Trinidad, 12½c. to 13c.; Jamaica, 12c. to 12½c.
Coco-nuts—Jamaica, selects, $27·00 to $29·00; Trinidad selects $31·00 to $32·00; culls, $15·00 to $16·00.
Coffee—Jamaica, 10c. to 14½c. per lb.
Ginger—8½c. to 10½c. per lb.
Goat Skins—Jamaica, 48c. to 50c.; Antigua and Barbados, 45c. to 48c.; St. Thomas and St. Kitts, 42c. to 45c. per lb.
Grape Fruit—Jamaica, $1·50 to $2·25.
Limes—No quotations.
Mace—50c. to 53c. per lb.
Nutmegs—110's, 12½c.
Oranges—Jamaica, $1·25 to $1·75.
Pimento—4c. to 4½c. per lb.
Sugar—Centrifugals, 96°, 2·98c. per lb.; Muscovados, 89°, 2·54c.; Molasses, 89°, 2·33c. per lb., all duty paid

Trinidad.—Messrs. Gordon, Grant & Co., April 13, 1914.

Cacao—Venezuelan, $11·50; Trinidad, $11·25 to $11·60.
Coco-nut Oil—95c. per Imperial gallon.
Coffee—Venezuelan, 14c. per lb.
Copra—$4·80 per 100 lb.
Dhal—$5·75.
Onions—$3·00 to $3·30 per 100 lb.
Peas, Split—$5·80 per bag.
Potatoes—English, $3·00 to $3·25 per 100 lb.
Rice—Yellow, $5·50 to $5·60; White, $4·99 to $5·00 per bag.
Sugar—American crushed, no quotations.

Barbados.—Messrs. James A. Lynch & Co., Ltd., April 14, 1914; Messrs. T. S. Garraway & Co., April 8, 1914.

Arrowroot—$4·00 to $5·50 per 100 lb.
Cacao—$12·00 to $13·27 per 100 lb.
Coco-nuts—$15·00.
Hay—$1·50 to $1·60 per 100 lb.
Manures—Nitrate of soda, $70·00; Cacao manure, $48·00 to $50·00; Sulphate of ammonia, $82·00 to $85·00 per ton
Molasses—No quotations.
Onions—$2·60 to $4·50 per 100 lb.
Peas, Split—$6·00 per bag of 210 lb.; Canada, $4·25.
Potatoes—Nova Scotia, $2·00 to $3·04 per 160 lb.
Rice—Ballam, $5·20 to $5·30 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
Sugar—American granulated, $3·04 per 100 lb.

British Guiana.—Messrs. Wieting & Richter, April 11, 1914; Messrs. Sandbach, Parker & Co., April 11, 1914.

ARTICLES.	Messrs. Wietino & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	$8·00 per barrel of 200 lb.	——
Balata—Venezuela block	No quotation	——
Demerara sheet	65c. per lb.	——
Cacao—Native	12½c. to 13c. per lb.	13½c. per lb.
Cassava—	96c.	——
Cassava Starch—	——	——
Coco-nuts—	$16 to $20 per M.	$23 per M.
Coffee—Creole	15c. per lb.	16c. per lb.
Jamaica and Rio	15½c. per lb.	16c. per lb.
Liberian	13c. per lb.	11c. per lb.
Dhal—	——	$5·80 per bag of 168 lb.
Green Dhal	——	——
Eddoes—	$1·44	——
Molasses—Yellow	None	——
Onions—Teneriffe	——	——
Madeira	7c.	5c. to 6c.
Peas—Split	$6·00 to $6·25 per bag (210 lb.)	$7·00 per bag (210 lb.)
Marseilles	——	——
Plantains—	16c. to 48c.	——
Potatoes—Nova Scotia	——	$2·75 to $3·00
Lisoon	——	——
Potatoes-Sweet, B'bados	$1·20 per bag	——
Rice—Ballam	No quotation	——
Creole	$5·25 to $5·50	$5·75
Tannias—	$2·64	——
Yams—White	$2·16	——
Buck	$1·92	——
Sugar—Dark crystals	$2·05	$2·00
Yellow	$2·00 to $2·60	$2·50 to $2·60
White	$3·40	$4·00
Molasses	——	——
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,, Cordwood	$1·80 to $2·00 per ton	——

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Printed at Office of *Agricultural Reporter*, 4 High Street, Bridgetown, Barbados.

AGRICULTURAL NEWS

Vol. XIII. No 314.] SATURDAY, MAY 9, 1914. [One penny.

AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW
OF THE
IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

VOL. XIII. No. 314. BARBADOS, MAY 9, 1914. PRICE 1*d.*

CONTENTS.

The Budding of Cacao.

DURING a recent visit to the Government Experiment Station at Trinidad, the attention of the writer was directed to several rows of cacao plants in bamboo pots, which had been successfully budded. The spectacle of the healthy growing shoots on the brown leafless stocks would be sufficiently pleasing and interesting under most circumstances from a horticultural point of view alone, but at the present time, when uniformity and good quality figure so prominently on the market as the essential requirements of the cacao industry, the botanical features of this form of propagation fade before the economic. It will be well, however, before proceeding to discuss the commercial significance of cacao budding, to present, in brief outline, the work that has been done and the success that has been attained in this direction during the past year or two in the West Indies and elsewhere.

It may be remembered that during 1912, articles appeared in this journal which signalized the successful budding of the mango and avocado pear in St. Lucia and Dominica, and the result of this work may be taken as having provided encouragement for the still greater achievement attained during the same year in Dominica in the matter of budding cacao. The method principally employed in Dominica was patch-budding (which had proved successful for the mango), but whilst the experiments showed that budding in bamboo pots could be successful, it was found to be by no means easy, and much remained to be learned by further observation and experiment; especially was this the case with regard to the T-method of budding. In Trinidad and Dominica, the success which has already been achieved has arisen slowly, and it has been found that good results depend largely upon the experience of the operators. In both these Colonies, the Departments of Agriculture maintain a decidedly optimistic attitude towards the possibilities ahead of budding cacao, and there seems little doubt but that the operation will soon find itself included in estate practice.

On another page of this issue will be found a short article describing the budding operation as carried on in the Philippines. In this territory, the vegetative form of propagating cacao by budding has met with remarkable success. Over 90 per cent. of the stocks budded

by the T-method were successful in a recent experiment: and although this work was done under nursery conditions, it seems improbable that with reasonable care it would be less satisfactory in practice. It is confidently believed that no cacao grower who has acquired the art of shield-budding, and who follows the instructions given in the article referred to above would hereafter have to crop a heterogenous lot of seedling trees. In the editorial which preceded the special article under consideration, we are told that 'by following the new method now placed before the public . . . . the planter can select his variety and at the same time propagate from his most prolific trees of that variety, so that within two years from placing of his buds, he will have changed his plantation from a haphazard mixture of several varieties and from a collection of good, bad and indifferent trees to a regulated plantation, having one, two or three varieties, all the trees of which are known to be heavy producers.'

The significance of this uniformity can be easily imagined. Instead of having one tree bearing 200 pods, and another near by with perhaps only ten, both will be prolific. This is certain, for it has been proved in Trinidad that the degree of prolificacy of individual trees is constant from year to year and probably hereditary. The degree of prolificacy can therefore without fail be maintained by vegetative propagation. Again, another very important aspect is that by increasing the average yield per tree, the same crop can be obtained from a smaller area of land than hitherto, which is a very significant matter in relation to cacao as a crop for the peasant proprietor. Lastly, there is the benefit which will be derived through the improved uniformity in the quality of the beans; this will simplify fermentation and most certainly lead to higher prices being obtained on the American and European markets.

Whereas grafting by approach—which has until lately figured as the only satisfactory way of propagating cacao vegetatively—presents difficulties in connexion with estate work, the new method of budding seems to be perfectly applicable. The land is cleared in the ordinary way, the seed of any hardy variety planted at the usual distances, and when the seedlings are about a year old, the operators—boys who have been specially trained—are sent round with freshly obtained material from selected trees and the operation performed. There are no stages to be built around the trees, and no special watering is required as in the case of grafting by approach.

The question of getting the skilled labour has to be considered, but this need offer no anxiety since it requires but a few weeks for boys and women to become expert at the work, under proper supervision. It would seem desirable for the various Experiment Stations to give special attention to the training of youths in the shield-budding of cacao. It might be possible, in fact, to arrange a series of short courses at the Stations to which estates could send any one of their employees for the purpose of getting proper instruction. Again, the secondary and elementary schools which have gardens should pay special attention to the matter. Even if the practical instruction which it may be found possible to give does not immediately find application in practice, the importance of the matter will have been emphasized and a larger circle made familiar with the existence of the method and its great possibilities in the development of the cacao-growing industry.

SUGAR INDUSTRY.

A SUCCESSFUL METHOD OF TRANSPORTING CANE CUTTINGS.

Although the method of shipping cane cuttings in damp charcoal has been known for many years, there has always been considerable risk involved on account of the time occupied by the transportation to distant countries. With a view to overcoming this difficulty, this Department last year decided to try the experiment of shipping cane cuttings in damp charcoal (1 lb. charcoal, 4 oz. water) to India by parcel post, thereby lessening the time of transportation. On account of the maximum weight which is allowed in sending by parcel post, being 11 lb., it was found necessary to have special tins constructed, and to reduce to a minimum the size of the cane cuttings. The light tins employed measured 18 inches × 4 inches × 4 inches, and cuttings were selected having the nodes moderately close together, thereby getting a good number of buds per cutting with a minimum bulk of cane.

The time taken during the transportation was only six weeks. On its arrival in India, the case of cuttings was opened immediately, and the following observations on the condition of the cuttings were recorded: Many of the buds had already sprouted, the sprouts varying from ½-inch to 2 to 3 inches in length. In a few cases rootlets had developed 1 to 2 inches long. These looked in perfect condition and were unbroken and undamaged. The canes themselves were perfectly healthy in appearance, not in the least dried or shrivelled up, quite hard and bright in colour.

The cuttings were planted out at once and in a later communication from the Agricultural Chemist, Assam, it was stated that the cuttings had all germinated and were doing well.

As an interesting extension of the experiment, this Department requested the Indian authorities to reciprocate the trial by forwarding cuttings of any good Indian cane by the same method to the West Indies. The cuttings of

a variety known as 'Dacca Gandari' have recently been received at this Office in good condition and forwarded to Antigua where their germination capacities will be tested. It is interesting to add that this Indian cane is described as a very free tillerer, good cropper, and of high quality.

AN ELECTRICALLY DRIVEN CANE MILL.

Within a short distance of Havana, the Kelvin Engineering Company have installed at Ingenio Amistad, an electrical appliance for operating an eighteen roller sugar-cane mill. The plant is described in the *Louisiana Planter* (March 21, 1914), from which source the following information has been taken:—

The shape of the factory building is nearly square. The old mills are located along one side, each one directly in front of the other, and to accommodate the two new mills an extension was built out from one end so that all are in a continuous line. There are no cross carriers except those for taking the bagasse to the boilers. These are located behind the milling plants and partly in an ell which projects from the opposite end of the building at right angles to the mill house.

The boiler machinery, crystallizers and centrifugals are in the centre of the factory; the refinery in the corner diagonally opposite from the mills; the filter presses are diagonally across from the boilers; and the electric generating plant is between the miter presses and the mills on two sides, and between the effects and the front of the building on the other two.

This plant consists of three Westinghouse generators directly driven by Parsons turbines, each one rated at 1,000 K.V.A. and supplying a three phase current at 440 volts. Only two of these generators are needed for the operation of the factory, the third simply being held in reserve. The generators together with the exciters, switchboards and other incidental machinery, are mounted on a huge concrete base or platform, from which a view of the greater part of the factory may be had. The turbines take steam at a pressure of 100 lb. and exhaust against a back pressure of 8lb., this exhaust vapour being employed as usual in the boiling of the multiple effects and pans.

The first six motors for driving the mills (a separate motor for each mill and the crusher) are of the induction type, 435 R.P.M., rated at 200 H.P., and operate at 440 volts. The seventh motor, which drives the last mill, is rated at 250 H.P. The principal reason for making all the first six motors of the same size, though they are driving a crusher and mills of different sizes, was to allow ample power for any emergency and also to cut down the stock of spare parts that must be carried.

Each motor is set alongside the bedplate of the steam engine that formerly drove the mill, and imparts motion to the old engine shaft by means of a herring-bone pinion and gear, which gives a reduction of 10 to 1, thus driving the main pinion of the mill gearing at about 40 R. P. M. In connexion with each motor car is a speed regulator, which allows a reduction from the maximum of 20 per cent. We did not see these regulators used, as the mills were working very smoothly, but we were told that by slowing down the mills and then speeding them up again, it is easy to make them take a chunk of bagasse that would ordinarily give trouble.

. . . . . .

The claims made for electric installations in general are the elimination of the immense amount of radiating surface in the labyrinth of steam pipes that fill so many houses, and the consequent saving of a very considerable quantity of heat; the saving of transmission losses in belting by directly driving such machines as centrifugals, etc.; elimination of leaky joints in steam pipes that help to keep the floors and platforms wet and dirty; ease and cheapness of the annual overhauling of the motors, generators and power pumps; increased space and simplicity inside the factory due to the absence of steam piping; economy of heat in replacing small direct acting steam pumps by those driven electrically—these and many others.

THE MANUFACTURE OF 'HABITANT' RUM IN GUADELOUPE.

From the earliest colonial days until the establishment of the first sugar central in 1862, rum and sugar were manufactured in Guadeloupe by each plantation owner upon his premises, but as the number of centrals increased, the planter found home manufacture attended with such expenditure that he could not compete with the sugar centrals or factories. Upon the flat, low-lying island of Grande Terre, where large areas of cane lands are in close proximity, most of the sugar centrals have been erected, and planters in the neighbourhood of these have found it more to their advantage to grow sugar-cane and sell it to the centrals than to manufacture sugar themselves. Upon the Island of Guadeloupe proper, with its abrupt slopes, great valleys and hills, and such small areas of level lands, widely separated, the location of centrals near sufficient quantities of cane was difficult, the centrals are few in number and small in output Many of the planters, however, unable to sell their cane or to compete in the manufacture, undertook the manufacture of a rum known to the Colonials as rhum, or 'habitant' rum, made from the pure juice of the crushed cane. This was very profitable at first, but in a short time the centrals began the manufacture of 'tafia', a rum made from the 'mélasse' left after the sugar had been extracted from the cane juice. This rum, because of the cheaper cost of production, undersold the rum of the small distiller, and commanded the market both at home and abroad. To relieve the small distiller, the Colonial Government, in December 1888, passed a law which provided that rum made on a plantation from pure cane juice, obtained from cane grown and harvested thereon, should receive a rebate of 30 per cent. of the excise tax if consumed within the colony. This rebate, costing the colony in nine years £113,000, made such inroads in the Colonial revenues, that, through the efforts of the Government, an agreement, which still obtains, was made between the centrals and the small distillers, by which all rum made by the former was to be exported, while the rum made by the latter was to be sold primarily for local consumption, and only the excess exported. The law of December 1888 was repealed in 1898, and only 'habitant' rum is consumed in the colony. Of a total of 2,788,000 gallons of rum exported in 1911, 2,628,000 gallons were made and exported by the centrals, and 160,000 gallons by the small distillers. (*Journal of the Royal Society of Arts*, for April 3, 1914.)

FRUIT AND FRUIT TREES.

RECENT WORK ON THE BUDDING OF CACAO.

Although a considerable amount of work has been done on the vegetative propagation of cacao, especially in Dominica where attempts to graft by approach and to propagate by means of patch-budding have met with considerable success, it is only quite recently that the process of budding known as shield or T-budding has answered satisfactorily. This has occurred in the Philippine Islands; and a paper on the results that have been achieved, appears in the *Philippine Agricultural Review*, for January 1914.

It is stated in this that the results, so far attained with this kind of budding, have been so uniformly satisfactory on a small scale that it seems highly improbable that the results in larger practice will be different, and it is confidently believed that no cacao grower who has acquired the art of shield-budding, and who follows the instruction given in the following paragraphs need hereafter crop a heterogenous lot of seedling trees. He can work over his entire estate to any single desirable variety, and every budded tree will bear cacao of exactly the same quality. The operation itself is simple, requires a minimum of propagating material, and is easily and rapidly performed.

After explaining the principles of vegetative propagation and the preparation of grafting wax and tape, the author gives the following instructions:—

'The budding operations should be performed in the following order: First make a virtical incision in the stock, about 15 to 20 centimetres above the ground: then, at the lower end of this incision, make a horizontal cut so that the resulting wound resembles an inverted ⊥; then, in order to facilitate the insertion of the bud, make a sloping cut upward, below the horizontal cut, and also lift the bark by passing the point of the blade under the bark upward along the vertical incision, loosening the bark sufficiently to allow the bud to slip into place easily; now cut a bud not less than 4 centimetres long, by passing the knife *diagonally* under the bud, taking special care that it is not cut too thin and that the tissues do not split or tear, which is liable to occur if the knife is dull or if it is held at too great an angle to the bud stick; as a further precaution it is well to hold the tip end of the bud stick toward the body in the act of cutting the bud; now insert the bud and tie firmly, without strangling, with waxed tape, beginning at the point of insertion and covering the entire incision so that no water can enter.

'Fourteen to eighteen days after the buds are inserted, the buds should be examined, and where they have taken, the tape should be unwrapped to below the leaf scar and the stock should be "lopped" about 10 centimetres above the bud. This is done by cutting through the stock about one-half to two-thirds with a knife or a pruning saw and bending the tops over. The budded plants should hereafter be examined once every ten days and all wild sprouts on the stock rubbed off. This work is most important, for if it is not attended to, the stock sprouts rapidly gain the upper hand at the expense of the bud, which frequently under such circumstances fails to grow at all. When the bud has made a growth of 30 or more centimetres, according to the size of the stock, and the wood is well ripened, cut off the stock immediately above the bud union. Paint the wound carefully with white lead or some other oil paint in order to exclude borers and fungi. If the buds fail to make straight upright growths they should be staked and tied; split bamboo stakes are very serviceable for this purpose.

'Large seedlings may, of course, be top-worked by heading them back and budding the young sprouts.'

CACAO FERMENTATION IN TRINIDAD.

In the March issue of *Tropical Life*, Mr. Arthur W. Knapp, B.Sc, of the firm of Messrs. Cadbury, Ltd., publishes his observations on the practice of cacao fermentation in Trinidad. It is the opinion of the writer that too much attention is given to making the cacao look right; it would be an advantage to manufacturers if they could encourage more attention being given to the real internal quality of the bean. In the article under consideration the importance of fermentation is shown by a table containing the comparative characteristics of dried beans and fermented beans. When dried unfermented beans are roasted the product is inferior to the roasted fermented beans in all respects. An experiment was conducted to find out the losses which occurred during fermentation, and it was found that whilst the fermented Criollo beans were 2 per cent. heavier than the dried, the fermented Calabacillo beans were nearly 5 per cent. lighter than the dried; that contrary to expectation, there was on fermentation a loss of butter in the shelled beans. This butter had not passed into the shell.

The general conditions for good fermentation are:(1) the mass of beans must be kept warm; (2) the mass of beans must be moist but not wet; (3) in the later stages there must be sufficient air; (4) the boxes must be kept clean.

The article concludes with an account of sweating boxes, their material, position and construction. An essential feature of the construction is that the air must circulate freely around them. To ensure this condition the boxes should be raised above the ground and a space should be left between the wall of the building and the side of the box thus forming a double wall with an air space.

THREE NEW NUTS.

In an article in the *Journal of Heredity*, the editor calls attention to the popularity in the American markets of three new edible nuts.

The best known of these is probably the Pili nut of the Philippines, which is now commonly sold throughout the United States at about 25c. per lb., although it has been in trade for only a few years. It would seem that the Pili nuts of commerce are the fruit of *Canarium ovatum* and *C. luzonicum*, of the Philippines, and to a slight extent of *C. commune* of the Dutch East Indies, belonging to the natural order Burseraceae. In addition to the nuts, these trees yield a valuable resin, the 'gum elemi' of the Pharmacopeia.

Somewhat similar to the Pili nut is the second kind, the Paradise nut, a near relative of the more common Brazil nut. It is grown in Brazil, Venezuela and Guiana. Its botanical genus is Lecythis, and it is probable that fruit from several different species of this genus are shipped to America. It is interesting to note that this plant belongs to the same natural order as the Canon Ball tree (*Couroupita guianensis*). The paradise nut contains generally about 39 per cent. of oil.

Lastly, the third nut which is referred to in the article under consideration is the Queensland nut (*Macadamia ternifolia*) of the order Proteaceae. Small shipments made from Queensland to London are said to have brought 12s. per lb. on the Covent Garden Market.

NUTRITION.

THE PROPER DIET IN THE TROPICS.

The *Experiment Station Record*, Vol. XXX, No. 3, publishes the following conclusions arrived at by Dr. A. C. Eustis, on the subject of human nutrition in the Tropics. The paper appears in full in the *American Journal of Tropical Diseases* (1913) No. 4:—

The author holds that there is greater danger from an excessive use of meat in tropical than in temperate regions, because 'ptomaines', which may be produced from undigested meat by the action of putrifactive bacteria in the colon, and which under ordinary conditions would be 'rendered inert by the liver cells', would not, in his opinion, be so taken care of where there is little severe exercise, as is the case with most residents in warm regions

He believes further, that in such regions 'there is little need of internal combustion to maintain the body temperature.'

Similar arguments are given against the use of alcohol.

In the author's opinion, not more than 40 gm. of protein per day should be eaten in the Tropics. He believes that the energy value of the daily diet should be from 2,000 to 2,500 calories, depending upon the muscular work done, fats being taken in moderation and the energy supplied largely from carbohydrates; that vegetable proteids are preferable to animal proteids; and that the diet should contain an abundance of fruits and vegetables.

The desirability of limiting the amount of meat in the diet is illustrated by a case cited, in which symptoms of toxemia in a patient were overcome by reducing the meat consumption, and which the author considers typical of many which he states have come under his observation.

COTTON-SEED MEAL FOR HENS.

The *Mississippi Station Bulletin* recently reports on the value of cotton-seed meal for laying hens This is also noted in the *Experiment Station Record* (Vol. XXX, No. 3).

This bulletin is a preliminary report of experiments in progress. Results of six months' work tend to show 'that cotton-seed meal used as the chief source of protein is palatable to fowls, and that when fed judiciously on it they will produce eggs; that hens fed on cotton-seed will produce eggs when eggs are highest in price; that as far as can be determined, the general condition of the cotton-seed meal-fed fowls seem just as good as the condition of those fed on beef scrap; that the tendency was to lose flesh and not get over-fat, although the fowls were allowed access to the feed at all times; and that there is a good margin of profit from hens when given a properly balanced ration.'

FEEDING EXPERIMENTS WITH CASSAVA.

The same journal contains an interesting note on the value of cassava as a foodstuff for pigs:—

Four pigs two and a half years old each fed a daily ration of 2·02 kg. of cassava, 2·0 kg. of a mixture of bran and low grade flour, 1·6 kg. of mangels, and 0·18 kg. of meat meal for seventy-seven days made a daily gain per head of 0·53 kg. (1·17 lb.). In another test five pigs each fed a daily ration of 1·47 kg. of cassava, 1·47 kg. of the bran-flour mixture and 4·99 kg. of skim milk for fifty-eight days, made a daily gain per head of 0·67 kg., and a similar lot 0·62 kg. per head. Methods and results of analyses of cassava by J. Van Buggenhout *et al.* are given.

MANURES AND MANURING.

THE MANURING OF MEALIES.

The appearance of a recent text-book on maize, which was reviewed in this journal, Vol. XIII, p. 141, where the question of manuring is discussed, makes the occurrence in *Tropical Life* (March 1914) of an article having the above title most opportune. In this article, Mr. A. Gordon Howitt, B.Sc., recommends the employment of what is known as the 'A' and slag mixture. The 'A' mixture is composed as follows: bone meal, 1,250 lb.; superphosphate, 500 lb; muriate of potash, 250 lb., making in all 2,000 lb. The slag mixture is composed of basic slag, 1,000 lb.; bone meal, 750 lb.; muriate of potash, 250 lb.—making in all 2,000 lb. It is recommended that a dressing of 200 lb. per acre of the 'A' mixture would be sufficient, and this would cost about 13*s.* 6*d.* per acre. The slag mixture should be applied at the same rate.

The importance of potash as a constituent of manurial mixtures for maize is shown by the results of an experiment in which manures were applied to plots of maize according to the following arrangement: plot I—no manure: plot II—100 lb. bone meal, 100 lb. of superphosphate, no potash; plot III—125 lb. bone meal, 50 lb. superphosphate, 25 lb. muriate of potash. The net profit on the no-potash plot (plot II) was 14*s.* 9*d.*; the net profit on the plot which received potash (plot III) was 41*s.* 7½*d.* This experiment was carried out in Natal on soil of a very uniform character. Each plot was ⅛-acre in area.

A NEW FERTILIZER: MOLASSED SUPERPHOSPHATE.

Considerable efforts have been made in the past to utilize the residues from the distillation of molasses either by drying the material or by mixing it with other substances. So far, these efforts have proved unsuccessful, as the product has always been hygroscopic, and factories have therefore been compelled to concentrate and ignite their residues to recover the potash contained therein, or sell them in a concentrated condition to cyanamide works, which recover not only the potash but also 60 to 70 per cent. of the nitrogen as potassium cyanide and ammonium chloride. Even in these cases a large percentage of nitrogen and the whole of the organic matter are lost, and a search has been made to find some substance which could be suitably mixed with the residues and so obviate these losses. According to the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases*, for March 1914, it has been found that the acid phosphates of betaine (betaine occurs in beet molasses) is not hygroscopic. It is stated that a friable, non-hygroscopic product is obtained when the residues from the molasses are treated with an amount of phosphoric acid and then dried. Better results still were obtained when the residues were mixed with superphosphates and the mixture heated for a short time at 108°C. (226°F.). The material thus prepared is friable, keeps well, and is easy to apply. The product does not damage sacks and has the advantage over other fertilizers of providing humus material as a basis for bacterial development in the soil. Molassed superphosphate, obtained by mixing 3 parts of superphosphate with 2½ parts of concentrated residues, contains 2·25 per cent. of nitrogen, 6·33 per cent. of potash, and 11·53 per cent of citrate-soluble phosphoric acid (8·48 per cent.) water soluble. It has 30 per cent. of undecomposed organic substance.

COTTON.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date April 20, with reference to the sales of West Indian Sea Island cotton:—

Since our last report between 250 and 300 bales of West Indian Sea Island cotton have been sold, including Antigua 19*d.* to 22*d.*, with a few super-fine bags at 24*d.*; St. Kitts and Nevis 19*d.* to 20*d.*, Barbados 20½*d.*, Tortola, St. Eustatius, Barbuda and Montserrat 15½*d.* to 16½*d.*

Prices for the finer sorts remain very firm, but the medium and lower qualities are pressed for sale and buyers are indifferent.

Planters and shippers would be well advised if they sent forward their cotton in commercial quantities. We wish to lay stress upon the fact that spinners will not look at lots of less than 10 bales. Planters of small quantities in one or two of the islands have been successful in pooling their cotton, and we do not see why this could not be done in all those islands where no superfine cotton is grown. Probably one-half of the total West Indian Sea Island crop comes forward in lots of 5 bales and under, and if this continues, the prompt sales which planters desire are not possible.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending April 11, is as follows:—

In our last report we advised the sale here of about 200 bales Fine at 22½*d.*, taking the entire offerings of this grade, the buying being on account of the Northern and Southern Mills. The unsold stock is now reduced to Planters' Crop Lots, aggregating about 250 bales, for which there is some demand at prices below the asking prices of the Factors. A portion of the above 250 bales is held on plantations, and will not be forwarded to market until sold. During the week there were shipped to Savannah to be put in warehouse there 344 bales, which have been held in warehouse one to three and a half years, having been brought over from previous crops.

We quote, viz:—

Extra Fine	26c.	= 14¾*d.*	c.i.f., & 5 per cent.
Fully Fine	24c.	= 13¾*d.*	,, ,, ,, ,,
Fine	22½c.	= 13*d.*	,, ,, ,, ,,

This report shows that the total exports of Sea Island cotton from the United States to Liverpool, Manchester and Havre, up to April 11, 1914, were 4,328 bales, 6,595 bales, and 4,066 bales, respectively.

BRITISH COTTON GROWING ASSOCIATION.

The one hundred and twenty-second Meeting of the Council of the British Cotton Growing Association was held at the Offices, 15, Cross Street, Manchester, on Tuesday the 7th ult. The President (The Rt. Hon. the Earl of Derby, G.C.V.O.) was in the chair.

WEST AFRICA. The crop in Lagos appears to be rather late this year, and until the returns for April are to hand it will not be possible to form any reliable estimate as to what the total crop will be. The purchases during the month of March amounted to 5,761 bales, which is the largest number for any one month since the Association commenced operations, and the purchases to date amount to 8,941 bales as compared with 7,909 bales for the same period of last year, and 4,741 bales for 1912.

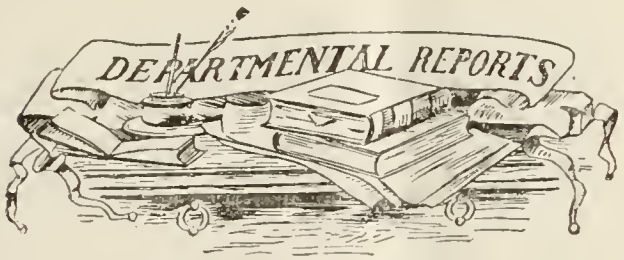
In Northern Nigeria the returns from the Zaria district are most disappointing; more cotton seed was distributed last season than ever before, and there is every reason to believe that a larger crop has been harvested. The demand for cotton for local manufacture has, however, been very great, and it is estimated that as much as 50 tons per day have been purchased by the local traders for the native weaving industry. The purchases in Northern Nigeria to the end of February were 172 bales, as compared with 521 bales for the same period of 1913.

NYASALAND. A letter has been received from the Governor in which he states that the year's operations have been excellent so far as the native cotton is concerned, the production amounting to 1,147 tons, against 740 tons the previous year. The Government markets for purchasing native cotton have proved a complete success, and it is proposed to extend them as much as possible another year.

LABOUR ON ESTATES IN THE EAST.

Judging from Eastern correspondence, one can only conclude that labour conditions throughout the rubber districts are far from satisfactory. In many areas it seems impossible to lower wages or reduce advances. Competition is getting keener every week, and the labour problem is undoubtly causing much anxiety among managers. We know that the view held by some London directors is that if a manager cannot get and keep labour he should be removed. This is truly a short cut towards solution. But we doubt whether it is fair or even wise to adopt such a course on the majority of estates. Obviously where labour troubles are so widespread it is futile even to make the suggestion. We are hopeful that the stopping of extensions, the decrease in number of tapping cuts per tree, and the adoption of alternate day, instead of daily, tapping—all agriculturally sound—will help to relieve the situation. Meanwhile the subject cannot be lost sight of. The margin between present and possible wages on Eastern plantations is small: a reduction below 30-35 c. per day seems quite impossible. But this is by no means the case in parts of Africa and Brazil. We are aware of some conspicuous reductions already made in Africa; here the process is simple, as it resolves itself largely into one offering a lower price for the rubber brought in by the natives. Similarly, in Brazil, rubber is not generally collected by workmen on regularly daily pay. Recently the collector in Brazil could make sufficient in some season to keep him twelve months, because he received a percentage of the market price ruling for rubber. (*India Rubber Journal*, March 21, 1914.)

H.M. Legation at Mexico City reports the publication of a contract entered into between the Mexican Ministerio de Fomento and Señor Carlos Lopez Zetina whereby the latter is granted the right to extract chicle gum and to cultivate maize over a total forest area of 100,000 hectares (247,000 acres) situated in the district of Champoton, in the State of Campeachy. The concession covers a period of five years from September 25 next. (*The Board of Trade Journal*, March 12, 1914.)



BARBADOS: ANNUAL REPORT ON THE LOCAL DEPARTMENT OF AGRICULTURE 1912-13.

In addition to the ordinary text containing matters of local interest concerning agricultural practice and experiments, the sixty odd pages of this report include twenty-six tables of figures and observations, thirteen pages of rainfall statistics and an appendix.

Dealing first with the results of the manurial experiments with sugar-cane at Dodds, which have been in progress for the last twenty years, it is seen from the tables, that the highest yield during the year under review was obtained where 60 lb. of nitrogen as dried blood was applied, 15 lb. in January and 45 lb. in June, but not the best monetary result, which was attained where 40 lb. of nitrogen as sulphate of ammonia was applied, 15 lb. in January and 25 lb. in June. In the case of the former, after deducting the cost of the manure, the value of the incremental sugar over the 'no nitrogen' plot was $9·69, and in the case of the latter $10·17, per acre per annum. The results of the trials with phosphates appear to be complicated and to some extent contradictory.

Turning to the cotton industry, it is mentioned that the cotton experiments for improving the quality and increasing the quantity of lint from the Sea Island cotton grown in Barbados, were continued. These experiments, we are informed, are carried on in two series. In the first series an effort is being made, by a system of selection of the best formed plants giving heavy yields of good lint, to improve the Sea Island, certain indigenous and other varieties of cotton. In the second series, an effort is being made, in like manner, to improve a number of hybrid cottons that have been obtained by crossing some of the best of the improved varieties amongst themselves, as well as some of the imported varieties with certain of the indigenous cottons. Samples of cotton obtained from these selection plots were forwarded to England for examination as to value, and were reported on satisfactorily. At the time this cotton was being examined in England, the price of West Indian Sea Island was 20*d.* per lb. while three of the varieties examined, namely, Waterford, Heaton, and C106 were valued at 19*d.* per lb. The respective yields of these varieties were: Waterford, 788 lb. of lint per acre; Heaton, 698 lb.; C106, 720 lb., as compared with Stirling Selected West Indian Sea Island, the yield of which was 629 lb. of lint per acre, valued at 20*d.* per lb. It is further stated, in regard to the cotton hybrids, that up to the present time only three plants of the 131 varieties were attacked by the leaf-blister mite, and these, which were apparently unhealthy, were destroyed. The remainder have been allowed to continue their growth for another year for the purpose of ascertaining whether they will continue to be immune to this pest.

With reference to the manurial experiments with cotton at Stirling plantation, the best result is said to have been obtained where 30 lb. of nitrogen as sulphate of ammonia, 60 lb. of phosphoric acid as superphosphate of lime, and 20 lb. of potash as sulphate of potash were applied. The value of the incremental cotton over that obtained on the no-manure plot, was $13·22 per acre.

While the series of selection experiments are said to have been introduced with the object of improving the quality as well as the quantity of West Indian Sea Island cotton, it may be of interest to point out that, as regards quality, West Indian Sea Island cotton can scarcely have said to have deteriorated, if one may judge from the prices that have been and are yet obtained for lint in the Liverpool market. But that the amount of cotton obtained from a given area (at least in Barbados) has been a diminishing quantity is abundantly shown on reference to Table XXVI of the report under review, where the area under cotton for the period 1902-3 to 1911-12 and the average yield of lint per acre for same period are given. For instance, we find that in the year 1902-3 the area under Sea Island cotton is stated as 16 acres and the average yield of lint per acre 338 lb.; thence onward the average yield decreases with the increase of area, until in the year 1911-12, from an area of 4,669 acres, an average yield of 98 lb. of lint per acre was obtained. Does this not point to faulty cultivation?

After recording the results of experiments with various economic plants, the subject of the exportation of fruit and vegetables is dealt with, and a precis of a report adopted by the Agricultural Society and forwarded to His Excellency the Governor on the advisability of resuscitating the banana industry, is presented. This, in brief, states: (1) That it is in the best interest of the owners of land suitable for growing bananas, that the banana industry should be resuscitated; (2) that all persons who were desirious of shipping bananas should communicate with the Superintendent of Agriculture on a certain date: (3) that when it was ascertained what the output of bananas was likely to be, the British West India Fruit Company be asked to enter into an agreement with the R.M.S.P. Company, for the carriage of the fruit until the end of June 1915, without any guarantee from the shippers; (4) that the Secretary of State be asked (on behalf of the growers) to enter into an agreement from July 1, 1915, with the R.M.S.P. Company as to the number of crates to be shipped in subsequent years; (5) that arrangements be made to ensure the cutting at the right stage, the weighing and proper packing of the fruit; (6) that any shipper failing to comply with the foregoing should be subjected to a penalty; and (7) that enquiries should be made as to the possibility of drying the fruit of small bunches, as figs are dried. It may be added that a certain number of planters are said to have agreed to grow bananas for shipment.

In the section of the report dealing with the fumigation of plants, it is mentioned that the results of experiments carried out with imported cotton seed showed, that of the three substances used—sulphur dioxide, hydrocianic acid gas, and carbon bisulphide—the last named gave the most satisfactory results. A review of that portion of the report dealing with fungoid diseases in Barbados during 1912-13, is presented on another page of this issue of the *Agricultural News*.

It would appear from information presented in *Tropical Life* (March 1914) that the clove industry in Zanzibar is capable of being revived from its present depressed condition, by the introduction of British capital and organization. It is said that the present private owners of land under clove are much in debt, and that the trees owing to lack of systematic care and expert advice are slowly dying in an inexplicable manner from some cause which should receive immediate investigation.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

Local Agents: Advocate Co., Ltd., Broad St., Bridgetown. *London Agents*: Messrs. Dulau & Co., 37, Soho Square, W.; West India Committee, Seething Lane, E.C. The complete list of Agents will be found on page 3 of the cover.

The *Agricultural News:* Price 1*d.* per number, post free 2*d.* Annual subscription payable to Agents, 2*s.* 2*d.* Post free, 4*s.* 4*d.*

Agricultural News

Vol. XIII. SATURDAY, MAY 9, 1914. No. 314.

NOTES AND COMMENTS.

Contents of Present Issue.

The object of the editorial in this issue is to emphasize the economic importance of cacao budding, a practice in which considerable success has been achieved in the West Indies and in the Philippines.

Under Sugar Industry, on page 146, will be found an interesting note describing a successful method of transporting cane cuttings.

On page 149 will be found information dealing with animal nutrition and the manuring of crops.

Under Departmental Reports, on page 151, the report of the Local Department of Agriculture, Barbados, is reviewed. A summary of that section of the publication treating of fungoid diseases in the Colony during 1912-13, will be found under Fungus Notes, on page 158.

Under Insect Notes, on page 154, appear articles on the control of onion thrips in the United States, the use of arsenate of lead, and the employment of naphthalene in the control of fleas.

Two interesting miscellaneous notes in this issue are those on the Canadian National Exhibition, 1914, (on this page), and that on oil-nut development in British Honduras (see page 159).

Canadian National Exhibition, 1914.

The Canadian National Exhibition will be held at Toronto this year opening August 29 and closing September 14.

Mr. C. S. Pickford, of the firm of Messrs. Pickford & Black, Ltd., Halifax, has kindly expressed his willingness to undertake the charge of exhibits from the West Indies as in previous years, and to make all arrangements for the West Indian Court.

The Royal Mail Steam Packet Company have agreed to convey exhibits from the West Indies free of charge, thus continuing the privilege so generously extended in the past by Messrs. Pickford & Black, Ltd.—a privilege which has been greatly appreciated by all the colonies concerned, and for which grateful acknowledgement is here tendered.

Mr. Pickford has advised that non-perishable goods should go forward by the S.S. 'Chignecto' leaving Demerara July 23, and perishable goods by the S.S. 'Chaudiere' leaving Demerara August 27. It is advisable that all goods which can posssibly be sent by the earlier opportunity should be so despatched, as in that case they can go forward from St. John to Toronto by ordinary freight; whereas those arriving by the later boat would have to be forwarded by express, which is very expensive.

The usual booklet distributed by the Imperial Department of Agriculture at the Exhibition each year is now in course of preparation, and intending advertisers are advised to send in their advertisements to this Office as soon as possible.

Agriculture in the Leeward Islands in 1912.

Information concerning the agricultural industries in the Leeward Islands during 1912, is presented in *Colonial Reports*—Annual, No. 793, which has recently been issued. From this the following details (supplied by the local agricultural officers) are abstracted.

The exports of sugar from Antigua for the year 1912 amounted to 11,690 tons, of which 7,503 tons were 96° crystals and 4,187 tons muscovado. In St. Kitts-Nevis the similar exports amounted to 10,285 tons, of which 3,866 tons were 96° crystals and 6,419 tons muscovado. The marked increase in the export of grey crystal sugar from St. Kitts is attributed to the working of the St. Kitts Sugar Factory, which took off its first crop during 1912, resulting in the production of 3,660 tons of grey crystal sugar, 35,439 tons of canes being crushed to produce this.

The exports of cotton during the year 1912 were as follows: Antigua and Barbuda 80,910 lb.; St. Kitts 332,168 lb.; Nevis 165,329 lb: Anguilla 97,142 lb.; Montserrat 346,568 lb.; the Virgin Islands 51,677 lb. Comparison with the exports for the two previous years shows that the exports for 1912 are below those for 1911, but exceed those of 1910. This industry appears to have settled down to a position of stability, and it is not anticipated that any great expansion is likely to occur in the near future.

The total exports of lime products from Montserrat during the year were valued at £9,370, and consisted of raw and concentrated lime juice, green limes, citrate of lime, and essential oil. From Antigua the exports of lime products were valued at £1,209. Interest continues to be shown in lime growing in Nevis and Tortola; and in regard to coco-nuts, the cultivation continues to increase in almost all the Presidencies of the Leeward Islands Colony.

In Dominica, the lime crop for 1912 is recorded as 370,000 barrels. Considerable falling off is reported in the export of citrate of lime, brought about by a demand in Canada for large supplies of raw lime juice. The total value of the exports of lime products was £96,673. The increase in values over the crop of 1911 amounted to £22,791. It may be added that of the 37,038 barrels of green limes exported, 35,046 barrels went to New York, 301 to Canada and 1,323 to the United Kingdom.

As regards other industries, the export of cacao was 11,877 cwt., being 1,822 cwt. over the shipments of 1911; the number of coco-nuts shipped, totalled 539,791 as against 402,622 in 1911: 22 000 seeds of Para rubber (*Hevea brasiliensis*) were imported from Singapore and a germination at the rate of 60 per cent. was secured; of cassava starch 31,156 lb. valued at £260 was exported, while 873 cwt. of dried bay leaves, and 133 gallons of bay oil were shipped. A small quantity of coffee (76 cwt. valued at £213), and cured vanilla beans to the value of £113 were also exported; whilst of lumber over a million feet, the value of which was returned at £11,488, was shipped.

International Phytopathological Conference.

The Board of Trade Journal for March 26, 1914, publishes the following provisions which were adopted at the recent International Phytopathological Conference at Rome, at which H. M. Government was represented:—

'The signatory States undertake to admit to importation only plants accompanied by phytopathological certificates issued by a competent official authority, except in the case of plants imported for scientific research at an Institute authorized by the Government. These certificates, which must be in conformity with a model given in the Appendix to the proposed Convention, include a declaration by the consignor that the plants come from a nursery subject to phytopathological inspection, a certificate in accordance with the Phylloxera Convention of Berne and a certificate from the official phytopathological service as to the sound condition of the plants and their freedom from the diseases, or enemies of plants, scheduled by the Government of the country to which the plants are being sent. This schedule of diseases, etc., is to be left to each importing country but it was decided that the list must be as short as possible and confined to diseases which are epidemic in character and destructive or at least injurious in their action, as well as easily propagated, and must not include common diseases which are widely distributed.

'The proposed Convention excludes from its operation vines, grain, seeds, tubers, edible bulbs, rhizomes and roots, as well as fruit, fresh vegetables, field roots and general agricultural produce.'

Present Position of the Wattle Bark Industry.

In the early part of last year it was thought possible that the cultivation of plants yielding wattle bark might eventually be of practical interest in the West Indies, and in view of this fact a series of articles on wattle bark were published in this journal during February and March. In the third article it was pointed out that although the exports of wattle were increasing and there was every probability of a very large future supply from East Africa, there was no indication that the supply would necessarily exceed the demand. Indeed it was noted that a new demand for wattle bark had arisen in Canada—a circumstance of special interest in the West Indies.

Since the time that these articles were written it would appear that the demands of the wattle bark market have undergone considerable change. According to the *Agricultural Journal of the Union of South Africa*—representing a country especially interested in the industry—the production of bark is on the increase, whilst the market for bark is at least stationary and possibly becoming restricted. Wattle bark, which was formerly employed extensively in England is now being displaced by prepared extracts, and the sole market for the raw bark at the present time would appear to be Hamburg. The position at present appears to be this: that in any case exported bark must be properly graded, whilst profitable returns comparable with those that have been obtained in the past, can only be maintained by the preparation of extracts from the bark and the entire cessation of the shipment of the raw material.

The Fractional Liquefaction of Rice Starch.

In a paper published in the *Memoirs of the Department of Agriculture in India* (see Vol. III, No. 5), Mr. F. J. Warth and D. B. Darabsett describe a new method by means of which rice varieties can be distinguished from one another by differences in the quality of their starches. It is shown that the cooking quality of rice is correlated with starch quality. Glutinous rice starch liquifies at a lower temperature than the starches of the non-glutinous rices.

The paper consists of two parts. In the first part the method of fractional liquefaction for comparing rice starches as devised and tested by the senior author is described. The second part contains the application of the method to the differentiation of the starches of seven common rice varieties of Burma. This shows the great advantage of fractional liquefaction. Methods which only indicate the temperature of complete scarcely enable certain important distinctions to be made, whilst by fractional liquefaction the differences are strikingly brought to light.

The paper is to be considered an important contribution to agricultural research in connexion with rice.

INSECT NOTES.

CONTROL OF THE ONION THRIPS IN THE UNITED STATES.

The onion thrips, which is a serious pest of onions in the United States, has been the subject of extensive investigations in different parts of the country. The *Experiment Station Record*, for October 1913, gives a summary of a paper on this subject by Mr. F. H. Chittenden, which appeared in the *Yearbook* of the United States Department of Agriculture, 1912, pp. 319-34.

In view of the recent developments of an important onion industry in Antigua, information as to the control of the pests is likely to be of interest to planters in that island, and it may be of value in other localities, since onions throughout the West Indies are liable to thrips attack.

The summary mentioned is reproduced herewith.

Of the insect enemies of the onion, the onion thrips (*Thrips tabaci*) is the most important. It causes injury to the onion crop practically throughout the country, producing a condition somewhat generally known as 'white blast', 'white blight' and 'silver top'. It is also the cause of 'scullions' or 'thick neck', terms used for the undeveloped and unmarketable bulbs. This thrips is now found in practically all cultivated fields in the United States, as well as in many uncultivated areas, so that there is always danger of infestation to onions and other susceptible crops, whether grown in new or in old land. Observations tend to demonstrate that in some localities, at least, it makes little difference as to the previous crop.

The life-cycle has been found to require under the most favourable conditions about three weeks. Thus a dozen or more generations might be produced during a season. 'Besides onions and related plants, this thrips attacks cabbage, cauliflower, parseley, cucumber, melon, pumpkin, squash, kale, turnip, tomato, seed beets, blackberry and strawberry. Of ornamental plants, it does much injury to carnations and roses and more or less injury to aster, blanket flower (Gaillardia), honeysuckle (Lonicera), daisies, nasturtium, narcissus, mignonette, candytuft (Iberis), four-o'clock (Mirabillis), and cone flower or golden glow (Rudbeckia). Very serious injury is frequently committed to cucumbers and carnations in greenhouses, the damage sometimes amounting to the destruction of entire plantings.

'Kerosene emulsion, whale-oil or fish-oil soaps, and tobacco or nicotin extracts are recommended for use, their application being commenced early in the season. The importance of clean methods of field management, including the destruction by burning of culls, tops, and injured plants after the crop is gathered, is emphasized. Investigations in Texas and Indiana have shown the following formulas to give the most successful results: (1) Nicotin-sulphate 3·2 oz., cresol soap 3 pints, and water 50 gallons; (2) nicotin sulphate 4·3 oz., whale-oil soap 4 lb., and water 50 gallons. When spraying is once begun it should be continued at intervals of from seven to ten days, in case there is no heavy rainfall during this period, and no surrounding breeding host for the species. The spraying should, as a rule, be continued up to three or four weeks of harvest time. In spraying for thrips, the nozzles should be held well down upon the plants and the spray applied with as much force as possible.

'Where setts are used considerable injury may be prevented by dipping them about a week before planting in nicotin sulphate at about the same strength as used for spraying, and then giving two dippings in the same insecticide at planting time, or in almost any other of the solutions mentioned, including kerosene emulsion. Since this thrips displays preference toward cabbage and cauliflower, neither of these two crops should be grown contiguous to onions.'

ARSENATE OF LEAD.

Arsenate of lead, as an insecticide, has not up to the present time found extensive favour in the West Indies, but in many places it is largely used instead of Paris green and London purple.

The chief advantage in the use of arsenate of lead lies in its insolubility. It was first developed as an insecticide in response to the need for a substance which might be used at greater strength, without injury to the foliage of plants, than could either of the others mentioned, for the control of insects, which were not killed by these when applied in mixtures strong enough to scorch the plants. In addition, arsenate of lead possesses exceptional powers of adhesion to the foliage of plants.

Paris green and London purple are ordinarily used at the rate of 1 lb. to 150 gallons of water, and from that strength to 1 lb. in 100 gallons. The addition of lime to neutralize the soluble arsenious acid has been practised, usually with good results, but these are not always uniform.

Arsenate of lead was for a number of years only sold in the form of a paste. In this form it could only be used as a spray, and the objection made to the material in that form referred to the large amount of water which it contained, increasing the cost of freight, and also to the fact that the paste dried out to a considerable extent. This drying out affected the strength of the material so that it was often impossible, under field conditions, to prepare mixtures of uniform composition.

To remedy these defects a dry, powdered form of arsenate of lead has been prepared, and this, during the last few years, has come to be largely used. It is stated to possess the advantages of the wet form and, in addition, to be without its disadvantages.

In certain of the West Indian islands where Paris green and London purple have been used in large amounts for the control of the cotton worm, it has been found that labourers sometimes object to the work of applying the poisons because of the irritating effects on the skin, and that light showers easily wash the poison off the leaves.

It is likely that arsenate of lead would be without these objections, but it might be somewhat slower in its action on the cotton worm than either of the others. In the case of heavy and repeated applications, there would be less danger of scorching the leaves by arsenate of lead.

The dry form of arsenate of lead, therefore, would seem to be worthy of trial by cotton growers, especially in localities where light showers frequently interfere with the application of Paris green and London purple, or where difficulty has been experienced in getting labourers to use them.

USE OF NAPHTHALENE IN THE CONTROL OF FLEAS.

The following note relating experience in the use of naphthalene for the control of fleas may be of interest to readers of the *Agricultural News*:—

'A few years ago I read of an instance in the United States in which a new house became infested with fleas before

anyone had lived in it. The owner, who had built it for his own residence, resorted to naphthalene as a remedy for the infestation. A sufficient quantity of this material was procured to cover the floor of one of the largest rooms some 2 or 3 inches deep. The naphthalene was used in succession in the several rooms, halls and passages of the house, being left in each place for twenty-four hours. This treatment freed the house from fleas.

'More recently, I have read an account of the successful use of this material for removing fleas from kittens. The naphthalene available for the purpose was in the form of the ordinary balls, which were pounded up and the fine powder of naphthalene was rubbed into the fur of the kittens from the tail toward the head. The fleas were said to retreat before the naphthalene, and eventually they were all driven from cover on to the heads of the kittens, where they were captured.

'For some time it has been rather a puzzle to know what to do for fleas on my dogs. The fox terrier has so much clear white in his coat that I have not liked to use Keating's powder or pyrethrum because of the yellow colour which is often left by these insecticides. Kerosene in any form and whale-oil soap are objectionable on account of their characteristic odours. The ordinary soaps used in washing the dogs bring out the fleas but do not kill them. With these difficulties in mind, I remembered about naphthalene and resolved to try it. I had on hand a small amount of the lumps or "crystals" as this form is sometimes called. This was pounded to a fine powder, almost a dust, and the application was made, the results being most satisfactory. Most of the fleas that came out of the dogs' coats were dead by the time they fell to the paper on which each animal was made to stand for treatment, or they appeared to be so, while the others were much stupified.

'By using a paper in this way the naphthalene may be taken up and saved for future use. It can be stored in a card board or wooden box, and if the fleas which fall on the paper are simply left in the naphthalene they will be all killed—there is no need to kill them in the ordinary way of catching and crushing.

'This is a very simple and effective method of freeing dogs from fleas, and it is clean and cheap. A pound of naphthalene will last a long time, the dogs are not affected by it, and it can be applied by anyone.'

THE SOIL.

THE EFFECT OF HEAT ON HAWAIIAN SOILS.

In the following summary, considerable light is thrown upon the reasons for the beneficial effect which heat has upon the manganiferous soils of Hawaii. The information is taken from Bulletin No. 30 of the Hawaii Agricultural Experiment Station. This publication should be consulted for further details.

Twelve different soils representing a wide range of types and agricultural conditions were studied with reference to the effects of heating to 100°C., to 250°C., and to ignition. The solubility of all the mineral constituents except sodium was determined, using water and fifth-normal nitric acid as solvents. The effects on the nitrogen compounds were also investigated.

The results showed considerable variation. Neither the absolute nor the relative solubility of the inorganic constituents was affected similarly in all the samples studied.

On the average, drying at 100°C. was found to bring about an increase in the water soluble manganese, lime, magnesia, phosphoric acid, sulphates, and bicarbonates. At this temperature an increase on the solubility of potash, silica, and alumina was produced in about 50 per cent. of the soils examined, but a decrease was observed in the solubility of these elements in some instances. The solubility of iron was increased in most instances.

Heating to 250°C. or ignition produced effects on the solubility in water similar to those brought about at 100°C. but varying in degree, these being sometimes greater, sometimes less in intensity than those produced at 100°C.

The solubility in fifth-normal nitric acid was not greatly affected by heating to 100°C., but in some instances heating to 250°C. considerably increased the solubility of alumina, manganese, potash, and phosphoric acid and at the same time effected a reduction in the solubility of lime and magnesia Upon ignition the solubility of silica, alumina, potash, phosphoric acid and sulphates was increased, while the solubility of lime and magnesia underwent a corresponding decrease.

The solubility of soils used in aquatic agriculture is abnormally high, but upon drying out these become much less soluble and approach a state similar to that existing in aerated soils. When such soils are heated after drying they seem to undergo changes of the same order as are produced in dry land soils.

No single factor is sufficient to cover the solubility effects resulting from heating Hawaiian soils. On the other hand, the subject is very complex and involves many factors. Among the more important of these may be mentioned flocculation, deoxidation of manganese dioxid, oxidation, particularly of iron; double decomposition, dehydration, and the attending physical alterations of soil films. Such alteration would destroy film pressure, thus allowing the solvent to come into more intimate contact with the soil constituents. At the higher temperatures bicarbonates become converted into normal carbonates, thus effectively lowering the solubility of lime and magnesia.

Nitrates undergo decomposition with heat, a decrease in nitrate content having been found to take place at 150°C., while at 200° or 250°C. practically total destruction of nitrates took place.

One of the noteworthy effects of soil heating is the production of ammonia, which at 200°C. was formed in abnormally large amounts. Soil subjected to heat from brush burned in the field was found to undergo stimulated ammonification after heating. Nitrification, on the other hand, was not restored after the lapse of two months.

Heating to 200°C. caused a loss of approximately 25 per cent. of the total nitrogen. A loss of nitrogen and the ammonia formed by the action of heat came largely from the monamino acid group, while the amids and diamino acid sustained much less loss.

The results of these studies are believed to throw important light on the subject of soil aeration, and consequently have a direct bearing on the practical question of soil management.

GLEANINGS.

In Nevis a considerable acreage of cotton has been planted very early this year and is looking in good condition. The shipment of coco-nuts from Nevis is becoming an important item in the island's trade.

The results of the St. Vincent experiments with planting arrowroot on the flat and on banks appear to indicate that the bank system leads to a decrease in yield. There seem to be no immediate advantages derived from the cultivation.

It is interesting to record the extension in Dominica of factories for the manufacture of citrate of lime. At the present time it is gratifying to report that the demand for fresh limes is strong, and the future prospects of the industry are in every way satisfactory.

As in most of the islands, the weather at Tortola has recently been very dry, and this has been mainly responsible for the poor returns of sugar-cane. Although limes were received very freely during March at the Government Factory, the crop is likely to prove a small one.

In St. Kitts it is to be expected that the factory facilities in the northern part of the island, which enforce the manufacture of muscovado sugar and molasses, will prove a serious inconvenience to many of the estates. The need of a central factory in this district is keenly felt.

The researches of C. B. Lipman and P. S. Burgess, of the University of California, appear to show that copper, zinc iron and lead exercise toxic effects on the ammonifying flora of sandy soils in that State, but have a marked stimulating influence on the nitrifying flora.

Two papers of some interest in tropical agriculture, which appear in the latest issue of the *Journal of Agricultural Research* (Vol. I, No. 6) are the origin of some of the Streptococci found in milk, and the crystallization of cream of tartar in the fruit of grapes.

It is of interest to learn that there will soon be seven steam-boiling lime juice plants in St. Lucia and that more will be erected. So far as we are aware, steam-boiling plants for lime juice only occur in St. Lucia. There are several citrate plants in Dominica, one in Montserrat, and one in Trinidad.

Dr. W. E. Cross refers in *Sugar* (April 1914), to the demand which exists for scientific sugar plantation managers. The training of men for this line of work is considered by the writer to be worthy of the serious consideration of the industry, and of those who contemplate the establishment of agricultural colleges in the Tropics.

According to *Research Bulletin* No. 30, of the Agricultural Experiment Station of the University of Wisconsin, grain food is deficient in calcium but rich in phosphorus. Animals, particularly swine, confined wholly to grain rations, should receive an additional supply of calcium either as calcium carbonate or calcium phosphate or legume hay.

The interesting announcement is made in the *Review of Applied Entomology*, to the effect that the injection of bacilli which causes tuberculosis in fish, into the caterpillar of *Achraea grisella* (which feeds upon the wax in beehives) produces tuberculosis in this insect. The bacilli causing tuberculosis in mammals do not appear to be able to infect insects.

A note in the *Experiment Station Record* (Vol. XXX, No. 3) states that, contrary to former observations, *Azotobacter chroococcum* has been found in all but one of a series of Java soils, and in this the chlorine content was 3·86 per cent., indicating sufficient sodium chloride to kill the bacteria. *Bacillus radiobacter* was also found to be generally present in Java soils.

In describing the chemical properties of the rice soils of Hawaii, Mr. W. P. Kelly, in *Experiment Station Bulletin* No. 31, says that from fertilizer experiments carried on through seven crops, it was found that the application of 150 lb. per acre of ammonium sulphate produced notable increases in the yield, but 300 lb. per acre proved the more profitable. Potash and phosphoric acid were without effect.

It is stated in some notes on pine-apple culture in the *Hawaiian Forester and Agriculturist* that there does not seem to be anything in pine-apple plant selection for uniformity and shape of fruit. The best prepared and cultivated ground gives the most uniform fruit. As regards manuring, fertilizers have hardly proved worth while on the first crop, but are considered necessary for second plantings, and for ratoons.

Volume IV, No. 1, of the *Bulletin Agricole du Congo Belge* consists of a report on the agricultural conditions of that Colony. Various reforms are suggested; for instance, easier conditions for land purchase, exemption of agricultural buildings from taxation, suppression of import duties on estate material, abolition of export duties on agricultural products, cheaper rates of transport, and lastly, a speedy organization of agricultural credit.

The Board of Trade Journal (April 2, 1914) states that a company has been formed in Namaqualand, South Africa, with a capital of £6,000, for the purpose of exploiting *Euphorbia drageana*, which grows in the uplands and is stated to yield 17·6 per cent. of pure rubber and 70 per cent. of resin. The company holds a concession of some 220 square miles containing about 6 million bushes of this plant.

According to the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases* (March 1914), an American inventor seems to have found a process for ripening cotton by artificial means, which will allow all the bolls to be gathered at one picking. It is stated that the strength of the fibre in the artificially matured bolls is greater, but it is not mentioned how this artificial ripening is effected.

AGRICULTURAL EDUCATION.

AN INDIAN REPORT.

III.

Dr. Coleman's Report on Agricultural Education in India has received attention in the last two issues of the *Agricultural News*. This, the third and final portion of the Report to be published in this journal, deals with secondary education in agriculture, emphasizes the value of local support, and the importance of co-operation between Agricultural and Educational Departments.

With regard to secondary education in agriculture, the question of the establishment of vernacular agricultural schools is one that should receive careful consideration. It is, moreover, a question that might well receive the attention of district boards, for I believe that, in order to make such schools a success, local interest is absolutely necessary, and this can be gauged perhaps in no better way than by ascertaining whether such schools could be partially supported by local contributions or a small local levy. In this connexion, I might recall the fact that for the congressional schools in Georgia, the buildings and land are supplied by the locality where the school is situated, the annual cost of upkeep alone being met by Government. In Wisconsin, the schools are largely supported by the counties in which they are situated. The question of establishing an agricultural school in each district has come up more than once for discussion at the Representative Assembly but it is hard to tell to what extent this represents a real demand on the part of the agriculturists of the State. Should it appear that there is a real demand for such schools, I feel sure that their establishment would mark a distinct forward step, but if they are to be a success they must be able to provide instruction much more cheaply than does the present agricultural school in Bombay.

Whether it is feasible to carry on instruction in agriculture in existing high schools seems to me doubtful, as the percentage of rural children attending such schools must be very small indeed. It is, however, a means of agricultural education which should not be lost sight of in the future.

It is clear that, in the development of agricultural education, progress will, at the beginning, not be rapid. The training of teachers and of proper supervisors will take time. At the best, any scheme must be a tentative one, as no one can with certainty say beforehand just what form of agricultural education will succeed. We find in other countries evidence enough of mistakes in the means employed, and we can hardly hope to be more fortunate here. Any experiments that are made should, therefore, be made only after a careful consideration of local conditions. A selection should then be made of those schools or groups of schools which appear most likely to yield satisfactory results. If, after a trial of several years, the experiment proves a success, more rapid extension of the work may then take place.

In the above discussion, I have purposely avoided the question of granting special subsidies to teachers and schools which take up this type of rural science instruction, as that is a matter for the Educational Department to consider. I wish it also to be clearly understood that, in the proposed scheme of co-operation, there is no thought of usurping the functions of the Educational Department. The functions of the Agricultural Department should be purely that of giving advice and supervision in the work, and dual authority over the teachers should, as far as possible, be avoided.

The Headmaster of the St. Kitts Grammar School has forwarded the following statement concerning the results of the recent Cambridge Local Examinations in the Science subjects, held at that institution in December 1913: Seniors —chemistry one candidate, one paper 'good'; botany, one candidate, three 'moderately good'; agricultural science, two candidates, one 'satisfied'; no failures. Juniors—chemistry, three candidates, two distinguished; botany, four, three 'good'; two failures. Preliminary—chemistry three, one moderately good; botany three, four satisfied; one failure. There was thus a total number of candidates amounting to twelve, of whom ten passed.

Prize Pasture Competition.—Through the liberality of Colonel the Hon. R. S. Cotton and Messrs. Henckel du Buisson & Co., a second prize pastur eimprovement competition will take place during 1915, at Antigua. The first prize, £20, is offered by Colonel Cotton; the second prize, £10, will be presented by Messrs. Henckel du Buisson & Co. The value of the third prize has not yet been decided upon. The following are the conditions under which the prizes are offered for competion: (1) competing pastures must have been properly entered for competition; (2) pastures must not be less than 20 acres in area; (3) pastures must be adequately fenced; (4) pastures must be free from all bush; (5) at least one suitable shade tree, preferably saman, must be planted per acre; this must be properly fenced and in a growing state at judging time; (6) pastures must have regularly been used as such up to the time of judging; (7) the awarding of any or all of the prizes is contingent on entries being of sufficient merit; the appointment of judges for the competition shall rest with the Department of Agriculture acting in conjunction with the Agricultural Society: the final decision in any question of dispute shall rest with the Imperial Commissioner of Agriculture.

Intending competitors must enter not later than January 1, 1915. A fee of 5*s*. will be required for each pasture entered for competition.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture, accompanied by the Mycologist on the Staff of the Department, returned to Barbados on May 6 by the R.M.S. 'Chaleur' from an official visit to St. Kitts.

Mr. W. R. Dunlop, Scientific Assistant on the Staff of the Department, returned to Barbados by way of Trinidad on April 29 by the R.M.S. 'Berbice' from an official visit to St. Vincent, St. Lucia and Grenada.

FUNGUS NOTES.

CONTROL OF DAMPING OFF DISEASE.

The following summary of investigations by Mr. James Johnson, of the University of Wisconsin, is taken from *Research Bulletin* No. 31, of that institution.

Damping off of seedlings in plant beds in Wisconsin is commonly caused by one of two fungi, *Pythium debaryanum* or Rhizoctonia.

These fungi are capable of attacking a large variety of different plants, as well as of living upon the dead organic matter of the soil, and are hence extremely persistent when once present in the soil.

The disease is favoured particularly by certain weather conditions such as excessive moisture and high temperatures, and very little can be done to check the disease when such conditions prevail. Therefore this necessitates the adoption of methods which kill the fungi in order to prevent the disease.

The preventive methods are of such a nature that they must be applied before the sowing of the seed, since the methods used to kill the fungi would also kill the seed.

A number of chemical agents have been tested as fungicides against damping off, but of these, formalin alone has proven of any value under conditions favourable to damping off.

Treatment of the soil with formalin at strengths of one part formalin to 100 parts of water and lesser strengths, as frequently recommended, does not kill the fungus. Although it may hold the disease in check for some time, it will allow it to develop later if weather conditions permit. The value of formalin at these strengths is therefore dependent, in a large measure, upon the time of the appearance of weather conditions favourable for damping off.

Treating the soil with 1-50 formalin at the rate of 2 quarts per square foot of soil, will kill the fungi which cause damping off, and will hence effectively prevent damping off under the most favourable weather conditions for fungus growth. Formalin soil treatment is also somewhat beneficial in stimulating the plant growth and in killing some weed seeds. The chief objections are the cost of the formalin, the time required for it to act, and the time required for the soil to dry out.

Sterilization of the soil by heat has proven the most satisfactory method of preventing damping off from all standpoints, excepting that under certain conditions it may be more expensive than the formalin treatment. Steam sterilization by the 'inverted pan' method is especially recommended where a steam traction engine is on the farm or can be obtained in the neighbourhood.

Aside from preventing damping off, there are several beneficial secondary effects of soil sterilization by heat. These are principally the killing of all weed seeds and insect pests of the soil, and greatly increased size and vigour of plants grown on such soil.

As a cultural control of damping off, growers should avoid infected, poorly drained soils and thick sowing of seed.

The only means of checking the disease after it has occurred in the plant beds is to remove the covers in order to reduce the temperature and the moisture of the soil and of the air immediately above the plants.

FUNGOID DISEASES IN BARBADOS, 1912-13.

The following notes form a brief review of that portion of the Annual Report of the Barbados (Local) Department of Agriculture for the year ended March 31, 1913. The investigations were carried out by Mr. William Nowell, Assistant Superintendent of the Local Department, and the information contained below has been taken from the report of that officer.

SUGAR-CANE DISEASES. The fungus, *Marasmius sacchari*, which causes root disease, was abundant and injurious during the period under review, while *Colletotrichum falcatum*, the fungus which plays the most important part in causing rind disease was observed in only a few instances. The root disease fungus is universally present, but being a weak parasite does not cause much injury as long as the canes are in a vigorous condition of growth. The effect of the severe drought of 1912 was to weaken the canes and, as a result, root disease was much in evidence, causing serious injury. With the advent of the rains many stools, apparently dying from root disease, sent out fresh shoots and produced healthy canes.

It is pointed out that planters should exercise greater care in the selection of the cane cuttings for planting, with special reference to the use of the strongest and healthiest plants, free from the presence of the fungus.

EVERGREEN TREES (*Ficus nitida*). Many of these beautiful shade trees have died in Barbados, the dead trees often showing signs of the presence of the black crustaceous fructifications of the fungus *Entypa crumpens*. The extent of the parasitism of this fungus is not definitely known, but it seems to be in some degree responsible for the death of the tree. It is recommended that dying branches should be cut off close and smooth at their bases so as not to leave any stubs or projections, and painted to prevent the cut surface from rotting until the new growth has time to cover it. Bad trimming, hacking of branches and tearing of bark are responsible for much injury to trees in Barbados.

A fungus, probably a *Coniothecium* sp., has been found on limes, producing a silvery scurf on the surface of the unripe fruits. It is suggested that spraying with Bordeaux mixture would be useful in controlling it.

ROSES. These have been attacked by a fungus, *Actinonema rosae*, Lib., probably the same as *Dicoccum* (Marssonia) *rosea*, Bon., which causes the leaves to turn yellow and fall. Spraying with Bordeaux mixture soon after the young leaves have unfolded, and at intervals during active growth is recommended as treatment. The picking off of infested leaves and clearing away fallen ones is likely to give results in checking the spread of the disease.

ROSE MILDEW (*Sphaerotheca pannosa*) is of frequent occurrence. Dusting with a mixture of flowers of sulphur and dry slaked lime is recommended as the treatment.

VINE DISEASE. The mildew (*Uncinula spiralis*, B. & C.) has caused trouble resulting in a brown spotting of the leaves and a general sickly appearance of the plant. The fungus may easily be recognized as a whitish mealy deposit on the leaves, stems and fruit. It may be controlled, or at least checked, by dusting with sulphur and lime. This should be done in dry weather, preferably in the early morning when the plants are moist with dew, which will enable the dust to adhere to the plant better than if it is applied when the surface is quite dry.

WEST INDIAN PRODUCTS.

DRUGS AND SPICES IN THE LONDON MARKET.

Mr. J. R. Jackson, A.L.S., has forwarded the following report on the London drug and spice markets for the month of March:—

The general tone of the markets throughout the month of March has been one of extreme dullness, business being slow in nearly all products. The principal item of interest perhaps has been the firm position maintained by citric acid throughout the whole month, and at the close of the month it was reported that it was practically unobtainable. Native Jamaica sarsaparilla also held a firm position at the beginning of the month: white grey Jamaica was lower. In the second week West Indian mace was firmer, while nutmegs and pimento were both lower. The following are the details affecting the chief West Indian produce: —

GINGER.

At auction of the 11th, the offerings amounted to 218 bags of slightly wormy and dull washed Cochin, only a few of which were disposed of at 21*s.* 6*d.* In consequence of the spice auctions being held now only once a fortnight, there has been no further transactions in ginger in the London market, though it was reported that some sales had been effected in Liverpool, of a small consignment of Jamaica at from 37*s.* 6*d.* to 50*s.* per cwt.

NUTMEGS, MACE AND PIMENTO.

At the first sale of the month on the 11th, some 242 packages of West Indian nutmegs were offered and sold at the following rates: 63's 9*d.*, 66's to 76's 6*d.* to 8*d.*, 78's to 85's 5*d.* to 5½*d.*, 90's to 100's 4¾*d.* to 5¼*d.*, 101's to 111's 4¾*d.*, to 5¼*d.*, 114's to 126's 4¾*d.* to 5*d.*, and 173's 5*d.* per lb. At the same auction, 37 packages of West Indian mace were offered and sold, fair palish fetching 2*s.* 1*d.* to 2*s.* 2*d.*, fair to good red 1*s.* 10*d.* to 2*s.*, dark red 1*s.* 8*d.*, and broken 1*s.* 6*d.* to 1*s.* 7*d.* per lb.: 162 bags of pimento were also offered at this auction and 117 were disposed of at 1⅞*d.* to 2*d.* per lb., for fair quality.

SARSAPARILLA.

At the first drug auction on March 5, sarsaparilla was represented by 29 bales of grey Jamaica, 11 of Lima-Jamaica, and 18 of native Jamaica: 25 bales of the grey Jamaica were sold at 1*s.* 10*d.* to 1*s.* 11*d.* per lb. for fair to good fibrous; the whole of the Lima-Jamaica were also sold at 1*s.* 7*d.* per lb. for fair to part roughish, and 1*s.* 6*d.* for sea-damaged. Of the 18 bales of native Jamaica, 14 were sold, fair red fetching 11*d.* to 1*s.* per lb., good red 1*s.* 1*d.*, and dullish 10*d.* At the next auction on the 19th, no grey Jamaica was offered and only 13 bales of Lima-Jamaica and 1 of native; none of the former were sold, the whole 13 bales being bought in at 1*s.* 8*d.* per lb. The single bale of native Jamaica fetched 11*d.* per lb. for dull yellow and red.

CITRIC ACID, ANNATTO SEED, TAMARINDS, LIME JUICE, LIME OIL, KOLA, CASHEW NUTS.

At the first auction in the month citric acid was firm at 1*s.* 11¼*d.* to 1*s.* 11½*d.* per lb., with difficulty in obtaining supplies for prompt delivery. A week later, owing to the scarcity, the price quoted was 2*s.*, and still a week later, namely on March 19, it was stated that the stocks being exhausted, 2*s.* 1*d.* or 2*s.* 1½*d.* was being paid for April delivery. Quite at the end of the month with no prospect of early supplies, it was said that 2*s.* 2½*d.* had been paid for some small lots. At the first auction on March 5, 16 cases of annatto seed from Ceylon were offered and sold, 1½*d.* per lb. being paid for ordinary bricky. In the same week 20 barrels of Barbados tamarinds were offered and sold at 17*s.*; West Indian lime juice was also offered at this auction, but did not meet with a purchaser, being bought in at 1*s.* 9*d.* for pale-green raw. Towards the end of the month good West Indian distilled lime oil was quoted at 1*s.* 11*d.*, and hand-pressed at 9*s.* 6*d.*, and at the same auction, 10 bags of dullish dried West Indian kola were offered but not sold, though it was said that a bid of 3*d.* per lb. had been made; some 22 bags of cashew nuts were also brought forward but none sold.

OIL-NUT DEVELOPMENT IN BRITISH HONDURAS.

The Oil-nut Development and Trading Company, Limited, has been formed principally for the purpose of the development of the oil-nut industry and the cultivation of, and dealing in, oil-yielding nuts of all descriptions, and has entered into a contract to acquire a freehold property, situate in the Colony of British Honduras, the total area of which is about 20,000 acres. The title is registered in the Land Registry of British Honduras. The property is situated about 32 miles south of Belize the capital of British Honduras and about 6 miles from the coast, the nearest port (about 7 miles) being reached by the Government Railway, which runs right through the estate (about 4 miles.) There is also a private railway from the estate to the coast town of Stann Creek, which line is part of the property to be acquired. There are about 6,000 acres of the estate on which the cohoun palms (a species of wild coco-nut, *Attalea cohune*) abound. These palms yield a nut the keruel of which contains according to a recent analysis by the Imperial Institute authorities, 72 per cent. of oil. These nuts have not hitherto been commercially dealt with, owing to the thickness and hardness of the shell, but a cracking machine has now been designed and manufactured for this purpose, capable of dealing with 20 tons of nuts per day. It is intended to instal eight of these machines, at a cost of £200 each, with the necessary power plant, as rapidly as possible. This is estimated to be sufficient to cope with the total output of the estate. This cost of collecting and cracking the nuts and preparing the kernels for shipment, freight and insurance is estimated at £14 10*s.* per ton, or £90,000, which leaves a profit on the above-mentioned quantity of over £60,000. The vendors have entered into a contract for the sale to Messrs. J. Bibby & Sons, oil refiners, of Liverpool, of the entire output of cahoun nut kernels for one year from May 1, 1914, with the option to the buyers of continuing on the same terms for the years 1915-16 and 1916-17. The company obtains the benefit of this contract. The capital is £100,000, in £1 shares, of which 75,000 are now offered for subscription at par. The list opens to-day. (*Financier and Bullionist*, April 8, 1914).

In the review of the Antigua Botanic Station Report in this journal, Vol. XIII, p. 87, reference was wrongly made to the irrigation of coco-nut land with salt water. It should have been the drainage of coast land affected by salt water.

MARKET REPORTS.

London.—The West India Committee Circular, April 21, 1914; Messrs. E. A. de Pass & Co., April 9, 1914.

Arrowroot—2¾*d.* to 4¾*d.*
Balata—Sheet, 1/10¾; block, 2/8½ per lb.
Beeswax—£8 10*s.* to £9 5*s.*
Cacao—Trinidad, 59/- to 64/- per cwt.; Grenada, 54/- to 60/-; Jamaica, 53/- to 60/-.
Coffee—Jamaica, 53/ to 78/6.
Copra—West Indian, £27 10*s.* per ton.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 15½*d.* to 24*d.*
Fruit—No quotations.
Fustic—No quotations.
Ginger—Very dull, 33/- to 60/-.
Isinglass—No quotations.
Honey—18/- to 28/.
Lime Juice—Raw, 1/2 to 1/9; concentrated, £31 to £32 10*s.*; otto of limes (hand-pressed), 8/9.
Logwood—No quotations.
Mace—1/5 to 2/6.
Nutmegs—4½*d.* to 6*d.*
Pimento—1⅞*d.* to 2*d.*
Rubber—Para, fine hard, 3/-; fine soft, 3/-; Castilloa, 1/10 per lb.
Rum—Jamaica, 2/3 to 5/-.

New York.—Messrs. Gillespie Bros. & Co., April 17, 1914.

Cacao—Caracas, 12½c. to 13½c.; Grenada, 12c. to 12¾c.; Trinidad, 12c. to 12¾c.; Jamaica, 11c. to 12c.
Coco-nuts—Jamaica and Trinidad selects, $27·00 to $28·00; culls, $16·00 to $17·00.
Coffee—Jamaica, 10c. to 16c. per lb.
Ginger—8½c. to 10c. per lb.
Goat Skins—Jamaica, 48c.; Antigua and Barbados, 45c. to 48c.; St. Thomas and St. Kitts, 42c. to 45c. per lb.
Grape Fruit—Jamaica, $1·50 to $2·00.
Limes—$12·00 to $13·00.
Mace—50c. to 54c. per lb.
Nutmegs—110's, 12½c.
Oranges—Jamaica, $1·75 to $2·25.
Pimento—4⅛c. to 4¼c. per lb.
Sugar—Centrifugals, 96°, 2·98c. per lb.; Muscovados, 89°, 2·54c.; Molasses, 89°, 2·33c. per lb., all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., April 27, 1914.

Cacao—Venezuelan, $11·50 to $11·75; Trinidad, $11·25 to $11·60.
Coco-nut Oil—95c. per Imperial gallon.
Coffee—Venezuelan, 12c. to 14c. per lb.
Copra—$4·60 to $4·75 per 100 lb.
Dhal—$5·50 to $5·75.
Onions—$4·00 to $4·50 per 100 lb.
Peas, Split—$5·80 per bag.
Potatoes—English, $3·00 to $3·25 per 100 lb.
Rice—Yellow, $5·50 to $5·60; White, $4·90 to $5·00 per bag.
Sugar—American crushed, no quotations.

Barbados.—Messrs. James A. Lynch & Co., Ltd., May 2, 1914; Messrs. T. S. Garraway & Co., May 4, 1914.

Arrowroot—$4·00 to $5·50 per 100 lb.
Cacao—$13·25 per 100 lb.
Coco-nuts—$15·00.
Hay—$1·50 to $1·60 per 100 lb.
Manures—Nitrate of soda, $70·00; Cacao manure, $48·00 to $50·00; Sulphate of ammonia, $82·00 to $85·00 per ton.
Molasses—No quotations.
Onions—$2·83 to $4·50 per 100 lb.
Peas, Split—$6·00 per bag of 210 lb.; Canada, $4·25. to $4·65.
Potatoes—Nova Scotia, $2·00 to $2·50 per 160 lb.
Rice—Ballam, $5·20 to $5·30 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
Sugar—American granulated, $3·50 per 100 lb.

British Guiana.—Messrs. Wieting & Richter, April 25, 1914; Messrs. Sandbach, Parker & Co., April 24, 1914.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	$8·00 per barrel of 200 lb.	——
Balata—Venezuela block	No quotation	——
Demerara sheet	65c. per lb.	——
Cacao—Native	14c. per lb.	13½c. per lb.
Cassava—	96c.	——
Cassava Starch—	——	——
Coco-nuts—	$16 to $20 per M.	$23 per M.
Coffee—Creole	15c. per lb.	16c. per lb.
Jamaica and Rio	15½c. per lb.	16c. per lb.
Liberian	11c. per lb.	11c. per lb.
Dhal—	——	$6·00 per bag of 168 lb.
Green Dhal	——	——
Eddoes—	$1·44	——
Molasses—Yellow	None	——
Onions—Teneriffe	——	——
Madeira	8c.	4c.
Peas—Split	$6·00 to $6·25 per bag (210 lb.)	$7·25 per bag (210 lb.)
Marseilles	——	——
Plantains—	16c. to 48c.	——
Potatoes—Nova Scotia	$3·00 to $3·25	$2·75 to $3·00
Lisbon	——	——
Potatoes—Sweet, B'bados	$1·20 per bag	——
Rice—Ballam	No quotation	——
Creole	$5·50	$5·75 to $6·00
Tannias—	$2·64	——
Yams—White	$2·16	——
Buck	$1·92	——
Sugar—Dark crystals	$1·92½ to $2·00	$2·00
Yellow	$2·60	$2·50 to $2·60
White	$3·40	$4·00
Molasses	——	——
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M.
,, Cordwood	$1·80 to $2·00 per ton	——

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Printed at Office of *Agricultural Reporter*, 4 High Street, Bridgetown, Barbados.

AGRICULTURAL NEWS

Vol. XIII. No. 315.] SATURDAY, MAY 23, 1914. [One penny.

AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

OF THE

IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES

VOL. XIII. No. 315. BARBADOS, MAY 23, 1914. PRICE 1d.

CONTENTS

The Manuring of Sea Island Cotton.

IN the search for plant nutrients which began early in the seventeenth century, it was held by some that oil was the principle of plant growth because it could be shown to contain a large amount of carbon. This was long before Liebig's famous report to the British Association appeared—a report which established once and for all that the plant's main, if not sole, source of carbon is the carbonic acid gas of the atmosphere. The effect of this discovery of the source of carbon has been very great as regards the question of manuring. We now know that practically all plant products which, like fixed oils, starches, fibres and sugars are composed of carbon, hydrogen and oxygen, are valueless as direct sources of plant nutrients because they have been derived from air. Hence in the cultivation of crops for certain products, for instance the sugar-cane for sugar and the cotton plant for lint, there would be no danger of diminishing the supply of plant food in the soil provided nothing but these main products were removed. Unfortunately this is impossible, for the whole cane with its composite ash is carried from the land, and the vegetative parts of the cotton plant with its mineral content are also removed. And not only in the cotton plant are the vegetative parts—the stem, leaves and branches removed— but also the seed, which, although it contains a large quantity of oil, has within it also a considerable amount of nitrogen, phosphoric acid and potash, the three principal soil nutrients on which the cotton plant, or any plant, depends for its successful development.

In view of the fact that the oil is useless for manurial purposes, but, on the other hand, very valuable in the manufactures, planters have for some time given consideration to the idea of expressing most of the oil for shipment and turning the residues which contain nitrogen and mineral ash (amongst other proximate constituents) into cattle food for exportation. This, however, at least in many parts of the West Indies, does not seem to pay; and it has been a difficult problem to know how to deal economically with this seed until the last year or two. Within this recent period the cotton crops which have been grown year after year on the same land have exhibited

signs of exhaustion. It has therefore been urgently necessary to consider what can be done to re-establish in cotton soils the standard of fertility. Strangely enough, the experiments which have been conducted with artificial manures in some places have shown that the application of nutrients not only does not improve but actually decreases the yield. On the other hand, experience in other places does not confirm this as a general result, and the question has been raised as to whether there is not something in the way the manure is applied, varying of course with the kind of soil and the system of cultivation. But even the trials which have produced results which decry the value of artificial manures are now showing a tendency towards indicating their employment, and taking experience all over the West Indies into account, the view may be expressed that cotton grown on the same land year after year must be manured. It is also probable that artificials would scientifically answer the crop's requirements, but whether their use would prove as economical as some other methods of fertilizing is open to considerable doubt.

One way out of the difficulty which has just received much support in St. Vincent and St. Kitts-Nevis is the utilization as manure of cotton-seed meal (the residue left after the expression of the oil). Chemically the method is sound in every way. Cotton-seed meal is a general organic manure; it contains most of the essential elements for plant nutrition and, as well, organic matter the importance of which is very great in tropical soils. Economically its use has several unique advantages, the principal one being that its employment as manure, if successful, would make the expression of oil pay, which has not been the case in many places up to now. In discussing the matter with several prominent growers of Sea Island cotton, it appeared that it would be undesirable to return the whole of the meal obtained per acre. We may take it that meal applied at the rate of 300 lb. per acre would be amply sufficient, and this leaves a balance of about 160 lb. (taking the yield of meal per acre as 460 lb.) to be disposed of. As a matter of fact, the information available concerning the use of meal as manure for cotton is at present very sparce, but experiments are now in progress and it may be found that larger dressings will prove remunerative.

It is almost needless to point out that what is probably the best manure for cotton lands is pen manure. On cotton estates there are not enough cattle to produce a quantity sufficient to meet requirements; but there seems to be no reason why the insufficient quantity that is produced could not be made adequate, or nearly so, by feeding the animals on the balance of meal, not to increase their weight but to maintain them for work and to enrich their faeces. It would seem that this double process of putting the meal direct in the soil in small doses, and feeding the remainder to cattle whereby part of it goes back to the land as energy during the cultivation of the soil and part as manure of the most valuable kind, is the best solution to the problem under discussion.

It may be found, of course, that the judicious use of artificial fertilizers in conjunction with the organic manure will be profitable, and there is also the employment of green dressings to be borne in mind. Experiments in the future will no doubt delineate the ideal method of procedure. The fact remains that yield as well as quality must be aimed at with West Indian cotton. In certain islands the yields are dropping: it may be due to seasons or to organic environment—or it may be due, in large measure, to insufficient food supply in the soil.

OPENING OF THE CORN-DRYING FACTORY IN ANTIGUA.

On Friday May 8, 1914, His Excellency the Governor of the Leeward Islands, Sir Hesketh Bell, K.C.M.G., presided at a small opening ceremony and formally inaugurated the undertaking known as the kiln-drying factory by means of which it is expected that the area under cultivation of Indian corn in Antigua will be considerably increased. It may be within the recollection of the readers of this journal that the possibilities ahead of the introduction of some system of drying locally produced Indian corn were first brought out in an editorial in the *Agricultural News* during July 1913. This article appeared as the outcome of important information concerning the drying process obtained by the Imperial Commissioner of Agriculture from various firms in the United States through the Chief of the Bureau of Plant Industry, United States Department of Agriculture. This information will be found in an article on page 213 in Volume XII of this journal. Early in October 1913, the Government of Antigua took the matter up definitely, and their proposals were outlined in a further editorial in the *Agricultural News* for October 25, 1913. It was suggested that the Government should institute an experiment with a central kiln-drier on commercial lines, the necessary funds to be obtained by co-operative donations and, if necessary, with the assistance of the Government. As a matter of fact the Government have now decided to undertake the entire expense of the experiment. The chief questions which the experiments were proposed to settle were first, whether locally grown corn could be properly kiln-dried in these islands; secondly, whether the grain so treated is equal in quality to the grain now imported; thirdly, whether it will keep as well; and lastly, whether it will sell as well. In the course of his address at the ceremony now under report, His Excellency said that what the meeting now saw in operation before them, conclusively answered the first two questions, and it was

apparent to all that the local corn was thoroughly dried and seemed to be of even better quality than that which came from America. The third question would be tested by sealing up a sample of the locally dried corn and a similar sample of the imported grain; these samples, as stated below, would be stored under proper conditions, and a committee would at the end of three months report upon their condition. If, at the end of that time, the Antigua corn proved to be in as good a condition as the American article, it might be taken for granted that the local grain would keep as well as the foreign maize and that it would be worth the same money. As a further example of the active interest which the Government are showing in this matter, it may be noted that convenient storage room for grain has been provided for the local planters in the Antigua gaol. His Excellency in continuation reminded his hearers that Antigua annually imported about 15,000 bushels of maize and 14,000 barrels of cornmeal. All this meant the expenditure of many thousands of pounds, and he hoped that, in future, instead of sending all the money abroad, it might go into the pockets of the local planters and peasants.

In a letter recently received from Mr. H. A. Tempany, B.Sc., Superintendent of Agriculture for the Leeward Islands, under whose direction the factory has been erected, it is stated that the premises are situated in Newgate Street, a convenient location for subsequent developments if they should take place. The plant consists of a No. 1 Hess drier, together with a small sheller, driven by a 6 h.p. steam engine, the boiler to drive which heats also the steam coils of the drier.

The corn is conveyed from the sheller to the drier in wooden boxes which are hoisted by means of a crane; the capacity of the machine working under these conditions is about 60 bushels of shelled grain per day; a higher rate of working is limited by the capacity of the sheller; the limit of capacity of the drier is about 200 bushels per day.

The drying is complete in about one hour and is performed at a temperature of 150 F.; the initial moisture content of the grain has been found to range from 17½ to 20 per cent. after drying; the moisture content is reduced to 11·4 per cent, on the average; the drying is being controlled by moisture determinations on each charge of grain by the Brown Duvel method.

Storage accommodation is provided for 200 bushels of shelled grain, which quantity it is proposed shall be purchased from planters and stored for a period of about three months to test its keeping qualities; the total quantity of grain intended to be handled in the experiment is 1,000 bushels, and no charge is being made for drying in the first instance.

It is anticipated that the duration of the experiment shall be about three months; should it prove a success it is hoped that operations on a larger scale will be undertaken; it is further proposed to add to the plant in a short time a small meal-making machine.

According to the *Experiment Station Record* (January 1914) *Agronomia*, No. 5 (1913), contains a paper in which a number of wild fruits belonging to the genera Psidium, Eugenia, Rollinia and Anona, are described with special reference to their value for cultivation, particularly in Paraguay. The same journal contains a notice of Mr. C. J. J. van Hall's first report on selection tests of Robusta coffee, a large number of plants having been studied with reference to numerous variations.

MAURITIUS AND AGRICULTURAL BANKS.

In the *Colonial Journal* for April 1914, an article gives consideration to the question of co-operative banks for the Indian small planters of Mauritius. Recently the Government appointed Mr. Wilberforce, who has had much experience in India, to advise in the matter, and the conclusions he has arrived at are given in the article under consideration. At the beginning of the enquiry every one pointed out that the circumstances of the Indian in Mauritius and India were different, that Indians in the colony are of different races and religion, and that not one of them trusted any other; that by becoming civilized they had lost the honesty of a more simple people; that they are always fighting and litigating; that they live in scattered hamlets one or more of which form a village, and that no commune spirit exists in these villages. While admitting the justice of these criticisms to a large extent, Mr. Wilberforce was not disheartened by these difficulties, as they are for practical purposes precisely the same as were met with and successfully overcome in India. Moreover, the colonial Indian is much more intelligent than the Indian at home. He has seen more of the world, and has acquired new tastes and ambitions. The frugal Indian of simple wants represents an original type which is disappearing in Mauritius. There is therefore no occasion on this ground to doubt that co-operative banks would be less successful in Mauritius than in India; but it would be necessary to educate the people in the matter, and to help them with Government supervision.

For several reasons which space prevents our going into here, and from experience obtained in India, Mr. Wilberforce advises that banks with share capital but of the Raiffeisen type have the best prospects among Indians in Mauritius. It is proposed that Government should advance to co operative banks sums not larger than Rs.10,000 at 6 per cent. and that the amount advanced should not be larger than the share capital that is actually subscribed, and the advance to be repayable in instalments spread over ten years. Government should have full power to recover the whole amount at any time, if it considered the bank is mis-managed, or for any other reason. The whole of the profits from the Government loan should be placed in the Reserve.

It is admitted that these proposals and others which we have not mentioned have the defect that they favour a bank of wealthy members and are of small benefit to a bank of poor members who all wish to borrow and can save little or nothing. But this argument does not apply as strongly in Mauritius as in India, as few Indians in the colony have not some buried money, and after the crop everyone can afford to buy one or two shares of capital of Rs.10 each with money which otherwise would probably be wasted.

A copy has just been received of the new (1914) edition of the St. Vincent Handbook, Directory and Almanac. The continued prosperous condition of St. Vincent seems to justify the decision that a revised edition of this handbook should be published every alternate year. After the almanac, the book contains a summary of the events during 1913, which are of considerable local interest. This is followed by historical notes of more general interest. The institutions and civil establishments of the colony are then described, and a special section is devoted to the agriculture of the colony. The chapter on towns has been rewritten. At the end of the book there is a business directory and an index.

FRUIT AND FRUIT TREES.

THE ATEMOYA, A NEW FRUIT FOR THE TROPICS.

The interesting article which follows is by Mr. P. J. Wester, Horticulturist in charge of the Lamao Experiment Station, Philippines, and appears in the *Philippine Agricultural Review* for February 1914. It will prove of particular interest in connexion with an article on the Cherimoya which was published in the *Agricultural News*, Vol. XI, p. 388:—

The acquaintance of the writer with the annonas dates from 1898, when he first sampled the sugar apple (*Annona squamosa*, L.) in Florida, but more intimately since 1904, when he first attempted to utilize the mamon (*A. glabra*, L.) as a stock for the cherimoya (*A. cherimolia*, Mill.). The cherimoya has hitherto failed on its own roots in south Florida, but it flourished grafted upon its vigorous relative.

However, when the plant came into bloom it failed to set fruit, and this led the writer to investigate the reason for sterility, with the result that the entomophilous and proterogynous characters of the flowers of this and related species were discovered*.

In the course of the pollination experiments that subsequently were carried on in connexion with the study of the flowers, sugar apple and the cherimoya were hybridized.

In coming to the Philippines, the writer brought with him a few seeds thus obtained, which were sown in March 1911. The resultant hybrids made a most remarkable growth, seemingly having the combined vigour of both parents, and some plants attained a height of 2·3 metres in one year, and blossomed at the age of sixteen months. The progress of the reorganization work at the Lamao Experiment Station, where the hybrids are growing, has twice necessitated transplantation of some, notwithstanding which they have made a most satisfactory growth. Because of the cutting back of the plants attendant upon their transplanting, practically no flowers appeared, and no fruits were expected this year. The blossoming season of the cherimoya is somewhat in advance of that of the custard apple, but owing perhaps in part to the shock and retardation due to the transplanting, a few flowers appeared in June on one of the transplanted hybrids. One of these was pollinated with pollen from the custard apple (*A. reticulata*, L) with the result that it set, and a fruit developed and ripened, October 8.

The following is a description of the fruit: Size small; weight 280 grammes; length 7·7 cm., equatorial diameter 7·6 cm.; cordiform in shape, with prominent carpels and areoles; exterior yellowish green, almost glabrous; skin very thick and tough; flesh white, tender, and melting, with a slight trace of fibre, juicy, subacid, rich and aromatic; flavour excellent, very similar to a good cherimoya with a dash of the delicate sweetness of the sugar apple; seeds four to seven, similar in shape to cherimoya seeds but darker coloured.

The fruit is rather small but regular and well shaped, about the size of a sugar apple which was to be expected considering that the father parent, the cherimoya, was also under-sized. With the employment of large-fruited cherimoyas for the breeding work we may also anticipate a progeny with larger fruits. The 'giant' cherimoya has been imported by the Bureau from Australia and will be used in the annona breeding work as rapidly as the plants become of age. A number of choice varieties have also been presented to the Bureau by Mr. David Fairchild, agricultural explorer in charge of the office of foreign seed and plant introduction, Bureau of Plant Industry, United States Department of Agriculture, which will be similarly employed.

The atemoya plants, of which there are twenty three, have not yet fruited, are very similar in appearance to the cherimoya and the fruit is also practically identical with the prominent-carpelled cherimoyas.

Superior to the sugar apple, it is not claimed that the atemoya is an improvement upon the cherimoya; but, as pointed out in a previous issue of the *Review*, it has been hoped that by crossing the cherimoya with the sugar apple the excellent flavour of the subtropical cherimoya, which does not succeed well in the low altitudes near the equator, might be imparted to the progeny, and that the other parent from the lowlands would impart to it adaptability to a tropical climate. It would seem that this anticipation has been realized in the above instance.

The seedlings that are being propagated from the fruit described above are of course one-half custard apple and a quarter each cherimoya and sugar apple. It will be exceedingly interesting to watch the results of this new combination, and a new hybrid will be forced to fruit as rapidly as possible.

The name 'atemoya', which is here being proposed for this new race of fruits, is derived from a combination of one of the old original names of the sugar apple, *Ate pannicensis*, quoted from Hermandez, in his work 'Nova Plantarum Animalium Mineralium Mexicanorum Historia' published in 1651, and cherimoya.

As far as material permits, the fruit is being propagated for distribution throughout the Philippines.

* Wester, P. J.: Pollination Experiments with Annonas. Bul. Torrey, Bot. Club, 37: 529-39, 1910.

THE CLOVE INDUSTRY IN ZANZIBAR.

Brief reference was made to the onerous conditions of the clove industry in Zanzibar in the last issue of this journal. According to *United Empire* (April 1914) the supremacy hitherto held by Zanzibar in the world's clove market is likely to be contested if prices show a tendency to increase. Efforts may be expected to arise in German East Africa and Madagascar, amongst other places. The following information on clove growing shows the distribution of the cultivation in Zanzibar, and gives the yields that are generally expected, together with a few facts concerning prices:—

The Clove Tree (the *Caryophyllus aromaticus*) of Linnaeus, indigenous to Moluccas, was brought from Mauritius to Zanzibar about 1790, and probably much about the same time introduced into Pemba, the environment of the two islands proving so favourable for its cultivation that at the present time some 58,000 acres containing about 5,500,000 trees, are taken up by the plantations. Out of this area over 38,000 acres are situated in Pemba, the latter therefore yielding some 75 per cent. of the total output. The Zanzibar plantations are, however, much younger than those of Pemba, the former having an average age of some forty years and some of the latter having records extending over ninety years. The reason of this is that the cyclone of 1872 which devastated Zanzibar destroying the trees hardly touched Pemba. In Zanzibar the clove belt extends a distance of some 25

miles from Tunguu, just south of the centre of the island, to M'Kokotoni, on the north, where the trees flourish on the red and chocolate-coloured marls of the sheltered ridges and slopes, and on the sandy loams of the flats away from the numerous swamps. In Pemba the belt commences at the southern extremity of the island at Pakaima and Kengeja, extending to Masuka within 5 miles of the northernmost point (Ras Kigomacha): in both instances the plantations occupy the western sides of the islands, following the beds of marl and sandy loams upon which they thrive and grow. The trees themselves have been planted out in geometrical lines from 21 to 24 feet centres, and commence to bear upon normal conditions about their seventh year, reaching their maximum yield on good soil about their fifteenth year. When half a century old they are some 45 feet high with a circumference near ground-level of about 5 feet.

The clove itself is the dried, unopened bud of the tree, and must be harvested before maturity, otherwise it is useless for commercial purposes. It produces one crop a year, the trees commencing to bud about January or February, in Zanzibar, and the harvest may start any time after the July following. As the buds ripen unequally, the picking may last some four months or so and, therefore, a tree may have to be picked two or three times. The yield is uncertain and varies from 4 to 8 lb. per tree per year, and there are especial cases in which a tree will bear as much as one frasila (35 lb.) in a single year. Besides the variation in the yield of a single tree there is also a considerable variation in the amount of the crops, a poor year yielding 2½ to 3 lakhs of frasilas (8,750,000 lb. to 10,500,000 lb.) and a good year over twice this quantity, the mean yield over a number of years being about 4½ lakhs (15,750,000 lb.), a mast or abundant crop occurring from every three to five years. The average yield, however, is generally somewhat in excess of the market requirements. After picking, the cloves are dried in the sun for six or seven days, being then packed in grass mats or gunny bags and sent to the Zanzibar Custom House for auction, the Government levying a duty of 25 per cent. upon the produce. The prices realized, work out from 2¼*d.* to 6*d.* per lb. during the last few years, so that the market is very fluctuating and speculative.

The bulk of the cloves are purchased by German and Italian firms, and are exported to Hamburg, London, New York and Bombay where they are largely employed for the distillation of clove oil, which is used in the manufacture of drugs, perfumes, confectionery, etc.

There are at present upwards of 1,480,000 acres of teak forests in Java, according to an article in the *Journal d'Agriture Tropicale*, and the acreage is steadily increasing, as the area reafforested is two and a half times larger than the area felled during the same period. The principal conditions for profitable cultivation are a fair soil of at least medium fertility, a minimum yearly rainfall of 40 inches, and an atitude not greater than 330 feet. Teak sends up numerous shoots from the stool, but as the trees thus obtained are inferior to seedlings, this method of cultivation is not employed. Seeds are sown in rows at 3 ft. by 10 ft., and during the first year other crops, such as rice or ground nuts, are grown between the rows. The chief enemy of the young plantations is the lalang glass (*Imperata arundinacea*), and in order to keep it down, as hoeing is too expensive, it is usual to sow a leguminous plant, *Leucena glauca*, between the rows. This chokes the lalang grass, and keeps the soil clean; it also prevents the leaching out of the earth, enriches it in humus and nitrogen, and disappears when the cover of the forest is sufficient.

AGRICULTURAL EDUCATION.

A MOVE IN MAURITIUS.

A communication has been received from the Director of Agriculture, Mauritius, describing the arrangements which have been made for the training of a limited number of young men in agricultural sciences with special reference to the sugar industry, at the laboratories of the Department of Agriculture.

The rules respecting the training of these students require the number to be limited to six, and these must bind themselves for three years to complete a course in accordance with the schedule which is summarized below. The instruction will be given by the officers of the Department of Agriculture, the lectures being limited to such times as their official duties may allow. A fee of Rs. 5 is to be charged monthly for such instruction, and the parents or guardians of each student will be required to enter into a contract at the commencement of the student's training to provide for the completion of such training.

Students should be ready to render assistance to the Department of Agriculture in its investigations, and they will be encouraged to work in a sugar factory for one crop during their period of instruction. Definite hours are specified in the regulations, and examinations, will be held annually on the basis of which a diploma will be issued. It is intimated that this diploma will only be given pending the establishment of an agricultural college in one of the larger colonies, when it is hoped to arrange that the diploma issued by that college may be substituted for the departmental one.

A research scholarship will be available once in every three years. Vacancies for students began on April 1, 1914, and applicants were required to have passed the Senior Cambridge Local or to pass a competitive examination in various science subjects.

The syllabus of studies referred to above include the general principles of agriculture, agricultural botany and biology, agricultural chemistry, and agricultural entomology and meteorology. From the schedule it would seem that no provision is made for a training in general chemistry, which would appear to be a serious omission since teachers have always realized the difficulties of giving instruction in applied science, particularly chemistry, unless the student possesses some idea of the general principles.

One of the reports of the Imperial Education Conference dealing with educational systems of the chief colonies not possessing responsible government concerns British Guiana. In the section dealing with technical education reference is made to the system of agricultural apprenticeship, which is designed to train boys for agricultural work and to give them certain instruction in the principles of agricultural science to render them fit to take the place of leaders and among the small cultivators of the soil. These are indentured to the Director of Science and Agriculture for a term of three years, and are employed in the Botanic Gardens and Experiments Fields at an average rate of pay of 20c. per day, special provision being made for their board and residence by the Government. As in earlier years, the weak point in the scheme is that the staff of the botanical and agricultural divisions are too fully occupied with other duties to give the teaching the attention it deserves; and it is felt that at the present time the work still suffers under this difficulty and it is considered essential that a special officer is necessary to superintend and give systematized instruction to the pupils.

COTTON.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date May 5, with reference to the sales of West Indian Sea Island cotton:—

About 200 bales of West Indian Sea Island cotton have been sold since our last report at prices ranging from 17½*d.* to 20*d.*, chiefly Montserrat 17½*d.* to 19½*d.*, and Barbados 18*d.* to 20*d.*, with stains at 7½*d.* to 7⅞*d.*

The stock is now considerable, and the bulk of it has arrived within six weeks; meanwhile, spinners are only buying in small quantities as they require it.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending April 11, is as follows:—

There is left unsold only about 150 bales, consisting almost entirely of a few Planters' crop lots held here and on plantation. In the absence of a demand for these crops, the market remains very quiet, with no sales to report.

We quote, viz:—

Extra Fine	26c.	= 14¾*d.*	c.i.f., & 5 per cent.
Fully Fine	24c.	= 13⅝*d.*	,, ,, ,, ,,
Fine	22½c.	= 13*d.*	,, ,, ,, ,,

This report shows that the total exports of Sea Island cotton from the United States to Liverpool, Manchester and Havre, up to April 11, 1914, were 4,328 bales, 6,595 bales, and 4,066 bales, respectively.

STUDIES IN INDIAN COTTON.

An important paper on the vegetative characters of Indian cottons, by H. Martin Leake, and Ram Prasad, appears as No. 4 of Vol. VI, of the *Memoirs of the Department of Agriculture in India*. An attempt is made to give an account of the observations which have been carried out on vegetative characters such as the method of branching, the red colouring matter in the sap, the leaf factor, and particularly the type of branching in relation to the length of vegetative period. Though these do not directly concern that portion of the crop which is commercially valuable, yet they are of very considerable indirect importance. The habit of the plant is dependent in great measure on the method of branching, and on this habit depends such vital points as the suitability of the plant for field culture, and the yield of lint per acre.

It is necessary to call attention to the importance of the interdependence between the type of branching and the length of the vegetative period.* It is essential in the United Provinces of India, where the work under review was carried out, that a plant which is to be cultivated on a field scale should pass through the entire stages and produce an abundance of fruit between the time of sowing in May or, in the case of unirrigated lands, at the beginning of the monsoon and the end of the year. Under these conditions, if a remunerative yield per acre is to be obtained, the plant must commence to ripen its fruit by the middle of October at the latest. This means that flowering should commence in the end of August, giving a maximum vegetative period, i.e., the period between the date of sowing and the appearance of the first flowers—of eighty to ninety days—a period which has to be considerably reduced in the case of a crop grown on *barani* lands. It is shown in the paper that in the monopodial types, the vegetative period is considerably longer than that of the sympodial types, and too long to render the cultivation of such forms on a field scale practicable. In crosses, therefore, which are produced with the object of transferring the long staple of the monopodial Type 3 to a plant having the sympodial habit, a knowledge of the exact conditions which determine the length of the vegetative period is essential.

In concluding, the authors state that the study of the commercially valuable portion of the crop is far more intricate, and while a considerable amount of information has already been gleaned, further study is necessary before it will be profitable to put forward a clear account of the results obtained in this section of the work. It is hoped, however, that it will be possible to do this at no distant date in a second part of that paper which has just been reviewed.

* This subject has recently received attention also by O. F. Cook, in America.

COTTON-GROWING IN QUEENSLAND.

It would seem from the March (1914) issue of the *Queensland Agricultural Journal* that fresh interest has been aroused in this part of Australia with regard to cotton-growing. An article which appeared in the *Agricultural News* on the subject of the British Cotton Growing Association and Australia is reproduced, and certain editorial remarks are made which appear to be of some interest. The reasons given by Mr. J. A. Hutton, Chairman of the British Cotton Growing Association, for barring the cultivation of Sea Island and perennial cottons in Queensland are regarded as being well worthy of consideration, but exception is taken to the statement made in our article that 'it must be remembered that although it has been proved experimentally that cotton can be grown in Queensland, the legislation against the importation of black labour makes the scale of wages so high that it is necessary to grow only the best type of high value, if the cultivation is to be a success commercially.' The editor observes that cotton-growing in Queensland has long ago passed the experimental stages, as is shown by the exports of Queensland cotton between the years 1866 and 1873, when the exports of cotton rose to 2,602,100 (℔.) in 1871. As regards the question of labour, the *Queensland Agricultural Journal* maintains that Australian cotton in its palmiest as well as in its decaying days has been grown, picked, ginned, and prepared for market entirely by white labour. In this matter the journal is quite in agreement with the conclusions arrived at by the Dominion Commission on the cotton industry, which stated that black labour is absolutely unnecessary for the successful cultivation of cotton, and that 75 per cent. of the labour in the cotton fields of Texas is white. Unfortunately the Commissioners state further in their report that hand picking in Queensland by white labour would cost 3*d.* per ℔. With a selling price of ginned cotton at 6½*d.* it is difficult to see that there is any possibility of establishing an industry in Queensland. Presumably the Commissioners' estimate of this charge is an error, at least it is to be hoped so, if there is any definite intention of investing capital in cotton-growing in Queensland.

LIVE STOCK NOTES.

THE PRESERVATION OF HIDES AND SKINS FOR EXPORT.

In view of the high prices which are realized by hides and skins, the *Bulletin of the Imperial Institute* calls attention to the importance of ensuring by proper treatment the arrival on the market of these products in the best condition. There are a number of methods in use for the protection of hides against putrefaction and the attack of insects, but many of these are unsatisfactory, the hide itself being sometimes damaged by the careless treatment which it receives. The method which the Commission appointed by the International Association of Leather Trades Chemists recommends is the 'wet-salted method'.

'The skin while being flayed should be prevented from coming in contact with dirt or blood and should be allowed to fall into a basket or other receptacle, where it is left to cool. It is then washed thoroughly and afterwards drained to remove the excess of water. The skin should then be laid out flat on a clean floor or a suitable low table, flesh-side uppermost, care being taken that every part of the flesh-side is exposed. Salt is spread evenly over the whole area of the flesh-side and other hides, similarly treated, placed on top, and the process repeated until a pile about 4 feet high has been raised. Each skin should be given a quantity of salt equal to 25 per cent. of its weight, and it should be seen that the top skin is well covered over. Where large numbers of hides are being treated, the piles may be built differently, but in whatever way it is done the hides should have plenty of salt. The skins are left in these piles until all the salt has been absorbed, which generally takes about a week, and should they not be 'salt-firm', that is, free from excessive moisture, at the end of this period they are again salted. As soon as the skins are salt-firm they may be baled for transport.'

Under certain circumstances, to reduce cost of transport it is more convenient to ship the hides in a dry state. After washing, as in the previous method, the skins must be hung up in a cool room until partially dried. They are then spread out and resalted until they have acquired a soft but elastic condition. It must be remembered that dry-salted skins are more difficult to wash and soften for tanning than wet-salted.

It will prove interesting to conclude this note on hides and skins with a statement concerning the great development which has taken place in regard to the exports of hides and skins from the British West Indies (excluding British Guiana) to Canada. In 1909 the value of these exports was $17,974; in 1911 there was a drop down to $12,029; but in 1912, the value rose to $24,212; whilst in 1913 hides were exported valued at $73,340.

CHICKENS AND BEES.

The following article has been taken from the *Tropical Agriculturist*, for March 1914.

The combination of bees, poultry and I might add, an orchard, is an ideal one. We have 2 acres of land in a young orchard, and here we have the bees and poultry. A good growth of elderberry bushes and small trees on the south, east and west lines of the lot, and the poultry buildings on the north, furnish a good wind-break. We have from 1,000 to 1,500 chickens and 50 colonies of bees.

As we hatch all our chickens with incubators, we are enabled to produce eggs and broilers (cockerels) when the prices are the highest. We feed the newly hatched chicks nothing for the first forty-eight hours, after which one of the commercial chick-foods is given every two hour for the first four or five days, gradually reducing the feeding to morning noon and night.

The brooder house, one room 28 × 16, is divided into pens by poultry wire, and a lamp heated movable hover is placed in each pen of 100 chicks. This admits plenty of pure air, gives scratching-space, and insures perfectly sanitary conditions.

Grit, oyster shells and charcoal are continually before all fowls. The morning and evening meals for the fowls of all ages consist of mixed grains thrown into the litter. A dry mash, fed in troughs, is given at noon. Green food is fed to all at nine in the forenoon.

At the age of six weeks the chicks are placed in the colony houses and given the free range of the orchard. About October 1 the pullets are moved to the large winter houses. The males are put with the two-year-old layers during the breeding season—from January 1 to June 1. The pullets are kept for laying entirely, as we make a speciality of sterile eggs for table use. We have a special trade in Cleveland, where there is a growing demand for *sterile* eggs.

We have not been in the bee business as long as we have in the poultry business; but we find business methods apply to the bees as well as to the poultry. A complete system of accounting is maintained. The hives are placed in rows, each one in the shade of a tree. Each hive bears a tin tag on which is painted the row letter, and hive number, enabling one to locate any hive immediately.

In the management of bees and poultry, every man, as he gathers experience, adopts methods peculiar to his own needs and conditions. We have found that it is the best policy to have all hives and parts uniform and interchangeable; and we therefore purchase all our supplies from one reliable manufacturer, which saves much time and labour.

We operate principally for comb honey. In order to check swarming somewhat we believe in plenty of hive room and ventilation. In the spring all queens are clipped.

We find the smoking plan of introducing queens one of the best.

There are several devices which have proven to be very convenient, among which is a frame the size of a hive covered with wire cloth, which when placed over the top of the frames, prevents the bees from flying out and robber bees from getting in when the cover of the hive is off. At the same time, one is able to see what is going on in the hive. When a hive is being robbed we find a wire-cloth box, large enough to telescope over the entire hive, very effectual.

Early in the fall all colonies that are short of stores are fed a sufficient amount of syrup, so that none have less than 25 lb. for winter. Weak colonies are united by placing one hive on top of the other, with a screen between them for three or four days.

Our bees winter on their summer stands, and are protected with chaff cushions in a super on top (grain bags, one on each side), together with an outer covering of roofing paper securely tied with a heavy cord.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

Local Agents: Advocate Co., Ltd., Broad St., Bridgetown. *London Agents*: Messrs. Dulau & Co., 37, Soho Square, W.; West India Committee, Seething Lane, E.C. The complete list of Agents will be found on page 3 of the cover.

The *Agricultural News:* Price 1*d.* per number, post free 2*d.* Annual subscription payable to Agents, 2*s.* 2*d.* Post free, 4*s.* 4*d.*

Agricultural News

Vol. XIII. SATURDAY, MAY 23, 1914. No. 315.

NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number deals with the question of manuring Sea Island cotton with special reference to the utilization of cotton-seed meal.

One page 162, the opening of the new corn-drying factory in Antigua is reported and an account is given of the history of its development and of its future functions.

Two articles in this issue deal with agricultural matters in Mauritius; one on page 163 summarizes the position in that colony as regards agricultural banks, whilst the second, on page 165, describes a move that has been made in connexion with educational affairs.

Cotton Notes, on page 166, contain two interesting articles concerning, respectively, studies in Indian cotton and the possibilities of growing cotton in Queensland.

Under the caption of Agricultural Engineering, on page 173, the new fibre-cleaning machine which has given such satisfactory results in Jamaica, is explained in considerable detail.

On page 174, Fungus Notes comprise an article dealing with two diseases of the tomato.

Insect Notes, on page 170, review the report on insect pests in Barbados, 1912-13.

Exports from Dominica, 1913.

The value of the lime products exported from Dominica in 1913 was £142,431 compared with £96,673 in 1912 and £73,883 in 1911. Analyzing the first total given, we find it composed of the following items: concentrated lime juice £60,842; citrate of lime, £17,026; raw lime juice £15,083; lime juice cordial, £349; fresh limes, £39,298; distilled lime oil £3,625; ecuelled lime oil, £6,208. Oranges were shipped valued at £1,119, whilst the cacao exported was worth £24,759—a falling off on the previous year's figures. Coco-nuts valued at £987 were exported.

Most of the produce represented by the above returns went to the United Kingdom. The trade with Canada has shown a falling off. Whereas in 1912 raw lime juice valued at £3,724 was sent to the Dominion, in 1913 only £623 worth was shipped. The exports of fresh limes to Canada, however, has nearly doubled itself, being valued at £120 in 1912, and £203 in 1913. The trade in fruits in general with the Dominion shows a firm tendency to improve, and it is hoped that advantage will be taken of the new steamship arrangemets to bring about still greater developments in this direction during 1914.

The Production of Rice.

According to the *Bulletin of the Imperial Institute* (January-March 1914), it is estimated that about 35 per cent. of the cultivated area of British India is under the rice crop. For 1911-12, the Indian rice crop was some 26,100,000 tons, and in spite of a large local consumption India exports more rice than any other country in the world, the shipments for 1911-12 amounting to 2,625,000 tons. Rice in Ceylon is the staple article of food of the native population, and in 1910-11 the estimated area under the crop was roughly 680,574 acres. Rice cultivation is an important native industry in the Federated Malay States, Fiji, Queensland and Egypt. In West and East Africa rice is grown by the natives but not sufficient to meet the local demands. Experimental shipments for the purpose of ascertaining the commercial value of the produce has demonstrated the necessity for more care in the selection of varieties and in the cleaning and husking of the grain.

No reference is made in the article to rice-growing in British Guiana where the area has increased from 6,000 acres in 1900 to over 40,000 acres 1912-13. The imports of rice into this Colony have fallen from over 11,000 tons in 1897-8 to 82 in 1912, while nearly 2,750 tons of a value of $185,856, and rice meal of a value of $13,336 were exported during that year, mainly to the West Indian islands, where the grain is considered by merchants to be superior to that previously obtained from the East.

New Canadian Tariff Changes.

The Canadian Trade Commissioner (Mr. E. H. S. Flood) has furnished this office with a memorandum issued by the Customs Department of Canada, which contains information of importance to the West Indies. The duties on cassava flour, when imported by manufacturers of explosives for use exclusively in the manufacture of such articles in their own factories, has been removed. The general and intermediate tariff on dried or evaporated bananas is $\frac{1}{2}$ cent per lb., whilst this produce may be entered free under the British Preferential Tariff. The duty on cocoa-nuts, desiccated, sweetened or not, per lb., is 3 cents under the British Preferential Tariff and 4 cents under the Intermediate and General. Peanut oil for manufacturing soap or for canning fish, and soya bean oil for making soap may enter free of duty.

In view of the efforts that are being made to extend the cultivation of cassava and coco-nuts in these islands, the above changes are very welcome and provide a source of considerable encouragement.

British Guiana and Peasant Agriculture.

A leading article, published as the outcome of the last number of the *West Indian Bulletin*, appears in the *Demerara Daily Chronicle* (Mail Edition) for May 8, 1914. In this it is stated that the papers which the number of the Bulletin under consideration contains put powerful arguments into the hands of those in British Guiana who are advocating the adoption of a more vigorous policy of land settlement and co-operative credit. In reviewing the contents of the publication, it is urged that the comprehensive schemes of settlement which have been the salvation of St. Vincent and other islands should be adopted in order to prove the salvation of British Guiana.

The number of the Bulletin under consideration begins with an introductory article by Dr Francis Watts, C.M.G., in which the various efforts made to organize a peasent agriculture in the different islands are briefly outlined: attention is given at some length to the history and influence of the Land Settlement Scheme in St. Vincent, which appropriately supplements a paper which follows on the working of the Settlements in that colony by Mr. W. N. Sands. The position as regards Land Settlements in Grenada and the Grenadines is fully dealt with by Mr. G. G. Auchinleck, Mr. Whitfield Smith and Mr. W. Bertrand. The subject of co-operative credit receives attention in a paper by Mr. W. R. Dunlop, and in a report on the working of the St. Vincent societies, by Mr. J. Anderson.

Is the Earth Drying Up?

Professor J. W. Gregory's articles on this question in the *Geographical Journal* have brought forth several discussions on the subject in various parts of the world, particularly in South Africa. Professor Gregory has examined critically the extensive and scattered literature from which evidence may be gleaned and has come to the conclusion that there may have been many widespread climatic changes in late geologic times, but in historic times there has been no world-wide change of climate. It has been asserted that the circumstance of the level of the Dead Sea being lower than it was in earlier times is evidence of desiccation, whilst biblical references to the luxuriant vegetation of Palestine has led to the belief that the rainfall has gradually become diminished up to the present time. But Professor Gregory says it may be concluded frrm the most precise test now available, namely, from the range of the date palm and the vine, that the climate of Palestine is the same to-day as it was in the time of Moses.

There have of course occurred within the various cycles which rainfall follow, periods, sometimes extending into years, when the rainfall is below what is believed to be the mean average. The past three years in the West Indies afford an example of this, and the significance of it is as follows: if, as is generally recognized, it takes from thirty to forty years' rainfall records to provide us with a true mean average, the remaining ten or fifteen years which will be required in most of the West Indian colonies before this data is complete, will include this period of low precipitation, which will probably indicate that the mean average rainfall is considerably less than what was popularly supposed. There may of course occur compensating periods of heavy rainfall which will increase the mean average. But agriculturally it is the maximum and minimum which are of the greatest importance since the success or failure of a steady rotation of crops is limited by these extremes rather than by the mean.

A New Map of the West Indies.

The latest issue of the *West India Committee Circular*, just to hand, notifies the fact that the Committee has published a new map of the West Indies. The size of this valuable publication, which has been specially drawn under the superintendence of the Committee, by the London Geographical Institution, is 3 feet 9 inches by 2 feet 10 inches. While no attempt has been made to give the physiographical features of the different islands—this being impracticable in view of the relative size of most of the islands—the principal railways, sea distances in nautical miles, cables, wireless telegraph stations, coaling stations and oil stations are all clearly marked. The map has three insets, one showing the routes and distances between Canada and the United States and the West Indies, another a plan of the Panama Canal, and the third showing by diagrams and figures the area and population of the various British West Indian colonies. The map is coloured and can be obtained either varnished and mounted on rollers or in sheets. The price to members of the West India Committee mounted and varnished, 7*s.* 6*d.* post free or in sheet 5*s.* post free. To others than members the price is 10*s.* 6*d.* and 7*s.* 6*d.*, respectively.

INSECT NOTES.

INSECT PESTS AND FUNGOID DISEASES IN BARBADOS, 1912-13.

The main body of the Report on the Local Department of Agriculture was reviewed in the last issue of the *Agricultural News*. In the present article that portion of the publication relating to insect pests is dealt with.

This part of the Report naturally falls into two sections: that prepared by Mr. J. R. Bovell, I.S.O., Superintendent of the Local Department, and that prepared by Mr. W. Nowell, D.I.C., the Assistant Superintendent. In the first of these sections, there are, in addition to an account of the general administrative work, field and plot experiments and other routine matter, reference to the fumigation of plants and insect pests and fungoid diseases, while Mr. Nowell's report deals with the entomological and mycological investigations carried out by him during the year.

During the twelve months under review, 497 consignments of plants and seeds, other than cotton seed, were examined, of which forty-seven were either fumigated or disinfected, and 51 were destroyed. The importation of cotton seed for oil extraction amounted to seventy-one lots with a total of 22,128 bags, all of which were fumigated.

Experiments as to the efficiency of the fumigation of cotton seed with sulphur dioxide showed that this gas did not penetrate more than 3 inches into the mass of cotton seed sufficiently to be effective in killing the insects experimented with. This was proved to be due to the absorption of the sulphur dioxide gas by the cotton seed in the outer layers. Trials made with hydrocyanic acid gas gave even less satisfactory results, the depth of penetration ranging from only 2 inches in some cases to 10 inches in others.

In the trials in the use of carbon bisulphide, it was found that this substance penetrated through the cotton seed sufficiently to kill insects in the centre of the bags. The dose was at the rate of 1 dram per cubic foot of space in the fumigating room, which was kept closed for twenty-four hours. The carbon bisulphide was exposed in open dishes in the room, which was kept closed for twenty-four hours.

The order prohibiting the importation of sugar-cane, etc., from countries where the froghopper is known to exist was, on November 21, 1912, made to apply to the island of Grenada, where a species of froghopper (not on sugar-cane) had been reported to occur.

Under the heading of Insect Pests and Fungoid Diseases, the Superintendent of Agriculture gives a summary of the efforts to forward *Tiphia parallela*, the parasite of the brown hard back (*Phytalus smithi*) to Mauritius, on account of the occurrence of *Phytalus smithi* on estates where it had not been known formerly, and makes mention of the fact that the leaf-blister mite of cotton had spread to the south-eastern portion of the island where it had not occurred in the previous cotton season. It is stated that the extinction of the cotton industry is feared if no suitable measures for the control of this pest are discovered, unless certain indigenous strains of cotton resistant to the attacks of the pest can be developed to produce good quality cotton in paying quantities.

This fear does not seem well founded, since in other West Indian islands the leaf-blister mite has been a pest of cotton for the last ten years and cotton has continued to be grown and to produce profitable crops. This has been accomplished by careful plant selection to produce pure strains of early-maturing Sea Island cotton, the picking off of the first-infested leaves, and in some instances the complete destruction of the old cotton as soon as the crop is finished, with special reference to producing a season on each estate of several weeks between the destruction of the old crops and the planting for the new.

The portion of the report by the Assistant Superintendent, comprising some eleven pages, records a very considerable amount of work in connexion with pests and diseases. Much of this is in direct continuation of that recorded in the previous Annual Report of the Local Department (see *Agricultural News*, Vol. XII, p. 58).

With reference to plant inspection, it is stated that seven species of scale insects, several species of aphis, and five species of caterpillars not known to occur in Barbados have been intercepted.

Root borer (*Diaprepes abbreviatus*, L.). The continued study of this pest of sugar-cane has led to increased knowledge as to its life-history and habits, but nothing new since the last report has resulted as to methods of control or natural enemies. The collection of the beetles during the year under review amounted on one estate to 69,700 from June to November; the greatest abundance was recorded in late October and early November, the collections for the week ended October 28 being 7,500, and for the week ended November 4, 7,700.

Although the period covered by the Annual Report extended only to March 31, 1913, figures for the collection of Diaprepes beetles are given to include the time to August 22, 1913.

From early November to early April the beetles were so scarce that no collecting was done.

Following slight rains in April, however, they began to make their appearance again, and the daily collecting was resumed with fairly regular catches ranging from about 500 weekly at first, up to 925 in the week ended July 11. There then came a fairly heavy rainfall (7·61 inches) between the 13th and 18th, and the numbers increased enormously, rising to a maximum of 28,357 for the week ended August 1, falling to about 12,000 in the following week.

The discovery in the previous year of the situation in which the eggs were laid made it possible to collect these during the period when the beetles were most prevalent. The boys who capture the beetles collected 6,138 egg batches. The number in a batch ranged from thirty to 200; the average of 60 batches counted was ninety-four. The egg capacity of a female Diaprepes is about 250, and the egg-laying period in captivity extends, over a period of from three to seven days, the shorter period probably being more usual in the field.

The beetles are active at night, hiding during the day in axils of the leaves of sugar-cane and corn and among the leaves of pigeon peas and cassava.

The eggs are found fastened between the wind-split tips of cane leaves, rarely in the same situation on corn, and they have not been found on other plants though extended search has been made for them.

The field toad or crapaud (*Bufo agua*) feeds upon the beetles. When the eggs hatch, the grubs drop to the ground, and it is believed that many are destroyed by the ants which are often abundant in the cane fields. It is suggested that it might be possible to take steps to increase the abundance of predaceous ants in the cane fields, and even to introduce additional species for the better control of the root borer.

An account is given of the feeding habits of the grubs, from which it appears that when the newly hatched larvae penetrate into the soil they begin feeding on the cane roots: later, from December to February, they attack the under-

ground stem portions of the cane stool, cutting off the water-supply from the above-ground portions of the canes and causing them to die with every appearance of having been killed by drought.

This is the same appearance as that caused by the root fungus (*Marasmius sacchari*) and is due to the same cause, namely the cutting off of the water-supply. It is shown by the investigations reported that the root borer and the root fungus are often found together attacking the same stool of canes, and that in many cases the root fungus is secondary in its attack and in its effect.

The practice of digging cane stumps immediately after the reaping of the canes is again recommended, but it is definitely stated to have practically no value if the stumps are left till they begin to dry out, because the grubs leave them and penetrate into the soil where they may lie dormant for some time. The length of this dormant period has been the object of study and it has been found that grubs have lived in captivity without feeding for periods ranging up to 334 days. This ability on the part of Diaprepes grubs has a very important bearing on the problem of control and on the attack of young plant canes when these follow canes in the same fields without an intermediate crop. No insect parasite of the root borer has been found though hundreds of egg clusters and thousands of grubs have been examined. Two grubs have been found in the field attacked by the green muscardine fungus (*Metarrhizium anisopliae*) and trials are being made with this fungus along the lines followed in Trinidad in connexion with the control of the sugar cane froghopper.

The cane leaf weevil (*Myochrous armatus*, Bailey) is described and mentioned as a potential rather than an actual pest It is a small, dark-brown weevil without perceptible snout, which feeds on leaves of cane and corn, hiding during the day in the leaf sheaths. The larvae and pupae are to be found in the soil among the roots of these plants.

The bronze hard back (*Phytalus smithi*) has frequently been referred to in the *Agricultural News* and an account of this insect appears in Pamphlet No. 73 issued by the Imperial Department of Agriculture. *Phytalus Smithi* is better known in Barbados as the brown hard back and it has been called the Mauritius hard back since it is in that island that it has occurred as a serious pest, probably having been introduced from Barbados with shipments of sugar-cane stools in soil.

In Barbados, this insect is held in check by its parasite *Tiphia parallela*, which is a small black wasp. The investigations of Mr. Nowell have led to a very complete knowledge of the life-history and habits of both brown hard back and its parasite. The portion of the report in which this information is presented is of much interest, and a few of the facts will be briefly reviewed in the next issue of the *Agricultural News*.

The brain in some birds is large in proportion to the body. If we admit that intelligence depends upon the weight of the brain, then the goldfinch and canary must be placed at the top of the list; the brain in these cases weighing one-fourteenth of the whole body. It is of interest to note comparatively that the brain of the sparrow is 1-25th, the parrot 1-42nd, the blackbird 1-68th, the duck 1-257th, and the domestic hen 1-412th. It would appear that domesticity lessens the brain's usefulness. In man, the brain varies between 1-22nd and 1-33rd of the body weight.

RUBBER GROWING.

BALATA IN BRITISH GUIANA.

The notes from British Guiana which appear in the *India Rubber Journal* for April 18, 1914, refer to the interesting conclusions arrived at by the officers of the Department of Agriculture respecting methods of bleeding balata. Collectors have been frequently warned against felling trees for the purpose of obtaining, as they thought, a greater quantity of latex; and it has now been proved that by felling the tree, the results are actually less than those obtained from the tree in a standing position. It is not altogether generally admitted that the ordinary cutlass which Mr. Bancroft has suggested should be used in the tapping process is a success; true the knife made locally may not actually be so efficient as a tool, but it must be remembered that the balata tapper has to be taught his work, and it requires a great deal of experience before an ordinary cutlass can be used with sufficient skill to avoid penetrating to the wood of the tree and causing damage.

The same notes call attention to the false impressions which have been made concerning the balata industry in Dutch Guiana. There is more virgin forest in Dutch Guiana than in British Guiana, and certainly the possibilities as regards the production of balata are greater. The point is, the industry has not been so fully developed in the foreign colony as it has been in our own.

Coagulation and Strength.—Mr. Newton W. Barrett, B.A., contributes an article to the *India Rubber Journal* of April 11, 1914, dealing with the subject of the coagulation of the latex of *Hevea brasiliensis* and its bearing on the strength of rubber. It is shown that the physical properties of the coagulation of Hevea latex depend on the concentration of acid and salts in the serum at the time of coagulation, and it is suggested that these have an important bearing on the difference in quality between rubber produced by different methods, notably fine hard Para and Plantation rubber. Suggestions are made for improving the plantation methods of coagulation and the difficulties of standardization are shown.

According to *The Board of Trade Journal* (April 30, 1914) a Belgium decree has been issued prohibiting the exportation across any of the frontiers of the Belgian Congo of adulterated and impure rubbers. The Governor General is to issue an Ordinance determining what rubbers are to be regarded as adulterated and impure. All rubbers presented for exportation must be accompanied by a certificate attesting its examination delivered in accordance with the conditions established by the Ordinance of the Governor-General.

The question of the yield per acre of tea is discussed in some correspondence in the *Planters Chronicle*, March 21, 1914. One planter established a field of 3 acres at an elevation of 2,000 feet high, which gave 216 lb. per acre during a period of four years and six months, counting from the time of sowing. In another case a yield of 400 lb. of made tea per acre was obtained when the clearing was three years and six months from planting. The average yield of tea per acre may be taken as about 140 lb. per annum.

GLEANINGS.

The weather on the leeward side of Montserrat in the early part of April was favourable for cotton planting and a very considerable area was established, but the planting operations were impeded later by the continued dry weather.

The *Revue Agricole*, Réunion, contains a lengthy article emphasizing the necessity for greater attention to all branches of agriculture in the colony. From all accounts it would appear that the agricultural situation in this colony is at present very grave.

The allottees on the Grenada settlements continued reaping their cane crops during March. The crop has been manufactured into syrup for which there is a fair demand, while some has also been used for rum making. There is no market for the locally made wet muscovado sugar.

The rainfall in Dominica for April was 6·45 inches, which is very wet for the time of the year. In St. Kitts 3·66 inches fell between May 1 to 8. In the northern districts of this island the rainfall has been particularly heavy. During one day, 1·67 inches fell in one hour.

The Venezuelan coffee crop of 1913 was not very good. According to *The Board of Trade Journal*, the cacao crop was better and prices remained very similar to those of 1912. During the period July 1, 1912, to June 30, 1913, 60,864,501 kilogs. of coffee and 14,804,833 kilogs. of cacao were shipped from Venezuela.

Green limes is being shipped from St. Lucia to the United States in increasing quantities. The cacao crop in this island is now nearly over, whilst an interesting fact concerning sugar cultivation in the colony is the reduction in area under Bourbon cane consequent on the satisfactory results obtained with D. 625.

In a communication received from the Analytical Laboratory, Apothecaries Hall, London, it is stated that the best method to adopt in the standardization of dried *Carica Papaya* juice is the determination of the amino acid formed (see *The Analyst*, April 1914). The archaic process with meat is stated to be useless.

Both in Antigua and Nevis during April there have been several interesting events happening in regard to cocoanuts. Over 5,000 nuts were shipped from Nevis to Demerara for planting purposes, whilst in Antigua 3,350 nuts have been received for planting and it is estimated that in this island 100 acres will be put in during the coming season.

A letter from the Curator of the Botanic Gardens, Dominica, states that 56 cases of dynamite were landed on May 7. The explosive will be used for subsoil experiments. A large number of different estates are taking part in the trials, and the results of these extensive experiments should be instructive and yield valuable information of wide application.

Some interest is being shown in the use of kapok, particularly as the outcome of the utilization of this material in the next south polar expedition. Kapok is going to be used in the manufacture of the Boddy life-jackets. It has been suggested that a disadvantage affecting the use of kapok for such purposes is its inflammability, but a recent demonstration showed conclusively the non-inflammable character of the articles in which it is intended to use the kapok.

An interesting procedure has been followed by bee keepers in the Isle of Wight with a view to dealing with the epidemic of disease which has been rampant there amongst bees for some time. The local apiarists have imported colonies of Dutch bees which are known to be immune to the disease, and it is thought that by interbreeding a race will be obtained which should be resistant to the disease in question. This information appears in *The Times* for April 11, 1914.

A note appears in the *International Sugar Journal* for April 1914, stating that graphite is of much service as a boiler scale remover It is most efficacious when mixed with the ordinary water-softening compound, and though definite proportions cannot be given since they vary so considerably according to the water, it may be said that good results have been obtained with a water of average hardness by the use of a mixture of ½ lb. of graphite and 1 lb. of soda ash. This mixture is fed at the rate of 1 lb. to 20,000 lb. of water, the ash and graphite being first mixed dry and put in the feeder.

After investigating the oil of *Acrocomia scerocarpa*, the gru-gru palm, Mr. A. W. Knapp, concludes that this oil is identical with Mocaya oil of Paraguay and the oil from the Maccasuba palm of Surinam. The note on the subject, which appears in the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases*, March 1914, concludes with a statement: 'though the tree is widely distributed in the West Indies and South America, and appears to grow on the poorest soils, large quantities of the kernels and oil are difficult to obtain.' Reference may be made to an article on oil palm industry in British Honduras in last issue of this journal.

The following interesting note appears in the *Chamber of Commerce Journal*, April 1914: 'The importation of motor ploughs appears capable of development in the West Indies. Following on trials made by the Danish authorities in the island of St. Croix, some of these machines have been imported into that island and have given good results. In the islands of Antigua, Montserrat, St. Lucia, St. Kitts and in certain parts of Barbados, the soil is deep and hard, and motor ploughing might be adopted with advantage. Cultivators are but little familiar with new methods, and manufacturers are recommended to import one of these machines and give demonstrations on the spot.' This notice is evidently the outcome of an editorial which appeared in the *Agricultural News*, Vol. XII, p. 241.

AGRICULTURAL ENGINEERING.

A NEW FIBRE-CLEANING MACHINE.

The following notes are given in continuation of an article which appeared in this journal a month or two ago on the cultivation of sisal hemp in Jamaica. We are informed that the Finnigan Zabriski fibre-cleaning machines are manfactured by the Riverside Machine and Welding Co. of Paterson, N,J., from whom a communication and catalogue have been received describing their machine in detail.

According to the firm's account, the fibrous leaves are placed side by side on the conveying belts of the feeding tables, after which the machine takes care of the leaves automatically, carrying them to the grip or conveying chains of the first scutching wheel, where one half of each leaf is stripped of the pulp or bagasse, and immediately this strip of clean portion of the leaf leaves the first scutching wheel it is carried automatically to the grip or conveying chains of the second scutching wheel, where the under or uncleaned portion is similarly operated on, thereby leaving the clean marketable fibre deposited in a holder at the delivery end of the machine, ready to be dried, baled and shipped to market.

The decorticator requires three attendants to operate it —two feeding the leaves and one to take away the clean fibre. It can be run with a 15 to 20 h.p. oil engine. The machine will extract fibre from leaves ranging from 16 to 72 inches in length. Of Bahamas sisal, for example, each machine will turn off about 1 ton of clean marketable fibre each day of ten hours. The production of the machine depends entirely upon the amount of fibre contained within the leaves. Bahamas sisal yields about 3 per cent. of the total weight of leaves in fibre, and from this it can be easily calculated what the production would be from other leaves after the exact percentage of fibre contained has been ascertained.

If it is desired, a system of piping can be arranged to wash the fibre as it is being put through the machine, but in their letter, the Finnigan-Zabriski Company state that from experience, they find that water is quite unnecessary and would not advise its use. All that is required is to take the fibre from the machine, to dry it, and then to bale it for the market.

The 'Hercules' decorticator—as the machine is called—is quoted at $2,500 properly boxed for export shipment, f.o.b. New York. Packed for sea shipment it weighs about 14,000 lb. gross, 12,500 lb. net, all contained within 10 cases measuring 30 cubic feet. The weight of the largest package is 1,700 lb.

RECENT PROGRESS IN LABOUR-SAVING DEVICES.

The *International Sugar Journal* for April 1914 contains an instructive article describing recent progress in the construction of cane loaders, cutting tools, planting machines, travelling irrigators and compression plants. In Hawaii considerable improvement has been effected with a cane loader, and a number of changes have been effected which have resulted in raising the rate from 20·7 to 25·5 tons per hour for time actually spent in loading and moving the car The article under consideration describes in detail the improvements that have been effected, and it is believed by the committee appointed by the Hawaiian Sugar Planters' Association that the machine has now been developed to its maximum degree of efficiency; or very nearly so. The greatest single factor to increase the quantity loaded is the use of flaring sides or box cars.

The cane-cutting tool which was brought to the notice of the committee is driven by a small light gasolene motor and the propeller, apparently of the aeroplane type, is removed and a flexible shaft on the same principle as those used in dental work attached in its place. With the end of a shaft in his hand, the labourer places the saw against the cane, cutting it off in one position. The cane may also be topped with the saw.

The cane-planting machine is described as an interesting and clever device, but the matter of the regular delivery of the cane 'seed' from the hopper to the trough is not made quite clear.

Although the committee do not feel sanguine of its success, it is interesting to record that Mr. J. C. Searle awaits a patent for an invention known as a travelling irrigator, by means of which a shower of rain equal to 1 inch or about 30,000 gallons per acre can be made. According to the present system of irrigation 3,650,000 gallons of water per annum are used, whereas with the travelling irrigator, it is claimed, this amount is reduced to 1,080,000 gallons, a saving of 2,570,000.

Lastly, a new method of shipping raw sugar was propossed during the enquiries of the commission. This consists of eliminating the use of the jute bags at present employed, and to compress the raw sugar into cubes of about 100 lb. weight having recesses for handholds. The corners of the cubes would be well rounded, and each may or may not be enveloped with a light inexpensive covering which would only be used to keep the sugar clean, and prevent losses from surface scratches. Ordinary raw sugar is capable of being compressed to about 50 per cent. of its volume, the resulting mass being very tenacious and not easily broken by ordinary handling. At the refinery, a suitable crusher will break up the pressed material for remelting. In this way a saving of 75 per cent. of the cost of the present system would be effected, it is claimed, besides having the sugar in a handy form for shipment.

A note in the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases* describes a trial of the 'universal' spring tooth cultivator. This implement consists of an endless screw with crank handle mounted on a support fixed at right angles to the rear wheels. A further novelty is an angle lever which forms an adjustable connexion between the intermediate frame and the pivoting carriage, by means of which, and by turning the above-mentioned crank handle, the implement can be adjusted simultaneously in front and behind to the required depth, even while working in heavy ground and without stopping the team. Another feature is the build and arrangement of the teeth. A tooth consists of two parallel iron bars fastened to the specially formed cross-pieces. The rear bar is prolonged above the cross-piece and connected by a bolt with a strong rod bearing around it a spring which takes up and deadens the shocks that the tooth encounters while working.

FUNGUS NOTES.

TWO TOMATO DISEASES.

Two important tomato diseases have recently been examined by the Mycologist to this Department on plants grown in Barbados from American seed.

The first is the well-known leaf mould disease due to *Cladosporium fulvum*, Cke. The fungus develops principally on the under side of the leaves, where it produces indefinite greyish patches, which later become smoky brown. The spots show through to the upper surface, where they are yellowish at first, then become brown as the invaded tissues die. On the under side the fungus is easily seen through a pocket lens in the form of closely set dense tufts of the conidiophores. The conidia are elliptical, somewhat elongated, very variable in size, mostly one-septate, but sometimes two- or three-septate.

The disease was first described from specimens obtained in South Carolina in 1883, since which time it has become generally known in the United States and has become common in Europe. It was first recorded in England in 1887.

It is found to be capable of causing great damage to plants grown under glass if ventilation and drainage are not good, and in America is sometimes troublesome in the open air in damp weather. Under the dry conditions which generally prevail in certain of the West Indian islands it is not likely to be of much account, but in wetter seasons and in the islands with more abundant rainfall it may require treatment. It can be fairly successfully controlled by spraying with 4 4 50 Bordeaux mixture about once a fortnight, especially if this is started at an early stage.

The second disease affects the fruits, and is described by numerous American authors under the name of blossom end rot. It appears in the green fruits, usually when they are half- or three-quarters grown. It almost invariably affects the tissues around the end of the tomato opposite to the stalk, hence its popular name. The first appearance is in the form of a watery spot, which later becomes black. It tends to develop in a circle round the point where the carpels meet, and may remain rather small or cover the whole end of the fruit. Owing to the growth of the unaffected parts, the spot soon becomes considerably sunken and the end of the fruit may be quite flattened. A longitudinal cut through the fruit shows that the rot is of a dry nature and often is quite shallow. This latter character appears to vary according to the age of the fruit when first attacked, apparently because the causal organism depends upon the supply of starch, which is abundant when the fruit is green but is dissolved in the process of ripening. Hence the spread of the disease is arrested by that process. In accordance with this, ripe tomatoes are very much less susceptible to the disease. A late infection produces a very shallow depression

Investigations as to the nature and identity of the organism causing the disease have been numerous and long-continued, and the results have been the subject of much dispute.

There is usually, and at a fairly early stage, an abundant development of fungi in the spots, and species of Macrosporium, Alternaria, Cladosporium and Fusarium were each described by earlier investigators as originating the disease.

In 1900 F. S. Earle (Alabama Experiment Station Bulletin 108) published the results of a study of the disease. After a description of the development and character of the spots corresponding with that given above, he continues:

'In the early morning drops of sticky exudation were observed on the spots of half-grown rotten fruit. These were found to be swarming with bacteria, which were found abundantly within the diseased tissues. Sound green tomatoes under a bell-jar were inoculated with a pure culture prepared from the exudate. In all cases they showed signs of rot within twenty-four hours. When agar containing the germs was smeared on the surface of sound tomatoes, no rotting took place even after a number of days. The disease cannot be contracted through the flowers, as in the case of pear blight. The stigmas of many open flowers were smeared with cultures of the germ without inducing a single case. In no case were inoculations successful where the fruit was less than one centimeter in diameter. It grows on ripe tomatoes, but less readily than on green ones. It seems to be strictly aerobic.'

Miss Elizabeth H. Smith carried out an investigation on the subject in the years 1902-4 (Massachusetts Agricultural Experiment Station Technical Bulletin 3, 1907). During the first year she found a species of Fusarium closely associated with the disease and apparently able to give rise to it, but in the following year this was absent in a large number of cases and a bacterium was isolated from the spots which was capable of producing the disease. Dr. George E. Stone, who directed Miss Smith's experiments on the bacterial rot, published in 1911 (Bulletin 138, Massachusetts Agricultural Experiment Station) his conclusions after sixteen years' observations on the disease. He regards the disease as being of bacterial origin and the fungi as of secondary importance. He states that imperfect moisture conditions tend to make the tomatoes coarse, ill-shaped and fissured at the blossom end, thus offering favourable conditions for the entrance of the bacteria. Other conditions, such as insufficient atmospheric moisture and too much sunlight also favour the disease.

Examination of the Barbados specimens showed that in the earlier stages the diseased tissues were full of bacteria, while no fungus hyphae were found at that stage. There was an exudation, from the skin covering the spots, of yellowish drops of fluid filled with bacteria. Needle puncture inoculations with this fluid produced exactly similar diseased areas on sterilized healthy green tomatoes of separate origin, beginning with a watery spot plainly discernible in about twelve hours, and full of similar bacteria. Cultures on nutrient agar showed small round compact yellow colonies. Circumstances did not permit of the investigation being pursued further, but the observations and experiments so far as they went were in close accord with those of Earle.

The remedial measures adopted were designed to prevent as far as possible irregularities in water-supply and excessive transpiration. The surface of the soil was made as loose as possible and covered with a thick mulch of leaves; light shade was provided overhead, and the plants thoroughly watered in the early morning. Although the weather conditions underwent no change, the spread of the disease was quickly arrested, so that the measures may be taken as having proved successful. Spraying with Bordeaux mixture is not recommended.

It may be noted that during a recent visit to Antigua the Mycologist found that an experimental plot of tomato plants of which the first crop of fruit was still green was infected throughout with this disease.

THE PRACTICE OF CACAO FERMENTATION.

A short account was given in the last issue of this journal of Mr. W. Knapp's first article on cacao fermentation. The second (which, like the first, appears in *Tropical Life*) is reproduced in full:—

THE BEANS. When the beans are scooped out of the pod, those from diseased pods should be put on one side. These must be treated separately. The rest should be freed from the placenta, 'guts', or 'heart'. The 'guts' should now be mixed with the beans, and the whole transferred immediately to the boxes.

DEPTH. The beans should be put in the boxes to a depth of from 2½ feet to 3 feet.

COVERING. They should then be levelled down, and covered with several layers of fresh-cut banana or balissier leaves. These may be pressed close to the beans by a few boards.

TURNING. Every day they are shovelled into an empty box. It should be remembered that the principal object of this turning is to *mix*, and the beans on the outside of the box should be transferred to the centre of the empty box. Wooden shovels should be used to prevent damage to the beans.

DURATION OF FERMENTATION. The time necessary to obtain a good fermentation varies with the kind of bean and the season of the year. With Trinidad beans, in which Forastero predominate, the shortest period is five days and the longest nine. If fermentation proceeds correctly, after three or four days the internal changes which give to cacao its characteristic rich colour and fine aroma and taste, are produced; but the bean is still flat, and to produce a plump bean we must continue the fermentation for another two to three days.

RISE OF TEMPERATURE. If fermentation proceeds properly, then in Trinidad the temperature of the mass will be as follows:—

	Degrees Cent.	Degrees Fahr.
After one day	30	86
,, two days	37	98
,, three ,,	47	117
,, four ,,	48	118
,, five ,,	49	120
,, six ,,	49	120

HOW TO KNOW WHEN TO REMOVE FROM SWEAT BOX. If I were asked to give a rule, I should say: Do not remove from the box before the beans are plump, brown without, and juicy within. The following observations on this should prove useful:—

The external appearance of the bean gradually changes from almost white to a rich brown. It should be a deep brown before removal from the box. By that time the beans will have become plump and round, and the external pulp, now of the consistence of thick paste, easy to remove.

The internal appearance of the bean alters also. If the beans are fermented properly a notable change is observed after sixty-four hours, or, roughly, after three days. From being mottled and heliotrope, the interior has become more red, and the colour is smooth and even. From being dry inside the bean has become wet. When a bean has been juicy for two or three days, and becomes wetter inside than out, and so full of juice that it spurts out when cut, then it is well fermented. It will be noticed then that there are spaces (between the two cotyledons forming the bean) filled with a purple or brown sticky liquid.

The odour of the mass during fermentation changes from a delicate melon-like odour to a heavy, sharp, fragrant acid odour (apparently ethyl and amyl esters with a little acetic acid). At the end the odour develops also a suggestion of sour barm.

REMOVAL FROM THE BOX. The beans should now be removed at once from the box to the drying houses and spread in a thin layer in the sun. The first two nights they should be made into small heaps, and covered with clean banana leaves to allow fermentation to continue. That fermentation (mainly oxidation) occurs is shown by the rise in temperature. (Thus some beans, after seven days' sweating in box and one day's sun-drying on floor, were heaped 18 inches high and covered with plantain leaves. The following morning their temperature was 42°C., or 108°F).

Of the art of drying I do not know sufficient to speak. The science of drying is to expose the beans for a long time to warm air. It is to be regretted that the temperature of the beans is permitted to fall at sundown, as the night periods are thus practically wasted from the point of view of colour change in the interior. Where artificial heat cannot be applied, an attempt might be made to retain this heat both by covering the beans with leaves, and by having the underside of the platform protected form the cool air by being double, with an air space of 6 inches.

Holding Back Cotton.—Schemes for holding back raw cotton make some present headway in the United States. The Louisiana legislature has devoted £600,000 to build warehouses to hold one million bales in New Orleans, and the authorities in South Carolina are entertaining similar proposals. Meantime private enterprise is active, and a tobacco magnate has fathered a scheme for spending £800,000 upon buying and building warehouses at central points. It is true that bale cotton is shockingly mishandled at present, and is left stacked on the bare ground exposed to the risks of fire and water by the week together, but there is very little reason to connect these schemes with any other intention than that of inflating prices. Cotton is among the most marketable of commodities, and holders have never any difficulty in converting it into cash. Public warehouses are advocated as a means of retarding sales and facilitating finance, and were there not already a highly organized market the case in favour of the creation of dealings in warehouse receipts might be a strong one. As both bull and bear transactions might be expected in certificate cotton, it does not follow that the effect of warehousing would always be to raise prices. Granting the maintenance of a free market in cotton warrants, buyers have not much to fear. The danger of these warehousing schemes is that they will put more control of the market into the hands of speculators whose operations are carried on at the expense of producer and consumer. It is only too much to be feared that warehousing will make conditions worse rather than better for the small cultivators who produce the great bulk of the American crop. (*Journal of the Royal Society of Arts*, April 24, 1914.)

MARKET REPORTS.

London.—The West India Committee Circular, May 5, 1914; Messrs. E. A. de Pass & Co., April 24, 1914.

Arrowroot—2⅝*d.* to 4¾*d.*
Balata—Sheet, 2/9; block, 2/- per lb.
Beeswax—£8 15*s.* to £9 5*s.*
Cacao—Trinidad, 57/- to 64/- per cwt.; Grenada, 51/- to 57/6; Jamaica, 51/- to 58/-.
Coffee—Jamaica, 52/ to 85/.
Copra—West Indian, £27 per ton.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 17½*d.* to 20*d.*
Fruit—No quotations.
Fustic—No quotations.
Ginger—Very dull, 33/- to 60/-.
Isinglass—No quotations.
Honey—22/- to 25/.
Lime Juice—Raw, 1/1½ to 1/3; concentrated, £31 10*s.* to £32; otto of limes (hand-pressed), neglected.
Logwood—No quotations.
Mace—1/5 to 2/6.
Nutmegs—4½*d.* to 6*d.*
Pimento—1⅞*d.* to 2 1/16*d.*
Rubber—Para, fine hard, 2/11¾; fine soft, 2/10½; Castilloa, 1/10 per lb.
Rum—Jamaica, 2/1 to 5/-.

New York.—Messrs. Gillespie Bros. & Co., May 1, 1914.

Cacao—Caracas, 12c. to 13c.; Grenada, 11¾c. to 12c.; Trinidad, 11¾c. to 12¼c.; Jamaica, 11c. to 12c.
Coco-nuts—Jamaica and Trinidad selects, $26·00 to $28·00; culls, $15·00 to $16·00.
Coffee—Jamaica, 10c. to 13½c. per lb.
Ginger—7½c. to 10c. per lb.
Goat Skins—Jamaica, 48c.; Antigua and Barbados, 45c. to 48c.; St. Thomas and St. Kitts, 42c. to 45c. per lb.
Grape Fruit—Jamaica, $1·25 to $2·00.
Limes—$12·50 to $14·00.
Mace—50c. to 54c. per lb.
Nutmegs—110's, 12½c.
Oranges—Jamaica, $1·75 to $2·25.
Pimento—4c. to 4⅛c. per lb.
Sugar—Centrifugals, 96°, no quotation; Muscovados, 89°, 1·93c.; Molasses, 89°, no quotations, all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., May 11, 1914.

Cacao—Venezuelan, $12·40 to $12·60; Trinidad, $12·25 to $13·00.
Coco-nut Oil—97c. per Imperial gallon.
Coffee—Venezuelan, 12c. to 14c. per lb.
Copra—$4·65 to $4·80 per 100 lb.
Dhal—$5·50 to $5·75.
Onions—$3·00 to $3·10 per 100 lb.
Peas, Split—$5·80 per bag.
Potatoes—English, $2·50 to $2·90 per 100 lb.
Rice—Yellow, $5·50 to $5·60; White, $5·00 to $5·10 per bag.
Sugar—American crushed, no quotations.

Barbados.—Messrs. James A. Lynch & Co., Ltd., May 2, 1914; Messrs. T. S. Garraway & Co., May 4, 1914.

Arrowroot—$4·00 to $5·50 per 100 lb.
Cacao—$13·25 per 100 lb.
Coco-nuts—$15·00.
Hay—$1·50 to $1·60 per 100 lb.
Manures—Nitrate of soda, $70·00; Cacao manure, $48·00 to $50·00; Sulphate of ammonia, $82·00 to $85·00 per ton.
Molasses—No quotations.
Onions—$2·83 to $4·50 per 100 lb.
Peas, Split—$6·00 per bag of 210 lb.; Canada, $4·25. to $4 65.
Potatoes—Nova Scotia, $2·00 to $2·50 per 160 lb.
Rice—Ballam, $5·20 to $5·30 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
Sugar—American granulated, $3·50 per 100 lb.

British Guiana.—Messrs. Wieting & Richter, May 9, 1914; Messrs. Sandbach, Parker & Co., May 8, 1914.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	$8·00 per barrel of 200 lb.	——
Balata—Venezuela block	No quotation	——
Demerara sheet	65c. per lb.	——
Cacao—Native	14c. per lb.	13½c. per lb.
Cassava—	96c.	——
Cassava Starch—	——	——
Coco-nuts—	$16 to $20 per M.	$23 per M.
Coffee—Creole	15c. per lb.	16c. per lb.
Jamaica and Rio	15½c. per lb.	16c. per lb.
Liberian	11c. per lb.	11c. per lb.
Dhal—	$5·80 to $6·00	$6·00 per bag of 168 lb.
Green Dhal	——	——
Eddoes—	$1·44	——
Molasses—Yellow	None	——
Onions—Teneriffe	7c.	——
Madeira	——	6c. to 9c.
Peas—Split	$6·00 to $6·25 per bag (210 lb.)	$7·25 per bag (210 lb.)
Marseilles	——	——
Plantains—	16c. to 48c.	——
Potatoes—Nova Scotia	$3·00 to $3·25	$3·00 to $3·25
Lisbon	——	——
Potatoes—Sweet, B'bados	$1·20 per bag	——
Rice—Ballam	No quotation	——
Creole	$5·50	$5·75 to $6·00
Tannias—	$2·64	——
Yams—White	$2·16	——
Buck	$1·92	——
Sugar—Dark crystals	$1·92½ to $2·10	$2·00
Yellow	$2·60	$2·50 to $2·60
White	$3·40	$4·00
Molasses	——	——
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M.
,, Cordwood	$1·80 to $2·00 per ton	——

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Printed at Office of *Agricultural Reporter*, 4 High Street, Bridgetown, Barbados.

AGRICULTURAL NEWS

Vol. XIII. No. 316.] SATURDAY, JUNE 6, 1914. [One penny.

AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW
OF THE
IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

VOL. XIII. No. 316. BARBADOS, JUNE 6, 1914. PRICE 1d.

CONTENTS.

Meat Production in the West Indies.

IN his well-known treatise on veterinary hygiene, General Smith, C.M.G., begins the section on the care and management of cattle by stating that 'cattle are kept for two specific purposes, viz., either the production of flesh or of milk. Both of these are intimately mixed up with the question of feeding.' In the West Indies, and in the Tropics as a whole, we have the distinction of remaining outside this generalization; for although the raising of animals for meat and milk does occur, the specific aim generally kept in view is the breeding of animals for work. In other words, the production of animals for meat or milk as a primary object is almost non-existent, and there is consequently no special regard paid to the question of feeding of balanced and nutritious rations beyond the consideration necessary for the provision of what is often nothing more than a maintenance diet.

The feeding of animals for meat or milk production is a far more complicated matter than feeding for the production of work. In the utilization of food for physical work there is principally a breaking down of the food—and chiefly of one constituent, the carbohydrates. But in the growth of fat and muscle, a building up as well as a breaking down occur, and these constructive processes involve the utilization of all the different constituents which a varied diet contains. There is also in regard to feeding for meat production, the effect of taste and flavour upon the quality of the meat, and the influence of the chemical composition of the foods upon digestion and upon the consistency of the flesh.

In the West Indies during crop time, the provision of food—of home-grown foods—is generally adequate. But there are periods in the year—especially in times of drought—when green food and sometimes even molasses are not available. At these times the pastures are in their poorest condition and are not only unable to support animals that it may be intended to keep in good condition for killing, but are also inadequate for the maintenance of the general herd. There is great need for the improvement of pastures. The Prize Pasture Competition inaugurated in Antigua is an admission

of this fact, and it is hoped that it will arouse a more general interest in the deficiency. A great deal can be done in the matter of pasture improvement by fencing, the provision of proper shade, the planting of a certain proportion in Guinea grass, and by a system of rotation with arable land every few years.

The feeding of artificial foodstuffs in proper quantities is important. Frequently, merely a quantity sufficient for maintenance is given. Under these conditions the animal cannot fatten because the nutriment is all used up in the working of the body, and in maintaining the normal temperature. But as well as sufficient quantity there is the matter of proper proportion. If flesh is required, the ration must contain flesh formers. These are to be got best in such foods as linseed and cotton-seed meal; and the diet for a meat-producing animal should, as a general rule, contain nitrogenous and non-nitrogenous digestible constituents in the ratio of about 1:6. An examination of the ordinary West Indian ration shows that the proportion of non-nitrogenous material is much greater than it ought to be.

Of even greater fundamental importance in meat production than feeding, is selection. In places where there is no big and organized demand for meat, and in places like the West Indies where the demand is not critical and epicurean, it must be confessed that there is no great stimulus for agriculturists whose main interests lie in other directions than cattle raising, to give a large amount of attention to this aspect of the subject. But in islands like St. Vincent and Nevis, and in a large colony like British Guiana where there are special cattle-raising industries, some of the fundamentals of selection ought to be attended to. It is perhaps too much to expect the establishment of beef-producing herds, resulting from the careful selection of bulls and cows; but more attention might be given to the selection of calves, and the possibilities before 'baby beef'. The points of a good feeding calf should be looked for—length of back, breadth over loin, deep chest, full eye; and every endeavour made to see that the most promising stock are given the best opportunities. The well-known system of 'baby beef', of course, consists in forcing from the first with the idea of turning out cattle which may be ready for the butcher at any age from twelve to eighteen months. With proper feeding and attention this system allows of a quick turnover of capital and there is also a large daily increase in weight. For baby beef a special demand can be created depending upon the request for small rather than large joints, which in a hot country, especially, ought to be easily established. But of course this system requires animals of an early maturing strain. In Trinidad and Jamaica, the Red Polls have shown signs of answering this purpose satisfactorily, though in England, the Shorthorns have been found best.

Reference has principally been made to this system of baby beef' production to show to what extent feeding and selection can enter into meat production. It is not held that it is necessarily suited to all local conditions, but the idea that something profitable can be achieved through systematic care and attention is worthy of consideration, and, we think, of guarded application.

After the estate animal is ready for sale, the planter's part in the business of meat production is nearly over. But there is the second phase—the marketing and retailing of the animal, which is of no little concern to the consumer. For a fair price he expects to receive wholesome meat of good quality. To ensure the consumer's rights in this respect there are in most public markets and slaughterhouses well-framed and well-executed regulations for his protection. But this is by no means universal, and even in some of the well-established islands in the West Indies, improvements could be effected in regard to meat inspection that would be productive of much benefit. There is first of all the slaughtering of the animals. The old-fashioned and cruel method of 'pithing'—driving a knive between the base of the skull and the atlas until the spinal cord is severed—should be abolished and the more humane system of shooting with one of the several patent pistols specially made for this purpose now on the market, adopted. Then scavengers—dogs, and boys and women in filthy rags—should be debarred from slaughterhouses, and the butchers should be licensed and perfect order and cleanliness enforced.

In the market itself an efficient system of meat control is essential. Every market should be under the inspection of a veterinary officer. It is true that the more obvious symptoms of diseased carcases induced by the better known diseases can be detected by the trained layman, for example tuberculous lesions, the unclotted blood of anthrax, and tapeworm cysts. But a professional man is required for diagnosing the doubtful, and for investigating the extreme cases, which in a general way are the commonest and certainly the most important ones.

A general outline has now been given of the principal features of meat production in the West Indies. The principal difficulty would seem to be that the demand for better meat by the general public is not sufficiently strong to compel its production—the more particular class of consumer relying frequently upon special supplies and the cold storage accommodation in the local ice factory for improving its quality. Incidentally a great all-round improvement in the quality of the general supplies would be effected in this way by the institution of cold storage at the public abattoirs. Toughness is often due to the short period between killing and consumption rather than the result of breed or feeding. But quite apart from the various demands for meat, stock-owners might with profit give more attention to breeding and feeding with the object of raising early maturity animals: and there is no doubt that apart from all other aspects of meat production, the public protection from tainted or diseased meat should be a *sine qua non* of the policy of every local government board.

SUGAR INDUSTRY.

NEW CHANGES AND DEVELOPMENTS.

The *Louisiana Planter* for May 2, 1914, says the results of the efforts made at the Preston Sugar Factory in Cuba to shred sugar-cane and to enter it free into the United States for final extraction, have been comparatively satisfactory though it has recently been suspended on account of a fire. As a further piece of news concerning the importation of cane, it is said that Porto Rico receives considerable shipments of cane from San Domingo, paying a duty of 15 per cent. It is said that from January to March, 22 000 tons of cane were received from San Domingo valued at $2 per ton. These importations seem to be causing or be the part cause of a tendency towards diversification in Porto Rican agriculture. This territory is of course paying attention to the Panama hat business, and in the near future the cigar trade will probably be the mainstay of the island. It is believed that much of the lands now planted in cane is suitable for tobacco cultivation and that tobacco to a considerable extent will replace cane culture.

According to reports, the island has been hit hard by the recent sugar legislation. Many of the factories are passing through a critical period. Three years ago when sugar prices were high, and when there was no prospect of any tariff reduction most of the islands paid attention to the planting of cane. Many factories were built and an enormous amount of money invested by Porto Rico and American interests. It is expected that probably the factories convenient to tide water, and those having their own transportation facilities will be able to survive, but it is thought many will be unable to adapt themselves to the new situation.

'BLACKSTRAP' (FEEDING) MOLASSES.

The superiority of 'blackstrap' (feeding) molasses over beet molasses formed the subject of an address recently delivered by Dr. W. H. Dalrymple before the Louisiana Sugar Planters' Association, and published in the *Louisiana Planter* for May 16, 1914. Whilst admitting that there are different grades of cane molasses for feeding live stock on the market it is maintained that these are generally more suitable for feeding purposes than beet molasses which are well known to have an irritating effect upon the digestive track of animals. This is due to the presence in beet molasses of a large percentage of potash salts which exert a purgative action. Then cane molasses are more nutritious than beet molasses as the following analyses show:—

	Cane molasses. (Blackstrap.)	Beet molasses.
Water	20·93	23·70
Cane sugar	30·73	46·70
Reducing sugars	29·67	00·60
Ash (salts)	8·85	13·20
Organic (non-sugar)	9·82	15·80
	100·00	100·00

In summing up, Dr. Dalrymple said:

Blackstrap is a valuable food for at least three very good reasons: (1) so far as this State is concerned I believe it is our cheapest viz: sugar; (2) its high carbohydrate content, or about 66 per cent.; and (3) the almost complete digestibility of this nutrient. And it is my opinion, that the marked success which has attended its adoption, during the past number of years in this State, is almost entirely due to its palatability; its condimental effect in promoting the more perfect digestion of other feeds fed with it; and the readiness with which it can be absorbed into the circulation of the animal body for nutrition purposes.

When the true value of this material is better and more widely known, its consumption is bound to increase, and over a very much greater area of the country than is using it at the present time. It simply requires to be known to be more fully appreciated.

On the Experiment Station we use it in the stable of the work stock, in the dairy, and in the feed lot, and there is rarely a ration that we may be asked, by our planters, farmers or feeders to compound for them that does not contain its legitimate quota of feeding molasses.

An article in the *International Sugar Journal* for April 1914 deals with the relation of genetics (the science of heredity) to the improvement of the sugar-cane. Observations and analyses of seedlings raised at the Porto Rico Sugar Producers' Experiment Station during 1912 showed that seedlings vary considerably. The average sucrose content of those coming from some varieties, was not only higher than those coming from other varieties, but the maximum and minimum were also higher. Considerable difference in the appearance was also noticed. A difficulty which is encountered with cane is of course the fact that many varieties seldom or never flower, or if they produce tassels do not produce them in sufficient abundance.

FRUIT AND FRUIT TREES.

CACAO CULTIVATION IN TRINIDAD AND THE GOLD COAST.

In this short note further publicity will be given to Mr. W. G. Freeman's discussion of the relative characteristics of cacao cultivation in Trinidad, and on the West Coast of Africa. The discussion arose through the publication in the *Philippine Agricultural Review*, of an article which contrasted the cultural skill of the two colonies much to the disadvantage of Trinidad. The general trend of this article is that the cacao planter of Trinidad should pay greater attention to cultivation and that if he did so he would secure a larger crop. It is stated further that whilst the output of cacao from the Gold Coast has increased largely since 1910, that from Trinidad during the same period has decreased. The explanation offered is that the Gold Coast industry has advanced owing to scientific horticulture and careful attention to field methods, whilst the diminution in the Trinidad output is presumably attributable to the combination of bad cultural methods, absurd overshading and a very severe fungus disease.

As a matter of fact this explanation of the decrease in exports since 1910 for Trinidad and the results for the Gold Coast is completely wrong. It so happens that 1910, the year taken for comparison is the year of the record cacao crop for Trinidad. Since 1910 the colony has experienced a succession of dry seasons—the droughts of 1911-12 and to a less degree of 1912-13 being amongst the most severe that the colony has ever felt. Thus the reduction in output is due almost entirely to the reduction of rainfall.

In the case of the cacao industry on the Gold Coast circumstances are entirely different. The enormous increase has simply been due to a rapid increase of the large and remarkably well suited areas for cacao growing which occur in that colony. The conclusion must be drawn from the reports of the departments of agriculture that the present magnitude of the Gold Coast industry is by no means due to science—it is essentially due to the natural advantage of large suitable areas and cheap labour.

Whereas the officers in charge of agricultural activity are doing excellent work in both colonies it behoves the growers in Trinidad to bear in mind that they have in the Gold Coast a formidable competitor, which, when means of transport have been more fully developed, will undoubtedly be a serious opponent of the Trinidad grower on the cacao market, unless he gives greater attention to uniformity, and to the production of the best type.

THE ORANGE OIL INDUSTRY.

The oils of orange (sweet and bitter) and lemon were first produced commercially in Southern Italy and Sicily. The output from these places has held the first position in the world's markets for many years. Each manufacturer or syndicate of growers sells under brands which are well known for their purity, standard, quality, etc., each shipment being sold under the guarantee of one or other of the well-known analytical chemists who test the various essential oils. Until the time of the Messina earthquake (where large stocks of new seasons oils were destroyed) there was practically no sale for West Indian orange oil; Sicilian sweet orange oil and bitter orange oil of well-known brands held the market at prices which ranged from 4*s.* to 4*s.* 9*d.* per lb., c. i. f. London or other parts. The very best of Jamaica oil was of no interest to the large consumers. There is quite an appreciable difference in its chemical constituents in comparison with the standard Sicilian oils. Buyers were afraid to use it largely as it would alter the flavour of their essences or the odour of their perfumes in which it would be used. There was an ample supply of the standard oil to which they had been accustomed, so why change, unless the West Indian could sell lower in price to induce a change. Small quantities of West Indian oil were sold at 3*s.* and 3*s* 6*d.* per lb., these prices being less than cost of production. The Messina earthquake occurred and apparently destroyed practically the whole of the season's production. Manufacturers had then to turn to the West Indies for their season's supply. Jamaican manufacturers did their best to meet the demand at the higher prices that were offered and were given a chance to show that the West India oil although slightly different, could under the circumstances be substituted for the oils previously used. The following season Sicily experienced a severe drought and a consequent shortage of oil. By this time the prices had dropped to normal but the West Indian oils were now being purchased by several buyers at a price which still left a fair margin to the producers. Fortunately the chief producers in Jamaica appreciated the fact that to hold their own, it was necessary to exercise the greatest possible care in every step of the manufacturing process, and to clarify the oil in such a way as to prevent the oxidation of the delicate ethers in the oil on which its value rests. While in Sicily the oranges are grown chiefly in groves and are rinded in central factories, Jamaican oranges are spread over pastures and hillsides. This condition makes centralization impossible. Peasants have to be sent out with hand machines and bottles to collect and rind the fruit under the trees, the bottles containing, after rinding the fruit, a mixture of oil, mucilage and juice. This has to settle and the oil to be decanted and sent as quickly as possible to be clarified and carefully packed in copper drums, the inside of which have been coated with a film of pure tin. The oil can then be shipped.

The greatest care has to be taken in every stage so far, but still more care has to be taken in offering the oil for sale. At the present time the bulk of the oil produced in Jamaica is handled by two firms of London merchants who act as agents for the producers. The oil is sold by private contract according to brand, great care being necessary both in selling and manufacturing so as not to overstock the market. The market must be carefully fed and stocks of oil securely held. This is most important. Oil deteriorates after twelve months and buyers know this. To embark on the orange oil business requires capital not only to pay for oil and the comparatively high expenses of manufacture and handling, but also to be able to hold it for several months if necessary until the market is favourable. A forced sale, to realize, means not only a loss to the owner of that oil, but also risk of causing a slump in prices which would affect other producers. For the past two years the prices paid by producers to the owners of fruit together with the wage paid to the person rinding the fruit has been higher than the normal selling price c. i. f. London. While prices in London during these times more or less warranted it, it is a very dangerous position. Prices are now falling in Europe and when the price becomes normal, producers here will have to reduce the prices to the orange growers and to the rinders.

In Sicily the cost of collecting is approximately 8*d.* per lb. In Jamaica, labourers are paid from 1*s.* 3*d.* to 1*s.* 9*d.* per bottle (1 lb. 2 oz.). The difference between

rinding cost in Sicily and Jamaica would show Sicily a handsome profit with selling prices equal. Apart from this the difficulty of collecting the oil from the different districts, the high railway rates and the extremely heavy freight rate now being charged by the steamship companies with the attendant risks of loss by leakage due to the very rough handling the cases get in transit (although very carefully packed) all place Jamaica at a great disadvantage in comparison with Sicily. Anyone who has carefully studied both ends of the business will appreciate these facts. I can only point out this in the hope that the business will be left alone in the hands of those who have by bitter experience learnt the 'ins and outs' of orange oil. It will be an unfortunate day for orange growers if the collection and shipment of this promising business gets into a multitude of hands with the usual fighting among producers and bidding up of prices here in the hopes of shipping *plenty* of oil and so making a quick fortune. This has been experienced before in other articles which have been overdone with the consequent loss to not only those who rushed in without full consideration, but to the originators of the various schemes. While one appreciates enlightenment, and new ideas, and welcomes new openings for products, it is better to study the selling of the articles before making it, and so avoid the rude awakening of an account sales with a debit balance, as is too often the case in this Island of Samples. (*Journal of the Jamaica Agricultural Society*, March 14, 1914.)

RUBBER GROWING

VARIETIES PRODUCED AND METHODS OF COLLECTION IN BOLIVIA.

H.M. Minister at La Paz has forwarded the following particulars relative to the rubber industry of Bolivia:—

Bolivia ranks as the second rubber-exporting country of South America, coming next to Brazil, with an annual output of over 2,000 tons. The exports of rubber in 1912 were as follows: fine rubber, 1,354,704 kilogs.; 'caucho', 689,401 kilogs, and 'cernamby', 166,241 kilogs; making a total of 2,210,346 kilogs., compared with a total of 1,643,576 kilogs. in 1911. The total exports of rubber for the first three months of 1913 amounted to 1,100,741 kilogs. The quality of the rubber is excellent There are just the three grades, namely: 'fina' (fine), 'caucho' (caoutchouc), and 'cernamby' (scrap or niggerhead).

Four varieties of rubber trees are worked in Bolivia: (1) the 'Morada', which is abundant in the swampy lowlying ground; (2) 'Blanca', which grows on the highlands; (3) 'Amarilla', and (4) 'Itauba', which, though giving less quantity, is equal in quality to 'Morada.' The average yield of latex is stated to be 8 lb. per tree, but virgin trees give considerably more. Many trees have to be 'rested' for a number of years in order that they may recover from the ill effects of the native method of tapping, which is described below. In many cases trees are rendered useless through having the 'cambium' penetrated by the axe, and being then attacked by white ants or 'borers'. The best season for tapping is from May to the middle of August, but the trees are again tapped from October 1 to January 15 The flowering season is in December and January, and the pod ripens in March and falls to the ground towards the end of April.

The rubber forests are divided into 'estrades' or paths cut in the jungle and each 'estrada' contains from 100 to 120 trees, the distance between each tree being usually so considerable as to entail a great loss of time on the part of the 'freguez' or collector, whose duty it is daily to visit the trees and collect the rubber. This employee does not receive a regular wage, but gets 25 bolivianos (£2) per arroba (25 lb.) of fine rubber, and 15 bolivianos (£1 4s.) per aroba of 'caucho'. The 'mozo' or unskilled labourer is paid a monthly wage of 40 to 60 bolivars (£3 4s. to £4 16s.), and although these figures would appear to be a reasonable remuneration, the fact that the workers are obliged to purchase all their supplies from the store which is always run in connexion with the rubber industry, where the prices charged are usually excessive, renders it practically impossible for these men to keep out of debt.

The axe used in Bolivia for tapping is smaller than the Brazilian 'machadinho', but nevertheless the ruthless methods in vogue for the extraction of the latex cause almost, if not quite, as much damage in the one country as in the other. The method of tapping is as follows:—

The collector visits his 'estrada' at dawn, and having first collected the scrap which has oozed from the trees, he proceeds to make a series of deep cuts. These cuts are first made as high up the trees as possible, and at intervals of 18 inches each day. Beneath these, metal cups, varying in number from three to six, are affixed in the bark just below the wound to catch the latex. After treating each tree in a similar fashion, the collector now returns to the first one bled, and collects the latex in a pail visiting each tree in turn until he has a pail full of the liquid, which he brings back to his hut for the process of coagulation.

When prepared, the rubber is allowed to dry for some weeks before being shipped to Europe. No boxes are used in shipping Bolivian fine rubber, which is usually sent in bulk, in balls weighing from 25 to 100 lb. 'Cernamby' (scrap) is sometimes shipped in boxes to avoid pilfering. 'Caucho' is usually sent in bales without covering, weighing from 100 to 150 lb.; it is also sometimes packed in hides, which are sold on arrival.

Rubber has hitherto paid an export duty of 12 per cent. *ad valorem*, based on the market price in London, which is published at La Paz every fortnight. According to the terms of a bill, however, which is now before Congress, the Executive is to be authorized to reduce the export tax, if necessary, to 2 per cent. *ad valorem*. (*The Board of Trade Journal*, April 9, 1914.)

The Times (Finance, Commerce and Shipping Supplement for May 5, 1914) contains a leading article on rubber plantation reform. It is stated that one of the most encouraging features of the report just issued by the Linggi Company is the reduction which has been effected during the past year in the average expenses. Another of the reasons for the success of this company is said to be the fact that the authorized capital per acre owned is less than £10, while the issued capital is equal to less than £14 per planting per acre. The corresponding figures for 30 Malayan companies formed in the existing days of the boom were £31 and £102, respectively.

COTTON.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date May 18, with reference to the sales of West Indian Sea Island cotton:—

Since our last report about 400 bales of West Indian Sea Island cotton have been sold. Firmer rates have ruled for the finer qualities, but easier prices have been accepted for the medium sorts. The sales include St. Vincent 20*d.* to 22*d.*, Anguilla 16*d.*, Montserrat 18*d.*, St. Kitts 19*d.* to 20*d.*, St. Martin 16*d* to 17*d.*, Barbuda 15½*d*, and St. Croix 18*d.*

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending May 9, is as follows:—

There has been no demand for the few Planters' crops remaining unsold, which constitute the entire stock, consequently the market is quiet with no change to report.

We quote, viz:—

Extra Fine	26c.	= 14¾*d.*	c.i.f., & 5 per cent.
Fully Fine	24c.	= 13¾*d.*	,, ,, ,, ,,
Fine	22½c.	= 13*d.*	,, ,, ,, ,,

This report shows that the total exports of Sea Island cotton from the United States to Liverpool, Manchester and Havre, up to May 9, 1914, were 4,391 bales, 6,777 bales, and 4,066 bales, respectively.

CO-OPERATIVE MOVEMENT IN EGYPT.

An interesting paper on the beginnings of the co operative movement in Egyptian agriculture published in the *Monthly Bulletin of Economic and Social Intelligence* (March, 1914) ends with the following conclusions:—

In the short space of this article we have therefore rapidly indicated the present situation of the Egyptian *fellah*, the various attempts made to promote a co-operative movement in Egyptian agriculture, the results so far attained and the proposals for the future.

If a positive judgment may be pronounced in so delicate a matter, we should say that Egypt presents an excellent field for the development of agricultural co operation, especially when the matter is considered from the point of view of the enormous advantages the Egyptian peasant might attain from a widespread movement of association. There are, however, some who object, and perhaps they are not wrong, that the *fellah* has not yet reached that degree of social evolution necessary for the co-operative principle to be applied well and safely. This is also for the moment, the opinion of the Egyptian Government, which, while it is granting the *fellah* a good system of savings banks, undistrainable 'homesteads' and a considerable amount of land for improvement, does not yet think fit to urge the peasant, *ex abrupto*, on the road to syndicalism and mutuality. Certainly every innovation, above all if radical, requires long preparation, at the risk of failing miserably and obtaining results contrary to those looked for. We cannot however deny that Egypt, through the action especially of Prince Hussein and the Khedivial Society of Agriculture, is being more and more prepared for the proposed end, so that the day cannot be far off when the ideals of Lufty Bey, now embodied in M. Ribet's proposals, will definitely come to be realized.

TEA MANUFACTURE.

The following article is part of a review of a recently published work on tea manufacture entitled 'La Technologie du The', appearing in the *Planters' Chronicle*, April 18, 1914:—

Dr. Neuville [the author] draws strong attention to certain important properties of the enzyme which have a direct bearing on tea manufacture and so deserve the earnest attention of practical tea makers. In the first place light exercises a powerful destructive influence upon the enzyme. This has long been empirically known even before Kelway Bamber's discovery, for even in the belief of the old fermentation theory it was the practice to keep fermenting houses dark. Further he points out that leaf gathered in the morning is richer in enzyme than that gathered later in the day, which has in consequence been longer exposed to the light. There is a good reason for the many deliveries of leaf which is the rule on many tea estates. Again he shows that within a narrow limit the leaf should be as neutral as possible. A very slight excess of acid either destroys the enzyme or paralyses it and, on the other hand, though to a less extent, the same is true of an excess of alkali. Dr. Neuville also contributes some very readable pages as to the researches of Dr. Mann and others who followed upon the above-named authorities, but he rejects the theory more recently put forward by G. Wargel, a German authority, in the *Chemiker Zeitung*, attributing the aroma of tea to the presence of special varieties of bacteria, which he points out is not novel, though an authority, Kozai, for a long time defended it. But, says Dr. Neuville, it does not seem that it is indispensable or even useful, since a septic fermentation gives excellent results while appearing to exclude the possibility of the intervention of bacteria.

The chapters in this work dealing with actual manufacture are full and complete, and accurately describe the procedure in the ordinary factory, but as these processes even in Java are carried out by the familiar British-made machines, there is scarcely any novelty for the British reader. The machines described are all of the Jackson or Davidson type. In the chapter on 'Fermentation', however, there is a good deal drawn from Dutch sources and the work of Nanninga, Van Romburgh and Lohmann, which bears very intelligently upon the somewhat obscure points of the fermenting or oxydizing process.

It has occasionally been complained in the West Indies that these colonies do not receive their fair share of recognition in the columns of the English press. As regards the *Financier and Bullionist*, this complaint is very clearly unfounded. But a few months ago a full page was devoted to the prospects of the West Indies and British Guiana, and now in the issue for May 4, 1914, a lengthy article appears urging the necessity for haste in the reduction of cable rates and the establishment of wireless telegraphy in these colonies. The article then goes on to describe the history and functions of the West India Committee, pointing out its value as an influential unofficial body whose advice at the Colonial Office is always received with careful consideration, and whose functions as a means of advertising and keeping English capitalists in touch with the colonies is an invaluable asset which cannot be too fully appreciated. A short account is also included to show the timely efforts that the Royal Mail Steam Packet Company are making to improve their services in these waters.

LIVE STOCK NOTES.

RESULTS OF CATTLE TICK ERADICATION IN THE UNITED STATES.

Quite recently a considerable amount of investigation work has been carried on in certain places in the West Indies in regard to the eradication of ticks which have for years occasioned so much loss amongst cattle and even amongst several other kinds of domestic animals in these islands. The following summary, therefore, of a recent report issued by the United States Department of Agriculture on work of a similar but far more extensive and far better organized kind in America, should be of considerable interest to most readers of the *Agricultural News*.

The particular tick which causes so much trouble in the southern states of America is known as *Margaropus annulatus*, and is the carrier of Texas fever. An organism very closely related if not identical with this species exists in the West Indies and has been determined as *Boophilus australis*. In the United States the cattle tick causes enormous losses to the industry, but before the introduction of the present system of quarantine and inspection and eradication methods, there was grave possibility of the cattle industry in Texas being completely crippled. That the work under consideration has had a vastly beneficial result is clearly indicated in the publication referred to above, and in the following paragraphs we will attempt to show the ways and the extent to which this beneficial influence has been felt.

In order to obtain this information the Bureau of Animal Industry sent out a circular containing eight questions to the stockmen and farmers in eleven States in the territory bordering on the quarantine line. The first question was: What has been the average increase per head in the value of cattle in your country since tick eradication began in 1906? The majority of the answers to this question showed that there was an immense advantage in favour of the tick free territory, and it was evident that a large portion of the gain in value in the clear portions of the eleven States above mentioned may fairly be ascribed to the influence of the tick work. Figures are given in the Bulletin under review which space will not permit our reproducing here. As regards the second question concerning increase in the weight of cattle as a result of tick work, the great majority of the replies stated there was a substantial increase in the weight of cattle subsequent to the clearing of the ticks. The figures sent in indicated, to put it shortly, that the cattle as a whole are considered to be about one fifth heavier now than they were before the commencement of the eradication work. Favourable results have been recorded concerning increase in quality as well as increase in weight. Out of a total of 939 replies there were only twenty-nine which said that there had been no betterment in quality—a minority of 3 per cent. The losses before tick eradication, arrived at from the information contained in the answers to the fourth question, are put down at $34,000,000 annually, not counting the depreciation in numerous other ways. This occurred before the tick eradication work was introduced. The fifth question raised a point as to whether there had been an increase in the cattle industry since the removal of the quarantine; there was almost a unanimous reply in the affirmative. A satisfactory feature of the progress of the work has been an increase in the number of pure-bred cattle and a large increase in the milk production. Testimony to these conclusions are to be found in the answers to questions No. 6 and 7 of the circular which was distributed amongst practical and responsible men who were in a position to give reliable information. Lastly it may be added that the work has led to an increase in feed crops and buildings. In fact the eradication of the tick has acted as a strong impetus to the cattle and dairy industries and has not only saved money being lost but has actually encouraged capitalists to invest more.

SWINE BREEDING IN THE PHILIPPINES.

A by no means unimportant minor industry on many West Indian estates is the raising of pigs, and therefore an article dealing with swine breeding in the Philippines, which describes the best methods adopted in that territory, should prove of some interest in the West Indies.

It is stated in the *Philippine Agricultural Review*, in which the article is published, that throughout the island the predominating colour of hogs is black, which appears better adapted to the climate than light colours. In some tropical climates where the hog industry is fairly well developed, white hogs are not looked upon with favour, because they are more liable to be sun scalded and have other skin disorders. In many places the red Tamworth has been found suitable.

In speaking of the breeding sow, it is emphasized that she must be prolific and be capable at least of producing two litters of pigs a year with six or more in each litter. Invariably it is the practice of hog raisers in the Philippines to pay little or no attention to the coming young brood sow, consequently nearly all of them are bred too young. Under no conditions should a sow be bred under eight or nine months of age.

In the care of the young pigs, the age to wean varies with the individual in each particular case. Those that have made a rapid growth should be weaned when about eight weeks of age, or in cases where the pigs and mothers are not doing well, it may be wise to wean at a much younger age even though the pigs are small. One of the secrets of success in the rearing of weaned pigs is the frequent feeding in small quantities. Little pigs when separated from their mothers for the first few days should be fed five or six times a day.

The article then goes on to give some useful information on the construction of buildings for pigs, which can best be got by referring to the illustrations in the article acknowledged above.

Of the many varieties of foods found suitable for the hog industry in the Philippines, the following are the most common and important: grains—corn, pelay, mongo and beans; roots—camotes, peanuts, taro, dasheer and cassava; fruits—banana, papaya, and copra meal; fodder—guinea grass, sugar-cane, cowpeas, sorghum, corn and peanut vines.

Extensive experiments in methods of feeding have been carried on in many countries, with the result that the general concensus of opinion seems to show that hogs do better when fed the same quantity of food per day divided into three feedings, morning, noon and night, than when fed in two feedings, morning and night. Many combinations of the various hog foods enumerated in the last paragraph but one, are in use, all of which, if judiciously and properly fed, are of great economic value. Not a single item mentioned is an imported food and nearly all can be grown in any locality throughout the Philippine Islands.

The article concludes with an account of the most common diseases of hogs as found in the Philippines.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

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The *Agricultural News:* Price 1*d.* per number, post free 2*d.* Annual subscription payable to Agents, 2*s.* 2*d.* Post free, 4*s.* 4*d.*

Agricultural News

Vol. XIII. SATURDAY, JUNE 6, 1914. No. 316.

NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number deals with meat production in the West Indies. The general principles of feeding and selection for the production of a good type of animal are discussed and attention is given to that important part of the subject—the control of slaughterhouses and markets.

Under the heading Sugar Industry, on page 179, certain changes and developments in Cuba and Porto Rico are described. On this page also, appears an article dealing with the subject of molasses as a food for stock.

An interesting discussion of the orange oil industry in relation to the West Indies will be found on page 180.

Live Stock Notes, on page 183, comprise two important articles on cattle tick eradication, and the breeding of swine under tropical conditions, respectively.

Under Insect Notes the review of the Report on Insect Pests in Barbados, 1912-13, is continued from the last issue of this journal.

A very suggestive theory is explained in an article entitled Nitrification and Disease, which will be found on page 187.

A University for China.

It is intimated in the *Incorporated Chamber of Commerce Liverpool, Monthly Magazine*, April 1914, that the chamber has been asked to memorialize the government to set apart a portion of the Boxer indemnity funds (£16,600,000) for the purpose of founding a British University in China. It is stated that such a university would be a great asset to the Chinese commercial relations in England. The sum aimed at is £250,000 and it is expected that a great deal of this may come from the source already referred to because the receipts from China on indemnity account do not affect the British Budget since they are paid into the National New Sinking Fund. It is understood that the proposal has the strong support of Sir Edward Grey, various other ministers and seventy members of Parliament, and the Chancellor of the Exchequer has already offered £150,000 out of the Budget if the public subscribe £150,000.

Whereas the proposal for establishing a British University in China out of British money is a very commendable one, it would seem somewhat hard that the small amount of capital (say £40,000) requisite for the establishment of a similar institution in the British Tropics cannot be obtained either from public or government sources when for both Imperial and economic reasons the claims of the Tropics are so infinitely greater than those of China.

Report on the Rothamsted Experimental Station, 1913.

Dr. Russell's Annual Report on the research conducted at the Rothamsted Experimental Station for 1913, outlines the principal sections of work which have engaged the attention of the chemical and biological staff during the year under review.

An important aspect in regard to soil investigation brought out by some of the manurial experiments, is that of soil type. It is now clearly recognized that crop production is largely limited by soil type. When this is the case, no mere addition of foodstuffs will necessarily rectify the conditions.

Work in the laboratory has largely concerned the supply of nitrogenous plant food. The researches have been directed to the elucidation of the chemical reactions involved in the production of nitrates in the soil, the agents bringing about the changes, and the influence on the whole process of soil and plant conditions. An important part of this work has been the micro-biological studies already referred to from time to time in this journal. A new and important conclusion arrived at during the year is that quicklime in the soil behaves like other antiseptics and causes at first a depression and then a great increase in bacterial numbers, but a permanent depression in soil protozoa.

Special lines of research which are now being carried on at Rothamsted include soil gas analyses, work on soil colloids, and the effect of inorganic poisons on plant growth.

Horticultural Society for Trinidad.

Our attention has been called to the recent formation in Trinidad and Tobago of a society for promoting interests in all branches of gardening. In a circular letter written by the Assistant Director of Agriculture (Mr. W. G. Freeman) who is responsible for the initiation of the club, it is pointed out that the objects of the society will be achieved by holding meetings where papers will be read and demonstrations made, by furthering exchange of plants among members, and by co-operating in the importation of seeds and plants from abroad.

The Society is to be congratulated in the matter of securing most generous financial assistance from Mr. J. W. Stevens of Port-of-Spain, who has offered to contribute to its funds the sum of $500 per annum for five years.

Plant Products as Manures.

In the examination at the Imperial Institute of oil seeds produced in the Tropics, it has frequently been found that the cake or meal remaining after the expression of the oil is unsuitable, sometimes because of acrid flavour, or perhaps from the presence of poisonous compounds, for employment as cattle food. In several instances, however, an analysis of the ash contained in this material has shown that it is particularly rich in the essential plant nutrients, and therefore of considerable value, providing prices will allow of its use, for application to the soil as a manure for cultivated plants.

In looking through the selected reports from the Scientific and Technical Departments of the Imperial Institute, several instances are to be seen, especially in the case of oil seeds imported from West Africa. One especially interesting case is that of Nsa-sana seed kernels from Nigeria (Southern Provinces). The cake left after the extraction of oil from these seeds resembles in composition decorticated cotton-seed cake, but on examination for poisonous constituents indications of the presence of an alkaloid were observed. On this account the material cannot be safely recommended for feeding purposes: but because it is particularly rich in nitrogen, it ought to be useful as a manure. An even more noticeable case has arisen from the examination of Senat seed from the Soudan. The husks from this seed have only a very low feeding value, and are therefore undesirable as a feeding stuff: but in view of the high percentage of mineral matter, the husks should be of great value as a manure, particularly for crops requiring potash. The composition of the ash of this material is sufficiently interesting to warrant the publication of the figures of percentage analysis in detail: lime, 8·42; magnesia, 4·11; potash, 42·69; soda, 0·70; phosphoric acid, 2·51; chlorine, 2·08; sulphuric acid, 3·85.

We may conclude this note by reference to the result of an examination of the cake derived from tea seed. This material, it is said, cannot be used as a feeding cake, owing to the large amount of saponin it contains. The interesting point, however, is that it is sufficiently rich in saponin to be of use in the preparation of vermicides for dressing lawns. Samples of the material have been submitted to two firms to ascertain its suitability for this purpose commercially, and both firms have reported favourably and offered to purchase trial consignments of the cake.

Mutation in Micro-Organisms.

About the middle of last year a note was published on this page describing certain observations made concerning transformations occurring amongst the well-known bacillary group of which *B. coli* is a representative. It was shown that one character which distinguishes the two end members of this group, namely, *Bacillus coli* and *B. prodigiosus*, is the power possessed by *B. coli* of splitting up lactose (sugar) and thereby forming lactic acid. It was discovered that the middle members of the *B. coli* group, which normally lack this power may suddenly acquire it, and what is still more remarkable, there was some indication that the new character was produced as the result of syngamy (sexual reproduction, e.g. conjugation).

Quite recently various alterations in the morphology and physiological characters of certain bacteria have been obtained by many observers. Mr. R. P. Hewlett, writing in *Nature* for April 23, 1914, points out that *Bacillus coli* (the plague bacillus), and other organisms show considerable variation in the size of the cells on different culture media. Again *Bacillus prodigiosus* which forms a brilliant red pigment when grown at ordinary temperatures, completely loses the power of pigment production after cultivation at blood heat, at which temperature (98° F.) it grows as luxuriantly as at 65° F.

One of the most remarkable of the recent artificial productions of mutation is afforded by the case of *Bacillus anthracis*, a particularly well defined and stable bacterial species. The exposure of anthrax germs to ultra-violet radiations for times varying from one to forty minutes, and afterwards sub-culturing, revealed the presence of a few living forms having characters decidedly different from the typical anthrax bacillus. The principal of these were (a) coccoid forms which remain stable during a period of two months: (b) thin filamentous forms not taking Gram's stain, not liquefying gelatin nor curdling milk, and producing an infection different from anthrax on inoculation. This form remained absolutely fixed after sub-culture for more than eighty days, but after passage through an animal, a certain number of bacillary forms approximating to typical anthrax were obtained.

These experiments open up wide possibilities in the transformation of micro-organisms but, as pointed out in the *Agricultural News* last year, facts like those put forward above, greatly add to the complexity of pathology.

INSECT NOTES.

INSECT PESTS IN BARBADOS, 1912-13. II.

The female Phytalus beetle deposits her eggs singly at a depth of from 4 to 6 inches in the ground; the life-cycle occupies from 265 to 333 days from egg to adult. The adults are most abundant in May or June: they are not much attracted to light, though sometimes they fly into houses and are caught in light traps.

Tiphia parallela is a very efficient parasite; its life-cycle occupies a period of about fifty days, and each female probably produces about seventy eggs. The Tiphia female burrows into the ground in search of the Phytalus grub, and on finding one, stings it into temporary insensibility, and lays an egg upon it, attaching the egg to the dorsal surface of the thoracic region. After a short time, the host recovers from the effects of the sting, and resumes its feeding and accustomed movements. In about five days the egg of the parasite hatches, and the larva penetrates the skin of the host with its mouth parts and begins to feed, growing rapidly for the first few days. In about ten days, the hard back grub succumbs to the effect of the feeding of the parasite, which then feeds vigorously, clearing out the skin of the host in a few hours, and more than doubling its own size in that time, after which it spins a cocoon and enters upon its pupal stage, which lasts from thirty to forty days, the average being about thirty five.

The adult Tiphias are not flower visitors, but feed on honey-dew, on plants infested with Aphis and other similar insects. This insect does not seem to be generally distributed over the island, as shown by the occasional outbreak of Phytalus in numbers, when, in certain cases, no Tiphias were to be found.

The ordinary hard back (*Ligyrus tumulosus*) has been found to be parasitized by *Dielis dorsata* in much the same way as in the case of Phytalus already mentioned, the chief points of difference being that the sting of the Dielis female produces a degree of paralysis from which the Ligyrus grub does not recover, and that the Dielis egg is deposited on the ventral surface and not on the dorsal, as is the case with Tiphia.

The Dielis wasps both male and female visit flowers. The species is parasitized by a Rhipiphorid beetle, which also is found in and about certain flowers. The common hard back is not known to attack plants, the grubs being found in manure, rotting megass, etc., while the adults are not known to feed at all. The rate of parasitism by Dielis is not very high.

The cane fly (*Delphax saccharivora*) is reported to have attacked both old and young canes. The attack was but of short duration, the insect apparently being controlled by natural enemies, principally the lace wings (*Chrysopa* spp.). The rust mite of canes (*Tarsonemus spinipes*) is reported of general occurrence but apparently it caused no damage to the canes. A small coccinellid beetle was found commonly among mealy-bugs on sugar-cane and was supposed to be predaceous on them, but this point is not determined.

COTTON PESTS. The leaf-blister mite of cotton (*Eriophyes gossypii*) is stated to have spread to all cotton-growing areas of the island, and to have become a very serious pest. The system of allowing cotton to remain in the land for second and third pickings and often until the new crop has been planted infests the new crop directly from the old. The writer of the report is of the opinion that the enforcement by law of the removal of all old cotton before the season for replanting is the only way to reduce the leaf-blister mite to negligible proportions and that under Barbados conditions this offers a fair chance of getting rid of it entirely. Cotton plants of the 'native' type growing among infested Sea Island show no signs of the presence of the mites.

SWEET POTATOES, ETC. These were attacked by thrips (*Euthrips* sp.), flea beetle (*Chaetocnema amazona*), and a red spider (*Tetranychus telarius*). These three pests usually work together, generally being much worse in dry weather. It is recommended that slips for planting should be fumigated in a tight wooden box or a puncheon by means of carbon bisulphide at the rate of 1 dram to each cubic foot of space, in order to prevent the introduction of these pests at the time of planting.

The cassava hawk moth (*Erinnyis* [Dilophonota] *ello*) occurred as a pest in a severe attack on fields of cassava resulting in the complete defoliation of the plants over an area of about 12 acres. Four broods of caterpillars were observed: these occurred at intervals of thirty days. It is estimated that there were eight broods during the season. Spraying with arsenate of lead and dusting with Paris green were found effective measures in controlling the caterpillars. In spraying, the arsenate of lead was used at the rate of 4 lb. to 50 gallons of water, with molasses added at the rate of 1 pint to the gallon. This was found necessary in order to overcome the water-repelling quality of the cassava leaves. The Paris green was used at the rate of 1 lb. to 6 lb. of lime. The caterpillars and pupae were eaten by the Barbados black birds (*Quiscalus fortirostris*), the caterpillars by the wild bees (*Polistes* spp.); the moths were captured by the rain bird (*Tyrannus rostratus*). A remarkable feature was the entire absence of Tachinid flies or other parasites, as far as could be seen.

The whitewood moth (*Duomitus punctifer*). The larvae of this moth were found tunnelling in whitewood (*Tecoma leucoxylon*); it was afterwards found in sour sop (*Anona muricata*), in Barbados cherry (*Malpighia glabra*), in the woody stems of Ipomoea vines, and in ornamental crotons (*Codiaeum* spp.).

SCALE INSECTS. Species of the Coccidae recorded during the year as being of interest are *Aspidiotus* [Chrysomphalus] *howreyi*, Ckll., on agaves, *Aspidiotus* [Pseudaonidia] *tesseratus*, De Charm., on *Cassia Fistula*. Another scale closely resembling the last named and probably a new variety was found on grape vine and *Vitis* [Cissus] *sicyoides* on the former of which it is capable of doing considerable damage. It occurs under the bark causing great numbers of small swellings. *Chionaspis unilateralis*, Newst., on a palm (*Thrinax*) is a new species. *Lecanium hesperidum* has been identified as occurring on *Pluchea odorata* and on seedlings of *Sterculia fulgens*. This is of interest since the original records of *L. hesperidum*, in Barbados and other of the Lesser Antilles as abundant and injurious, probably referred to *Lecanium viride* (*Coccus viridis*), while *L. hesperidum* was and is a rare insect.

An experimental plot of papaw was severely attacked by leaf hoppers of the family Jassidae, apparently the same species which occurs on cotton without appreciable injury to the plant. The damage to the papaws was severe and the plants were sprayed with resin compound; the attack was checked but reinfestation soon took place.

NITRIFICATION AND DISEASE.

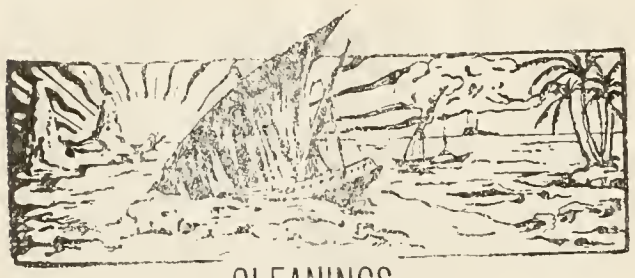
The disease known as 'die-back' in citrus trees has for many years worried the citrus growers of Florida and California in this country, and has thus far baffled the efforts of the agricultural scientist to discover its cause. The writer has recently made some observations and experiments on several citrus soils bearing trees affected with 'die-back', which lead him to believe that a poor nitrifying power on the part of the soil, with the ammonifying power remaining normal, may be the cause of the peculiar manifestations which are characteristic of the disease, and which, for the purposes of this preliminary report, need not be described. The theory upon which I am working at the present time, looking toward the solution of this problem, is that in the absence of normal nitrification and in the presence of sufficient ammonification, the tree does not obtain a sufficient quantity of nitrate for its development and is sooner or later forced to assimilate ammonia compounds as produced by ammonifying organisms in the soil; or in the presence of a sufficient amount of bases in the soil even the ammonia may be set free, thus causing the plant to starve for want of nitrogen. While it is true that some plants can use ammonia compounds just as well as nitrates as a source of nitrogen, and further, that some of them even prefer the ammonia compounds, as Kelly has shown is the case with rice, it is very possible that we have in the citrus tree, a plant which is deleteriously affected by ammonia compounds when it is forced to absorb them. As above explained, however, when a soil's power to fix and hold ammonia is very feeble, owing to the presence of bases in excess, a poor nitrifying power and a strong ammonifying power may mean nitrogen starvation for plants on that soil. The writer has examined and tested the nitrifying power of four citrus soils in various parts of California, on which trees were suffering from 'die-back', and has found in every case a very slight nitrifying power or none at all. The tests were made by adding to soils, kept at optimum moisture conditions at a temperature of 26° to 28°C. for approximately a month, both dried blood and sulphate of ammonia, but only slight or no increases of nitrates over the amount in sterile checks or dry soil were obtained. The dried blood was used also in varying quantities from 1 per cent. up to 5 per cent. of the dry weight of the soil, but the same results were obtained in all cases. In some of these soils, particularly, the ammonification of the blood proceeded so rapidly as to give an intense odour of ammonia when the Petri dish cover was raised from the tumbler in which the soil cultures were kept.

This theory of the writer's, which inclines to account for the die-back by the fact that too much ammonia is assimilated by the three under compulsion in the absence of nitrates, or under certain circumstances, because ammonia is set free and therefore there is scarcely any nitrogen for the tree to assimilate, would also seem to be in part confirmed by the observations made by Florida investigators on the disease in question, in which it was noted that in all cases the application of organic manures to citrus groves invariably made conditions worse or increased the amount of 'die-back'. In accordance with the idea above expressed, and in the absence of nitrification, this would be, for the reason that either the added organic matter would be responsible for the formation of so much ammonia, which (through its enforced absorption) would poison the plants or because, under some soil conditions, most of the ammonia would be set free and pass off into the atmosphere in a gaseous form, thus inducing nitrogen hunger.

I feel justified in transmitting this brief preliminary note on the subject in question, before the theory has been fully tested out, by the fact that the disease known as 'die-back' has been studied in many different ways without giving encouraging results, and because, further, this new method of attack related to the chemical and bacteriological conditions of the soil, as affecting plant nutrition, and as applied to a problem of this kind, deserves to be called to the attention of other investigators working along this or similar lines. I am vigorously proceeding to test out the theory above given by simultaneous green house and field experiments with citrus trees which are now under way, in which, on the basis of what I have said above, I am not only trying to overcome the disease by variously treating soils in the field, so as to provide a plentiful supply of nitrates and reduce ammonification, but I am also making an effort to produce the disease experimentally in the green house with seedling citrus trees on soils deficient in nitrates by the addition to the latter of various ammonia compounds, and to overcome it by means of adding stimulants for the nitrifying bacteria. The writer feels confident that a definite relationship may be shown between the abnormal soil conditions mentioned and the 'die-back' of the lemon, and perhaps as well of other citrus trees, when the experiments have progressed far enough. The theory above enunciated is not only in accord with the Florida observations but also with all other observations with which I have become acquainted in respect to the disease known as 'die-back'. Moreover, it allows for the production of bad soil conditions which will result in a poor nitrifying power through a large variety of causes. Such are, for example, the poor physical conditions of soils, unfavourable drainage conditions, the presence of a vigorous denitrifying flora of one kind or another, and many other chemical, physical and bacteriological conditions, not to mention conditions respecting the origin of the soil which would seriously affect the nitrifying power thereof.

These lines for the most part were written about a year and a half ago when I first formulated the theory and may need slight revision and some additions in the light of many new facts with which we are now acquainted, but in the main, the theory seems to be better supported in fact at the present time than it was two years ago. Moreover, it seems very probable now, from a large series of tests which we have been making, that not only 'die back', the true Exanthema, is to be accounted for by the theory under discussion, but also that the equally disastrous, and much more widely spread disease known as 'mottled leaf' of citrus trees is capable of being explained in a similar way, if I may regard a large series of tests on various soils in this State as a reliable criterion. Quite unlike the 'die back', the 'mottled leaf' condition in citrus trees is to be found in all citrus districts of California, and is at the present time regarded as one of the most menacing factors on the production of citrus fruit for profit here.

The 'die back' and 'mottled leaf' conditions of some districts in this State are becoming so bad as to make it imperative to solve these questions as quickly as possible from the practical standpoint alone. One orchard on which, in particular, the writer is working, has a very large proportion of its trees badly affected by the first-named disease, and most trees in the orchard show some manifestation of the disease. The trees are about four years old and had for a time grown vigorously, and then suddenly began to give symptoms of one of the worst and most widespread cases of 'die-back' of which we have knowledge in the State. It is hoped that our experiments may serve eventually to remedy such conditions. A description of detailed experiments will soon appear. (Chas. B. Lipman in *Science*, for May 15, 1914.)



GLEANINGS.

Colonial Reports, Miscellaneous No. 88, is composed of a selection of reports from the scientific and technical department of the Imperial Institute, the publication under notice (No. 5) being devoted to subjects of oil seeds, oils, fats and waxes that have been received for examination during the past year from different parts of the Empire.

The *Experiment Station Record* for February 1914 contains a note on the propagation of cotton plants by slips. In this method herbaceous slips are pricked out in the hot beds or green-house. The plants from which the slips are taken are removed from the fields to the green-house late in the season and profuse budding is induced.

Der Pflanzer for March 1914 publishes an article on the kapok tree describing the varieties, pests, prices of seed and the preparation and shipment of the cotton. In another article the coagulation of Manihot latex is dealt with and various methods described. A short note includes an account of the cost of a factory for desiccated coco-nuts.

Statistics concerning the California orange and lemon crop, published in the fifty-ninth annual report of the California State Board of Agriculture, 1912, show that in 1896 the imports of oranges into California from Mexico, the West Indies and Italy were worth $2,694,131, whilst in 1912 the value of the exports of oranges from California was $3,022,859 compared with nil in 1896.

Under the heading Another Industry for Trinidad the *Port-of-Spain Gazette*, May 17, 1914, refers to the projected manufacture of bamboo pulp in that colony. It is stated that a factory capitalized to the extent of £30,000 is soon to be erected at Champs Fleurs. Bamboos will be planted and these will be manufactured into pulp, which will be shipped to Scotland for paper-making.

A copy of a further Act (No. 4 of 1914, dated February 25), has been received which amends the 'Wild Birds (Protection) Act, 1907', and *inter alia*, prohibits the exportation of the skin and feathers of any 'wild bird' from Barbados. Any person who exports the skin or feathers of such wild birds shall be liable to a penalty not exceeding £5. The Act adds the following wild birds to the list of birds scheduled in the original Act: Red seal coot, White-seal coot.

In a communication received from the Agricultural Superintendent, St. Kitts, information is given to show that a very good and creditable attempt has been made to represent that Presidency at the forthcoming Tropical Products Exhibition. No less than seventy-six different articles have been sent, chiefly cotton and cotton products (for competition for the Presidency's trophy and the B. C. G. A.'s cup); but also sugar, including cut canes and crystals have been sent.

Attention is called in *The Times* for April 25, 1914, to the reformed method of reading the barometer which will be introduced into the daily weather reports next month. The principle of the change will be the adoption of absolute units for barometric pressure in place of mercury inches. The absolute unit is the dyne per square centimetre. As this unit is exceedingly small, a practical unit one million times as great (megadyne) has been suggested and will be used in the daily weather reports.

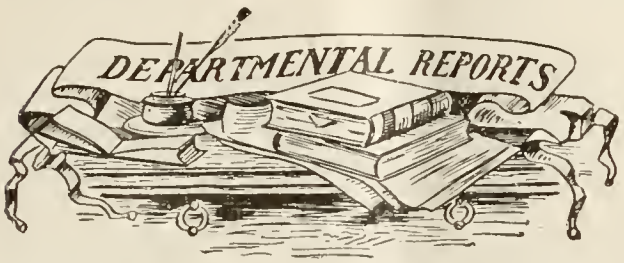
An interesting publication in the form of the Madras Agricultural Calendar, 1914-15, has just been received from the Superintendent, the Government Press, Madras. Its contents include several articles of agricultural interest written in most cases by the officers on the staff of the Department. Attention is given to such subjects as co-operative sale and credit, implemental tillage, good seed supply, manuring, particularly green manuring, and the like in particular relation to conditions in Madras.

At a general meeting of the Agricultural Society of Trinidad and Tobago held April 3, 1914, the question of proclaiming love vine a pest injurious to agriculture was discussed as well as the matter of preservation of bird life. Both these matters are receiving consideration. Efforts are being made to supply the Naparima peasantry with a more standard quality of rice seed and prizes will be offered for the cleanest and best samples of the standard variety. (*Proceedings of the Agricultural Society of Trinidad and Tobago*, April 1914.)

Suggestive economies of an interesting nature are referred to in *The Times* for May 8, 1914, in an article on steel manufacture. The gaseous products of coke ovens are stated as likely to become of use in the lighting of towns and works and a possible application of this gas is in the direct manufacture of nitrate by the Hausen process; while it is being sought to obtain from it the hydrocarbons, the derivatives of which are found in india-rubber, and experiments are being conducted with a view to the manufacture of artificial rubber.

A copy has just been received of the report on the Blue Book of Trinidad and Tobago, for 1912-13. Of special interest is the report attached to this, on Forest Conservancy. As for most lines of agricultural work, the past year has been decidedly unfavourable, owing to drought, for activity in connexion with sylvicultural operations. A serious fire in a cedar plantation occurred during the year, in which 50 acres of cedar plantations were burnt over and some 8,000 out of 10,000 cedar trees, varying in age from one to five years were killed. The fire appears to have originated from sparks dropped from a traveller's torch.

A note in the *Experiment Station Record* for February 1914 refers to a trial of Niger cake for milch cows in Belgium. 'On a ration of hay, straw, mangels, bran and wheat two cows for five days before and ten days after an experimental period of thirty days gave a daily average per cow of 8·17 litres (about 8·6 quarts of milk testing 2·59 per cent. of fat). During the thirty-day period in which the above ration was supplemented with from 1 to 2 kilogrammes of Niger cake the average milk production was 8·5 litres testing 3·08 per cent. fat. The cows gained 13 kilogs. and 36 kilogs. respectively in weight during the thirty days.' The journal quoted, states that the original paper contains an analysis of the Niger cake.



BRITISH GUIANA: REPORT OF THE DEPARTMENT OF SCIENCE AND AGRICULTURE, 1912-13.

During the period under report almost every section of agricultural work in the colony was seriously affected by the dry weather conditions which prevailed. The drought early in the year which had continued from the preceding year proved most disastrous to the sugar cane crop. After the autumn grinding of 1911, ratoons sprung very badly and it was most difficult and in some cases impossible to establish either supplies or plant canes. As a result, the export of sugar, 76,360 tons, was very low, lower in fact than it had been since 1869. It is stated that the disastrous effects of the drought will be noticeable on the sugar-cane exports for a considerable period.

Luckily very favourable weather was experienced during October and November 1912, which enabled very successful work to be carried out in the matter of raising new varieties of sugar-cane from seeds. Altogether 6,058 were raised, and many of these have been found to be of considerable promise. As regards the experimental work with sugar-cane in the matter of testing varieties from the manurial aspect, it was found that, contrary to other years, the manurial value of nitrate of soda proved higher than that of sulphate of ammonia. But the Department is in possession of numerous proofs that the sugar-cane shows a distinct preference for ammonia over nitrates as a source of nitrogen in normal years, whilst in abnormal years of very short periods of active growth, nitrate of soda and nitrate of lime may be more efficacious than sulphate of ammonia, dried blood, nitrolim and other more slowly acting nitrogenous manures. The best results in the manurial experiments with varieties were obtained with D.118, D.145, Bourbon, D. 419, D.721, D.167, D.293, D.317, D.651 and D.246.

The exports of rice and of rice meal during the year under review were 2,766 and 2,179 tons, respectively, as compared with average exports of 2,298 tons of rice during the preceding nine years and of 1,771 tons of rice meal in 1911-12. The experiments with rice were continued during the year at the experimental fields of the Botanic Gardens, part of the land being occupied by well tested varieties, the paddy of which was distributed throughout the colony to the more progressive rice farmers. The report under review gives the yield of the different varieties and variants under trial.

As with the other crops, the output of coco nuts was decreased through drought, but the interest in this industry is steadily increasing and a further extension of the area now planted (about 14,000 acres) may be expected in the future. In some districts trees have died out from the want of adequate drainage, whilst bud rot is not uncommon in other parts. It is said that plants raised from the colony's coco-nuts make more rapid progress than the plants from the imported Tobago and Trinidad ones, but some of the latter promise to yield fruit of excellent strain.

The report of the Director of Agriculture, concludes with notes on other horti-agricultural industries in which reference is made to the great possibilities before lime cultivation, and with notes on the live stock industries where it is stated that the marked reductions in the numbers of cattle, sheep and pigs were directly due to the drought.

In connexion with agricultural education, reference is made to the good work done with model gardens, and to the satisfactory circumstance that the apprentices of the department who have completed their indentures readily obtained employment at remunerative rates amongst the various companies at work in the cultivation of products other than sugar.

The general administration report of the Director is supplemented by the report of the Government Analyst, in which it is noted that the number of fiscal samples for chemical examination greatly exceeded the number of agricultural. Following this is the report on the Botanic Gardens by Mr. J. F. Waby, which is followed by the report of the Economic Biologist. A brief report by the Government Veterinary Surgeon is inserted. The publication concludes with reports of the Science Lecturer and the reports of the Board of Agriculture, the Onderneeming Farm School and of the Agricultural Stations in the north-western and the Pomeroon district. All these sections of the publication contain a large amount of useful and interesting information which will well repay perusal, especially by those who are directly connected with the agricultural industries of the colony.

British Guiana: Recent Meeting of the Board of Agriculture.—Several matters of considerable interest were brought up for general discussion at the meeting of the Board of Agriculture held on May 12, 1914, at the offices of the Department of Science and Agriculture, Georgetown, British Guiana.

The department has decided to abandon the cultivation of Sapium rubber at Bonasika. This does not mean that success has not attended rubber growing in the colony as a whole. Mr. Bancroft has shown conclusively that Para rubber will grow as well in British Guiana as in the Malaya Peninsula.

In the course of his remarks, His Excellency the Governor referred to certain unsatisfactory results experienced in regard to seed supply. In the future, His Excellency pointed out that planters would no longer be dependent upon outside supplies of seed. In the gardens at the present time there were plenty of rubber seeds available to meet local requirements. Out of the 3,467 seeds of the newly imported African oil palm (*Elæis guineensis*) only sixty-seven plants had been derived.

Professor Harrison in the course of a few remarks spoke on the increased interest taken in coco-nuts. At greater length, the Director dwelt upon the question of instruction for the East Coast farmers. He expressed the view that the present system of agricultural instruction and shows should be modified. It was suggested that one of the agricultural officers should be stationed in the district and be given a definite area to look after.

After considerable discussion on the subject of contagious diseases in general and mal de caderas in particular, in which the necessity for strengthening the Contagious Diseases (Animals) Ordinance 1892 was pointed out, the Board rose.

The above information has been abstracted from a report in the *Daily Argosy*, of Demerara, for May 13, 1914.

FUNGUS NOTES.

BASE ROT OF PINE-APPLES.

During the recent visit to St. Kitts of the Commissioner and the Mycologist of the Imperial Department of Agriculture, an inspection was made of the manurial experiment plots of pine-apples at La Guérite. The series comprises separate plots treated with pen manure, tankage, sulphate of potash, and phosphate, a plot with tankage, phosphate, and potash combined, and a control plot receiving no manure. The experiments were established in St. Kitts in order to see whether fungus troubles experienced in Antigua would be met with in an island where pine-apples have been very little grown, and in a situation as to which there is no record of the plant having been previously tried. The cuttings were from the Ripley variety and were carefully disinfected with Bordeaux mixture before planting.

The plots in question are just beginning to ripen their fruit, and it is as yet too early to say whether the principal disease, which causes an internal discoloration of the tissues immediately beneath the 'eyes', will make its appearance. A sickly, yellow appearance of many of the plants was, however, very noticeable, and was made the subject of investigation.

It was found that the more seriously affected plants were easily lifted by hand, and the number of living roots was very small. The underground stems of these plants were rotted to a degree broadly corresponding to the amount of sickness visible in the leaves, the worst cases retaining only a few roots attached immediately below the bases of the lowest leaves.

The investigation was pursued further in the laboratory. No evidence of a disease attacking the remaining roots and rootlets was found. The loss of the roots appeared to be entirely due to the rotting of the stem from which they spring. The blackened tissues of the stem proved to be filled with dark hyphae, penetrating the tissues in every direction and lying in coils in the cells, and with a great abundance of black spores produced in simple chains. A large plant with healthy leaves and a well developed root system was noticed, when carefully cleaned, to have a brown spot about the middle of one side of the underground stem; after being kept for four days in a closed chamber a rot of the nature of that observed in the field had extended from this point throughout the stem, and was found to be accompanied by the advance of the same fungus.

The fungus appeared identical in character with a macrospore-producing condition of *Thielaviopsis paradoxa*, V. Hohn (*T. ethaceticus*, Went.). No microspores were found in course of formation, and none could be recognized with certainty. If they were present at all it was in relatively very small numbers. Of a number of the supposed macrospores placed in hanging drops of 10 per cent. sugar solution a few germinated and the resulting hyphae produced terminal chains of similar spores from lateral branches. A piece of fresh sound sugar-cane was washed in 4 per cent. formalin and cut into four parts with a sterile knife. Each part was then split; one half was inoculated with spores from the internal tissues of a diseased pine-apple plant, the other kept as a control in the same Petri dish. In each case there was an immediate and abundant development of typical Thielaviopsis, with micro-and macrospores, from the point of inoculation, while in each case the control remained sterile. No pine apple plants were available for inoculation experiments, but the appearance presented by the fungus in question in the tissues afforded good presumptive evidence that it causes the disease, and there seems no reason to doubt that it is identical with *Thielaviopsis paradoxa*.

The presumption is strengthened by a comparison with the disease known as base rot of cuttings described by L. D. Larsen in Bulletin 10 (Pathological and Physiological series) of the Hawaiian Sugar Planters' Experiment Station. The description and photographs given accord very closely with the appearance of the St. Kitts specimens, and conclusive proof was obtained in Hawaii by means of inoculation experiments that Thielaviopsis is the cause of the disease. It was also demonstrated that the fungus is able to live in and penetrate for some distance into ordinary soil. An increase of organic matter was found to induce quicker growth and more thorough penetration of the fungus through the soil. Further, it was shown that pure strains from pine apple and from sugar-cane were capable of infecting the alternate host plant and were indistinguishable in their virulence and behaviour.

Thielaviopsis is well known in countries growing sugar-cane as a wound parasite of that plant and the cause of great destruction of cuttings in certain seasons. It is a curious coincidence that when it was described by Went in 1893 as it occurs on sugar-cane in Java, he gave it the name of pine-apple disease owing to the characteristic smell produced by its action on the cane, while it has since been found to give rise to the most serious diseases of the pine-apple itself.

It is obvious that in cane-growing countries the fungus will always have to be seriously reckoned with in pine apple cultivation. Sterilization of the cuttings before planting cannot be counted on as a preventive measure against an organism which is generally present in the soil, and which is extremely likely to be present in any organic manure applied. In the La Guérite plots there was no evidence that any of the manurial treatments had helped the plants to resist the fungus. A number of the plants remained apparently healthy, but one of the best looking of these was the plant mentioned above as having the beginning of an attack upon it. There is some evidence that plants sometimes throw off the disease, and the experiment is worth watching with a view to securing a resistant strain. It would appear that it is only in this direction that hope lies of avoiding losses which would be pretty sure to be sometimes serious.

A New Spray Fluid.—Dr. Max Issleib, writing in *Möllers Deutsche Gärtner-Zeitung*, suggests the use of the jelly-like matter produced by boiling certain algae in water for the purpose of a spray fluid. He points out that when certain marine algae (*Chondrus crispus* and *Gigartina mamillosa*) are heated with water, 2·52 parts of the former with 100 of the latter, a gelatine-like fluid is produced which, sprayed on plants, sets to form a thin skin, in which insect pests are entangled and destroyed. It may be mixed with 5 or 10 per cent. petroleum or paraffin. The substance recommended is one which has many applications. We ourselves have it in common use for the stiffening of jellies and the like, and its properties are indeed remarkable. The fisherfolk of Brittany collect the red seaweed, *Chondrus crispus*, expose it on the grass to dry and bleach, and send it to Germany, where as we are told, it is used to give body for jam. The consistency of the jelly which it makes is, of course, determined by the amount of water which is added to the dry seaweed. In our household about as much as

may be held in a teaspoon serves to make the 'body' of a large dish of jelly. The proposal to use this simple specific is one which certainly deserves attention, but whether its powers of adhesion are better than those of the substances in general use remains to be determined. An objection which occurs to the mind is the general one that in wet weather the jelly-like skin formed when the stuff is sprayed on the plant would swell and wash off As, of course, is well known, this property of many seaweeds to form with boiling water a gelatine-like jelly is utilized in many ways in medicine, commerce and science. Thus the stalks of Laminaria are used in surgery, and a Japanese seaweed supplies the source of agar agar, the medium so much used in cultivating bacteria in the laboratory. (*Gardeners' Chronicle*, April 25, 1914.)

SOIL INVESTIGATION.

PLANT GROWTH AND PARTIAL STERILIZATION.

The *Experiment Station Record* (Vol. XXX, No. 3) publishes the following abstract of Russell and Petherbridges' recent paper on the above subject which appeared originally in the *Journal of Agricultural Science*:—

For a number of years experiments have been in progress in growing plants in partially sterilized soils, and some of the observed facts are placed on record. The partial sterilization was effected by the use of toluene and by heating to 55° and 100°C.

The germination of seeds planted in these soils was sometimes hastened, at other times retarded. Retardation was almost always produced in soils heated to 100° or treated with toluene, while acceleration often followed the planting of seeds in soils heated to 55°. The retarding effect was generally more pronounced in moist than in dry soils and in rich than in poor ones.

In the seedling stages the plants produced on partially sterilized soils were sometimes indistinguishable from those on untreated soils. Seedling tomatoes grown on heated soils in comparison with those grown on untreated ones had smaller roots and smaller cotyledons of a darker green colour, frequently showing some purple. The effect on the seedlings was most pronounced during the dull days of winter, and this has a practical application in the use of partial sterilization for the growth of plants under glass. Later marked differences were shown, the purple colour disappeared, and the plants began to show remarkable growth.

Sometimes soils treated with toluene behaved like those heated to 55°, but on rich soils early development was retarded. Other volatile antiseptics were found to behave like toluene.

Comparing partially sterilized with untreated soils, the authors found that there was generally a retardation in germination, although sometimes partial acceleration occurred. An acceleration in growth followed up to the time of the appearance of the third or fourth leaves, but sometimes a marked retardation was noticed, especially in rich soils heated to 100°. Where this retardation occurred it was accompanied by a very dark green leaf colour and either the formation of a purple pigment or a tendency for the leaves to curl toward the underside. Later the purple colour disappeared, the curling ceased, and rapid growth took place. The subsequent growth was finally proportional to the amount of food present. Plants grown on soils heated to 100° showed a remarkable development of fibrous roots, and in comparison with those on untreated soils, had larger leaves of a deeper green colour, stouter stems, usually shorter internodes, flowered earlier and more abundantly, and contained a higher percentage of nitrogen and sometimes of phosphoric acid in their dry matter. Plants grown on soils heated to 55° or treated with volatile antiseptics showed fewer of these effects.

Considering the chemical differences in the soils, it is stated that partially sterilized soils are characterized by an accumulation of ammonia, while untreated soils contain practically no ammonia. Soils heated to 100° are characterized by the presence of decomposition products, some of which possess characteristic colours and odours.

The authors present the data upon which their paper is based and give an extended discussion of their observations.

In connexion with the above, a note published in the same journal, on P. L. Gainey's investigation of the effect of toluol and carbon bisulphide on the microflora of the soil is of interest:—

(1) Small quantities of CS_2, toluol, and chloroform, such as have been used practically and experimentally, when applied to the soils studied exert a stimulative rather than a diminishing effect upon the total number of bacteria present.

(2) An application of such quantities of CS_2, and toluol does not have an appreciable effect upon the number of types of protozoa present in such soils as have been studied.

(3) A very marked increase in yield may be noted following such an application when no evident change occurs in total number of bacteria present.

(4) In the light of the recent work of Koch, Egorov, Goodsey, Fred and others, with results presented in this paper, the theory advanced by Russell and Hutchinson to account for the increased yield following the application of such chemicals appears not tenable for general application.

It has frequently been asserted that the characteristics of an animal may be changed during the development of the fœtus. That which is known of such cases as have been reported, gives no ground for making them a basis of eugenic teaching. It is true that during development the characteristics may be adversely affected by malnutrition or through accidents that may happen to the mother, but the so-called 'maternal impressions' have no scientific foundation. Besides this idea of prenatal influence, we have also a series of myths more scientific in aspect, but equally unfounded, under the name of telegony. The first mate of a female animal is supposed under this theory to affect or infect all her future progeny. This idea is probably without any scientific foundation either in man or beast. It is based on a misinterpretation of the single experiment where a mare once mated to a zebra bore after to a horse father, a colt with traces of dark bars or stripes. But such bars occur amongst horses not suspected of zebra parentage. The original horse as a wild animal was probably marked by dark stripes. (Professor David Starr Jordan, in the *Journal of Heredity*, January, 1914.)

MARKET REPORTS.

London.—The West India Committee Circular, May 19, 1914; Messrs. E. A. de Pass & Co., May 8, 1914

Arrowroot—3½*d.* to 4¾*d.*
Balata—Sheet, 2/8½; block, 2/0¾ per lb.
Beeswax—£9 to £9 10*s.*
Cacao—Trinidad, 57/6 to 65/- per cwt.; Grenada, 52/6 to 58/; Jamaica, 52/- to 58/-.
Coffee—Jamaica, 52/ to 85/.
Copra—West Indian, £26 5*s.* per ton.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 15½*d.* to 22*d.*
Fruit—No quotations.
Fustic—No quotations.
Ginger—Very dull, 33/- to 60/-.
Isinglass—No quotations.
Honey—18/- to 30/.
Lime Juice—Raw, 1/1½ to 1/3; concentrated, £30; otto of limes (hand-pressed), 8/-.
Logwood—No quotations.
Mace—1/5 to 2/6.
Nutmegs—4⅛*d.* to 5¼*d.*
Pimento—1⅞*d.* to 2 1/16*d.*
Rubber—Para, fine hard, 2/9; fine soft, 2/8; Castilloa, 1/10½ per lb.
Rum—Jamaica, 2/2 to 5/-.

New York.—Messrs. Gillespie Bros. & Co., May 1, 1914.

Cacao—Caracas, 12c. to 13c.; Grenada, 11¾c. to 12c.; Trinidad, 11¾c. to 12¼c.; Jamaica, 11c. to 12c.
Coco-nuts—Jamaica and Trinidad selects, $26·00 to $28·00; culls, $15·00 to $16·00.
Coffee—Jamaica, 10c. to 13½c. per lb.
Ginger—7½c. to 10c. per lb.
Goat Skins—Jamaica, 48c.; Antigua and Barbados, 45c. to 48c.; St. Thomas and St. Kitts, 42c. to 45c. per lb.
Grape Fruit—Jamaica, $1·25 to $2·00.
Limes—$12·50 to $14·00.
Mace—50c. to 54c. per lb.
Nutmegs—110's, 12½c.
Oranges—Jamaica, $1·75 to $2·25.
Pimento—4c. to 4½c. per lb.
Sugar—Centrifugals, 96°, no quotation; Muscovados, 89°, 1·93c.; Molasses, 89°, no quotations, all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., May 25, 1914.

Cacao—Venezuelan, $12·00 to $12·40; Trinidad, $11·80 to $12·10.
Coco-nut Oil—98c. per Imperial gallon.
Coffee—Venezuelan, 12c. to 14c. per lb.
Copra—$4·50 per 100 lb.
Dhal—No quotations.
Onions—$2·25 per 100 lb.
Peas, Split—$5·80 per bag.
Potatoes—English, $1·75 to $2·00 per 100 lb.
Rice—Yellow, $5·50 to $5·60; White, $5·00 to $5·10 per bag.
Sugar—American crushed, no quotations.

Barbados.—Messrs. James A. Lynch & Co., Ltd., May 2, 1914; Messrs. T. S. Garraway & Co., May 4, 1914.

Arrowroot—$4·00 to $5·50 per 100 lb.
Cacao—$13·25 per 100 lb.
Coco-nuts—$15·00.
Hay—$1·50 to $1·60 per 100 lb.
Manures—Nitrate of soda, $70·00; Cacao manure, $48·00 to $50·00; Sulphate of ammonia, $82·00 to $85·00 per ton.
Molasses—No quotations.
Onions—$2·83 to $4·50 per 100 lb.
Peas, Split—$6·00 per bag of 210 lb.; Canada, $4·25. to $4·65.
Potatoes—Nova Scotia, $2·00 to $2·50 per 160 lb.
Rice—Ballam, $5·20 to $5·30 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
Sugar—American granulated, $3·50 per 100 lb.

British Guiana.—Messrs. Wieting & Richter, May 23, 1914; Messrs. Sandbach, Parker & Co., May 22, 1914.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	$8·00 per barrel of 200 lb.	——
Balata—Venezuela block	No quotation	——
Demerara sheet	65c. per lb.	——
Cacao—Native	13c. per lb.	13½c. per lb.
Cassava—	96c.	——
Cassava Starch—	——	——
Coco-nuts—	$16 to $20 per M.	$23 per M.
Coffee—Creole	15c. per lb.	16c. per lb.
Jamaica and Rio	15½c. per lb.	16c. per lb.
Liberian	11c. per lb.	11c. per lb.
Dhal—	$5·80 to $6·00	$6·25 per bag of 168 lb.
Green Dhal	——	——
Eddoes—	$1·44	——
Molasses—Yellow	None	——
Onions—Teneriffe	7c.	——
Madeira	——	5½c. to 6c.
Peas—Split	$6·00 to $6·25 per bag (210 lb.)	$7·25 per bag (210 lb.)
Marseilles	——	——
Plantains—	16c. to 48c.	——
Potatoes—Nova Scotia	$2·75 to $3·00	$2·80 to $3·25
Lisbon	——	——
Potatoes-Sweet, B'bados	$1·20 per bag	——
Rice—Ballam	No quotation	——
Creole	$5·50	$5·75 to $6·00
Tannias—	$2·64	——
Yams—White	$2·16	——
Buck	$1·92	——
Sugar—Dark crystals	$2·05 to $2·15	$2·10
Yellow	$2·60	$2·50 to $2·60
White	$3·40	$4·00
Molasses	——	——
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M.
,, Cordwood	$1·80 to $2·00 per ton	——

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Printed at Office of *Agricultural Reporter*, 4 High Street, Bridgetown, Barbados.

AGRICULTURAL NEWS

Vol. XIII No 317.] SATURDAY, JUNE 20, 1914. [One penny.

AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW
OF THE
IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

VOL. XIII. No. 317. BARBADOS, JUNE 20, 1914. PRICE 1d.

CONTENTS.

Vegetation and the Conservation of Rainfall.

THE prolonged discussion and controversy in the South African press on the question of the supposed increased aridity in that country, has recently turned to a consideration as to whether many of the climatic changes that have undoubtedly taken place during recent years cannot be accounted for by the removal of vegetation. The subject possesses particular interest in the West Indies where considerations of a similar kind have received attention in regard to the water-supply in several of these islands. It is now well recognized that the indirect effects of forests and of vegetation in general are economically useful largely as the outcome of the retarding influence exercised by trees and even herbaceous plants on the flow of water that has been precipitated. Besides the beneficial effect produced by a forest cover on streams in its immediate neighbourhood, it is being increasingly recognized that much of the water retained by the forest bed may slowly percolate in a diffused manner through the surrounding soil, and may serve to maintain a useful degree of moisture in the subsoil of land lying at a considerable distance away. This subsoil moisture thus steadily maintained by the distant forest may greatly increase the fertility and drought-resisting power of cultivated lands, and it is conceivable that in many of the islands under consideration, the cultivated lands at the foot of the mountains may derive much benefit from the retentive forest bed situated at the top.

The question constantly arises as to whether forests appreciably increase the actual rainfall. It is difficult to get a satisfactory answer supported by well ascertained facts. The probability is, however, that forests by lowering and equalizing the temperature of the air on mountain tops, may to a small extent lead to increased precipitation: this increase however is probably almost negligibly small when compared with the benefits derived from forests as regards conservation, and as compared with the effects of the hills themselves in forcing moisture-laden air into the upper atmosphere. Indeed, altitude is inseparably associated with

vegetation in regard to the conservation and increase of rainfall—a circumstance which is not always fully recognized. In America it has been found that the forest area on the Atlantic slopes appreciably increases the moisture content of the air currents which pass over them towards the West. In this way forest land in continental regions lying to windward may very possibly augment the rainfall over extensive plains such as those existing in the central States of America.

One more beneficial effect, mechanical in nature, will be referred to before we proceed to discuss the relationship of these facts and ideas to the climatic changes which have taken place in South Africa. The mechanical effect in question is simply the protective influence which trees may be made to have in regard to orchard cultivation. At the present time the retention of areas in forests, or, what is generally more practicable, the planting of trees as wind-breaks must now be regarded as matters of ordinary agricultural practice. The physical advantages derived from wind-belts depend upon the well-known fact that breezes lower the temperature of the soil through their accelerating influence upon evaporation; for the same reason wind-breaks check the transpiration of plants. Also the mechanical effect of wind upon the habit of growth of plants is too obvious along the windward coast of the West Indian islands to need a statement that in this respect, too, the provision of wind-belts serves a useful purpose.

Turning now to the position in South Africa, we learn from an editorial discussion in the *Agricultural Journal of the Union of South Africa* (for April 1914) that although the concensus of opinion clearly indicates that the climatic conditions in South Africa are different to-day from what they were 100 years ago, these changes are to a large extent not permanent ones. They are mainly the result of a cycle of wet and dry seasons—small cycles perhaps within larger ones of 100 years duration. But this explanation is not alone sufficient to account for many of the changes observed. The view is expressed in the reference quoted that it is the destruction of natural forests that have played the most important part in the evolution of the arid and semi-arid regions of South Africa. As well as this, the gradual disappearance of large sheets of water, the natural concomitant of the destruction of the forests, has constituted a factor of no mean importance. This, it is interesting to know, is recognized by a great many residents in the farming districts of the Cape, and several of them have suggested that improvements could be effected by the formation of huge dams. Whatever may be the practical difficulties in the way of carrying out this suggestion, the idea seems a sound one, for not only would a considerable amount of rainfall, which is now lost, be saved, but it is very probable that with considerable sheets of water presented to the atmosphere, an increased precipitation would be induced. It must not be imagined, however, that the buildings of dams and reservoirs is the only thing necessary. Such provision would be an important aid, but the principal requirement for the conservation of moisture is afforestation and the immediate cessation of veld fires.

African veld in a primitive state consists of a mass and tangle of coarse grass. To satisfy the requirements of colonization this overgrowth has to be got rid of and the simplest process to employ is fire. This process in the management of stock farms is repeated annually. The natural result is that the finer grasses are killed out leaving the strongest to survive. These stronger grasses growing in bushes, provide a condition of the surface soil which is well adapted for the loss of earth and rainfall. With a heavy downpour of rain after a long spell of dry weather, the water rushes down the hillsides, between the tufts of grass making for itself and gradually deepening enumerable channels. The process may take many years to accomplish a very obvious change of a climatic kind, but it is a decided forerunner of denudation and desiccation.

It will thus be seen that there are no very deep-seated causes underlying the increased aridity which is observable in many parts of South Africa. Although partly due to a cycle in rainfall, the lowest point in which would appear during the last two or three years to have been with us, the principal cause is the removal of vegetative covering. This being so, it is possible to seek a remedy. Afforestation, a modification of the system of veld burning, the construction of large sheets of water, and the planting of wind-belts will all help to conserve if not increase such rainfall as may be received. These remedies are not parochial ones, and apply equally well to the West Indies, and the Tropics in general. Locally, in these colonies pasture and bush fires are no uncommon occurrence and are, for the reasons brought forward in this article, to be strongly deprecated.

In concluding it may not be irrevalent to call attention to the fact that a natural state of aridity can be met by the selection of drought-resistant types of cultivated plants. This method of approaching the

opposing factor of desiccation is a progressive one: but the best results of all are produced by a combination aiming at the conservation of moisture, together with the production of plants which make the lowest demands upon this water-supply whilst giving a maximum yield of high quality produce.

THE RELATION BETWEEN RAINFALL AND VEGETATIVE REST.

In temperate regions it is well known that periods of vegetative rest occur as a whole, and are largely due to the effect of the low temperature which prevails during winter time. In the Tropics seasonal changes which occur, principally in connexion with alternations of drought and rainfall, render periodic variation less obvious, and induce resting periods only for certain functions rather than periods of rest for vital processes as a whole, though a dry season in a measure has a similar effect to the winter temperatures of a cold country. In a nearly uniform climate like that of the West Indies internal causes are mainly or solely responsible for the alternation of rest and of activity.

The truth of this circumstance has recently been very clearly shown in Barbados during the long prevailing drought which has characterized the climatic conditions this year. The behaviour of most of the characteristic trees has afforded interesting evidence of the remarkable independence of rain to the coming into leaf and flower of the plants in question.

The rainfall in the neighbourhood of Bridgetown during the first five months of the year has been only about 5 inches; but still the Frangipani trees have come into flower in May in full profusion without any evidence of being retarded or the flowers being sparse for lack of moisture. Similarly the Mahogany trees have shed their old leaves and put out new ones with, apparently, no interruption on account of the drought.

The Flamboyant trees, which form a striking feature of Bridgetown and its suburbs, are flowering profusely early in June and under conditions where it does not appear that the roots of the trees can be receiving any appreciable supply of water.

These remarks are general, but they are supported by many observations of particular instances. For example, the Mahogany trees in the grounds of Government House, and young trees of the same species in the gardens of neighbouring houses on the Pine Hill, situated in positions where the soil is shallow and where no water appears to reach the roots, have gone through the usual leaf-fall and renewal. Note has been made of a clammy cherry tree (*Cordia collocca*) on the Pine pasture a few yards from the entrance to Bishop's Court; this tree is growing on a ridge of hard coral rock in extremely scanty soil: to the eastward there is a cleft or gully about 15 feet deep, effectively preventing access of water from that side; while on the other side there is a dry fragment of pasture with the coral rock showing through at very frequent intervals, and no evidence of any water-supply. Yet this tree is now in full leaf and flower and young fruit.

Instances of this kind could be multiplied indefinitely, but the most striking instance of the seasonal flowering of a tree independently of rainfall or other surrounding conditions is exemplified by a case recently reported. A branch having three bud ends was cut from a Frangipani tree in February and fell over a wall on to a dry rock under a *Terminalia Catappa* in such a position as to be effectively protected from any rain, though very little fell: the situation is such that the rock falls away rapidly and there is no indication of surface water having reached the severed branch.

At the beginning of June, it was observed that the branch was blossoming freely, one end having fully developed flowers and the others two prominent bud clusters. On all three ends the leaves had started to develop. At this time the parent tree is approaching full bloom.

It is interesting to note that the cut end of the branch is dry and shrunken, showing no evidence of having received moisture. It was noticed that the whole structure was somewhat shrunken with the exception of the upper 6 or 8 inches of each one of the ends.

This affords a striking illustration of the fact that seasonal flowering is due to internal causes and is independent of external stimulus.

SUGAR INDUSTRY.

SYRUP TREATMENT.

In the manufacture of white sugar it is very essential to have the syrup which is taken into the pan as clear and free from suspended particles as possible. A clarified juice, carried slightly acid, which has been very carefully filtered before evaporation, will give a syrup which is very fairly free from suspended impurities. This is a generally recognized fact in Louisiana, and our experiments have confirmed the view. It is therefore extremely desirable to make the clarification and filtration of the juice as perfect as possible, especially if the facilities of the factory do not allow of adequate treatment and manipulation of the syrup.

In houses where the whole juice is not filtered at least once, the syrup is likely to be fairly clouded with suspended matter, at least now and then, and this will undoubtedly be detrimental to the quality of the sugar obtained. It would appear, therefore, that in the endeavour to turn out the highest grades of sugar the removal of mechanical impurities from the syrup would be essential where juice filtration is not carried out, and often beneficial where this practice obtains.

A series of experiments was planned to determine how best to remove the suspended matter in syrups. Syrups from juices clarified by double carbonatation or a thorough single carbonatation were found to filter well through bags or other mechanical filters. Sulphitation juices, on the other hand, yielded syrups which, while more in need of filtration than those from carbonatation, it was not possible to filter successfully. Settling had therefore to be resorted to. Experiments showed that even this operation was very difficult if the syrup was more concentrated than about 26° Beaumé. It was, moreover, easier to settle the syrups the higher the temperature to which they were heated before settling. In our experiments the syrups were heated to at least 70°C., and suitably small portions of various settling agents added, allowing the syrup to settle during a limited time. The results indicated that most success was obtained with common sodium phosphate, using 1 or 2 parts (dissolved in a small quantity of water) to 100,000 of syrup. The syrup thus treated settled well, usually within three or four hours. The scums were mixed in with the raw juice, this being found to be the best way of disposing of them. (From *Louisiana Agricultural Experiment Station Bulletin*, No. 144.)

FRUIT AND FRUIT TREES.

CANNED PINE-APPLE TRADE.

It has been suggested that experiments might be started in Montserrat with a view of testing the possibility of developing in that Presidency a profitable canning industry in regard to pine-apples and possibly other fruits. The principal advantages of canning pine-apples are as follows: firstly, this form of preservation enables the difficulty of the bad keeping quality of the fruit to be overcome; secondly, it allows the smaller grades of fruit being utilized; thirdly, it reduces freight.

In the *West Indian Bulletin*, Vol. VII, p. 178, a paper appears on the subject under consideration and sets forth the particulars of the pine-apple canning industry in other countries, especially in Florida, Australia, the Straits Settlements, Hawaii and the Bahamas. At the present time Singapore holds the biggest trade in the exportation of canned pine-apples, and the prosperity of the industry in this part of the Far East is said to be due largely to the cheapness of the Chinese labour.

Of considerable interest is the development of the exports of canned pine-apples from Hawaii. According to *Diplomatic and Consular Reports*, the number of cases of canned pine-apples (each case contains twenty-four cans, $4\frac{1}{2} \times 4$ inches diameter) during the period 1904 to 1911 was as follows:—

1904	8,500
1905	25,000
1906	36,000
1907	103,000

(These quantities were exported by the Hawaiian Pine-apple Company only in 1907; seven other companies started and the total export was 190,000 cases.)

1909	411,000
1910	610,000
1911	800,000 (estimated)

The exports of pine-apples and canned pine-apples from the Bahamas, are recorded in *Colonial Reports*—Annual, as follows:—

Year.	Pine-apples. Dozens.	Pine-apples. Value. £	Canned Pine-apples. Cases.	Canned Pine-apples. Value. £
1900	602,751	59,191	41,913	8,836
1901-2	380,094	28,892	41,055	8,897
1902-3	521,482	36,957	47,892	9,515
1903-4	—	24,471	—	7,582
1904-5	228,608	22,616	65,159	13,033
1905-6	197,546	19,776	64,606	11,713
1906-7	146,487	11,524	117,196	19,090
1907-8	67,012	4,242	68,349	13,579
1908-9	118,526	11,856	9,839	10,997
1909-10	52,351	3,629	46,639	8,999
1910-11	8,000	500	43,041	9,219
1911-12	3,000	150	29,532	5,970
1912-13	—	—	27,536	5,175

Readers who are interested in the subject under consideration from the practical standpoint may be referred to an article entitled 'Fruit Canning and Bottling' in the *South Wales Agricultural Gazette*, Vol. XVII, Part VII, and to another which describes a cheap canning outfit, in the *Natal Agricultural Journal*, Vol. IX, p. 1,081.

EXPORTATION OF GRAPE FRUIT FROM EAST AFRICA.

A small box of grape fruit grown at Nairobi was forwarded to the Imperial Institute by the Director of Agriculture in the East Africa Protectorate in July 1910, with a request for information as to the condition of the fruit on arrival, its quality, and as to whether there is a market for such fruit in London.

The box contained ten fruits of various sizes, which were submitted to experts immediately on arrival.

The condition of the fruit was stated to be practically perfect, and its quality to leave little to be desired. The only point to which attention was drawn was that these fruits from Nairobi contained more pith than the grape fruit received from Jamaica and California, and this fact might detract a little from their value when placed in competition with fruit from those countries. This slight defect will, however, probably not exist in fruit gathered from older trees.

The commercial value in the United Kingdom of grape fruit from the East Africa Protectorate will depend on (1) the time of year at which it can be placed on the market, and (2) the grading and packing of the fruit.

During the months of July and August there are practically no arrivals of grape fruit in Europe. If any quantity of the fruit could be landed in this country from the East Africa Protectorate during those two months (in the present case the fruit reached London on August 24) a very profitable business would result, and prices averaging from 15*s.* to 20*s.* per case could be obtained. During the other months of the year Jamaica and California send fair supplies of grape fruit which realize prices ranging from 10*s.* to 14*s.* per case.

The fruit is graded into several sizes. The largest size, which is larger than any of the fruits in the present sample from Nairobi, is packed in boxes, each containing 54 fruits. The 'count' increases as the size diminishes, and the smaller grades comprise 64, 72, 80, 90, 96, and 112 fruits in a box. The small 'counts' which consist of the larger fruits, are of course the more valuable. The boxes in which the fruits are packed measure 2 feet × 1 foot × 1 foot and each box has a partition in the middle to strengthen it.

The fruits are wrapped in tissue paper and packed diagonally to avoid crushing, and it is essential that each box should be packed quite full, whatever grade of fruit it contains, so that the fruit does not get shaken about and bruised. The care taken in the packing will be well repaid by the superior conditions of the fruit on arrival.

There is a steady increase in the demand in this country for grape fruit, which has been growing in popular favour for some years past, and a constant supply from the East Africa Protectorate would find a ready sale. (*Bulletin of the Imperial Institute*, Vol. IX, No. 1.)

In St. Lucia the cacao crop has suffered in some localities from drought, though the yields have been fair. Limes promise a good crop, commencing in June. The general cultivation is extending. As regards sugar, the yields are poor throughout the island owing to climatic conditions and disease. At the Experiment Station at Réunion, budding and grafting of oranges and mangoes have been in progress, and the preparation of land and the sowing of cotton. Ground nuts received from Montserrat have also recently been sown.

REPORT ON THE WORKING OF THE REUNION LAND SETTLEMENT AND EXPERIMENT STATION, ST. LUCIA, FOR THE YEAR ENDING MARCH 31, 1914.

Communications including the report of Mr. A. Brooks, the Officer-in-Charge of the Government Estate (Réunion) St. Lucia have been received at this office from the Administrator, and the following review deals briefly with the establishment of the estate and more fully with the progress that has been made in the working of it during the past year.

It may be remembered that the estate of Réunion, with the four small neighbouring estates in the Choiseul district were purchased by the Government of St. Lucia on February 22, 1913, at a cost of £1,928, the purchase money to be paid in five equal annual instalments with interest. The acquirement of this land was made, as has been stated in the report of the Local Agricultural Department, with a view to transferring thereto the Experiment Station formerly at Union; the extension of the village of Choiseul; and for the sale of small holdings to the peasantry. In furtherance of this latter object the Crown Lands Ordinance, 1878, Amendment Ordinance, 1913, was passed by the Council in December 1913, and regulations under the Ordinance were subsequently made for the disposal to small holders of the land in question.

A survey of the whole estate has now been made and the value of the several allotments approved under the regulations. As regards the Land Settlement (which constitutes the larger part of the estate), there are forty-seven allotments varying from 2 to 6 acres in area, at an appraised value of about £7 per acre. According to Mr. Brooks' report, these forty-seven lots occupy 165 acres, and roads are being laid throughout this area to give each allottee a right of way. Mr. Brooks further points out that the close proximity of the new Experiment Station and Plant Nurseries, situated on the remainder of the estate, should be of practical assistance to the land settlement holders. Moreover the Land Officer, residing on the estate, is available at all times to render assistance and advice.

Turning more particularly to the observations made in the report concerning the Experiment Station, it is stated that the present buildings contain sugar machinery (worked by water power) which is in excellent working condition, but the buildings themselves require careful attention to bring them into proper order. To undertake the whole of this work at one time would entail a somewhat heavy expenditure which the present sugar crop would hardly justify. It is therefore suggested that the work be done gradually.

In considering the improvement of the buildings on the estate, Mr. Brooks further calls attention to the possible development of lime cultivation in the Choiseul district, the rainfall of which (about 60 inches) is quite sufficient for successful cultivation of this crop provided that care and attention be given to the question of wind belts. Already on the estate an example is being set in this connexion by the planting of bamboo and Eucalyptus.

In view of the existence of the sugar-mill on the estate, assistance is being given to encourage the cultivation of good varieties of sugar-cane and seven ¼-acre plots have been laid out and planted up with the following varieties: D.109, D.625, D.116, B.147, B.376, B.208 and White Transparent. Records are being kept carefully as to the suitability of these varieties for local conditions, and later on cuttings will be distributed to Land Settlement holders.

In view of the fact that many months would have to elapse before the necessary legal arrangements could be made for the disposal of the land under the Land Settlement Scheme, arrangements were made at the beginning of 1913 to rent out as much of the land as possible to peasants for the cultivation of ground provisions, at a rental of 18s. per acre. Other land near the Choiseul River and village boundary, being unsuitable for general cultivation, has been reserved for house sites, at a monthly rental of 1s. Twelve sites have already been taken up and others are likely to follow. There have as well been several land sales which have helped or rather have been the principal source of revenue during the year under review.

At the time of writing, and indeed for several months previous, the principal requirement of the estate has been an adequate water-supply. The execution of the scheme whereby the nurseries are to be irrigated with water elevated by means of a hydraulic ram from the river which drives the sugar-mill, has been in progress for a considerable time, and as soon as this scheme has been brought to a successful conclusion it may be expected that the Experiment Station will be well equipped for the raising of seedling plants for the supply of the different estates, and for obtaining information concerning the local suitability of crops, that should be of the greatest assistance to the larger estates near by, as well as to the peasant owners on the Land Settlement.

In conclusion it may be of interest to record that a map of the estate has been received at this office. This shows on a scale of 4 chains to the inch the arrangement and areas of the allotments and the extent of the reserve and the position of the roads and the river.

Report on Agricultural Education, South Africa, 1912-13.—In the letter of transmittal of the Secretary for Agriculture covering this lengthy report, which runs into 184 pages, it is stated that hitherto votes for agriculture and agricultural education in the Union, although appearing separately on the estimates, had been dealt with as one vote, but in order to ensure better supervision and for other reasons it has been decided to deal with them separately, and to place each in charge of an Under Secretary. It is claimed that no country in the world is less understood from an agricultural point of view and therefore has greater need of a sound educational policy than South Africa. The country is vexed with more numerous, virulent pests and diseases of live stock and crops than any other, and the recent occupiers of the greater portion of the country are Europeans, and the methods of farming pursued, makes a knowledge of agriculture of an up-to-date kind difficult to acquire. Until quite recently, very little was done in South Africa in the way of agricultural education or research by the Governments and practically nothing by private enterprise. At the date of Union, the only research conducted was that undertaken by the Departments of Agriculture. When Union took place it became necessary to concentrate the threads of administration in the hands of a single Minister. This led to the centralization and association of education and research, the various local agricultural colleges which had previously existed being maintained and further strengthened by co-operation These colleges, situated in various parts of the country, possess farms which are representative of the agricultural conditions of the Union.

COTTON.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date May 29, with reference to the sales of West Indian Sea Island cotton:—

Since our last report about 100 bales of West Indian Sea Island cotton have been sold, chiefly St. Croix 18*d.* to 19*d.* with a few St Vincent at 21*d.*, also about 50 bales of Stains at 6½*d.* to 7¾*d.*

Prices continue firm for the finest qualities, but there is pressure to sell the lower grades.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending May 16, is as follows:—

There is no change to report in the market. The few Planters' crops which compose the stock remain unsold; but there is an order for one of them, which the Factors are unwilling to sell at the price offered.

This report shows that the total exports of Sea Island cotton from the United States to Liverpool, Manchester and Havre, up to May 16, 1914, were 4,391 bales, 6,777 bales, and 4,066 bales, respectively.

In Montserrat the weather being favourable during May, all the experiment plots for cotton have been planted, and the Curator states that arrangements have been made to supply larger quantities of cotton seed of the best strain, to cotton growers in the Presidency. It is estimated that the area this year under cotton is larger than that of last year, which was 2,200 acres, giving an average yield of 136 lb. of lint per acre, the climatic conditions not being altogether favourable.

An Ordinance has been passed in Montserrat to regulate the planting of cotton. No copy has yet been received at this Office, but on its arrival the said Ordinance will be reviewed.

The interest in bay trees continues at the present time in Montserrat, and numerous enquiries are being made for seedlings; but the Station's supply does not appear to be sufficiently adequate to meet the demand. It is expected that at least 20 acres will be planted from the seedlings now on hand.

The specimen of oil distilled from a plant known locally in Montserrat as geranium, which was sent to the Imperial Institute for examination, has been reported on as being of no commercial value.

It is reported that a meeting of members of the St. Vincent Agricultural and Commercial Society was held on June 10, to discuss methods for dealing with bovine tuberculosis in that colony, and the prospects of supplying the Canadian market with dried cassava roots.

THE SOIL AND PLANT GROWTH.

THE BACTERIAL TREATMENT OF PEAT.

The natural home of nitrogen-fixing bacteria of the Azotobacter type is not in a liquid but in the soil. This explains partly the failure of past attempts to cultivate this useful organism in appreciable quantities in liquid media for application to soils where it is lacking. Recently attention has turned to the growing of nitrifying bacteria artificially in solid substances, and Professor Bottomley, of King's College, London, has just published in the *Journal of the Royal Society of Arts* for March 13, 1914, results on the bacterial treatment of peat. At the beginning of the experiments numerous substances containing humus were tried, but all without success. Finally trials were made with peat, but the nitrifying organisms refused to grow in such a medium, even though peat is rich in humic acid, which can be converted chemically into soluble humates on which the nitrifying organisms might be expected to thrive. By a more or less happy chance, it was discovered that certain bacteria possess the power of converting peat into a 'humated' neutral medium in which Azotobacter flourishes well if the humating bacteria are killed off by sterilization before the culture of Azotobacter is added.

Having successfully prepared in this way the bacterized peat, the investigator made several series of analyses to show the extent to which the new substance is able to increase the nitrogen content in the soil It was found that the increase of nitrogen was so great in pot experiments, that if the increase could have been obtained throughout an acre of soil for a depth of 3 inches it would represent the equivalent of a dressing of 28 cwt. of nitrate of soda per acre, taking nitrate of soda to contain 15·6 per cent. of nitrogen.

The experiments at King's College were supplemented by a series of important independent trials carried out by the authorities at the Royal Gardens, Kew. A wide variety of plants was selected for treatment in these experiments, including Begonia, Asparagus, Primula, Carnation. Twelve plants of each kind were selected by the Curator of the Royal Gardens as being similar in size, age and health. The plants were potted up on April 20, 1912, and within ten days the effect of the peat was evident in increased growth and stronger development of the treated plants. This increase was maintained throughout the extent of the experiments, and in six weeks' time the treated plants were double to three times the size of the untreated ones. One very important fact demonstrated by the two experiments was that production, and especially root development, are promoted equally with increase of foliage. At Chelsea Physic Garden, a plot of radishes watered once only with an extract of the bacterized peat gave an increase by weight over 54 per cent. above the untreated plot. Equally striking results were obtained on some experimental plots at Eton School Garden. As well as this, the beneficial effects of bacterized peat as a top dressing for grass have been noticed by several experimenters, and remarkable results were obtained on the mid-Surrey golf course in the matter of the improvement of the greens—as described by the editor of the *Garden*, writing in *Country Life*, for November 1, 1914.

The question has been raised as to whether the results obtained are due to nitrogen fixation directly, or to a more general manurial effect. Probably both are important.

More recent experiments, however, indicate the probability of the presence of another factor. During the Kew experiments it was noticed that a small amount of bacterized peat often gave as good results as a heavy dressing. This was most evident when the treated soil contained plenty of available plant food. In an experiment with Richardias plotted up in heavily manured soil, it was found that a top dressing of about ½ oz. of peat to a 10-inch pot, doubled the weight of the treated plants in a month's time. Dr. Rosenheim, of King's College, obtained equally striking results on *Primula malacoides*, by treating twice only with the water xtract of 0 18 gramme (2¾ grains of bacterized peat).

Professor Bottomley ends his paper by drawing the conclusion that such effects cannot be due to the small amount of direct food material present in the peat or its extract added to the soil, and it was realized that in the prepared peat there is something which has the effect of stimulating and promoting growth in an extraordinary manner. Numerous experiments now in progress indicate that this 'something' is probably similar in nature, as Dr. Rosenheim has suggested, to the accessory food bodies recently found to play such an important part in animal growth and nutrition. If this is confirmed, it will go far towards explaining the specific action of bacterized peat as a fertilizer.

The Imperial Department has in view the carrying out of similar experiments to those conducted at Kew with cultivated plants in the West Indies. It is probable that cane megass or trash may provide a suitable substitute locally for peat. At all events, some of Professor Bottomley's material will be imported for the purpose of making a preliminary trial, and the results of this work will be made public in due course.

NITRIFICATION AND DISEASE.

Since the reproduction of Dr. Lipman's article* in the last issue of this journal on the possible relationship in California between a disease of citrus plants and the extent of nitrate formation in the soil by bacteria, another and more detailed paper† by Dr. Karl F. Kellerman and R. C. Wright has arrived, containing results of interest on the same subject.

Dr. Lipman's view is that the disease of citrus trees known as 'die back' is induced not merely by the lack of nitrate in the soil, but by the presence of ammonia which is believed to exert a toxic action on an otherwise healthy plant. The theory is, that in the absence of normal nitrification, and in the presence of sufficient ammonification, the tree does not obtain a sufficient quantity of nitrate for its development and is sooner or later forced to assimilate ammonia compounds as produced by ammonifying organisms in the soil; or in the presence of a sufficient amount of bases in the soil, even the ammonia may be set free, thus causing the plant to starve for want of nitrogen. But from experiments already conducted, it is confidently believed that the enforced absorption of ammonia compounds is the principal cause of the trouble. Tests are now in progress having for their object the artificial production of the disease in the green-house by the addition to soil of ammonia compounds. If these give positive results, then Dr. Lipman's hypothesis will be regarded as confirmed.

In regard to the equally disastrous and much more widely spread affection called 'mottled leaf' of citrus in California, Dr. Lipman considers that his hypothesis also explains the cause of this perplexing trouble. From their paper, referred to at the beginning of this article, it would appear that Kellerman and Wright hold a different opinion, and since their views are supported by considerable experimental data, they must for the present be accepted as constituting the correct explanation.

Kellerman and Wright assert that the general decadence of citrus trees in small areas scattered throughout the orange belt of California is due to over stimulation amounting in the critical cause to distinct poisoning owing to an excessive supply of readily available nitrogen in the form of nitrate Green-house experiments have been conducted at Washington with seedlings of grape fruit, sour oranges and sweet oranges; and although (as the authors point out), the results of laboratory experiments cannot directly be translated into field results, these results do indicate that the nitrate nitrogen in excess does produce the typical symptoms of the mal nutrition known under the name of 'chlorosis' or 'mottled leaf'. As well as nitrates, chlorides were found to be fatal after a certain limit of concentration had been reached, but not as fatal as nitrates. As might be expected, nitrates and chlorides together intensify the symptoms of injury, but moderate quantities of lime—less than 10 per cent. of calcium carbonate—exert a more or less protective action. It should be noted here, that while rather large quantities of calcium carbonate (limestone) are favourable, slight traces of calcium oxide (quicklime) or calcium hydrate (slaked lime) have an immediate toxic effect. The flocculating action and consequent improvement of soil permeability to the circulation of air and water renders it valuable from a physical as well as from a biological standpoint.

Perhaps the most significant part of the work under discussion was the study of the effect of different kinds of organic matter upon nitrification in the soil. Barley straw or pure cellulose when ploughed under may entirely eliminate nitrates from the soil through the utilization of all the nitrates in the soil by the bacteria which decompose straw and cellulose. Green manures, on the other hand, while causing some actual loss of total nitrogen do not materially disturb the ratio of nitrogenous compounds.

The total number of bacteria in the so called 'good' and 'bad' soil, is apparently without significance. The condition of fundamental importance is to control within reasonable limits the rate of nitrification. 'In pot experiments a normal rate of nitrification is shown to be possible with a green crop turned under, and it seems reasonable to recommend this practice in the field for maintaining the humus supply of the soil. The evidence of the above experiments suggests that the extensive use of mature straw is to be avoided, though light applications of straw to fields too high in nitrate, probably also with the liberal use of ground limestone, might be advantageous.'

From what has now been said it will be evident that Lipman's explanation does not hold good in the case of 'mottled leaf' though his view of ammonia poisoning may explain the cause of 'die back', which is an affection more definitely restricted to certain localities than 'mottled leaf'. Possibly, therefore, the soil conditions in places where 'die back' occurs are exceptional in the way Lipman describes. Little more can be said until the appearance of results in greater detail; and it would be interesting if a map could be published showing the distribution of these seemingly opposite soil conditions which in both their extremes are unfavourable for the healthy growth of citrus trees. Finally it must be remembered that the investigations of 'mottled leaf' have been concerned not with normal, but with irrigated soil.

* *Science*, May 14, 1914.

† *Journal of Agricultural Research*, Vol. II, No. 2.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

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Agricultural News

VOL. XIII. SATURDAY, JUNE 20, 1914. No. 317.

NOTES AND COMMENTS.

Contents of Present Issue.

The recent discussion in South Africa on climatic changes in that country has suggested the subject of vegetation and the conservation of rainfall, which is dealt with editorially in this issue.

Under the heading of Fruit and Fruit Trees, on page 196, a review is given of the canned pine-apple trade. An article on the exportation of grape fruit from East Africa also appears on this page.

Under Departmental Reports, on page 197, will be found a review of the work done in connexion with the new Government Land Settlement and Experiment Station in St. Lucia. A short note appears as well on the Annual Report on Agricultural Education (1912-13) in the Union of South Africa.

Two important articles entitled, respectively, Nitrification and Disease, and The Bacterial Treatment of Peat, appear under the general heading Soil and Plant Growth, on page 198.

Two notes occur in this issue dealing with tropical development, on pages 200 and 206 respectively.

Under Insect and Fungus Notes, a new invention in the form of a soil sterilizer composed of carbon bisulphide in emulsion is described in detail on pages 202 and 203.

Publications of the Imperial Department of Agriculture.

The next number of the *West Indian Bulletin*, Vol. XIV, No. 2, will contain papers on soil chemistry, veterinary science, and miscellaneous subjects. An interesting study of the results of the manurial experiments with cacao conducted at the Botanic Station, Dominica, will appear in the form of a paper by Mr. H. A. Tempany, whilst the same writer contributes another paper on the bacterial relationships of certain soils in the West Indies. Three papers on veterinary subjects will appear, written by Mr. P. T. Saunders, M.R.C.V.S., Veterinary Officer to the Imperial Department of Agriculture. These comprise the following subjects: Spraying for the Control of Ticks in Antigua, Notes on Some Parasites of Live Stock in the West Indies, and a paper on Mal de Caderas.

The 1914 edition of the West Indies in Canada is now nearing completion, and will be issued about the middle of July. It will contain one or two new features, and many changes have been made in respect of the illustrations. In connexion with this publication (which is distributed gratis at the Canadian National Exhibition held at Toronto), it may be mentioned again that Mr. C. S. Pickford, of the firm of Messrs. Pickford & Black, Limited, Halifax, has advised that non-perishable goods should go forward by the S.S. 'Chignecto', leaving Demerara July 23, and perishable goods by the S.S. 'Chaudiere', leaving Demerara August 27. (See *Agricultural News* for May 9, 1914.) Mr. Pickford has further advised that adequate and prominent space has been secured for the display of the West Indian exhibits.

Tropical Development.

Of recent years much more attention has been given in England and other European countries to the development by means of capital and literature of the Tropics than was formerly the case. An attractive publication, entitled 'Invest in the Tropics' has recently been issued by the Tropical Agriculture Development Agency, London. This book describes in a popular way the cultivation and the scope before the investment of capital in tropical crops. Reference is made to the rising prices of food and to the increased demand in manufacturing centres for raw produce like oils and fibres. As might be expected, a large amount of attention is given to coco-nuts, owing to the wide varieties of uses to which this plant can be put and its general importance in the manufacturing industries.

Special reference is made in places to the position of tropical agriculture in the West Indies, and on page 48 will be found an extract from an editorial in the *Agricultural News* on the market prices for West Indian coco-nuts, and another on page 103, which discusses the market conditions in respect of the lime industry.

The publication is well illustrated, and should serve a useful purpose in the matter of bringing the Tropics more prominently before the eyes of British and American investors.

Meat Scarcity in Temperate Countries

An article in *The Times* for May 19, 1914, calls attention to the increased world's competition for meat supplies which is being felt in certain temperate countries. The United States which used to send huge consignments of meat to Great Britain has sent nothing at all during the last two years; instead it has abolished its meat tariff and is importing on a large scale. At present the keenest competition is taking place between British and American buyers for the available supplies of Argentine and Australian meat.

All this as regards England makes a call upon the British farmer, but it is a question for doubt as to whether he will be able to cater fully for the increased demand.

The advancement in the price of meat will have a tendency to reduce its consumption, and the public are likely to resort to a greater extent to highly rich albuminous food of a vegetable nature imported from the Tropics. In this way the competition for the supply of meat may be of indirect value to the Tropics. Finally, there are some grounds for suggesting the possibility for certain parts of the Tropics, where large tracts of pasture land occur, or where conditions are in other ways suitable for the production of meat (for instance, pork), to seize upon the present economic situation described in *The Times*, and endeavour to establish a trade, though it even be small at first, with European countries, and possibly America, in animal products.

Agricultural Progress in the German Protectorates.

The interesting information presented in the form of an abstract in the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases* (April 1914) was derived from the official report of 1914 published by the Imperial Ministry for the Colonies, on the German Protectorates.

During the year dealt with by the report, the market conditions for the principal products exported were favourable, with the exception of those for rubber. Sisal yielded good crops and sold easily at high prices, whilst the production of coffee increased. In the Kameroons there is good future prospects before a flourishing banana industry owing to the formation of a firm for the exportation of this fruit. In Togo, the plantations have increased in number and in extent. In German New Guinea, a similar extension has occurred.

The establishments of the Administration for the Promotion of Agriculture have continued to develop and have displayed great activity, especially in German East Africa. Extensive veterinary measures for the control of cattle plague have been organized in this colony, and in German South-West Africa, the campaign against the diseases of live stock in general has been continued. In German New Guinea, the basis of a veterinary service has now been laid. The agricultural experiment station in Samoa during the year under review has been newly organized and special attention is being paid to the Phytopathological Service. For forestry, the chief measures have consisted in the creation of new forest reserves, especially in East Africa and in Togo. The forest reserves in East Africa extended, in 1913 (April 1), over an area of 1,833,817 acres against 1,197,040 acres in 1912.

The foreign trade of all the protectorates rose from £11,700,000 in 1911, to £12,890 000 in 1912. This is principally due to the total increase of trade in East Africa.

Manurial Experiments in the German Colonies.

In connexion with the above outline of agricultural progress in the German Protectorates the same journal calls attention in another abstract to the extensive scheme of manurial experiments recently planned in the German tropical Colonies.

In Kameroon, in order to establish a rational system of manuring, the Agricultural Experimental Institute at Victoria has organized a series of manurial trials based on the system adopted by the German Agricultural Society and modified according to local requirements. Thirty-two series were running in 1911-12, and these were increased to forty-seven in 1913, embracing the following crops—cacao, Funtumia, Hevea, Manihot, oil palm, bananas, tobacco, maize, cotton, earthnuts, sweet potatos, and pine-apples.

In Togo, the agriculture is chiefly in the hands of native cultivators, and here the manurial trials are being carried out on their own plantations in the hope of eventually inducing the peasants to use fertilizers. In German New Guinea, thirty-five series of trials are now in operation distributed over the same crops mentioned under Kameroon in addition to coco-nuts, coffee, castor oil and vegetables.

The result of the first year's trials in Samao is said to have shown that in the case of the taro crop (*Colocasia antiquorum*) the experimental plots, which had previously been under cacao, gave on manurial treatment crops of tubers equal to those on virgin land. Moreover the formation of these tubers was greatly stimulated, and the number of new shoots formed averaged ten per plant or twice the usual number, so that not only was the harvest larger but the means of propagation was also increased.

Owing to the trials referred to above having only recently been instituted, conclusive results in the majority of cases are not yet available. But from the organized nature of the experiments it would seem that in a few years time they should provide much useful and interesting information that may in certain cases be applicable even under conditions obtaining outside the German Colonies.

Department News.

Mr. P. T. Saunders, M.R.C.V.S., having concluded his term of appointment on the Staff of this Department leaves the West Indies for England by the R.M.S. 'Danube' on the 24th instant. Mr. Saunders will represent the Department at the forthcoming International Veterinary Conference in London.

INSECT AND FUNGUS NOTES.

THE USE OF CARBON BISULPHIDE IN EMULSION AT MARTINIQUE AND GAUDELOUPE.

Experiments have been made from time to time in the British West Indies on the use of carbon bisulphide as a soil insecticide and soil disinfectant, on the lines of the methods which have been claimed to be very successful in European vineyards. It has been found that the application of carbon bisulphide in its ordinary form gives very unsatisfactory results with our soils and crops. The need of a good and cheap soil-sterilizing agent for dealing with the root diseases of permanent crops is strongly felt, and the need of a means of destroying root grubs not less so.

We are much indebted to Mons. G. Bordaz for copies of the Martinique newspaper, *La Paix*, for May 9 and 14, 1914, containing an article of which he is the author dealing with the preparation and use of carbon bisulphide in emulsion.

It may be noted that the root disease (*pourridié des racines*) of which Mons. Bordaz speaks is most probably a Rosellinia disease, similar to, or identical with those occurring in St. Lucia and Dominica, while the name *Diaprepes famelicus* is synonymous with *Exophthalmus famelicus*, an insect differing little from *Exophthalmus esuriens* and the various species of Diaprepes occurring throughout the West Indies.

The article, freely translated, and with British weights and measures and Barbados prices substituted is as follows:—

Cacao, coffee, lime and other trees are destroyed in Martinique as in Guadeloupe by different animal or vegetable parasites, the most common of which are the white grubs and the eel-worms among the animal parasites, and the root disease amongst the vegetable.

Among the white grubs the most dangerous is the larva of a handsome beetle very common in our colony—*Diaprepes famelicus*. This larva is found to some extent in all soils, but particularly in those of an alluvial nature. It is this larva which causes, in most cases, the death of the young cacao trees, which comes unexpectedly and rapidly in a spell of sunshine, and is ordinarily attributed to crickets or to the story of the tap roots coming in contact with stones heated by too ardent a sun, etc.

We have been able to confirm the fact that it has attacked the plantations of lime trees established a few years ago. In short, one can say that it is found wherever the newer crops have replaced sugar-cane. It is doubtless for this reason that it is commonly said that permanent crops, and notably cacao trees, cannot succeed in land previously planted for a long time in sugar-cane.

The eel-worms chiefly attack coffee, and especially Arabian coffee, known here as Martinique coffee. In various studies published in 1899, M Thierry, now Chief of the Department of Agriculture and a cacao planter at Case Navire, has fairly proved that the eel-worm was the principal cause of the disappearance of the well-known plantations at Vauclin. He has proposed either grafting on Liberian stocks or treatment with carbon bisulphide, but his has merely been a voice crying in the wilderness, and if we still have a little coffee in Martinique we owe it to the plantations of Liberian and of Robusta coffee which have by degrees been established, whereas a simple treatment with carbon bisulphide would have helped to supply the necessary vigour to the Arabian coffee trees, dying then, and now dead, and to produce once more good crops and bring back prosperity throughout the region now ruined and desolate.

The root disease occurs most frequently in compact damp soils, and also in light soils superimposed on an impermeable subsoil. Its attacks are particularly serious during rainy years. It is almost as terrible an enemy for permanent crops as the Diaprepes. Now these three diseases, serious as they are, are all easily curable by the treatment with carbon bisulphide. The experiment was first made, as has been said above, for the eel-worm and the root disease on coffee trees. Later, after long and expensive investigations carried out on the plantation of Case Navire, M. Thierry asserts that the larva of Diaprepes is unable to withstand a similar treatment.

Several proprietors in the colony followed his example and their plantations have been kept out of danger.

On the strength of such conclusive results one hoped that the use of carbon bisulphide would become general and that a simple occasional treatment would be a regular and ordinary method of cultivation. Such a hope was vain.

Under the impulse given by the Department of Agriculture, which freely distributed plants of the best species to those planters who asked for them, many new plantations were tried. This distribution of plants was practically a complete loss, the new estates succumbing steadily and fatally under the attack of Diaprepes, the eel worm and the root disease. The results of these numerous and expensive free distributions of plants are to be summed up now as follows: The Arabian coffee has practically disappeared from cultivation in the colony, and in spite of the coming in of important cacao cultivations, and in spite of the large number of young plants delivered for about ten years by the Department of Agriculture, we see that the exportation of cacao not only makes no progress but has rather a tendency to diminish. The year 1913 only shows an output of 528,000 kilos., whilst the average for the last five years reached 555,000 kilos.

Leaving other reasons on one side, one may say that apparently the difficulties the proprietors found in procuring the carbon bisulphide, and the difficulties that appeared in its use afford reasons why this treatment, so efficacious in every case, has not been more generally applied.

This difficulty has now disappeared and there only remains to be considered the method of employment.

On large properties, without doubt, the use of emulsion pumps is always to be recommended. At Case Navire, the Fateur pump is employed. The results are marvellous. The white grub and also the root disease disappear as if by magic, and where one only saw trees wasting away, there is established a uniform and luxuriant vegetation. But the emulsion pump is not within the reach of everyone. If it is cheap in the application of the treatment, it is expensive to buy, difficult to transport on rough lands, and must be handled delicately.

On the other hand, the soil injector (pal) which gave such convincing results in France in the war against Phylloxera, is less to be recommended for cacao and coffee trees because their root systems differ from that of the vine. It gives unequal and frequently dangerous results, and is almost always useless in compact soils or soils of an insufficiently friable nature. For small planters the purchase price is again somewhat high.

Under the circumstances, the most efficacious method is to pour the emulsion round the foot of each tree. After the results obtained by M. Thierry on the Case

Navire estate, we pointed out to M. Castelli, Professor of Agriculture, the possibility of making an emulsion of carbon bisulphide with alcohol. Carbon bisulphide is soluble, part for part, in pure alcohol. On pouring this solution into an appropriate quantity of water, and shaking it briskly, a sort of emulsion is obtained, representing fairly exactly that produced by the special pump employed at Case Navire.

We know from information given by M. Castelli and by the Department of Agriculture that this mode of procedure was tried with success by several proprietors.

But the emulsion with alcohol presents certain inconveniences We propose to replace it by another kind—an emulsion made with oil, which is much more practical, still less expensive, and very easy to use. It is prepared as follows:—

1. Mix together equal volumes of carbon bisulphide and vegetable oil of the lowest quality obtainable (castor oil or cotton seed oil). The mixture is easily made and forms a sort of stock solution from which one may make emulsions of the required strength.

2. Take the required quantity of water and make it alkaline by the addition of about 1½ oz. of carbonate of soda (washing soda) to each gallon.

3. Into the quantity of water to be employed per plant pour the required dose of the mixture of carbon bisulphide and oil.

The period of treatment is preferably during the months of September and October for cacao, and those which follow on the dry season in the case of coffee. In the one case as in the other, one catches the eel-worms and the Diaprepes larvae at the commencement of their development, before they have been able to commit their depredations. These times coincide moreover with those periods when on all the plantations it is easy to store a sufficiency of rain-water near enough to the scene of operations to render the carrying out of the treatment as economical as possible. Although the rainy season is recommended as the time of treatment, it does not follow that one should choose rainy weather to make the application. It is, on the contrary, preferable to work in fine weather in order that the dry soil will rapidly absorb the emulsion. Treatment carried out in rainy weather means trouble thrown away.

The appropriate dose and the method to be employed vary with the parasite to be destroyed and with the nature of the plant attacked. According to M. Thierry one should work as follow:

Arabian coffee.—The parasite to be feared and to be destroyed is the eel-worm. The emulsion should contain 1 part of carbon bisulphide or 2 parts of the stock solution to 1,000 of water, that is to say ½-oz. of the stock solution to each gallon of water. With this soak round the foot of the tree within a radius of 16 inches, after having stirred the soil to facilitate the penetration of the liquid. A sufficient amount should be used to impregnate the soil to a depth of 4 inches. It requires 4 to 10 pints of emulsion per tree according to the age of the plant.

Cacao.—The emulsion should be much stronger. A strength of 1 part carbon bisulphide per 1,000 is not sufficient to kill Diaprepes; double that strength, namely ⅔-oz. of the stock solution per gallon of water is required.

The larvae of Diaprepes are destructive throughout the districts with alluvial soils and the treatment applied for that larva serves at the same time to destroy the root disease, for which a strength of 1 per 1,000 appears to suffice.

For application of the emulsion to cacao, make round the stem of the tree a trench 6 to 8 inches in breadth and 2 to 4 inches in depth, according as to whether the primary roots are found near to, or distant from, the surface. No attempt should be made to uncover the lateral roots, so as to avoid wounding or barking them. After loosening the soil at the bottom of the trench, fill the latter with the emulsion of a strength of 4 parts of stock solution per 1,000 of water, using 4 to 10 pints according to the size and age of the plant. As much as 18 pints may be used for the larger trees if sufficient water to go round is available.

In Barbados, carbon bisulphide (Fuma Brand) is obtainable in 5-gallon drums at 15c. per ℔. Crude cotton seed oil may be obtained at present at about 75c. per imperial gallon. Washing soda is sold at 4c. per ℔. Taking the quantity of emulsion used per tree at 1 gallon, the cost is as follows:—

·6 oz.	carbon bisulphide at 15c. per ℔.	·6c.
1·5 "	carbonate of soda at 4c. per ℔.	·26c.
·6 "	cotton seed oil at 75c. per gal.	·28c.

The cost per adult cacao tree using the stronger emulsion is thus a little over 1c.

To sum up, the carbon bisulphide destroys white grubs, and eel-worms, and cures root disease, the principal causes of the death of the trees. In addition, it has the faculty of sterilizing the soil, that is to say, it destroys the toxins which have a prejudicial effect on vegetation. This fact alone leads to results which justify its use.

It would be wrong to consider the treatment as resting on a purely theoretical argument. It is by its application as a preventive during many consecutive years that M. Thierry has saved his cacao plantations, which were ravaged by the larva of Diaprepes. The area thus cultivated, treated, and maintained in prosperity enables it to be said that the method is not merely one of the laboratory.

The preventive treatment with carbon bisulphide constitutes there not merely an occasional operation but a regular agricultural practice.

EXOPHTHALMUS ESURIENS.

In 1912, *Exophthalmus esuriens* was found in St. Kitts associated with root borer grubs in sugar-cane in such a way as to cause it to be suspected of being the parent form of these grubs. Information is not yet available as to the amount of injury caused by the feeding of the grub of this species on the roots of lime trees. It will be seen, however, from the article which appears on this page that a closely related form, *E. fameliens*, is known to be a serious pest of lime, cacao and other trees, the grubs feeding on the roots and causing the death of the trees.

During the present year, a severe attack of root borer in canes on one estate in St. Kitts has been accompanied by a remarkable abundance of the weevil *Exophthalmus esuriens*, some 40,000 of these insects having been collected on cotton plants in fields adjoining those in which the sugar-cane was so severely attacked by root borer. The grubs had completed their growth and development at the expense of the canes, and the adults, on emerging, had congregated on the cotton plants for the purpose of feeding and mating.

About the same time, these weevils made their appearance in great numbers at the Botanic Station in Montserrat, where they were feeding on the leaves of limes and other citrus plants. During the present month (June), a similar occurrence has been reported from Antigua where 47 acres of limes have been attacked, 7 acres badly, the remainder somewhat, by these weevils. At this place, 23,400 weevils were collected in four days.

GLEANINGS.

A catalogue on lime-crushing machinery, lime concentrating plants, and of various accessories for the transmission of power, has been received from Mr. T. A. Siddall, engineer, 19 St. Dunstan Hill, London, E.C.

L'Agronomie Coloniale for April 30, 1914, publishes statistics to show that in 1913 there has been a considerable increase in the exports of sugar, molasses, rum and cacao from Martinique. A reduction is indicated in the case of coffee and cassava

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Archief voor de Suikerindustrie in Nederlandsch-Indie (April 1914) contains two interesting botanical articles respecting the sugar-cane: (1) the course of the bundles, and the cortex of the root; (2) a comparison of the taking in and giving out of water in sereh-diseased and healthy plants.

Recent issues of the *Louisiana Planter* have contained an interesting series of articles on the electrification of cane sugar-mills. These contributions are by Mr. W. S. Scott, and are illustrated by a large number of interesting photographs, which clearly show the details, and the working of the whole system.

Mededeelingen Van Het Agricultuur Chemisch Laboratorium (Nos. VI and VII) contain interesting articles on the results of manurial experiments carried on in Java with ground nuts, cassava, sweet potatoes, etc. The general instructions as regards manuring (No. VI, p. 66) appear especially interesting.

It is stated in the Annual Report of the Inspector of Schools on Elementary Education in Trinidad, for the year 1912-13, that distinct progress has been made in the schools as regards nature study and agriculture. The necessity, however, is keenly felt for the supervision in this work of a specialist in agricultural education.

The exports from British Honduras for 1911 and 1912 are published in the *Canada-West India Magazine* for May 1914. Except in the case of rubber and sugar, all the exports have shown an increase The output of cedar has been nearly doubled, whilst large increases have occurred in the case of mahogany, coco-nuts, rum and bananas.

The contents of *Der Tropenpflanzer* for May 1914 include articles on sheep, ostriches, and as regards crops, Manihot rubber (German East Africa trade in 1913), and the oil palm industry. It is notified in this copy that a new German book has been published on cotton culture—'a pure compilation, whose author is neither an agriculturist nor a botanist.'

In Antigua the kiln drying of corn experiment was finished during May. The Curator states further that increased interest is being taken in the coco-nut industry, and that about 7,000 nuts will be needed for planting purposes this year. Furthermore, in consequence of good rains received during May, the young cane crop in this island is rapidly recovering from the effects of drought.

Studies of Ammonification in Soils by Pure Cultures is the title of Vol. I, No. 7, of the University of California publications in agricultural sciences. In this Dr. Lipman and C. B. Burgess state that marked differences have been observed in the ammonifying power of fifteen organisms in pure cultures. The nature of the soil as well as the nature of the nitrogenous material, markedly modify an organism's ammonifying power.

In connexion with the report in this issue on the Réunion lands in St. Lucia, the *Voice of St. Lucia* (May 23, 1914) calls attention to the allotments which are now available for purchase, and states that applications for these lots are now invited and should be made in writing to the Land Officer, Réunion estate, Choiseul, St. Lucia, who will proceed to allocate in accordance with the regulations referred to in the review on page 197 in this issue.

The Acting Curator, Tortola, Virgin Islands, reports that there has been a considerable amount of activity displayed by cotton growers in the matter of cleaning up their lands, thereby ensuring an early planting for the coming season. In this connexion, the address given by the Acting Curator to growers on cotton and coco-nut cultivation at Virgin Gorda may be regarded as having served a useful purpose. At the meeting referred to the Chair was taken by His Honour the Commissioner.

During May, a considerable amount of time was devoted by the agricultural officers at the Island Experiment Stations in connexion with the forwarding of exhibits to the International Tropical Products Exhibition now open to the public in London. At Dominica, it is proposed that exhibits will be forwarded also to the Canadian National Exhibition at Toronto. The proposal has been sanctioned by the Government. Exhibits are also being forwarded from Antigua, St. Kitts-Nevis, Montserrat, St. Lucia, St. Vincent, Grenada, Barbados, and Trinidad.

In England public interest is being aroused in what is known as 'vegetable milk' manufactured by infusing in boiling water the bruised kernels of the Soya bean (*Glycine hispida*). The *Botanical Journal*, for April 1914, remarks that the infusion contains both fat and casein, and can well be used as a substitute for cows' milk in certain conditions. Unlike cows' milk, it does not readily become rancid, and will keep for any reasonable length of time. Of late years, it has been manufactured in Germany, where it is said to have met with a favourable reception. A question was asked in Parliament as to whether the article was likely to be sold under the name of ordinary milk. The President of the Board of Trade replied that such an action would be open to procedure under the Sale of Foods and Drugs Act.

STUDENTS' CORNER.

AGRICULTURAL EXAMINATIONS.

In view of the approaching annual examinations of the Imperial Department, which are held in October and November, registered students should now be devoting steady attention to their reading and estate observations. These courses, which are essentially designed for overseers, cover three years' study. The first year's work includes general agricultural science, but students who have passed the Cambridge Local in Agricultural Science or equivalent examinations are exempted. In the second year, the work includes special study of insect pests and fungus diseases of the special crops with which the candidate is concerned, and the cultivation and general estate practice on which the production of these special crops depends. For the third year the work should be of a more general nature, and the reading should be wide, since the final examination is intended to test the candidate's ability as an estate manager and not merely to determine the extent of his knowledge of isolated facts and acquaintance with practical operations, although this is the aim of the second year or intermediate examination.

A guide to the literature that should be studied in connexion with these courses is presented in the form of a Circular which can be obtained from the local Agricultural Officers. Most of this literature is inexpensive and easily obtained, since much of it is published by the Imperial Department in Barbados and some of it is furnished to students registered free of charge.

It is scarcely necessary to dwell upon the benefit which may be derived from serious study along the lines suggested above. The educational value is considerable, whilst from a purely utilitarian standpoint much value is to be placed on the work—a fact amply demonstrated by the recognition which successful candidates have in the past received from their employers. Moreover, apart from the improved scientific equipment—which must ensure better and more efficient work in every-day life—the success achieved by voluntary application is in itself a useful index of personal keenness.

For several issues the questions usually set for the three courses of study have been omitted. With a view to the stimulation of increased attention the system of questions is now revived.

Questions for Candidates.

PRELIMINARY QUESTIONS.

1. Give an account of any animal pest of cotton that is not an insect.

2. What is nitrification? What different kinds of soil treatment increase the rate of this process?

INTERMEDIATE QUESTIONS.

1. What would you do to protect seedling limes from drought? Explain carefully the effect which the treatment has.

2. Give an account of the various trees commonly employed for wind-break purposes on cacao and lime plantations. What are the various economic advantages and disadvantages of the trees?

FINAL QUESTIONS.

1. Describe in detail the preparation for shipment, under co-operative conditions, of either (a) onions or (b) cotton.

2. Write an account of the so-called minor industries in the West Indies, and indicate, in the case of those you are in touch with personally, what might be done to stimulate their development.

NOTES ON AGRICULTURAL CO-OPERATION AND SMALL HOLDINGS.

In view of the important position occupied by Land Settlement Schemes in several of the West Indian Colonies, these notes on agricultural organization in Great Britain (abstracted from the *Journal of the Board of Agriculture*, May 1914) should be of some local interest.

According to the reference quoted, the total quantity of land acquired for small holdings under the British Small Holding Act up to December 31, 1913, was 182,022 acres, 125,971 acres having been purchased for £4,126,421 and 56,051 acres leased for rents of £68,291 a year. It appears that the Act has resulted in the provision of small holdings for 17,005 applicants in six years. During this time applications for land have been made to the County Councils by 43,245 individuals and eighty-nine Associations, and a total quantity applied for amounts to 723,497 acres. Of the individual applicants, 25,567 were provisionally approved as suitable, and 17,005 of them have obtained holdings. The proportion of applicants who express any desire to purchase holdings shows no signs of increasing, the percentage remaining at less than 2 per cent. of the applicants who express any definite preference in the matter. The number of applicants in 1913 who had been described as agricultural labourers were 988, which is nearly 24 per cent. of the total number. This is a smaller proportion than was the case in previous years, but the classification is necessarily not very exact, and the figures can only be regarded as an approximate estimate. In the majority of cases, an agricultural labourer in regular work has neither the time nor the capital to cultivate a small holding, and the needs of men of this class are more suitably met by the provision of small allotments, which they can cultivate in their spare time. The majority of the applicants for small holdings are either men who have small quantities of land already and want more, or men who have some business of their own which does not occupy the whole of their time.

The average price of land purchased by County Councils in the six years was £32 12*s.* 5*d.* per acre, and the average rent of the land leased was £1 4*s.*

Within the last two years (namely 1912 and 1913) the amount of land annually acquired has shown a reduction having been 36,358 in 1911, 33,493 in 1912, and 24,493 in 1913, though the largest quantity of land, 39,472, was acquired in 1909. The decline appears to be due mainly to the fact that in the earlier years the Councils were occupied in acquiring land for those applicants whose needs were most easily satisfied, and that at the present time these are left with all the difficult cases. At present the Councils have to deal principally with the application of men whose requirements can only be satisfied by the acquisition of land in close proximity to their present homes.

The Board of Agriculture has made enquiries as to whether the rent charged for the Small Holdings established under the Act have been paid punctually, and, with few exceptions, the replies received have been in the affirmative.

MISCELLANEOUS NOTES.

IMPERIAL DEVELOPMENT.

The Imperial Edition (May 23) of the *Financier* will be found to contain a perfect symposium of information on the material resources of the Empire. The edition, which runs into sixty-four pages, profusely illustrated, presents an account of the political history, the physical features and commercial achievements of the various busy centres of population distributed through the Colonies and Dominions. The great British industries of shipping and ship building, which have played such a conspicuous part in the exploitation and consolidation of the Empire find a place in the pages under review, whilst consideration is given as well to mining, agriculture, and various other fields for the investment of capital. It is recorded that out of the total capital of £3,700,000,000 supplied by Great Britain up to the end of last year, nearly £1,800,000,000 has been furnished to the Overseas Possessions.

A new feature of the Empire number is the section devoted to a discussion of the opportunities in the Dominions and Colonies for the rising generation in England. The information in regard to these matters has been obtained from authorities who are eminently fitted to give their views.

Considerable space is devoted to an account of the resources and opportunities of the West Indies, and an account of the opening in this part of the world for British capital and settlers is described by Mr. A. E. Aspinall, Secretary of the West India Committee, in an interesting interview with a representative of the *Financier*.

ORGANIZATION OF THE PIG INDUSTRY.

An instructive article contributed by the English Agricultural Organization Society to the same Journal outlines what might be done in English country districts to make pig breeding, rearing and fattening more profitable than it is under present conditions. The aims of the organization would be to place on the market an article of the quality and in the form demanded by the consumer; and to eliminate the unnecessary profit between the producer and consumer with a view to obtaining a better price for the former. The erection of bacon factories is advocated, though in this connexion it is pointed out that a regular weekly supply of pigs and thorough management together with a large amount of capital and the existence of loyalty amongst the members are essential.

Through the organization society live pigs could be sold, and one of the greatest advantages which might be derived from the former through the co-operation under consideration, would be the possibility of improving local breeds by providing for the use of members a number of well bred and suitable boars. These animals would be sent out to members in different parts of the district covered by the society and would be available for the use of members at a nominal fee. An essential feature of the system would be that the district of each boar would be changed every year.

RUBBER.

A pamphlet on rubber and balata in British Guiana, 1914, prepared by the direction of the Governor of British Guiana, states that the yield at Hills plantation (Mazaruni River) was 1 lb. 12 oz. of dry rubber per tree for nine months. At Onderneeming (Essequibo) a yield at the rate of over 4 lb. per tree per annum has been obtained: whilst in the North-West District, 3 lb. per tree per annum is being maintained. The above figures show that most satisfactory yields of rubber have been got, and the results compare favourably with the best yields obtained in the East.

The *India Rubber World* (June 1, 1914) describes a somewhat ingenious wash bottle for use in laboratories. The employment of this apparatus obviates the practice of placing a tube in the mouth in order to operate the washbottle. The apparatus calls for the use of a three-hole rubber stopper, a slit rubber tube and a rubber valve, as well as a glass rod and glass tubing. Simultaneous pressure of the valve and of the finger on the relief tube creates a pressure within the bottle which will cause the liquid to flow through the spout. When the finger is removed from the relief tube the flow of liquid is instantly shut off.

Attention is drawn in the *India Rubber World* (June 1, 1914) to the forthcomeng International Rubber Congress and Exhibition at Batavia, Java. The preliminary programme of the Congress, which will be held during September 7 to 12 of the present year, is a notable one. This programme, copies of which may be obtained on application to Dr. A. A L. Rutgers, second Secretary of the Congress Committee, Buitenzorg, Java, contains a list of the papers and addresses that will be read These include papers by Professor Went, Mr. Henry C. Pearson of New York, Professor Baur of Berlin University, Dr. P. J. S. Crammer of Buitenzorg, and several of the British Agricultural officials from the Federated Malay States and Ceylon.

ONION TRADE.

On March 28, 60 crates of onions were shipped from Antigua to Canada. These crates were examined by the officials of the Antigua Onion Growers' Association. Thirty were passed as being up to standard; the other 30 were not up to requirements and were not marked by the Association. Account sales have since been received, and the results show that the 30 crates certified by the Association were sold at $1·80 per crate, and the 30 uncertified at $1 30 per crate: gross results, $54 and $45 respectively. The above shows the sound lines on which the Association is working and that it deserves the support of all onion growers. (The Antigua *Sun*, May 9, 1914.)

With further relation to the Antigua onion industry it may be mentioned that the Superintendent of Agriculture for the Leeward Islands has recently forwarded a copy of the scheme which has been put forward as a basis for extending the operation of the Growers' Association. It is proposed that the onions will in the first place be purchased at a flat rate of not less than 1c. per lb. from growers spot cash. After deducting the expenses of grading, sale and shipment and 3 per cent. commission for the Association, the surplus proceeds of the season will be distributed *pro rata* amongst the growers.

RICE.

The Physiology of Germination.— The *Monthly Bulletin of Agricultural Intelligence and Plant Diseases* (April 1914), states that during a series of years the conditions of germination of rice have been studied, and the results hitherto obtained are summarized as follows: the maximum, optimum, and minimum temperatures for the germination of rice are 40°C., 30° to 35°C., and 10° to 13°C., respectively. From the practical point of view it is important to know, that the development of strong seedlings is favoured by warm irrigation water; light exerts no influence on the germination of rice; the same holds true for light of varying refraction; rice germinates equally well both in water and in air, when the grains are husked or unhusked, and when the grains are treated with water which contains oxygen or which has been deprived of it by boiling; the plumule appears sooner if the grain is placed in favourable moisture conditions than in water; the radicles and crown roots develop considerably sooner in the air than in water; the stem grows much more rapidly in water than in the air. The opposite is the case with the radicles and crown roots; the frequent renewal of the water in the experiment had no sensible effect upon the development of the stem or roots; the same holds true for differences in the depth of water, provided they keep within the limits of 3 to 20 cm. (1·2 to 8 inches); the suitable degree of moisture for the germination of rice is 60 to 95 per cent. by weight of the seed-bed's capacity for water; rice grains are saturated by an amount of water equal to about 25 to 30 per cent. of their air-dry weight; rice grains cannot be made to germinate until they have absorbed about 25 per cent. of their air-dry weight of water; the loss of weight of the unhulled grains during steeping amounts to only 1·5 per cent. of their weight, even after twenty days, if the temperature is 10° to 15°C. (50° to 59°F.).

WEST INDIAN PRODUCTS.

DRUGS AND SPICES IN THE LONDON MARKET.

Mr. J. R. Jackson, A.L.S., has forwarded the following report on the London drug and spice markets for the month of April:—

The period under review covers five weeks namely, from April 1 to 30, both inclusive. During the first three weeks there was very little activity in the markets which, however, improved towards the end as the following notes will show.

GINGER.

At the first spice auction on the 1st of the month the offerings amounted to 644 bags of Cochin, new crop, 350 of which were sold, fair bright washed rough fetching 26*s.* per cwt., 50 bags of limed Japanese were also offered and bought in at 24*s.* Privately, it was stated that the quotations for Jamaica were 37*s.* to 38*s.* for common, and 45*s.* to 50*s.* for medium to good. A fortnight later the offerings amounted to 253 bags of Jamaica and 80 bags of Cochin, a part of each was sold, the former at 36*s.* to 47*s.* and the latter at 21*s.* for wormy, washed, rough.

NUTMEGS AND MACE.

At the spice auction on the 1st of the month nutmegs were represented by 256 packages of West Indian, the bulk of which were sold at the following rates: 59's 11*d.*, 65's to 75's, 6½*d.* to 9*d.*, 77's to 86's 5½*d.* to 6*d.*, 90's to 100's 4¾*d.* to 5¼*d.*, 101's to 111's 4½*d.* to 5¼*d.*, 130's 4¼*d.* A fortnight later namely on the 22nd, 109 packages of West Indian were brought forward and sold at slightly varying rates. Mace was in good supply at each of these auctions, at the first 52 packages of West Indian were disposed of at 1*s.* 9*d.* to 2*s.* 4*d.* and broken at 1*s.* 7*d.* and at the second 34 packages at 1*s.* 9*d.* to 2*s.* 2*d.* and broken at 1*s.* 4*d.* to 1*s.* 8*d.* per lb. Four cases of Java red were also sold at 1*s.* 10*d.* per lb.

SARSAPARILLA.

At the first drug auction on the 2nd of the month Sarsaparilla was in steady demand, and was represented by 13 bales of grey Jamaica, 20 of Lima-Jamaica and 7 of native Jamaica; of the former 12 bales were disposed of at 1*s.* 10*d.* to 2*s.* per lb. being nearly one penny per lb. advance on previous rates. Six bales only were sold of the Lima Jamaica which realized 1*s.* 8*d.* per lb. Six bales also of the native Jamaica were also sold at 1*s.* 2*d.* for good red and 1*s.* to 1*s* 1*d.* for dullish to fair red. At the last auction on the 30th there was a very full supply, amounting to 47 bales of grey Jamaica, 42 of Lima-Jamaica and 23 of native Jamaica; 43 bales of the first were disposed of at 1*s.* 10*d.* to 1*s.* 11*d.* for fair to good grey, and 1*s.* 9*d.* for part rather coarse Seven bales only of the Lima-Jamaica found buyers, 1*s.* 6*d.* being paid for fair. The whole of the native Jamaica was disposed of, 1*s.* 3*d.* being paid for good red, 1*s.* 1*d.* for fair, and 11*d.* to 1*s.* for dull yellow and red mixed.

CITRIC ACID, LIME OIL, LIME JUICE, CASSIA FISTULA AND KOLA.

Of citric acid, the month started without any supplies, and consequently only a retail trade was done at 2*s.* 3*d.* per lb. As the month advanced occasional small sales were reported at 2*s.* 3½*d.* per lb., at which figure it stood at the close. At auction at the beginning of the month, lime oil was represented by 8 cases of West Indian distilled, 4 of which sold at 2*s.* per lb. The quotation for hand pressed was 9*s.* 6*d.* per lb. A fortnight later 2*s.* 3*d.* was demanded for distilled, and at the close 2*s.* 4*d.* had been paid, but as much as 2*s.* 9*d.* was asked, while hand pressed had gone up to 2*s.* 6*d.* On the 30th at auction, 16 cases of West Indian distilled were offered, and 3 only disposed of at from 2*s.* 4*d.* to 2*s.* 5*d.* per lb. Lime juice has been inactive, fair West Indian averaging 1*s.* 6*d.* per gallon, and good to fine 1*s.* 8*d.* to 1*s.* 10*d.* Cassia Fistula was represented at auction on the 2nd of the month by 10 baskets of fair sound pods, all of which were disposed of at 15*s.* per cwt. Later in the month the article was reported to be scarce, but on the 30th, 27 packages were brought forward, 7 only of which were disposed of at 18*s.* per cwt. for fair Dominican. For kola there was a fair demand in the early part of the month, which somewhat declined towards the close. At the first auction on the 2nd of the month the offerings amounted to 50 bags of Java, and one bag of West Indian. The former sold at 2¾*d.* per lb. for fair, part dark, and 1½*d.* per lb. for part wormy and pickings. The single bag consisted of fair West Indian halves, and realized 3¼*d.* per lb. At the last sale on the 30th, 7 bags were offered and only one disposed of at 2¾*d.* for dull halves and whole nuts.

MARKET REPORTS.

London.—The West India Committee Circular, June 2, 1914; Messrs. E. A. de Pass & Co., May 22, 1914.

Arrowroot—No quotations.
Balata—Sheet, 2/8; block, 2/0¾ per lb.
Beeswax—£9 to £9 2s. 6d.
Cacao—Trinidad, 58/- to 64/- per cwt.; Grenada, 52/- to 58/; Jamaica, 52/- to 58/-.
Coffee—Jamaica, 52/ to 74/.
Copra—West Indian, £25 10s. per ton.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 18d. to 21d.
Fruit—No quotations.
Fustic—No quotations.
Ginger—Dull, 33/- to 60/-.
Isinglass—No quotations.
Honey—17/- to 29/6
Lime Juice—Raw, 1/2 to 1/10; concentrated, £30 to £38; otto of limes (hand-pressed), 8/6.
Logwood—No quotations.
Mace—1/5 to 2/6.
Nutmegs—4½d. to 5¼d.
Pimento—1⅝d. to 2 1/16d.
Rubber—Para, fine hard, 2/10; fine soft, 2/5; Castilloa, 1/11 per lb.
Rum—Jamaica, 2/2 to 5/-.

New York.—Messrs. Gillespie Bros., & Co., May 29, 1914.

Cacao—Caracas, 12c. to 13c.; Grenada, 11½c. to 12c.; Trinidad, 11¾c. to 12¼c.; Jamaica, 10½c. to 12c.
Coco-nuts—No quotations.
Coffee—Jamaica, 10c. to 13½c. per lb.
Ginger—7½c. to 10c. per lb.
Goat Skins—Jamaica, 48c.; Antigua and Barbados, 45c. to 48c.; St. Thomas and St. Kitts, 42c. to 45c. per lb.
Grape Fruit—Jamaica, $1·25 to $2·00.
Limes—$6·00 to $8·00.
Mace—45c. to 53c. per lb.
Nutmegs—110's, 12½c.
Oranges—Jamaica, $2·00 to $2·50.
Pimento—4c. to 4⅛c. per lb.
Sugar—Centrifugals, 96°, 3·39c.; Muscovados, 89°, 2·95c.; Molasses, 89°, 2·74c., all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., June 8, 1914.

Cacao—Venezuelan, $11·50 to $11·65; Trinidad, $11·25 to $11·50.
Coco-nut Oil—98c. per Imperial gallon.
Coffee—Venezuelan, 13c. per lb.
Copra—$4·50 per 100 lb.
Dhal—No quotations.
Onions—$2·50 to $3·00 per 100 lb.
Peas, Split—$5·80 per bag.
Potatoes—English, $2·00 to $2·25 per 100 lb.
Rice—Yellow, $5·00 to $5·25; White, $5·25 per bag.
Sugar—American crushed, no quotations.

Barbados.—Messrs. James A. Lynch & Co., Ltd.; May 2, 1914; Messrs. T. S. Garraway & Co., May 4, 1914.

Arrowroot—$4·00 to $5·50 per 100 lb.
Cacao—$13·25 per 100 lb.
Coco-nuts—$15·00.
Hay—$1·50 to $1·60 per 100 lb.
Manures—Nitrate of soda, $70·00; Cacao manure, $48·00 to $50·00; Sulphate of ammonia, $82·00 to $85·00 per ton.
Molasses—No quotations.
Onions—$2·83 to $4·50 per 100 lb.
Peas, Split—$6·00 per bag of 210 lb.; Canada, $4·25. to $4·65.
Potatoes—Nova Scotia, $2·00 to $2·50 per 160 lb.
Rice—Ballam, $5·20 to $5·30 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
Sugar—American granulated, $3·50 per 100 lb.

British Guiana.—Messrs. Wieting & Richter, June 6, 1914; Messrs. Sandbach, Parker & Co., June 5, 1914.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	$8·00 per barrel of 200 lb.	——
Balata—Venezuela block	No quotation	——
Demerara sheet	65c. per lb.	——
Cacao—Native	13c. per lb.	13½c. per lb.
Cassava—	96c.	——
Cassava Starch—	——	——
Coco-nuts—	$16 to $20 per M.	$23 per M.
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Jamaica and Rio	15c. per lb.	16c. per lb.
Liberian	11c. per lb.	11c. per lb.
Dhal—	$6·00	$6·25 per bag of 168 lb.
Green Dhal	——	——
Eddoes—	$1·44	——
Molasses—Yellow	None	——
Onions—Teneriffe	4c. to 5c.	——
Madeira	——	5½c. to 6c.
Peas—Split	$6·00 to $6·25 per bag (210 lb.)	$7·25 per bag (210 lb.)
Marseilles	——	——
Plantains—	16c. to 48c.	——
Potatoes—Nova Scotia	$2·50 to $3·00	$2·50 to $2·75
Lisoon	——	——
Potatoes—Sweet, B'bados	$1·20 per bag	——
Rice—Ballam	No quotation	——
Creole	$5·50	$5·75 to $6·00
Tannias—	$2·64	——
Yams—White	$2·16	——
Buck	$1·92	——
Sugar—Dark crystals	$2·05 to $2·20	$2·20
Yellow	$2·60	$2·75
White	$3·40	$4·00
Molasses	——	——
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,, Cordwood	$1·80 to $2·00 per ton	——

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Printed at Office of *Agricultural Reporter*, 4 High Street, Bridgetown, Barbados.

AGRICULTURAL NEWS

Vol. XIII. No 318.] SATURDAY, JULY 4, 1914. [One penny.

AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW
OF THE
IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES

VOL. XIII. No. 318. BARBADOS, JULY 4, 1914. PRICE 1*d.*

CONTENTS.

The Circulation and Storage of Facts.

WE often talk of research as if the advancement of science depended only upon the elucidation of new facts and ideas and ended there. This may have held good in the early days of pioneer research in chemistry and physics, but during the present century getting out results is one thing and publishing them properly another. Potential knowledge, knowledge not in motion, cannot, perhaps, be described as useless; but it is ineffective. A good example of this was afforded by the narrow range of publicity given to Mendel's original papers, and it is safe to say that had there been in existence at that time one-half of the journalistic channels that carry knowledge round the world to-day, Mendel's discovery would not have rested ineffective until twenty years after. The number of technical and scientific journals that absorb the results, often no more than the gist of the results of modern research, is very very large. Some of them are of high standing and some of low, but they may all be regarded as conveyances for bringing new facts into the central warehouses of knowledge, known better under the more formal term of libraries.

It has now become well recognized that there is often grave danger unless due prominence before the right kind of person is given to new facts during their journey to the libraries, that they may be put on the shelf and forgotten. The proper publicity is obtained by publishing results only in well recognized periodicals many of which have a special circulation and status. But in the rush to get results 'out' which characterizes modern research, there is not always time to await editorial convenience, and consequently quite good and original work will occasionally appear in quite poor and unoriginal journals. In this way fresh facts may pass along possibly gaining but the briefest reference (to show they exist) in the summarizing publications at the clearing houses, and then pass unnoticed into the files at the libraries. Even information which has been given ample publicity in the right quarters may run some risk of being locked up. But a library and particularly a scientific or an agricultural library, is more than a store for facts. It is a reservoir which should be in active communication with the various fields of research.

Curiously enough, in scientific and agricultural research, it is the makers of the library who are the principal users. This is different from the case of general public libraries where the users are merely readers and not always even critical readers. Therefore in the case of scientific libraries it is to the double interest of scientists and investigators of all kinds to express their results with proper care and caution in such a form as will facilitate reference, and to co-operate in the matter of aiding those who are immediately responsible for the management of libraries to prevent anything in the nature of stagnation. The academic student, though also a user of the library, confines himself more particularly to text-books and treatises. Unless there is some special problem in hand, it is not necessary nor indeed is it possible, to keep up-to-date. The degree of modernity of the student's facts will depend largely upon the amount of attention his various lecturers bestow in the library upon publications concerning their respective lines of study. The gap between text-books and what is known, is very wide, and none but specialists are in a position to keep this gap properly bridged.

But however keen and conscientious the user of the library may be, these virtues must be even more in evidence in the librarian himself. The popular idea of a librarian would not appear to be such as to overestimate the attractiveness of the occupation. Yet the position is one which calls for considerable versatility. The librarian must adopt vitalized methods and must fully appreciate that books and periodicals are as necessary as apparatus or any other working equipment for the conduct of research. He must preserve a live mental attitude towards the general trend of investigation in every direction, and possess the ability to understand the inter-relationships of the various branches of knowledge. As a bibliographer he must be acquainted with the various centres of research and with the names of the principal investigators; this is of special value when it becomes necessary to supplement available references with information obtained by correspondence. Then in the organization of the library an efficient card-index system is desirable, as well as various other systems of record. The efficiency of the general work of a large library depends to a great extent upon the provision of an adequate staff of reliable assistants, for if overburdened with too much detail the librarian is restricted is his grasp of matters covering a wider range. Lastly, the office of librarian demands a knowledge of modern languages. At the present day when the speaking of English has so widely spread, and at a time when English-written periodicals embrace in their pages notices of foreign papers, the necessity for a knowledge of foreign languages on the part of the librarian is perhaps less than is generally imagined. But it is desirable, as is shown for instance by the large amount of Russian work that has until lately remained hidden; only to be brought out and properly circulated by those invaluable summarizing publications that have within recent years made their long-needed appearance.

Agricultural libraries have special problems to face which are absent in the case of other literary establishments From the very scattered nature of agricultural research, results might be expected to appear diffused through a large number of publications. Though this would not appear to be unavoidable it nevertheless for the present exists and places a vast amount of work upon those who are engaged in the classification and recordance of the literature in question. Then, on the other side, the wide distance of separation between experiment stations themselves and between central libraries makes the utilization of central bureaus by investigators a matter of difficulty. Hence in agriculture a large number of small libraries have sprung into existence many of which contain but the bare essentials for the conduct of research in the various branches of applied science. In America, and to a less extent in England, the Government agricultural libraries have endeavoured to surmount this difficulty by lending out bound volumes and by distributing duplicates. But all this means considerable organization and expense. For the practical agriculturist the provisions made by most Governments are much more efficient. In the United States publications are distributed free on application and if these are carefully preserved they form in time the very best and reliable collection of literature that the practical man in that country could desire.

From all that has been said it will be seen that the modern conception of a working library is not the dusty and gloomy sanctum for out-of-date books that many persons may unknowingly think it to be. It is a vitalized source of power to be drawn upon incessantly, to be fed by current literature periodically and to be engineered with skill by those who are in possession of real ability. Large libraries are more desirable than small libraries, but it does not follow that the small need be less efficient than the large as regards their activities.

SUGAR INDUSTRY.

THE MANURING OF THE SUGAR-CANE.

The question as to what fertilizers give the most profitable returns with the sugar-cane is discussed at some length by Dr. F. W. Zerban in *Sugar*, for May 1914. In this article the main point emphasized is that the most important nutrient for sugar-cane is potash. This fact, it is stated, has been brought to light by experimental work in Louisiana, Hawaii, Java and several other sugar-producing countries. It would seem that Dr. Zerban bases this conclusion largely upon the results obtained in regard to the question as to what quantities of the different food elements the cane takes up from the soil. Experimental work in the countries mentioned above has shown that the sugar-cane removes much more potash from the soil than it does phosphoric acid; but of course, the composition of the soil is not necessarily a criterion as regards its requirements in this respect. Although the soundness of Dr. Zerban's conclusions that the sugar-cane plant makes large demands upon the potash in the soil will be admitted, it does not necessarily follow that potash manures will appreciably increase the yield of sugar per acre. On the contrary, in the West Indies it has been found that the addition of potash produces little or no remunerative gain. Professor Harrison in his account of sugar-cane experiments in British Guiana, which was published in the *West Indian Bulletin*, Vol. XIII, No. 2, says: 'The addition of potash when applied either as sulphate of potash or as nitrates has exerted little if any effect. The normal weathering of the constituents of the soil sets free for each crop potash in excess of the quantity necessary for the requirements of plants. This holds good under ordinary conditions of cultivation where the greater portion of potash taken up by the plants is directly returned to the soil; but where the canes and cane tops are removed from the land, as in nurseries for the supply of cane plants, it is probable that partial potash exhaustion will take place in the course of a very few crops.'

Mr. H A. Tempany, B.Sc., in discussing the manurial experiments with sugar-cane in the Leeward Islands, 1912-13, states that during the season under review the experiments comprising certain applications with phosphoric acid and potash were not laid out, repeated tests with these manures having in the past shown that they are unproductive of remunerative returns under the conditions governing the performance of the Leeward Islands experiments. In the Leeward Islands, as well as in Demerara, the most profitable returns are obtained by the application of nitrate of soda or sulphate of ammonia. In the Leeward Islands most profit has been got when the land has received 40 lb. of nitrogen per acre as nitrate of soda. Under certain conditions, notably in the case of heavy non-calcareous soils, there is evidence to show that sulphate of ammonia is likely to give better results. In Demerara, according to Professor Harrison, nitrogen in the form of sulphate of ammonia, nitrate of soda, nitrate of potash, nitrate of lime, nitrolim, dissolved guano, raw guano and dried blood exerts a favourable influence upon the yields of sugar-cane, and is without doubt the manurial constituent which mainly governs the yield of that plant. This applies to every variety of sugar-cane which has been under trial. When applied in quantities capable of supplying not more than 40 to 50 lb. of nitrogen per acre, in ordinary seasons there is practically no difference in the effects of sulphate of ammonia, dissolved guano and nitrate of soda, but, on the whole, the first is a preferable manure to apply Nitrate of lime, nitrolim, dried blood and raw guano appear to be inferior to these. In the earlier crops of the experiments the best results were obtained by a mixture of nitrate of soda and sulphate of ammonia: but during the latter years this mixture did not prove more efficacious than did either sulphate of ammonia or nitrate of soda alone. Where applied in quantities supplying more than from 40 to 50 lb. of nitrogen per acre, dissolved guano and sulphate of ammonia are the best sources of nitrogen for the sugar-cane on the alluvial soils of British Guiana, but the latter is the more economical for application. In British Guiana it is interesting to observe the use of lime results in largely increased yields during the earlier years of the trials. But whether or not its use results in profitable increases depends on the price of sugar. Its action is principally mechanical in improving the texture of the land, and it is a question of much importance whether its effect could not be obtained more profitably and at a lower cost, by the use of light ploughs and cultivators.

From the foregoing it will be seen that Dr. Zerban's views are more physiological than agricultural, for although it will be admitted that potash is an essential factor, possibly the most important factor governing the synthesis of sugar in cane plants, its supply in the soil is seldom so deficient as to require the addition of potassic fertilizers. At least this view would appear to hold good for the West Indies. At variance with this are the statements made at the end of Dr. Zerban's article referring to the results obtained from certain experiments conducted by Mr. Gibbon in Porto Rico during 1913, which appear to show that the addition of potash produced a material increase in the yield of canes. 'More experiments', it is stated, 'will be made to adduce further evidence in this respect. But it is highly desirable that many more such tests be carried out on the individual plantations. For the guidance of those who wish to engage in such work the writer desires to state that the potash should preferably be applied to cane in the form of sulphate. Kainit should generally not be used on cane because it contains a large percentage of chlorine, an element which, according to the researches of Maxwell and of Eckart, of Hawaii, is quite detrimental to the growth of sugar-cane. Kainit may do all right if it is applied and well mixed with the soil a long time before planting the cane, but in the general practice of fertilizing cane in late spring it should be avoided and sulfate of potash used instead.'

According to *The Board of Trade Journal* for May 28, 1914, the Cuban sugar crop for 1913 amounted to 2,428,537 tons, about 30 per cent. larger than the previous largest in the history of the island, but owing to low prices throughout the year its value was less than in 1912, being about £23,000,000. Five new mills will be in operation in 1914. The tobacco crop as well as the sugar crop was larger than the one for 1912, and was again of excellent quality. The tobacco industry is in a thoroughly prosperous condition and in 1913 about 165,000,000 cigars were exported, of which 59,000,000 were sent to the United Kingdom.

FRUIT AND FRUIT TREES.

THE DOMINICA MANURIAL EXPERIMENTS WITH CACAO.

A paper of considerable interest to the cacao industry in general appears in the recently issued number of the *West Indian Bulletin* (Vol. XIV, No. 2). It is compiled by Mr. H. A. Tempany, B.Sc., Government Chemist and Superintendent of Agriculture for the Leeward Islands.

During the past eleven years manurial experiments with cacao have been systematically conducted on plots of mature trees situated in the Botanic Gardens, Dominica. Annual accounts of the results of these experiments have appeared in the Progress Reports on the Botanical and Experimental Stations, but the object of the present paper has been to study the cumulative results in greater detail, particularly in connexion with the influence of various environmental factors on the results in question.

Although the original series of trials was begun in 1902, and has been continued up to the present time, in 1907 four additional plots were laid out to afford extra information on points elucidated by the original series. The evidence derived from the additional experiments fully confirms the conclusions drawn from the original series. The manurial treatment which the plots (0·28 to 0·37 acre in area) has received is as follows: Plots C, no manure; plot A, basic phosphate 4 cwt. per acre, sulphate of potash 1½ cwt. per acre; plot B, dried blood 4 cwt. per acre; plot E, basic phosphate 4 cwt. per acre, sulphate of potash 1½ cwt. per acre, dried blood 4 cwt. per acre; plot D, mulched with grass and leaves. In the additional series of the experiments, the manurial treatment was: plot F, mulched with grass and leaves; plot G, manured with cotton-seed; plot H, no manure; plot I, mulched with grass and leaves.

In describing the physical characteristics of the soils of the plots, it is shown in the paper by the figures of analysis that these are distinctly light and sandy in type; the underlying subsoil forms a continuation of the top soil, and presents a considerable thickness of coarse sand and gravel through which water percolates freely. During the rainy season the permanent water table usually stands about 8 feet below the surface of the ground. In order to determine what the exact physical character of the soil is from plot to plot, a series of shrinkage determinations was made whereby the approximate amount of agricultural clay is obtained. These have shown, on the whole, that the texture of the soil varies only slightly throughout the plots, except in the case of plot E.

Turning now to the treatment received by the plots, it should be pointed out first, that the variety of cacao cultivated on plots A to E is, on the whole, of the Forastero type, with a tendency towards Calabacillo. Plots H and I, on the other hand, are planted with trees of the Amelonado type. The manures and the mulch are applied once a year, usually during the months of May and June. In applying the manures the material is spread uniformly over the surface of the ground, and then lightly raked under. The mulch is composed largely of grass from the lawns mixed with leaves and pods of the Saman trees (*Pithecolobium Saman*), which surround and shade the lawn. The mulching material is given at the rate of 5 baskets each containing 20 lb. to every tree. In view of the importance of the mulching methods as demonstrated by these experiments the question of the manurial value of various descriptions of mulches is considered in a special section of the paper.

After having described the meteorological conditions (from which, unfortunately, data concerning relative humidity and wind pressure are necessarily omitted), the author proceeds to describe the methods of the cacao growing in each of the plots. These observations seem to confirm fully the quantitative results, and show a gradual transition from highly vigorous growth and good health in the case of the mulched trees down to less vigorous and less healthy condition in the case of the trees that have received no fertilizer.

The yields recorded from the plots from year to year are treated in the paper graphically. In Plate I the returns from the original series of experiments are displayed, while Plate II gives those obtained in the two additional series. Inspection of the curves shows that while in the case of the No Manure plots, C and H, the returns fluctuate closely around the mean value, those for the plots which received manure show, on the whole, a distinct upward tendency in the earlier years of the experiments, and subsequently settle down to fluctuations around the mean value higher than that of the No Manure plot. Moreover, when this value has been attained, the annual fluctuations in yields are less marked in the cases where the plots have received a dressing supplying all the various manurial constituents than when the dressing in character is incomplete.

The important corollary follows, that in applying manures to orchard cultivation under conditions such as those governing these experiments, a period of from three to five years will usually be required to elapse before the trees settle to the standard of fertility conditions as the treatment applied.

In the next section of the paper, data are given showing the mean probable error attaching to the various experiments and demonstrating that the value of this factor is in all cases of such magnitude as to allow of the results adduced being regarded with confidence as indicative of real differences derived from various forms of treatment.

The chemical characteristics of the soils of the plots bring out the effects of the manurial applications as regards soil composition. In respect of the nitrogen content, the mulched plot B is by far the highest, whilst it is followed by plot E which received the complete manure. Possibly owing to leaching, plot B showed a lower nitrogen content than plot E, though it has received the same manurial treatment. Observations are included in regard to available phosphoric acid and potash The results in relation to organic carbon, on the whole, follow those found in the case of nitrogen, being highest in the case of plot B, and lowest in plots A and C. The question of the relationship of the plots in this respect is considered further at a later stage in the paper.

The manurial gains and losses which have accrued to the plots are dealt with at considerable length in the paper and bring to light many points of great interest. This and the remaining sections of Mr. Tempany's paper will receive consideration in the next issue of the *Agricultural News*.

In the *Chamber of Commerce Journal* for June 1914, attention is directed to two tropical products of new commercial interest: (1) The Philippine oil nut, apparently belonging to the Meliaceae, the nuts of which contain 45 per cent. of non-drying good soap-making oil; and (2) some important hardwood timber of the Solomon Islands—*Callophyllum inophyllum*, useful for furniture making, and *Afzeila bijuga*, which appears to be absolutely impervious to the attacks of white ants. These timbers are becoming recognized on the New Zealand and Australian markets.

SOIL INVESTIGATION.

BACTERIAL ACTION AND ORGANIC MATTER IN SOILS OF THE LEEWARD ISLANDS.

The following is the summary of Mr. H. A. Tempany's paper on the above subject, which appears in the recently issued number of the *West Indian Bulletin* (Vol. XIV, No. 2):—

To investigate the changes likely to take place in soils under tropical conditions, small plots of land were subjected to clean weeding for periods varying between twelve and fifteen months at the experiment stations in Antigua, St. Kitts, Montserrat and Dominica. At the outset of the experiment, the soils of the plots were sampled to a depth of 12 inches, and on the samples were determined the content of organic carbon, nitrogen, and calcium carbonate. At the end of the period the soils were re-sampled, and the organic carbon and nitrogen were re-determined. Lots of the original samples were also kept in the laboratory for six months under moist conditions, and at the end of that time the organic carbon, nitrogen and nitrate contents were also determined. The soils of the Dominica, St. Kitts and Montserrat plots are all light in texture, while that at Skerretts, Antigua, is stiff and heavy.

At the end of the experiment it was found that both in the field and in the laboratory considerable losses of organic carbon had taken place as the result of bacterial activity, the losses varying between 25 per cent. and 50 per cent., in the case of the Antigua, Montserrat and St. Kitts samples: at Dominica, only a small loss is recorded.

With regard to the nitrogen contents, considerable decreases are seen in the field in the case of the Antigua, St. Kitts, and Montserrat samples; in the case of the Dominica sample, the loss is small. In the laboratory, an appreciable loss of nitrogen occurred in the case of the Antigua soils; in the case of the Montserrat and St. Kitts samples, no loss was observed, while the Dominica sample showed a small loss. All the soils exhibit nitrifying power: this is greatest in the case of the Antigua and Montserrat samples and smallest in the case of that from Dominica.

The losses of nitrogen which occur in the field is attributed to nitrification and subsequent loss by leaching at St. Kitts and Montserrat, and probably in some measure to denitrification at Antigua. In view of the small content of calcium carbonate, the suggestion has been put forward that ammonia formed in the course of ammonification may serve as a base for the neutralization of a part of the nitric acid formed in nitrification.

The results emphasize the high degree of bacterial activity existing in tropical soils, and indicate the necessity of maintaining an adequate supply of organic matter. In this connexion it affords direct evidence of the correctness of the policy followed by the Imperial Department of Agriculture in advocating the liberal employment of organic manures such as pen manure, combined with the growth of green dressings in the case of arable crops, and the application of mulches and pen manure together with the utilization of grass and weeds by cutlassing in the case of orchard soils.

COMPOSITION OF THE NATURAL SOIL SOLUTION.

At the time of its publication, only brief reference was given in this journal to the results obtained by A. D. Hall, Winifred E. Brenchley and Lilian M. Underwood in regard to the soil solution and the mineral constituents of the soil. Wheat and barley, according to the *Experiment Station Record* (February 1914) were grown in solutions made from soils on which wheat and barley had been grown for sixty years. The general conclusions arrived at were as follows: 'The composition of the soil solution as regards phosphoric acid and potash is not constant but varies significantly with the composition of the soil and its past manurial history. Within wide limits the rate of growth of a plant varies with the concentration of the nutritive solution, irrespective of the total amount of plant food available. When other conditions such as the supply of nitrogen, water and air are equal, the growth of the crop will be determined by the concentration of the soil solution in phosphoric acid and potash, which in its turn is determined by the amount of these substances in the soil, their state of combination, and the fertilizers supplied. On normal cultivated soils, the growth of crops like wheat and barley, even when repeated for sixty years in succession, does not leave behind in the soil specific toxic substances which have an injurious effect upon the growth of the same or other plants in that soil. The net results of these investigations is thought to uphold the theory of the direct nutrition of the plant by fertilizers.

In connexion with another note in this issue (on page 221) dealing with the function of calcium, the observations reported in the *Experiment Station Record*, Vol. XXX, No. 2), as the outcome of H. B. Hutchinson's work on the action of quicklime on the soil, are of interest It was found in these experiments that the addition of small quantities of quicklime to soils stimulates general bacterial growth, but large quantities cause a depression and a destruction of certain large protozoa, and finally a cessation of all biological processes. When lime is converted into carbonate or combines with soil constituents there is a great increase in the number of bacteria and an acceleration of ammonification.

A note appears in the *Experiment Station Record*, (Vol. XXX, No. 6), pointing out some of the important relations of colloidal chemistry to the soil. Most soil gels are considered to be reversible and most soil colloids are considered to be negatively charged, which is said to explain their power for absorbing the positive bases of basic salts. Heat and dryness are said to coagulate the soil colloids and improve the structure, but too heavy rains form soils of the reversible gels, and also by washing out the soil salts cause a return of the compact, badly aerated structure. Soil formation by weathering is thought to be based on colloidal chemistry, and the beneficial effect of lime salts on soil structure is attributed to the higher gel-forming power of bases of higher valence. Moreover, the beneficial effect of green manure on soil structure is attributed to the addition of new colloids, which not only form gels, but also dissolve lime.

COTTON.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date June 15, with reference to the sales of West Indian Sea Island cotton:—

Since our last report, a large business has been done in West Indian Sea Island cotton, and upwards of 1,000 bales have been sold, including Montserrat and Anguilla 15½*d.* to 16½*d.*, St. Croix 15½*d.* to 16½*d.*, with a few bales at 17*d.*, Tortola 15*d.*, Nevis 14½*d.* to 16*d.*, Barbados 17*d.*, St. Martin 16*d.* to 18½*d.*, Barbuda 15*d.*, St. Kitts 15½*d.* to 18*d.*, St. Eustatius 14½*d.* to 17*d.*, with a few superfine bales at 19*d.*, Antigua 16½*d.* to 19*d.*, St. Vincent 18*d.* to 24*d.* and Jamaica 10½*d.* to 12*d.*

The bulk of this cotton has been purchased by the largest consumers, who, although they have a large stock and will have to hold for many months, have relieved the position in order to assist the industry.

We would again like to call attention to the fact that the extra fine qualities command full rates, whereas medium fine and fine have only been purchased at concessions. As we have before remarked, these grades at 15*d.* to 17*d.* are considered dear as compared with Sakellarides Egyptian cotton, which sells at 11*d.* to 12*d.*, and which is suitable for all the coarser purposes, being particularly strong. Had it not been for this new growth of Egyptian coming into large supply during the last few years, all West Indian cotton would have commanded much higher rates. The same remark applies to Carolina Sea Island, the bulk of which has been sold this season at 14½*d.* to 15½*d.* Quotations are reduced ½*d.* per lb.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending June 6, is as follows:—

The business of the past fortnight was limited to the sale of the 26 bales Margareta on private terms for export to England.

The unsold stock is now reduced to two Planters' crop lots, viz., 40 bales Reliance, held at 30c., and 50 bales Little Bobs, held at 28c.

This report shows that the total exports of Sea Island cotton from the United States to Liverpool, Manchester and Havre, up to June 6, 1914, were 4,391 bales, 6,803 bales, and 4,066 bales, respectively.

THE RELATION OF COTTON BUYING TO COTTON GROWING.

A discussion on the above subject, of considerable interest to West Indian growers, appears as Bulletin No. 60 of the United States Department of Agriculture. The conclusions arrived at are given in the summary below, but one or two special references to Sea Island cotton production in the United States may be noted here as being of particular local interest. Mention is made of the general decline in quality of the Carolina crops owing to lack of uniformity. Hybrids between Sea Island and Upland types are of frequent occurrence in the fields. The old rigorous selection is no longer practised. This is stated to be the outcome of manufacturers no longer accepting contracts three or four years in advance at prices well above the ordinary market quotations. The only way, it is stated, to change the farmer's attitude towards the desirability of producing long staple lint of fine quality, is to pay him less for short inferior fibre, and more for strong and uniform lint.

The main conclusions as regards the relation between buying and growing of cotton in general are as follows:—

The production of cotton of superior quality in the United States is influenced by methods of buying, as well as by the prices paid for the crop. Failure to use proper discrimination in buying encourages careless or dishonest mixing of varieties on the farm or at the gin, and leads to deterioration and loss of uniformity, so that the market value of the product is soon destroyed. Long staple cotton of superior quality could be grown to great advantage in many parts of the American cotton belt if the necessary care were taken to preserve the purity and uniformity of varieties. The natural conditions are favourable for the production of such cotton, and almost unlimited supplies could be grown if precautions against contamination and degeneration were observed.

Manufacturers have complained for many years that supplies of long-staple cotton were inadequate and uncertain, and the boll-weevil invasion has been supposed to jeopardize the very existence of the long-staple industry. But these dangers no longer threaten. New early-maturing varieties of long staple cotton have been developed; also improved cultural methods that make it possible to produce good crops of long staple cotton in many parts of the United States despite the presence of the boll-weevil. The problem now is to induce the farmers to take the precautions that are necessary to maintain the uniformity of varieties, and the manufacturers who use the long-staple cottons have the key to this problem.

The prices that have ruled for the last few years have been high enough to stimulate the production of long-staple cotton, but the methods of buying have been too indiscriminate to lead the farmer to understand the necessity of maintaining the purity and uniformity of varieties. Little of permanent benefit can come from the development of superior varieties by the Department of Agriculture if the farmer is not led to appreciate the necessity of preserving such varieties after they are placed in his hands. As long as the buyers take inferior mixed fibre and pay as much for it as for the best and most uniform, the farmer cannot be expected to observe the precautions that are necessary to maintain the purity and uniformity of a variety of cotton, nor even to regard very highly the advice of the Department of Agriculture regarding the necessity of such precautions. More general planting of long-staple cottons cannot be advised unless marketing conditions are improved.

Greater discrimination in buying would be the most effective way to encourage the production of long-staple cottons by giving the farmer a more direct interest in maintaining the purity and uniformity of his crop as a means of securing the full market price. The present tendency to buy long-staple cotton at flat prices like short-staple cotton does not encourage greater care and discrimination on the part of the farmer, but encourages the opposite tendencies to carelessness, loss of uniformity of fibre, and degeneration of varieties. Accordingly, it may be urged upon manufacturers and others who are interested in the development of the long-staple cotton industry, the importance of improv-

ing the methods of buying, so that greater discrimination may be used, instead of paying the same prices for mixed fibre as for fibre raised from pure stocks of seed.

Inspection of the cotton in the field affords a much better basis of judgement regarding the essential quality of uniformity than the present method of pulling samples from the bales. Field inspection should precede warehouse grading, especially with long-staple cottons. Familiarity with a variety of cotton makes it possible to recognize much smaller percentages of admixture or degeneration than can be detected in the bale; thus affording a greater degree of protection to the buyer and manufacturer and at the same time offering a greater inducement to the farmer to maintain the purity and uniformity of his cotton.

COMMERCIAL NOTES ON ESSENTIAL OILS.

Messrs. Schimmel & Co.'s Semi-annual Report for April 1914 contains information of interest to those engaged in citrus and allied cultivations in the West Indies and elsewhere. Mention is made in the course of the report, that the price of bitter orange oil has dropped considerably during the past six months as a result of poor demand; but it is considered likely that during the next six months improved requests will be made for this oil, and as a result the price will advance to the level of 31 to 32 marks where it stood, about last September. Turning to the notes on sweet orange oil it is said in that month last year the prospects for the crop and the manufacture were not good, but this gave no reason for suspecting any serious fall in the price of sweet orange oil. Nevertheless, no sooner had the new oil made its appearance than prices began to recede seriously, the principal reason for this state of things being the appearance of a powerful competitor of the Sicilian product in the shape of West India orange oil, the quality of which is reported to be equal to that of very fair average Sicilian. It is stated that the appearance upon the market of a new source of production has had a paralyzing effect upon local speculation and so the article has been left to itself, that is to say to the natural effect of supply and demand. Finally in connexion with the by products of the orange crop, reference should be made to the statement of Messrs. Schimmel in regard to Neroli oil. This comes from the south of France where the new orange flower crop is said to be very behind hand because of the cold weather which has prevailed in the south of France during the months of January and February, with a result that at the time of writing (the middle of March), the trees are barely showing the first signs of new buds.

In regard to nutmegs, the marketing of which has occasioned some anxiety in the West Indies lately, it is said that there has been a selection of those varieties which are suitable for distilling, and it has therefore not been necessary to carry out the advance in prices which was lately feared to be unavoidable. Messrs Schimmel regard the decline in the market as practically out of the question, and the present quotations therefore appear to offer an inducement to lay in a plentiful stock. Messrs. Schimmel report that they always have several thousand kilos. in their warehouse and are therefore able to offer nutmeg oil at advantageous prices.

During the last few months there has been no lack of sufficient supplies of bay oil and it has therefore been possible to reduce the price. Reference is made in the report under consideration to the excellent qualities of West Indian bay oil but parcels of bay oil have been imported occasionally which had been adulterated with oil of cloves and pimento to a degree which made identification almost impossible. Messrs. Schimmel has ascertained that these parcels had found buyers in the European market and they would warn the trade against allowing the price to be the principal guide to buying. They state that by using such oil as described above many a bay rum manufacturer has already lost his reputation and his customers.

RADIO-ACTIVITY AND VEGETATION.

An interesting article appears in the *Gardeners' Chronicle* for May 30, 1914, based upon the discussion of the subject of the influence of radio-active substances on plant growth as made by M. Georges Truffaut in *Jardinage* (May 1914).

After referring to the investigations of Professor and Madame Curie, which led eventually to the discovery that air by radium is rendered a better conductor of electricity and provides an electrical method whereby the existence of radio-active substances may be discovered, the article (having referred to the enormous energy liberated in the emanations) goes on to consider the effects of radio activity upon the growth of plants. These phenomena were demonstrated first by Stoklasa, who showed some years ago that seedlings treated with water containing radio-active substances developed more rapidly than normal seedlings. Later experiments with plants showed that radio activity produces an effect on vegetation, and that on a soil of no fertility and poor in nitrogen, the effect is but slight. On these first series of experiments were based M. Truffaut's investigations which involved the use of radium bromide as a radio-active manure The experiments were carried on with various economic leguminous plants, and they showed that the radio-active substance had exerted a marked influence on growth, but that this influence, instead of resulting in an increased yield, brought about a decreased yield. As pointed out by the *Gardeners' Chronicle*, this fact, though at first disconcerting is by no means fatal to the prospects which lie before the use of radio-active manures. For those plants which had the largest doses of radio-active manure were found to suffer most from an excess of nitrogen, whereas the treated crops all exhibited conspicuous evidence of having enjoyed a surfeit of nitrogenous food. This is borne out by the fact that the later crops taken from the treated plants were somewhat larger than those from the untreated, indicating, perhaps, that as the stores of nitrogenous food material in the soil become less copious, the radio-active substances produced a beneficial effect.

In a second series of experiments the relative values of different radio-active substances were investigated. These experiments were carried out with chrysanthemums in pots. From these experiments M. Truffaut concludes that (1) radio-active substances produce a definite effect on vegetation; (2) the insoluble radio-active substances, (e.g. oxides of uranium, give at least as good results as those given by soluble radio-active substances; (3) radio-active mineral or oxides give the best results; (4) the use of black oxide of uranium is practicable because the results are good and the price is low. This substance costs about £1 per lb., and 1 lb. suffices for about a ton of soil. It may be dangerous to use radio-active residues of commercial manufactures, since these residues may contain poisonous substances, for example, salts of barium and sulphuric acid.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

Local Agents: Advocate Co., Ltd., Broad St., Bridgetown. *London Agents*: Messrs. Dulau & Co., 37, Soho Square, W.; West India Committee, Seething Lane, E.C. The complete list of Agents will be found on page 3 of the cover.

The *Agricultural News:* Price 1*d.* per number, post free 2*d.* Annual subscription payable to Agents, 2*s.* 2*d.* Post free, 4*s.* 4*d.*

Agricultural News

Vol. XIII. SATURDAY, JULY 4, 1914. No. 318.

NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number deals with the functions of scientific and agricultural libraries, and endeavours to show the necessity for careful storage and circulation of literature under an organized system.

Under the heading Sugar Industry, on page 211, is an article on the manuring of the sugar-cane with special reference to potash.

The subject of manurial experiments receives further attention on page 212, where the trials carried out with cacao for the last ten years in Dominica are described

Cotton Notes, on page 214, embrace important information. The report on the sale of West Indian cotton should be given special attention, and the article which follows, on the relation between cotton growing and cotton buying should be of particular interest in the West Indies where the economic obstacles referred to in the article as occurring in the United States do not exist in connexion with the cotton industry in these islands.

The notes and comments on the opposite page of this issue deal with several topics of considerable interest, including the question of meat scarcity and the demand for alcohol as a motor fuel.

Insect Notes, on page 218, review a recent report on entomological pests prevalent on cultivated crops in British Guiana.

Tropical Products Exhibition.

The *West India Committee Circular* (June 16, 1914) publishes a short account, from the West Indian standpoint, of the programme for the International Exhibition and Congress which opened on June 24. The exhibits from these colonies are being displayed under the special superintendence of the West India Committee.

The papers from the West Indies, that are being laid before the Congress, include the following: Agricultural Education and its Adjustment to the Needs of the Students, by Dr. Francis Watts, C.M.G.: Some Considerations affecting the Fertility of Soils in Tropics, the Cotton Industry in the Leeward Islands and Some Minor Industries in the Leeward Islands, by Mr. H. A. Tempany, B.Sc.: The Production of Fine Sea Island Cotton in the West Indies, with special reference to St. Vincent, by Mr. W. N. Sands, F.L.S.; The methods of Tapping cultivated Castilloa Trees and yields of Rubber therefrom, and Notes on some Experimental Results in Cacao Cultivation, by Professor Carmody: Sugar-cane Insects in British Guiana, by Mr. G. E. Bodkin, B.A: Publications dealing with Tropical Agriculture, by Mr. W. R. Dunlop.

An account of the proceedings and a summary of the papers will be published in the *Agricultural News* in due course, as soon as the detailed information has been received.

Alcohol as a Fuel in the Colonies.

We are indebted to Mr. C. Watts, of Coventry (England) for forwarding some interesting observations on the fuel question with particular relation to alcohol, recently published in the *Light Car* (April 8, 1914). Readers of the *Agricultural News* will remember that an editorial on the production of alcohol appeared in this journal for March 14, 1914, advocating the conversion of by-products on sugar, cacao, banana and coco-nut estates into this spirit with a view to its local utilization for fuel purposes. The observations now to hand are interesting in continuation of the idea, and show that as regards the export of alcohol, the British sur-tax is the chief difficulty from the colonial producer's point of view. Apparently denatured alcohol can be satisfactorily employed for motor engines with ordinary carburettors, the only difficulties being the regulation of a proper air mixture and uniformity of the spirit, which tends to vary in its water content.

Since tariff arrangements only constitute the principal hindrance to the employment of alcohol for fuel, it might be suggested that an effort be made to use alcohol locally for motor engines in those colonies where the spirit could be made from estate products. This would save the importation of a large quantity of petrol and would in every way be to the colonial interests. There would seem to be no serious reason why in places like Trinidad and British Guiana the Government should not take the matter up and by legislation and perhaps by financial encouragement

help to establish a new industry whereby the large amount of motor fuel now consumed could be made, sold and used on the spot. If only as an experiment, such action would attract world-wide attention to the practical possibilities which undoubtedly lie before the use of alcohol as a motor fuel.

Meat Scarcity.

The suggestion that was made in the last issue of the *Agricultural News* concerning the effect of meat scarcity upon the consumption of tropical foods is strengthened by an article in a recent number of the *Produce Markets' Review* (London, May 23, 1914), which says that if the price of meat rises to a point that restricts its consumption, one man's misfortune may be another's opportunity, and the grocer may be able to increase his sale of meat-substitutes of which bananas and dried fruits and legumes are of proven worth. As a matter of fact the most likely reaction of the meat scarcity will be an extension of cattle ranching to places hitherto lying idle or else devoted to other agricultural purposes. *The Times* for May 26, 1914, calls attention to the growing importance of cattle raising in Southern Rhodesia. Liebig's Extract of Meat Company have large estates in this country, which has been found very suitable for ranching and the cattle industry in general. Provided the demand for more meat continues to grow in the United States, we may see in the near future a profitable export industry established in the undeveloped savannah lands of British Guiana. Reference to the business with which the Liebig Company is concerned suggests that it might prove profitable to prepare meat extract in British Guiana and export the meat in this concentrated form rather than in bulk which would offer great difficulties as regards transport. These difficulties would be got over if only the extract were shipped. There would, of course, in addition, be the usual by-products—hides, tallow, etc.,—and these should materially augment the profits that may reasonably be expected to accrue from the acceptance of the proposition that we have suggested.

Effect on Coco-nut and Palm Oil Trade.

The scarcity of cattle, besides increasing the price of meat, has made animal fats more expensive. This in turn has increased the demand for coco-nut oil, which will now tend to constitute the only instead of a supplementary ingredient of margarine. During 1913 the price of copra was high—£33 per ton—but as a result of speculation on the market it has slowly slipped back to £25 10s. The stronger demand now existing should stimulate increased shipments, and there is every probability that the price will regain the higher level, provided other and cheaper oils cannot be found to take its place. Palm oil has entirely ousted coco-nut oil for the manufacture of soap. It is possible that the edible oils from some of the newly investigated nuts from West Africa and elsewhere may come to be a further competitor of the coco-nut and find a use as ingredients of margarine. It has to be remembered that the labour charges are much less in Africa than they are on capitalized estates in the West Indies and the other old-established regions of the Tropics. This is one of the reasons, as pointed out on page 220, why the competition of West African cacao is so serious.

A New Veterinary Diploma.

An article in *The Times* (June 4, 1214) says: 'The most important feature of the 71st annual report of the Council of the Royal College of Veterinary Surgeons for the year 1913-14, approved at the annual meeting of the College yesterday, is the proposal to establish a Diploma in Veterinary State Medicine. As has so frequently been urged in *The Times*, the veterinary profession deserves to occupy a much more important position than is at present accorded to it. The new diploma would, it may be hoped, have the effect of bringing human and animal medicine into still more intimate relationship in the great field of public health, in which, indeed, it is essential that they should meet and co-operate. The problems of disease, it has been proved, are as wide as the animal kingdom itself.'

Candidates for the new Diploma will be required amongst other things, to receive six months practical instruction in meat inspection, hygiene of byres, stables and markets under veterinary inspectors or teachers recognized for that purpose by the Royal College of Veterinary Surgeons.

It is to be expected that this new innovation will pave the way towards a wider understanding of the inter-relationships between the diseases of man and domesticated animals, and be the means whereby public health will be rendered more secure.

Ornamental Hibiscus in Hawaii.

The genus Hibiscus of the Natural Order Malvaceae is one which possesses the distinction of containing not only many species of useful fibre-producing plants, but also many forms which are noted for the decorative value of their flowers. As regards the latter feature of the genus, the large amount of interest which is being taken in the West Indies—particularly in Trinidad—in connexion with newly introduced varieties and species seems to warrant the attention of readers being drawn to Bulletin No. 29 of the Hawaii Agricultural Experiment Station, which describes with coloured illustrations a large number of native, introduced and hybridized forms of these ornamental shrubs. Of particular interest is the matter which refers to the hybridization experiments conducted in Hawaii with Hibiscus. The various forms possess many characters of interest to breeders, and remarkable cases are quoted in which hereditary characters fail to blend.

INSECT NOTES.

INSECT PESTS IN BRITISH GUIANA.

In the Annual Reports of the Department of Agriculture and Science, British Guiana, 1912-13, the Report of Mr. G. E. Bodkin, B.A., Government Biologist, appears in Appendix III.

The following is a brief review of this report presenting the principal points of general interest.

The Government Biologist mentions his visit to the United States and Porto Rico which extended from August 1912 to January 1913, a period of nearly six months, under the provisions of a Carnegie Scholarship in Entomology. The report deals with the insect pests under the headings of the principal crops of the colony.

SUGAR CANE.

The principal pests of sugar-cane are the small moth borer (including both *Diatraea saccharalis* and *D. canella*), the giant moth borer (*Castnia licus*), and termites or wood ants.

The small moth borer is regarded as a most persistent pest, which requires most rigid regularity in carrying out control measures. No noticeable diminution in numbers of this pest was observed on any one estate.

The practises of cutting out dead hearts and collecting the larvae and pupae found therein, the collection of egg clusters, and the use of trap lights are recommended as useful control measures.

As a result of the impression obtained of the value of the use of natural enemies, especially parasites, during the visit to the United States already mentioned, the Government Biologist has undertaken to a greater extent than formerly the study of the natural enemies of the small moth borer in British Guiana with a view to ascertaining the number and efficiency of the native forms, and in the hope eventually of being able to introduce from abroad additional species of possibly greater value.

The native forms at present known are as follows:—

Parasites of the egg:

Trichogramma minutum, Riley.
Prophanurus alecto, Crawford.

Predaceous on the eggs,

Two species of ant (undetermined).

Parasites of the larvae:

Braconidae, Iphiaulax medianus, Cameron.
Cremnops parvifasciatus
Mesosteniodeus sp.
Chalcididae Heptasmicra curvilineata, Cameron.
A species of Tachinid fly (undetermined).

Predaceous on larva and pupa,

The larva of an Elaterid beetle (undetermined).
Histeridae, Lioderma 4—dentatum.
The larva of a Stratiomyiid fly (undetermined).

A number of new pests of sugar-cane have been discovered. These are at present of minor importance but possess possibilities for assuming serious proportions.

They are as follows:—

Calymniodes (Prodenia) latifascia, Walk.
Lycophota infecta, Ochs.
Monodes agrotina, Guen.
Lepidoptera, Pamphilla sp.
Philisora catallus, Fabr.
Lerema accius, Abb.

All these lepidopterous insects feed as caterpillars on the cane leaves.)

Coleoptera Myochrous armatus, Bailey.
Coccidae Pulvinaria sp., on the foliage.
Orthezia insignis, Douglas.
Pseudococcus citri, Risso, at the roots.
Hemeoptera Tomaspis flavilatera, Urich, at the roots.
A leaf hopper (undetermined).
Neuroptera A new species of Termites, completely destroys the stools.
Orthoptera Conocephaloides maxillosus, Fabr.
Schistocerca pallens, Thunb. Both these grasshoppers feed on the foliage.

RICE

Rice was severely attacked by the larvae of the corn ear worn (*Laphygma frugiperda*) and the grass moth (*Remigia repanda*). The attacks were most serious in the nursery beds where the corn ear worm was the most abundant.

A short list of these insects recorded as having attacked rice at different times in British Guiana is given, but the outbreak already referred to was the only serious occurrence of the kind during the year under review.

RUBBER.

Para and other rubber trees suffered from a serious attack of the cassava hawk moth (*Dilophonota ello*) early in the year. The pest was controlled by hand picking on small trees and on small areas Spraying with arsenate of lead at the rate of 4 lb. to 50 gallons of water was found to be effective treatment on a large scale.

An egg parasite (*Telenomus dilophonotae*, Cameron) was instrumental in reducing the caterpillars and moths to normal numbers.

Para rubber on a whole is very free from insect attacks in British Guiana. The report gives a short list of insects which have been recorded as occurring on this crop

The list of insects known to attack Para rubber in British Guiana are, in addition to *Dilophonota ello*, a locust *Tropidacris cristata*, and an undescribed grasshopper, which destroys the foliage, a bug, *Empicoris variolosus* which attacks the young shoots, causing an exudation of latex, and six species of well known scale insects. These are *Asterolecanium pustulans*, *Vinsonia stellifera*, *Lecanium nigrum*, *Aspidiotus destructor* and *Aspidiotus personatus*.

COCO-NUTS.

Coco-nut palms in British Guiana are attacked by several insects. The following list gives their names and habits:—

Lepidoptera. *Castnia licus* and *Castnia daedalus* the larvae of which are borers in the stem. *Brassolis sophorae*, *Sibine trimacula* and a skipper butterfly, the caterpillars of which feed upon the leaves.

Coleoptera. The palm weevil (*Rhynchophorus palmarum*), the weevil borer (*Metamasius hemipterus*), and *Rhina barbirostris* all of which are borers in the stem. *Dycinetus hidentatus* and *Strategus alveus* destroy young plants.

Homoptera. The two scale insects *Aspidiotu destructor* and *Vinsonia stellifera*, the aphid, *Cerataphiss lataniae*, and the two species of white fly, *Aleyrodicus cocois* and *Aleyrodes* sp., occur on the leaves.

Brassolis sophorae appears from the report to be the most serious of these pests, and this, it is stated, in spite of the fact that it is an insect comparatively easily controlled. It is the opinion of the Government Economic Biologist that an Ordinance is necessary to compel owners of infected trees to control this pest. The scale insects are said to be controlled by the application of kerosene emulsion. *Aspidiotus destructor* is held in check to some extent by two predaceous lady-birds *Cryptognatha nodiceps*, Marshall, and *Azya trinitatas*, Marshall.

CITRUS FRUITS, CACAO, COFFEE.

Citrus fruits are attacked by some twelve species of scale insects. These are controlled in normal seasons by the parasitic fungi *Cephalosporium lecanii* and *Sphaerostilbe coccophila*, with the result that the attacks are not often severe except when the citrus trees are grown on unsuitable lands and under conditions which are generally unfavourable.

The caterpillars of the swallow tail butterfly (*Papilio anchisiades*) sometimes occur in numbers, feeding on the foliage of the trees.

The cacao beetle (*Steirastoma depressum*), the cacao thrips (*Heliothrips rubrocinctus*), the citrus mealy-bug (*Pseudoccus citri*), and two small homopterous insects *Horiola arcuata* and *Acthalion reticulatum* are occasionally observed on cacao trees.

Coffee is attacked to some extent by several species of scale insects.

VETERINARY NOTES.

FORAGE POISONING.

(CEREBRO-SPINAL MENINGITIS.)

Nearly world-wide in its distribution, and the cause of great losses amongst horses, it is a remarkable fact that in spite of careful investigation the cause of this disease still remains an obscure and puzzling problem. The large number of different names which have been applied to the disease affords evidence of its extensive distribution and of the uncertainty which has always existed as to the specific cause of the ailment. Perhaps the most comprehensive discussion of forage poisoning is that which appears as Bulletin No. 65 of the United States Department of Agriculture, written by Dr. J. P. Mohler, Chief of the Pathological Division of the Bureau of Animal Industry. Dr. Mohler in discussing the nomenclature of the disease comes to the conclusion that the proper name for the complaint is cerebro-spinal meningitis which represents a disease synonymous with Borna disease, which occurs to a considerable extent in Germany.

Although the specific cause of the complaint as already stated has not yet been discovered, the years which have been passed in careful study and experimentation have shown that the disease can be controlled effectively only by a total change of feed and forage; in other words, by preventive measures and not by medicinal treatment. It would seem however, in considering Dr. Mohler's discussion of the etiology of forage poisoning, that the theory of toxic fungi in fresh fodder is not antagonistic to the observed facts in many of the outbreaks. For instance, an outbreak investigated several years ago among the United States army horses showed that many horses had died of cerebro spinal meningitis as a result of eating mouldy baled hay, and as soon as the hay was eliminated the deaths ceased. Other horses in the vicinity not fed upon this hay failed to contract the disease, but after the hay had been opened and exposed to the sun for three or four weeks, its feeding could be carried on without producing any ill-effect. Forage poisoning, therefore, seems to be an auto-intoxication rather than an infection, and due to certain chemical poisons or toxins formed by organismal activities. The nature of the substance which causes these harmful changes or of the poisonous bodies that are formed remain unknown. That the disease is not infectious is proved by the fact that in several cases a herd of diseased animals, although separated merely by a wire fence, did not infect a healthy lot the other side. Moreover, all the different bacteria that various investigators have isolated from the lesions of the disease could not, when inoculated into healthy animals produce the typical symptoms.

FEEDING PRICKLY PEARS TO INDIAN CATTLE.

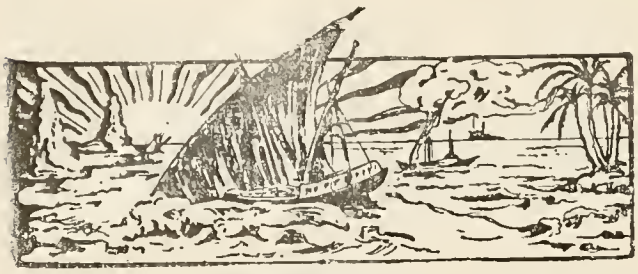
Some interesting trials have been made recently by the Indian agricultural authorities on the feeding of prickly pears as a famine fodder to ordinary cattle. The results are published in detail in the *Agricultural Journal of India* for April 1914.

The pear used is stated to be the common variety which is to be found anywhere along the road sides and on waste land. The botanical name of the species is not given. The chemical analysis of the pear made during both dry and wet seasons was:—

	Wet season.	Dry season.
Moisture	92·65	79·32
Ether extract	·22	·78
Albuminoids	·31	·68
Soluble carbohydrates	4·37	11·61
Woody fibre	·85	2·48
Ash	1·60	5·13
	100·00	100·00
Containing nitrogen	·049	·11
Containing sand	·12	·04

The fodder is prepared for feeding by removing the spine by burning. In carrying out this operation it is necessary to be careful that the pear is properly burned, otherwise the cattle will refuse to eat it. Fed alone the material is not sufficiently nutritious to form a maintenance ration, and it was found desirable to add 6 lb. of cotton seed to every 100 lb. of pear. The results obtained in this and in further experiments with cows were satisfactory, in accordance with the conclusions set out in the following summary:—

'It has been clearly demonstrated that the prickly pear if properly prepared and mixed with 6 per cent. of its weight of cotton seed, is not only enough to support life, but will enable an animal to regain condition even after it has become very poor from semi-starvation, that the cultivators could save their cattle in times of famine by feeding the above, the cost of preparation being very low. With the "Effective" stove enough pear could be prepared for a pair of bullocks, weighing 1,450 to 1,500 lb. at a cost of Re. 0 1-6 for oil and Re. 0-3-3 for the necessary cotton seed, or a total of Re. 0-4-9 per pair per day. One stove would be sufficient to burn pear for ten pairs. The pear was used with profit at Manjri, for the dairy dry stock, when fodder was dear, and effected a considerable saving. It is profitable to feed it as part of the ration at any time when fodder is scarce and prices are high. No ill-effect was noticed at any time throughout the whole six months of the experiment, and it is still being carried on to find if there will be any ill-effect produced by feeding it for a much longer period. A point worthy of notice is, that, although the stoves used worked well if properly managed, and the directions which accompany them are carried out, they will soon get out of order, if carelessly handled or negligently treated.'



GLEANINGS.

An interesting publication has been received in the form of the Annual Report of the Government Geologist, South Australia. Of special interest is that section of the report dealing with surface contours, iso-potential lines and the underground portion of hydraulic surface.

The contributions of the United States National Herbarium, Vol. XVIII, Part II, deals with new or noteworthy plants from Columbia and Central America. The sections dealing with the Sapodillas (*Acras* spp.) and with *Sapium* spp. and *Lucuma* are of considerable interest to the West Indies.

Information has been received setting out the regulations of the Pure Seeds Act recently passed in Queensland. Under this law, low grade seeds may be sold but they must be seeds in which the germination capacity is not more than 50 per cent. of the amount set forth. Low grade seeds must be contained in branded bags or packages.

A communication has arrived which describes the extensive nature of the live stock exhibit at the Panama-Pacific International Exhibition. The exhibits of this section will be educational as well as competitive. They will present, in exhaustive measure, a complete exposition of the most modern breeding and cultural methods.

An article appears in the *Journal d'Agriculture Tropicale* for February 1914, on the cultivation of rice on dry soils with a special view to the adaptation of the crop to the agricultural conditions obtaining in the coffee-growing districts of Brazil. Rice is also considered as a rotation crop in which capacity it can be grown in a cycle with tobacco, cotton, sugar-cane and other crops.

In the notes on agriculture, in the *Demerara Chronicle* for June 5, 1914, reference is made to the fact that Liberian coffee has on various occasions been stated to possess an inferior flavour to the 'creole'. This idea has arisen, it is believed, through the want of uniformity in roasting the beans. The reference under notice quotes an interesting extract from *The Grocer* on the question under discussion.

In discussing the simultaneous method of inoculating cattle with serum from animals that have been recently immunized, the *Philippine Agricultural Review* (March 1914) states that the simultaneous inoculation with blood drawn in the field has demonstrated that there is no necessity for maintaining an expensive permanent laboratory and herd for the production of anti-rinderpest serum from hyper-immunized animals.

The Times for May 25, 1914, published a half-page map of the West Indies and Central America, pointing out that opening of the Panama Canal, which is now announced for July 1 next, will convert the Caribbean Sea from being a stifling water of coasting commerce, into one of the main arteries of international trade. The legend further refers to the various British possessions in the West Indies and forms a somewhat striking advertisement for these colonies.

The recent depression on the rubber market does not, at least, seem to have been felt by the Kuala Selangor Company, which, according to *The Times* for May 13, shortly declared a dividend of 100 per cent. This was due partly to the increase in the output and partly to the decrease in the cost of production; and lastly to the company having taken the responsibility of selling a considerable portion of the crop for forward delivery at 4*s.* 8*d.* per lb.

The *Experiment Station Record* (Vol. XXX, No. 6) refers to a useful list of economic plants, occurring in the Dutch East Indies, published at Batavia. In this work a synoptical catalogue of the collections in the Technical Museum at Buitenzorg is presented, and detailed notes are given on the occurrence, distribution, parts used, methods of preparation, culture, commerce, of the various plants described.

A communication has been received at this office from the acting Curator of the Experiment Station, Tortola, Virgin Islands, briefly recording the recent tour made by that officer and His Honour the Commissioner to different parts of the Presidency. Virgin Gorda valley was visited first. Later, Virgin Gorda sound was reached and subsequently Anegada. The last place visited was Jost van Dyke. At all these places the peasants were addressed in connexion with agricultural matters.

According to the *Journal of the Royal Society of Arts*, the African oil palm *Elaeis guineensis* has been introduced into Asia with very satisfactory results. In Sumatra, preparations have been made for planting 7,500 acres per year. Experiments show that 1 acre of these trees yields 2,500 lb. of palm oil producing a profit of £24 per acre. The trees come into bearing after four years, and the cost of establishing and maintaining them during that period is about £32 per acre.

In the *India Rubber Journal* for May 30, 1914, a new apparatus is described for the collection of latex from rubber trees. The invention is designed to provide a means whereby the spout does not pierce the bark of the tree, and whereby a very short spout can be used of approximately about 2 inches in length, so that there is less surface to which scrap or dirt can adhere, thereby allowing a considerable reduction of scrap rubber and consequently an increase of pure latex tapped per tree.

It is well known that cotton plays an important part in the manufacture of motor car tyres. Although not all the cotton employed for this purpose is Sea Island or Egyptian cotton, the greater part of it is, and this explains where a good deal of the longer cotton fibres go, particularly in view of the statement made recently in the *India Rubber Journal* (for May 16, 1914) that there are a far larger number of tyres produced than is recorded in the market returns

STUDENTS' CORNER.

AGRICULTURAL EXAMINATIONS.

The first question for preliminary candidates in the last issue of the *Agricultural News*, was intended to bring out the students' knowledge of the characteristics of a true insect, and his acquaintance with the life-history and structure and habits of a closely allied form of organism like the leaf-blister mite of cotton. The second question on nitrification was introduced owing to the large amount of information on this subject that appears in the last issue and in this number of the *Agricultural News*.

The intermediate students were asked last fortnight about the protection of seedling limes from drought. In this connexion the use of dust mulches will have been suggested, and the employment of trash (the dressing being heavy enough to keep down weeds). If the student has not already made the observation for himself, he should transplant a few seedlings and keep them under conditions of dryness. When the leaves begin to curl up, mulch half of the plants with grass trash and note the effect.

As regards the question on trees for windbreaks, reference should be made to the Pamphlet issued by the Imperial Department, on Lime Cultivation. The demands made by certain kinds of wind-break plants (e.g. bamboo) upon soil moisture should be considered and the susceptibility of others (e.g. Pois doux) to disease observed.

The final questions referred to the work of the Antigua Onion Growers' Association which has been fully described from time to time in this journal, and to the Government system of purchasing cotton in St. Vincent and the Virgin Islands as well as to co-operative ginneries run as private enterprises like those in Barbados and Nevis.

The last question was general in nature and required for its answer a knowledge of provision crops and of what has been done in the islands during the last year or two in connexion with bay trees, papaw, and other minor cultivations.

Questions for Candidates.

PRELIMINARY QUESTIONS.

1. What do you know concerning the use of carbon bisulphide as a fungicide and an insecticide?

2. Give an account of your observations on the dispersal of seed, in nature.

INTERMEDIATE QUESTIONS

1. What operations will be carried on during the coming month in connexion with (a) sugar-cane (b) cotton?

2. Discuss the use of the following substances as manures: sea-weed, Saman pods, lime and nitrolim.

FINAL QUESTIONS.

1. What are your views as to the value of (a) phosphatic and (b) potash manures for sugar cane?

2. Describe the preparations that are being made for the coming lime crop.

AGRICULTURE IN THE PRIMARY SCHOOLS OF ST. LUCIA.

The report of the Agricultural Superintendent (Mr. J. C. Moore) on the teaching of agriculture in the primary schools of St. Lucia during 1913 appears in the report of the Inspector of Schools on the Education Department, published as a supplement to the St. Lucia *Government Gazette* for May 23, 1914. The examination on which the report is chiefly based, was conducted by Mr. R. W. Niles, Junior Agricultural Instructor. For purposes of the examination three hours were devoted at each school to oral questioning of the classes and to inspection of the school gardens. The number of scholars presented for examination was 411, being an increase of 21·2 per cent. on last year's number. Seventeen schools were examined as against sixteen last year.

The examiner reports improvement in the useful feature to which attention was called in last year's report, of combining with garden work practical lessons in weight, measures and numerations.

The outlines of simple experiment and demonstration work given to the head teachers last year are reported to have been particularly useful in making the garden work interesting. In this connexion Mr. Moore points out that it is desirable to avoid attempting too much experimental work at one time, as its efficiency both as regards teaching and assimilation may thereby suffer.

The garden note books were kept in all the schools and examined and they furnished interesting and useful records. A table is appended to the report in which are shown the percentage of possible marks awarded each year since the institution of the agricultural examinations and the number of marks awarded. This table shows that steady and satisfactory progress has been made in the standard of the work done throughout the six years' period during which the examinations have been in operation.

The *Port-of-Spain Gazette* for June 11, 1914, in reviewing an article in a recent number of the *Nineteenth Century*, refers to the significant circumstance that agricultural products are produced practically free of labour changes in West Africa. As regards the cacao industry on the Gold Coast, it is pointed out that this is practically the feat of the small cultivator; the unlettered African farmer is beating all competitors and, considerable as his industry has become, it is still only in its infancy. Messrs. Cadbury's recent report shows that the quality of the cacao on the Gold Coast has of recent years undergone considerable improvement. In 1908 the cacao exported from the Gold Coast was composed of 5 per cent. 'good', 15 per cent. 'fair', and 80 per cent. 'common'. In 1912 the proportions had altered thus: 35 per cent. 'good', 50 per cent. 'fair', and 15 per cent. 'common'. All this shows that in the Gold Coast the West Indies have a competitor whose operations they have every reason to watch.

An interesting reference to the function of calcium in plants appears in the *Experiment Station Record* (Vol. XXX, No. 6.). It is stated that the injurious effects of a calcium free medium are due to its extraction of calcium from the plant organs, which by inside supply with calcium may be protected from such injury. The element strontium may in part take the place of calcium, but its influence is partial and temporary, and this element does not appear to influence the distribution of carbohydrates or the localization of that process.

FUNGUS NOTES.

COCO-NUT ROT IN MEXICO.

Under the heading Fungus Notes in the issue of this journal dated July 20, 1912 (Vol. XI, No. 267) page 238, appeared a reprint from the *Review of Tropical Agriculture*, Vol. II, No. 4, pp. 295-6 of an article on 'A Coco-nut Disease in Mexico', by Runar Olssen-Seffer, described as Editor of the Review and late Chief of the Botanical Section of the Department of Agriculture, Mexico. The article as it appears in the *Agricultural News* is a reprint of the article in the *Review of Tropical Agriculture* save for a paragraph and a half of introductory generalities and the concluding sentence of the article reproduced. The latter expresses the author's intention of putting forward the results of further investigation in a later issue.

We are indebted to Mr. S. F. Ashby, Microbiologist on the staff of the Jamaica Agricultural Department, for calling our attention to the real nature of this production. With the exception of the unreproduced matter above-mentioned, the source of which has not yet been traced, the article is compounded of ingeniously blended extracts from accounts of (a) *Pythium palmivorum* in India and (b) Bud rot in the West Indies, both reprinted in Fergusson's Coco-nut Planters' Manual (4th Edition 1907, Appendix, pp. 52-4) from a supplement or supplements to the *Tropical Agriculturist*.

The original sources of the information are (a) a special report to the Madras Government by Dr. E. J. Butler, Imperial Mycologist of the Agricultural Department of of India, and (b) a letter from Mr. L. A. Wates, at that time a planter in Jamaica, to the Secretary of the Jamaica Agricultural Society.

Written in the first person singular, the article is put forward by Olssen-Seffer without the slightest acknowledgment, and without verbal alteration save for the omission of a word or two and the substitution of 'Eastern Coast' (of Mexico) for 'Southern India'.

Apart from this article, which is obviously worthless as evidence, there appears to be no record of the occurrence of the fungus in question in the Western Hemisphere.

DECAY OF PINE-APPLES.

In continuation of the notes published on page 190 dealing with *Thielaviopsis paradoxa* as the cause of base rot of pine-apple plants, it may be well to summarize here the available information respecting another disease, the principal of all pine-apple troubles, which is connected with the same fungus

It should oe first noted that there is considerable confusion in the use of popular names applied to pine-apple diseases. So far as the West Indies are concerned it is necessary to distinguish clearly between two types of disease affecting the fruit. The one is an affection of growing pine-apples, visible only when the fruit is cut, and indicated by dark-brown spots or streaks extending some distance inward from the base of one or more of the eyes. This has been most commonly designated 'black heart' by writers in the West Indies, and it has been suggested, but not proved, that it is due to a species of Penicillium. A disease very similar in appearance occurs in Hawaii. It is described under the name of brown rot by L. D. Larsen, and is regarded by him, on experimental evidence, as most commonly due to a species of Fusarium.

The other type of disease is of the nature of a storage rot, though it also occurs to some extent in the field, and is due to *Thielaviopsis paradoxa*. It is of very general occurrence. Frequently the fungus enters through the cut end of the stem and passes with great rapidity up through the core. Its subsequent spread through the softer tissues produces a distinct water-soaked appearance. Later the affected tissues turn black owing to the profuse formation of spores. Wounds or bruises in any situation afford easy means of access for the fungus, and Larsen and others have shown that in a moist atmosphere it is capable of penetrating the fruit surface without the help of wounds of any kind.

The measures to be adopted for the prevention of this trouble are largely matters of handling and packing, arising principally in connexion with export; though it must be remembered that the fungus develops so rapidly in a tropical climate that fruit intended for local consumption is liable to be quickly spoiled.

In dealing with the fruit it should be taken for granted —it is indeed usually a fact—that the spores of the fungus are present on the fruit and only await suitable conditions for their development. These conditions are supplied by the presence of a certain degree of heat, and moisture. Unless the fruit is artificially cooled the former may be taken as in all cases sufficient, and it is on the control of the latter that success will depend. The requisite moisture may be supplied by the juices of the fruit on cut or bruised surfaces, or by the water given off by the fruit accumulating either on the packing material or in surrounding air enclosed or allowed to remain still.

It follows that the pine-apples must throughout be handled with the greatest care to avoid bruising or scratching. They must not be broken off from the stem, but cut with a stalk 3 or 4 inches long, which itself must not be stripped. It would probably be of advantage to cut off an inch of the stalk when the fruit is brought in from the field and then sear the freshly cut end or dip it in melted adhesive wax. The fruit should be laid out for twenty-four hours to cool and dry before packing. It is obvious that the method of packing should be such as to prevent contact between, or movement of, the fruit, while permitting free circulation of air, and that storage and stowage should be in well-ventilated places.

J. E. Higgins in Hawaii, and Vera H. Charles in Washington have experimented with the use of formaldehyde gas for fumigating pine-apples previous to storage, the object being to kill the spores adhering to the outside of the fruit. Both report very considerable improvement in the keeping qualities of fruit so treated.

The fumigation is carried out in an air-tight chamber; the gas is liberated by the action of permanganate of potash on commercial (40 per cent.) formalin. Two and a quarter imperial pints (45 fluid oz.) of formalin must be used for each thousand cubic feet of space, and for each pint of formalin 10 oz. of permanganate crystals are required. A large receptacle must be used for the mixture, as very considerable foaming takes place: an 8 quart tin pail may be used for a quantity of about 2 pints. The permanganate is placed in the pail, the formalin poured upon it, and the door of the chamber quickly closed. Exposures of thirty minutes or more are effective. The fumes are destructive to iron.

Sisal Hemp.—A correspondent to the *Journal of the Jamaica Agricultural Society* (April 1914) states that he has grown Henequen (Yucatan sisal) in Jamaica on hard clay soil and that the yields have been exceptionally good. Five leaves of varied lengths gave 8½ oz. of dry fibre, which means a little over 100 lb. per 1,000 leaves. The plant takes three years to arrive at the cutting stage. The writer then proceeds to point out the difference between Henequen and Mexican sisal (*Agave sisalana*) as regards their respective yields. Henequen, it is stated, gives at least 60 per cent. more fibre per 1,000 leaves than sisalana. Another important point is that Henequen is a long-lived plant, while several other varieties possess much shorter vegetative periods.

The reader will remember that the successful cultivation of *Agave sisalana* in Jamaica was described in a recent issue of the *Agricultural News*, and the above note is of interest as showing the attention which sisal in general is receiving in Jamaica, many parts of which island are admirably suited for what has already been proved to be a very paying cultivation.

WEST INDIAN PRODUCTS.

DRUGS AND SPICES IN THE LONDON MARKET.

Mr. J. R. Jackson, A.L.S., has forwarded the following report on the London drug and spice markets for the month of May:—

The general condition of the London drug and spice markets has shown but little improvement during the month of May, from that which previously prevailed. The demand for goods generally has been very slow, and prices have, for the most part maintained an even balance. Citric acid still maintains its high position. West Indian mace and Cassia Fistula both advanced towards the close of the month; white grey Jamaica sarsaparilla which at the beginning was lower, recovered itself towards the end. The following are some of the chief details.

GINGER.

At the first spice auction on the 6th, the offerings of 559 bags of Cochin and Calicut were all bought in at 28*s.* for good, bright, washed, rough, Cochin, and 20*s.* for brown, rough wormy Calicut. On the 20th, 101 bags of Japan were offered and sold without reserve at 19*s.* 6*d.* to 20*s.* for limed; 770 bags of Cochin and Calicut were also offered and bought in, slightly wormy and unsorted native cut, at 45*s.*, washed, rough Cochin at 27*s.*, and brown, rough Calicut at 26*s.* to 30*s.*

NUTMEGS, MACE, PIMENTO AND ARROWROOT.

Nutmegs were in good demand at the first auction on the 6th of the month, 78 packages of West Indian being offered and sold at the following rates: 64's to 71's 7*d.* to 9*d.*, 76's to 87's 5¼*d.* to 6*d.*, 89's to 99's 5*d.* to 5¼*d.*, and 119's 4¾*d.* On the 20th of the month 297 packages of West Indian were brought forward and sold at: 61's to 67's 7*d.* to 9½*d.*, 72's to 77's 5½*d.* to 6½*d.*, 83's to 88's 5¼ to 5½*d.*, 97's to 107's 4¾*d.* to 5¼*d.*, 108's to 116's 4½*d.* to 5*d.* and 123 to 129's 5*d.* At these two auctions West Indian mace was represented at the first by 37 packages, all of which were disposed of, fair to good fetching 2*s.* 2*d.* to 2*s.* 4*d.*, red 1*s.* 9*d.* to 1*s.* 10*d.*, ordinary 1*s.* 11*d.* to 2*s.*, and broken 1*s.* 5*d.* A fortnight later, namely, on the 20th, 71 packages of West Indian were disposed of, 2*s.* 1*d.* to 2*s.* 2*d.* being paid for fair and pale, 1*s* 10*d.* to 2*s.* for red and 1*s.* 3*d.* to 1*s* 8*d.* for broken. For 12 packages of Java, 2*s.* 5*d.* was paid for bold heavy red, 2*s* for broken red, and 1*s.* 7*d.* to 1*s.* 10*d.* for damaged. Of pimento, 43 bags ordinary were offered on the 6th of the month and bought in at 2½*d.* At the same auction 140 barrels of fair St. Vincent manufacturing arrowroot was offered and bought in at 2¾*d.*

SARSAPARILLA.

At the drug auction on the 14th, sarsaparilla was in good supply, being represented by 38 bales of grey Jamaica, 6 of Lima-Jamaica, and 11 of native Jamaica. The whole of the first and last were disposed of, fair grey fetching from 1*s.* 8*d.* to 1*s.* 9*d.*, and course slightly sea damaged 1*s.* 7*d.* This was from 2*d.* to 3*d.* cheaper than previous rates. For the native Jamaica, on the contrary, 1*d.* per lb. advance was paid, namely 1*s.* 2*d.* to 1*s.* 3*d.* for fair red, 1*s.* 1*d.* for dull red and yellow, and 1*s.* to 1*s.* 1*d.* for dull red and yellow. For the 6 bales of fair Lima Jamaica 1*s* 6*d.* per lb. was asked, and an offer of 1*s* 5*d.* refused. At the last auction on the 28th the offerings were grey Jamaica 9 bales, Lima-Jamaica 27 bales, and native Jamaica 7. The whole of the first were sold, 1*s.* 9*d.* to 1*s.* 10*d.* being paid for fair to good grey, 1*s.* 7*d.* for part dark and coarse, and 1*s.* 2*d.* for rough and chumpy. The 7 bales of native Jamaica were also sold, part dullish red fetching 1*s.* 3*d.* per lb. and 1*s.* 1*d.* to 1*s.* 2*d.* for bright red and yellow mixed; 2 bales only of the Lima-Jamaica found buyers at 1*s.* 5*d.* for good rolled.

CITRIC ACID, LIME JUICE, LIME OIL, TAMARINDS, CASSIA FISTULA AND KOLA.

At the beginning of the month citric acid was quoted at 2*s.* 4*d.* to 2*s.* 4½*d.* per lb., which was an advance on that of the previous month. At the close of the month it was reported scarce and very firm at 2*s.* 5*d* per lb. Lime juice also was quoted in the early part of the month at anything from 1*s.* 4*d.* to 2*s.* per gallon, according to the quality. At the close it was stated that good pale raw Jamaica could be had at 1*s.* 9*d.* per gallon. At auction on the 14th lime oil was represented by 15 cases from Martinique, all of which sold at 2*s.* 9*d.* to 2*s.* 10*d.* per lb. for good distilled. It was stated that privately some sales had been effected in West Indian distilled at 2*s.* 11½*d.* per lb., for hand pressed 9*s.* to 9*s.* 6*d.* was asked. At the last auction on the 28th, 10 cases of Jamaica distilled were offered and held at 3*s.*, 2*s.* 11*d.* being refused. Five cases of hand pressed St. Lucia were sold at 8*s.* 6*d.* per lb. Of tamarinds, 31 cases were offered at auction on the 28th, fair Barbados fetched 15*s.* at which rate 10 barrels were disposed of; 6 barrels of Nevis were also sold at 14*s*, and at this rate Tamarinds remained firm at the close of the month. Cassia Fistula was represented at auction on the 28th by 23 packages of fair lean Java, none of which sold, being firmly held at 22*s.* 6*d* per cwt. Kola was also represented at this auction by 2 bags of West Indian, both of which found buyers at 3½*d.* for fair dried, and 2¼*d.* for dullish mouldy.

MARKET REPORTS.

London.—The West India Committee Circular, June 16, 1914; Messrs. E. A. de Pass & Co., June 5, 1914

Arrowroot—2¾*d.* to 4¾*d.*
Balata—Sheet, 2/7½; block, 2/0½ per lb.
Beeswax—£8 17*s.* 6*d.* to £9.
Cacao—Trinidad, 58/- to 64/- per cwt.; Grenada, 51/- to 57/; Jamaica, 51/- to 58/-.
Coffee—Jamaica, 45/- to 74/6.
Copra—West Indian, £24 10*s.* per ton.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 14½*d.* to 24*d.*
Fruit—No quotations.
Fustic—No quotations.
Ginger—Dull, 33/- to 60/-.
Isinglass—No quotations.
Honey—18/- to 32/6
Lime Juice—Raw, 1/9 to 2/-; concentrated, £33 10*s.* to £39; otto of limes (hand-pressed), 8/6.
Logwood—No quotations.
Mace—1/8 to 2/6.
Nutmegs—4½*d.* to 6*d.*
Pimento—1 7/8*d.* to 2 1/8*d.*
Rubber—Para, fine hard, 2/9½; fine soft, 2/5; Castilloa, 1/9 per lb.
Rum—Jamaica, 2/2 to 5/-.

New York.—Messrs. Gillespie Bros., & Co., June 12, 1914.

Cacao—Caracas, 11¼c. to 13c.; Grenada, 11¼c. to 11½c.; Trinidad, 11c. to 11½c.; Jamaica, 10c. to 12c.
Coco-nuts—No quotations.
Coffee—Jamaica, 10¼c. to 14½c. per lb.
Ginger—7½c. to 10c. per lb.
Goat Skins—Jamaica, 48c.; Antigua and Barbados, 45c. to 48c.; St. Thomas and St. Kitts, 42c. to 45c. per lb.
Grape Fruit—Jamaica, $1·25 to $3·00.
Limes—$5·50 to $6·50.
Mace—45c. to 53c. per lb.
Nutmegs—110's, 12½c. to 12¾c.
Oranges—Jamaica, $1·25 to $2·00.
Pimento—3¾c. per lb.
Sugar—Centrifugals, 96°, 3·29c.; Muscovados, 89°, 2·85c.; Molasses, 89°, 2·64c., all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., June 22, 1914.

Cacao—Venezuelan, $11·10 to $11·30; Trinidad, $11·00 to $11·50.
Coco-nut Oil—96c. per Imperial gallon.
Coffee—Venezuelan, 13c. per lb.
Copra—$4·25 per 100 lb.
Dhal—No quotations.
Onions—$2·00 to $2·25 per 100 lb.
Peas, Split—$6·00 to $6·10 per bag.
Potatoes—English, $1·50 to $2·00 per 100 lb.
Rice—Yellow, $5·00 to $5·25; White, $5·25 per bag.
Sugar—American crushed, no quotations.

Barbados.—Messrs. James A. Lynch & Co., Ltd.; June 27, 1914; Messrs. T. S Garraway & Co., June 29, 1914; Messrs. Leacock & Co., June 19, 1914.

Arrowroot—$3·10 to $4·50 per 100 lb.
Cacao—$13·00 to $13·50 per 100 lb.
Coco-nuts—$17·00.
Hay—$1·60 to $1·75 per 100 lb.
Manures—Nitrate of soda, $65·00; Cacao manure, $48·00 to $50·00; Sulphate of ammonia, $78·00 to $85·00 per ton
Molasses—No quotations.
Onions—$2·25 to $2·75 per 100 lb.
Peas, Split—$6·00 to $6·25 per bag of 210 lb.; Canada, $4·35 to $4·40.
Potatoes—Nova Scotia, $4·50 per 160 lb.
Rice—Ballam, $5·35 to $5·75 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
Sugar—American granulated, $3·77 per 100 lb.

British Guiana.—Messrs. Wieting & Richter, June 20, 1914; Messrs. Sandbach, Parker & Co., June 19, 1914.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co
Arrowroot—St. Vincent	$7·00 to $8·00 per barrel of 200 lb.	—·—
Balata—Venezuela block	No quotation	——
Demerara sheet	65c. per lb.	——
Cacao—Native	13c. per lb.	13c. per lb
Cassava—	96c.	——
Cassava Starch—	——	——
Coco-nuts—	$16 to $20 per M.	$23 per M
Coffee—Creole	15c. per lb.	16c. per lb
Jamaica and Rio	15c. per lb.	16c. per lb.
Liberian	11c. per lb.	11c. per lb
Dhal—	$5·25	$5·75 per bag of 168 lb.
Green Dhal	——	——
Eddoes—	$1·44	——
Molasses—Yellow	None	——
Onions—Teneriffe	——	——
Madeira	3c.	3c. to 3½c.
Peas—Split	$6·00 to $6·25 per bag (210 lb.)	$7 25 per bag (210 lb.)
Marseilles	3c.	——
Plantains—	16c. to 48c.	——
Potatoes—Nova Scotia	$2 50 to $2 75	$2·50 to $2·75
Lisoon	——	——
Potatoes-Sweet, B'bados	$1·20 per bag	——
Rice—Ballam	No quotation	——
Creole	$5·50 to $5·75	$5·75 to $6·00
Tannias—	$2·64	——
Yams—White	$2·16	——
Buck	$1·92	——
Sugar—Dark crystals	$2·07 to $2·25	$2·20
Yellow	$2·50 to $2·60	$2·75
White	$3·40	$4·00
Molasses	$2·00	——
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M.
,, Cordwood	$1·80 to $2·00 per ton	——

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FOR THE WEST INDIES.

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Printed at Office of *Agricultural Reporter*, 4 High Street, Bridgetown, Barbados.

AGRICULTURAL NEWS

Vol. XIII. No. 319.] SATURDAY, JULY 18, 1914. [One penny.

AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

OF THE

IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

VOL. XIII. No. 319. BARBADOS, JULY 18, 1914. PRICE 1*d*.

CONTENTS.

Care of Publications.

THIS Department issues for the benefit of the West Indies publications numbering nearly 100,000 copies annually, and a large proportion of these are distributed gratis. For over ten years this output of printed matter, dealing with all branches of tropical agriculture and catering for all classes of agriculturists has been steadily continued, and we should expect that by now a large number of Government Offices and even a larger number of estates in these colonies would be in possession of a useful and well preserved collection of literature that should constitute a technical library of much local interest and value. Unfortunately, in many instances it appears evident that this is not the case. From enquiries that have been made, and from voluntary expression of opinion by those who receive the literature, it would appear that this neglect to take proper care of it is not due to a want of intelligent interest in the publications as they arrive. It seems to be rather the outcome of not appreciating the value of periodicals for purposes of reference and also perhaps due to dilatory and careless habits in the matter of filing and binding.

It will be readily seen that because the neglect under discussion involves an unnecessary limitation of the useful functions of publication work, it is clearly the duty of this Department to take the matter up, especially as the funds by means of which the work is carried out are derived from Imperial sources. A feature in the case which gives cause for particular regret is that, as already intimated, the various departmental offices of local Governments are not entirely exempt from neglect—a circumstance of considerable official as well as exemplary significance. There can be no questioning the view that the above mentioned offices ought to be in possession of a complete and properly bound set of the publications of the Imperial Department. The local Agricultural Departments, of course, as a matter of ordinary routine, give the requisite attention to the preservation of agricultural literature: but the publications of this Department are not entirely agricultural from the estate point of view only; they deal with movements many of which have Government financial support, such as small holdings and credit systems and

central factories; they deal also with trade statistics, official correspondence and legislation relating to the diseases of plants and animals, and with a large number of other matters that are more than merely interesting to the planter and agricultural scientist. The literature, therefore, should be found in the general libraries of the offices referred to, and in the Public Libraries. In these latter institutions, it is true that the Department's work is now carefully recorded, but it was only after some amount of trouble that this was brought about. With regard to the preservation of agricultural literature generally in the above mentioned offices and institutions, the advocacy which this article puts forward may well be extended to include the proper care of literature received from outside sources as well, including the publications of other agricultural departments, for a considerable amount of external literature of this kind is in circulation in these islands.

It may help to drive home the wasteful nature and irrationalism of the neglect under consideration, if we point out that on frequent occasions this Office has received letters of enquiry on technical matters the answers to which resolve themselves into nothing more than a copy of information presented in a previous number of the *Agricultural News* or *West Indian Bulletin*. This demonstrates on the part of our correspondents either failure to make use of the indexes to the above periodicals, or else displays the fact that the volumes of the journals in their possession are not complete. Unnecessary correspondence of this kind involves much unnecessary work, and is simply due to failure to take full advantage of the Department's publications.

It is from the practical standpoint that the planter loses by his neglect to care for a free and efficient library. On the estate, for instance, a pest may make its appearance quite unexpectedly; but in all probability its description and name and treatment are to be found in the Department's literature. A few minutes search amongst a complete set will reveal the desired information, and not infrequently be the means of suggesting immediate action that may turn out to be of no little value, pending the special advice of the Government Entomologist or Mycologist. And here it should be stated that, in the case of the Windward and Leeward Islands where in most cases specialists are not resident on the spot, scientific information presented by them in the Department's literature is vastly more important to the planter than if these investigators were always available personally. The same thing holds good in botanical and chemical matters, and it is clearly in the interest of planters in places where expert advice is not immediately obtainable to do their utmost to make the greatest use of literature, to educate themselves so that they can apply the information it contains, and to look after this literature carefully in order that it may be available at any moment when it may be required.

SOIL IMPROVEMENT.

THE LIMING OF SOILS IN THE TROPICS.

One of the principal reasons why it has been found difficult to give advice in regard to the desirability of liming soils in the Tropics is afforded by the scantiness of exact information and the circumstance that lime in the soil hastens the decomposition of organic matter, the supply of which, under most estate conditions, is limited. But apart from these important theoretical considerations there are the results of actual trials with lime on tropical crops, many of which have been discouraging and, in some cases, contradictory. With a view to ascertaining in a general way the extent and efficiency of available information in the liming of soils in the West Indies, various authoritative references on the subject have been examined, and this article is the outcome.

It is not considered necessary to enter into the well-established facts concerning the chemical, biological and physical action of lime on soils in general. This information can be readily obtained from former volumes of the *Agricultural News*. It will be well, however, to state that in this article the term 'lime' is used to represent slaked lime ($CaOH$); the unhydrated oxide is referred to as quicklime (CaO); and limestone as carbonate of lime ($CaCO_3$).

It is proposed to discuss first the results obtained with lime in actual trials with cultivated crops under field conditions.

EXPERIMENTS WITH LIME IN THE WEST INDIES.

Most of the West Indian investigation work on liming the soil has been carried out in British Guiana, the Leeward Islands and Jamaica. In the first named colony (see *West Indian Bulletin*, Vol. XIII, No. 2) it has been shown that 'there is a great loss of "available" lime from the soil of limed sugar-cane plots, due mainly either to loss by surface washings, or to the lime being carried into the deeper layers of the soil, or to a large proportion of the lime being retained in the soil in the form of silicate. . . .

'The use of lime resulted in largely increased yields during the earlier years of the trials. But whether or not its use results in profitable increases depends on the price of sugar. Its action is principally mechanical in improving the texture of the land, and it is a question of much importance whether this effect could not be obtained more profitably, and at a lower cost by the use of light ploughs or cultivators.'

As regards the effects of lime on sugar-cane soils in the Leeward Islands, we have the evidence afforded by the results of several series of trials carried out during 1902-5 and described in the Reports on Sugar-cane Experiments in the Leeward Islands for the years mentioned. In these reports such observations as the following appear: 'The plots receiving lime [in St. Kitts] gave smaller returns than the plots not receiving lime. Small quantities of lime thus applied do not appear to have any manurial value.' Again

in the case of Antigua where the soil is such that considerable benefit might be anticipated: 'There was an increase of 293 lb. of sucrose on the plots receiving 150 lb. of lime, but no increase on the plots receiving 300 lb. of lime. The use of lime in these small amounts appears to be without influence.' It should be observed that *small* dressings were applied; larger applications would doubtless have a considerable beneficial action on the mechanical conditions of heavy soils.

In the case of Jamaica, the Department of Agriculture obtained a few years ago more promising results than were got in the Leeward Islands. It is stated in the *Journal of the Jamaica Agricultural Society* (May 1914) that the application of lime to sugar-cane soils was found to be actually remunerative, but one has to be careful in accepting this statement as being one of general application, even for Jamaica.

From time to time small trials have been made with lime as a fertilizer for ground nuts and other provision crops in the West Indian islands, but in nearly every case the results have been inconclusive.

SOURCES OF LIME.

It is possible that certain well defined cases exist where the application of lime owing to the physical condition of the soil is very desirable, but neglected because of difficulties in procuring the lime. In the West Indies limestone is fairly generally abundant and in many places kiln-burning is a local industry. In districts where lime cannot be readily obtained, limestone might possibly be ground on the estate by means of a machine such as that described in the *Agricultural News*, Vol. XII. p. 223. A still better procedure would be to manufacture quicklime in a rotary kiln.

It is a fact of some importance that lime is not so inexpensive as many may imagine. In Jamaica for instance, a barrel of dry (temper) lime weighing 220 lb. costs in Kingston 4*s.* though it can be bought on the spot in the country for 1*s.* to 1*s.* 6*d.* This has been mentioned to show that the cost of the material and its application may form a deterrent to its employment even if doing so seemed theoretically desirable. It should be added that lime is employed more often than ground limestone because lime has a more pronounced flocculating effect on clay soils, and, therefore, 'lightens' them more readily.

SPECIAL EFFECTS OF LIME.

Recent research has considerably extended our knowledge of lime as a factor influencing biological changes in the soil. Work at Rothamsted has shown that the addition of small quantities of quicklime to soils stimulates general bacterial growth, but large quantities cause a depression and a destruction of certain large protozoa and finally a cessation of all biological processes. When lime is converted into carbonate or combines with soil constituents, there is a great increase in the number of bacteria and an acceleration of ammonification. But it is probable that the benefit of lime is more physical than chemical, through the flocculating action and consequent improvement of soil permeability to the circulation of air and water. In considering the biological effects of quicklime, the value of this substance as a sterilizer in the case of certain root diseases of plants may be noted, e.g. root disease of cacao caused by *Rosellinia* sp. Lastly there is the interesting observation made in Jamaica that the presence of lime prolongs the vegetative period of the sisal hemp plant, i.e. retards the time of poling. This is of significance in considering the application of lime to soils with a view to its influence on the habits of cultivated plants.

Of more theoretical than practical interest is the conclusion arrived at at Rothamsted, that certain bacteria can oxidize calcium oxalate to calcium carbonate in the soil if the lack of other food makes it necessary for them to employ it in nutrition. There is also of interest the recent work on the calcium-magnesia ratio in the soil. But these matters do not help us in coming to clear decisions as to when lime should be applied to the soil. It will be evident that the whole subject requires revision experimentally and is one to which the attention of experiments station workers may well be directed. For the present no general principles can be laid down for tropical soils as a whole. Each particular area will demand local investigation until more experiments have been made in different places and the results from them brought into better agreement.

AGRICULTURAL CO-OPERATION.

IMPROVEMENT OF RICE IN MADAGASCAR.

In Madagascar, according to *Diplomatic and Consular Reports*, No. 5186 Annual Series, the Government of the colony during 1912 started experiments with selected seed rice on land owned by natives who have entered into an agreement to co-operate. Under the terms of this agreement the Department of Agriculture supplies to each native a certain quantity of the selected seed and rice which the latter undertakes to plant as directed, the Government agreeing to purchase the first year's crop at 50 per cent. over the cost of production. The crop thus purchased will be divided into two equal lots, one of which will be handed over to the natives by whom it was grown for the purpose of planting out a more extensive area the following year; the other lot will be distributed among planters who may be willing to accept it on similar conditions. In order to encourage the parties thus co-operating with the administration, to plant exclusively the seed rice provided, bonuses will be offered in cases where the area set apart for the improved cultivation has been entirely planted with the rice provided by the Government. In this way it is hoped that a more uniform grade will be eventually obtained.

Agricultural Credit in Trinidad.—The question of Agricultural Banks is still being discussed in Trinidad. It is stated in the *Proceedings of the Agricultural Society of Trinidad and Tobago* for May 1914, that an interesting paper was recently read by the Secretary of the Mayaro District Agricultural Society on the subject of agricultural credit schemes. The writer's remarks were warmly in support of the movement and detailed operations of a hypothetical country bank were outlined to show how advantageous these institutions would be to rural communities where the people are under the thumb of the moneylender.

FRUIT AND FRUIT TREES.

NEED FOR THE CLASSIFICATION OF MANGOES.

It has frequently been pointed out in this journal that the application of science to tropical fruit has been largely neglected compared with the systematic attention given to fruit grown in temperate countries. This has been due largely to the unimportance, until recent years, of tropical fruits in the world's commerce, and to the extensive areas over which the different varieties and species of any particular fruit are scattered. In the case of the banana, pine-apple and coco-nut, which have of late years formed the basis of enormous industries, a considerable amount of attention has been given to the classification of the best varieties, but even as regards these fruits, a great deal remains to be done before the large number of different forms are conveniently systematized. In the case of the mango much less work has been carried out in this direction, and therefore, particularly welcome on this account is the paper recently published by Mr. F. W. Popenoe describing a basis for the future classification of the mango. It is suggested that greater care should be given to the description of the fruits of different varieties. The mango fruit possesses certain characteristic features which are different and constant for the several varieties. Of these features, the cavity at the base of the stalk, the dorsal shoulder and the ventral shoulder each side of the stem are important characteristics, whilst equally worthy of observation are the ventral edge of the seed and the apex and what is known as the beak of the fruit—the point on the ventral side at the base of a mango. After giving an outline of the basis on which the fruit should be fully described, the author puts forward the following suggestions as regards the classification of the mango in general:—

'An accurate and systematic classification of varieties is at present one of the greatest desiderata in connexion with mango culture. There seems to be ample basis for a classification by natural characteristics, in which, could all named varieties be included, their relationships would be vividly brought out, and the synonomy established of many considered distinct.

'The principal obstacle confronting such a work is the widespread distribution of the mango, making it impossible to gather together all varieties for study and comparison. There is no reason, however, why a classificatory system could not be formed which could be applied by each pomologist to the varieties of his particular region, when a collaboration of the various investigators would bring together the fragments and produce the desired result. At present our knowledge of the mango is so elementary that no satisfactory system of classification can be drawn up, the subject requiring much more study and investigation than have so far been given it.

'Recent investigations seem to indicate that all mangoes can be divided into two classes, monoembryonic and polyembryonic, which in a classification might form the first great division. The Indian mangoes as a rule appear to be monoembryonic, while those in the Philippine Islands as well as some now grown in Florida, Mexico and the West Indies, are polyembryonic. The polyembryonic varieties have the characteristic of reproducing themselves fairly true to type when grown from seed, by some authorities believed to be due to the fact that the embryos are adventitions and not formed from the germ cells in the ovary, i.e., they are not the product of the fertilization of the ovule, as is the single plant produced from the seed of the monoembryonic type, whose progeny is variable.

'Following the division into two primary classes might come the subdivision of each into distinct races or types. Indian horticulturists already recognize a number of more or less distinct types, such as the Langras and Maldas, each of which include a number of closely related varieties, having in common certain characteristics which prove their affinity. Maries divided the mangoes of his acquaintance into four classes—Bombays, Maldas, Langras and Budayas; Rolfs divided the mangoes of Florida into seven groups, while Wester has found three distinct types in the Philippines. Many so-called varieties are in reality races or types embracing a number of very closely allied forms.'

SUGAR INDUSTRY.

RESULTS OF THE ST. CROIX SUGAR-CANE EXPERIMENTS.

Tables setting forth the results of the experiments with new varieties of sugar-cane at the Agricultural Experiment Station, St. Croix, D.W.I., are published in the St. Croix *Avis* for May 30, 1914. Again it is a matter of interest to observe how little reliance can be placed upon the results which a new variety of cane gives in its first and second years of growth. The only 1912 seedlings which came within the first ten in that year and have retained their position in 1913 and 1914 are Nos. 12-1, 12-2, 12-4, and 12-6. Cane 12-11 has done well in both 1913 and 1914; it has headed the list in 1912 and also headed the list of 1912 seedlings planted in May 1913. Canes 12-34 and 12-48 are interesting on account of the very high yield which they have given this year, the former having produced cane at the rate of 60 tons per acre and the latter at the rate of over 50 tons per acre. Last year these two canes took quite a low position.

An interesting observation was that which showed, in the course of the experiments, that duplicate plots of the same variety gave the same yield of cane though the number of stools in the duplicate plots differed considerably. Another point of interest is the fact that there is a wide variation in the amount of juice expressed from the different varieties of cane by the laboratory mill and the wide variation in the richness and purity of the juice of different varieties. This is well exhibited by the results obtained with SC 12-41 which, while taking the tenth place in point of tonnage, takes the first place in point of sugar yield yer acre.

For fuller information on the subject of these interesting experiments the reader is referred to the Official Report of Dr. Longfield Smith, Director of the St. Croix Department of Agriculture.

Growth in the Application of Polarimetry.—In recent years there has been a rapid extension in the employment of the polariscope for commercial purposes and the *Louisiana Planter* (June 6, 1914) states that the United States Department of Commerce has found it necessary to revise Circular No. 12 dealing with the basic principles of modern polarimetry. The preceding circular has been enlarged by a résumé of the work done at the Bureau of Standards and elsewhere. The publication deals further with the various scales, French, German and international, with light sources, various minor apparatus, the testing of raw sugars, the mixing of samples, the determination of moisture, the use of the

refractometer, estimates of reducing substances, and a large number of other matters. The book ought to be in the possession of every practical chemist, and can be obtained from the Director of the Bureau of Standards, Department of Commerce, Washington, D.C.

American Molasses in Europe. The same issue of the *Louisiana Planter* reports that American blackstrap molasses is regularly imported into Liverpool to be used as a stock feed, and fetches about 91c. per 112 lb. A steamer arrives in Liverpool at intervals of about one month from Cuba carrying a cargo of molasses in tanks and this Cuban molasses generally brings 97c. per 112 lb. As a feed for stock the molasses is generally most in demand during winter time when artificial feeding is needed most. During 1911 and 1912, the imports of Cuban molasses for distillers' use and as feed for stock was valued at $700,000. The imports for 1912 was valued at slightly over $1,000,000. For the same two years the United States imports into Liverpool were worth $210,000 and $219,000 respectively.

The Sugar Industry in Australia. The May issue of the *Australian Sugar Journal* brings out the interesting point in an article on potash manuring, that the economic advantage of growing a big crop is that it enables a maximum return from a limited area of land and reduces labour troubles owing to the fact that cutters are not as likely to take on work with a light crop as they are with a heavy one of from 30 to 40 tons per acre.

On another page in this journal a short article deals with experiments with canes from Louisiana and Trinidad. As a matter of fact several of the varieties which the *Australian Sugar Journal* calls Louisiana varieties have simply been obtained from that State and were originally raised in Demerara and Trinidad,—for example D.117, D.604, and T.211. T.211 seems to have done satisfactorily, having given 20,691 canes per acre weighing 39·7 tons and yielding 5·3 tons of sugar per acre. A variety called Cassilis gave a yield of 40·4 tons per acre and 6·9 tons of sugar.

RUBBER GROWING.

RUBBER IN BRITISH GUIANA.

The following are the conclusions arrived at by Mr. C. K. Bancroft, M.A., Assistant Director of Science and Agriculture, British Guiana, in regard to the development of rubber growing in that Colony:—

There are two primary factors which operate in the cultivation of Para rubber, viz., the cost of bringing areas to maturity and the future cost of production per lb. of dry rubber. That the former can be effected in this country so as to compare not unfavourably with other parts of the world there appears to be sufficient data in the above report to indicate. With respect to the latter there are no actual data available from which to judge. What is at my disposal indicates that the cost of production will not be heavy. The low cost of supervision as compared with other rubber-growing countries and the health of the labour force are factors which are in favour of a reasonable cost of production of rubber in the colony. It must be borne in mind that the dominant factor in production is the cost of tapping, a factor in which organization plays a most important part. The utilization of women and children to do this work will naturally lessen the cost of collecting the rubber. It is not likely that the cost of production of a pound of dry rubber in this colony with the present cost of labour, can reach as low a figure as 16c. the cost estimated for some of the better plantations in Sumatra and the lowest which has to my knowledge yet been given in any part of the world. But there is every reason to suppose, with a market price for the raw product of 48c. (2s.) a pound, that under proper supervision Para rubber can be cultivated in this colony at a fair profit. The relation of supply to demand and of the quality of plantation to wild Para rubber are the two factors which will govern the price on the market in the future; and there appears to be a consensus of opinion that with a price of 48c. (2s.) a pound plantation rubber might be utilized for purposes for which it has hitherto not been employed and which will considerably increase the demand for the product in the future.

The extension of the rubber industry of British Guiana may be effected by two sources: (1) the utilization of local capital, and (2) the introduction of foreign capital. The former is more likely to operate in the direction of the conversion of previously existing cultivations into rubber cultivations. The latter may be utilized in this way or may be directed towards an extension of the area under cultivation in the colony, viz., the conversion of original forest into rubber cultivations. The conversion of existing areas of sugar into rubber cultivation, a practice which has been extensively employed in North Perak and Province Wellesley (Malay Peninsula), is receiving attention by one private firm. Here, in addition to Para rubber other permanent crops are there being planted in an existing sugar cultivation with the object of retaining the sugar only until the other crops are matured. The employment of foreign capital to convert a previously existing cultivation of coffee, cacao and fruit trees into a rubber cultivation is in operation on one property. While in another case an extensive area is being developed from original forest by the employment of foreign capital. These three enterprises must be watched with considerable interest.

It is probable that the establishment of rubber plantations by manufacturers of prepared rubber goods will at some future time be taken up on a larger scale than has hitherto been done, more particularly if the quality of plantation rubber can be made to approximate more closely to that of the wild Brazilian product. The proximity of British Guiana to the principal market for rubber, the United States of America, should offer inducements to the introduction of capital from the United States for development of rubber in this colony. For this reason the only existing enterprise of this nature in the colony must be regarded with special interest.

A useful article appears in the *Barbados Education Gazette* for June 1914 in explanation of the meaning of the term 'tonnage' as applied to steamships. Reference is made to displacement tonnage which means the actual weight of water displaced by a vessel when she is leaving port fully laden. Gross tonnage is explained as the cubic contents of a vessel's interior; whilst net registered tonnage represents the actual capacity of a vessel for carrying cargo, and it is on this register that all ship's dues are levied. Besides these uses of the word tonnage, there is the 'measurement capacity' and the 'dead weight capacity' both of which have special significances in marine commerce.

COTTON.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write this fortnight as follows, with reference to the sales of West Indian Sea Island cotton:—

Since our last report about 140 bales of West Indian Sea Island cotton have been sold at prices ranging from 17*d.* to 19*d.*, and values are without change.

The business include Anguilla 18*d.*, Barbados 17½*d.* to 18*d.*, St. Vincent 19*d.*, St. Martin 17*d.* to 18*d.* and a few St. Kitts at 18*d.*

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending June 27, is as follows:—

The sales since the 6th instant here were limited to 6 bales, being a small lot off in preparation, which was bought on private terms on account of a Northern Mill. The unsold stock here is reduced to two planters' crop lots, viz.: 40 bales Reliance, held at 30c., and 50 bales Little Bobs, held at 28c. There is some demand for these crops, but at prices below the views of the planters.

This report shows that the total export of Sea Island cotton from the United States to Liverpool, Manchester and Havre, up to June 27, 1914, were 4,391 bales, 6,803 bales, and 4,091 bales, respectively.

LITTLE-KNOWN COTTON-GROWING AREAS IN FOREIGN COUNTRIES.

The notes on which this article is based have been derived from information distributed through a considerable number of the more recent *Diplomatic and Consular Reports* issued by the Foreign Office of Great Britain. The facts presented are likely to be of some interest since they deal with areas that have not up to the present received much attention in the *Agricultural News* or in journals of a similar kind.

GREECE. In the Piræus district of this country the Government has been encouraging for the past three years the cultivation of Egyptian cotton, as this kind grows in Greece for the most part without irrigation. Experiments that have been carried out show that as a rule the season is too short for cotton growing but with proper manuring and sowing at the earliest possible date, satisfactory results have been obtained. The extension of the irrigation scheme is likely to stimulate the production of cotton in this district.

In his report for the year 1912 on the trade and agriculture of Thessaly, His Majesty's Consul states that during that year 5,590 cwt. of cotton was produced.

TUNIS. The attempts to grow cotton in this North African regency have not been very successful. Constant droughts, the absence of reserves of water under the surface of the soil, as also of irrigation works, seem to indicate that, in present conditions, the cotton plant cannot find the sustenance necessary to its good and plentiful development.

CHINA. One of the most important cotton-producing provinces in China is Chekiang. The sowing of cotton begins at the end of the spring. The ground is loosely dug and divided into long beds some 14 inches wide and the seed is sown in parallel lines 4 inches apart. Away from the sea-coast the seed is previously soaked in salt water but along the border this is unnecessary. The crop is picked at the beginning of the autumn and is said to average from 80 to 200 cattels per mow according to the season. The extraction of the seed is generally performed with Japanese gins but the packing process is very primitive, the lint being stamped into bags under the feet of men. The chief market for locally produced lint is in Shanghai and Japan.

Cotton is sometimes watered or shipped in wet weather to increase the weight, but the Cotton Guild is vigorously enforcing regulations forbidding such mal-practices.

Some twenty years ago, in the vicinity of Yuyao, an experiment was made with American cotton seed, but proved a failure, the pods of the variety used turning up and rotting with the rain, whereas the Chinese variety turns down, thus shedding the water. It is suggested that it might be worth while to repeat the experiment with different varieties of American and Indian seed, utilizing modern methods of planting and cultivation.

In the report for the year 1912 for the trade of Shanghai it is stated that the cotton crop was a very large one, but business with foreign markets is very difficult owing to the high rates of exchange and especially because of the mal-practice of watering the cotton which as we have seen is typical of the cotton business in Ningpo. The Cotton Anti-adulteration Association is making vigorous efforts to put a stop to the mal-practice.

NEW CALEDONIA. It is only a few years ago that cotton growing was started in New Caledonia, but it is already a flourishing industry and promises to assume important dimensions. The progress has been rapid as is shown by these figures representing the value of the exports since 1908: £44, £275, £858, £3,633, £15,536. The quality of this cotton is stated to be good and in 1912 it was quoted on the Havre market at from 1*s.* 7*d.* to 2*s.* per kilo. A small consignment was recently sent to Liverpool, and is reported to have been sold at a higher price than the maximum paid at Havre. The price paid to local planters is 50c. per kilo. unginned. The present area under cotton is estimated at just under 2,500 acres. It is suggested that the outbreak of a disease of coffee has provided a great stimulus to the production of cotton and it is predicted in the report that in a few years cotton will become the staple agricultural product of the colony.

BRAZIL. São Paulo is the most favourable zone for cotton growing in the South American Republic. The best areas seem to lie in the vast region crossed by the Sorocabana railway. The Upland cotton known also by the name of Paulo is stated to be the best and most suitable for local cultivation.

Cotton at the International Congress.—The *Manchester Courier* for June 24, 1914, gives a short review of Mr. Hutton's paper read before the International Congress of Tropical Agriculture, on the work of the British Cotton Growing Association. Mr. Hutton, who is Chairman of the Association, pointed out that India, Uganda and Nyasaland, West Africa, the Anglo-Egyptian Soudan, and the West Indies, are the best fitted areas for practical developments. The problem differs in different countries. In India a better quality of long staple must be procured such as the West Indies can produce. On the West Coast of Africa transport and communication in general are a handicap, and the same thing, to some extent, holds good for Nyasaland. Great prospects lie before an appreciable increase in the amount and quality of cotton grown on the Gezira Plain in the Soudan. Mr. Hutton was of opinion that there is enough suitable land in the British Empire to supply the quantity and quality of cotton required by the textile trade of Lancashire.

LIME CULTIVATION.

THE CONCENTRATION OF LIME JUICE.

Mr. G. A. Jones, Assistant Curator of the Botanical Gardens, Dominica, has forwarded through the Curator, Mr. Joseph Jones, a memorandum in which the table of calculations made by Mr. Macintyre of Dominica in 1912 and published in the *West Indian Bulletin*, Vol. XII, in regard to the economical point of concentrating lime juice at values of £15 and £18 10*s.* per pipe, has been extended in order to include the price of concentrated lime juice ruling at present, the highest quotation for which was £41 last month.

In employing the table it should be remembered that these calculations are based on Mr. Macintyre's determinations of the loss of citric acid when concentration takes place in tayches heated by direct fires. Recent information obtained in the working of the steam concentrating plant installed by the Government of St. Lucia and worked by the Agricultural Department, leads to the view that when concentration is effected in steam-heated vats, the loss of citric acid is only about 3 per cent. even when concentrating to about 107 oz., per gallon. At this concentration Mr. Macintyre's figures show a loss of 11 per cent. by destruction. These figures are exclusive of mechanical losses in straining, handling and storing.

While the following table will be of great interest in connexion with lime factories in Dominica where concentration is carried on in fire-heated tayches, it has no bearing on the position of the St. Lucia factories where concentration is performed in steam-heated vats. In these latter, a concentration to about 107 oz. still appears to be sound.

Degree of concentration.			Net value after concentration of 12,000 oz. when value of 1 pipe of concentrated juice is											
Basis 12 oz. per gallon.	Basis 14 oz. pergallon.	Acid oz. per gallon in concentrated juice.	£ 40	s. 0	d. 0	£ 36	s. 0	d. 0	£ 32	s. 0	d. 0	£ 18	s. 10	d. 0	£ 15	s. 0	d. 0
7:1	6·0:1	78	52	10	3	46	14	8	40	19	3	21	9	2	16	7	3
8:1	6·8:1	88	52	9	9	46	16	2	41	2	7	21	16	6	16	16	10
9:1	7·7:1	98	52	2	2	46	9	8	40	17	4	21	18	1	16	19	10
10:1	8·6:1	107	51	5	5	45	15	9	40	5	11	21	17	7	17	1	0
11:1	9·4:1	114	50	6	1	45	0	0	39	11	7	21	9	11	16	16	0
12:1	10·3:1	121	48	13	10	43	9	9	38	5	7	21	0	11	16	9	10

Fig. 2. Lime Trees Dying from Too Close Planting.

Recovery from Injury by Wind.

Fig. 1. Healthy Lime Tree Developed from Base of Old Tree Blown Down by Wind.

Growth of Lime Trees.—The illustrations on this page (figs. 1 and 2) show two interesting features connected with the growth of lime trees. If a lime tree is loosened or caused to bend over in the soil by wind, it can generally be righted again by means of props and manuring. Occasionally a tree completely blown down will recover itself as shown in fig. 1. This is an interesting illustration of the great vitality of the lime plant.

Fig. 2 shows the effect produced by planting lime trees too close together. The distances at which lime plants should be established vary according to the conditions of the estate, but 15 feet by 15 feet may be taken as the average distance, though when the soil is very good and the rainfall is abundant, 20 feet by 20 feet will probably be found more suitable. The trees in the illustration are as close as 6 to 10 feet together.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

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The *Agricultural News*: Price 1*d*. per number post free 2*d*. Annual subscription payable to Agents 2*s*. 2*d*. Post free, 4*s*. 4*d*.

Agricultural News

VOL. XIII. SATURDAY, JULY 18, 1914. No. 319.

NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number deals with the care of publications, and points out the advantages that may be obtained in official quarters as well as on estates by utilizing properly filed literature of this and other departments for purposes of reference.

On page 226 appears an article on the liming of soils in the Tropics, that brings out the necessity for more investigation into this important subject.

The notes on the sugar industry, on pages 228 and 229, deal, amongst other matters, with the results of the St. Croix sugar-cane experiments, 1913.

Under the heading Cotton Notes, on page 230, will be found an article of some general interest containing information on cotton growing in foreign countries.

New facts concerning the concentration of lime juice are described on page 231, which is devoted to the general subject of lime cultivation in the West Indies.

A note on the International Tropical Products Exhibition and Congress appears on page 233.

Insect Notes, on pages 234 and 235, deal with insect pests of sugar-cane in British Guiana.

The notes under Students' Corner, on page 237, comprise a discussion of the answers to questions that appeared in the last issue of this journal.

Fungus Notes, on page 238, deal with a new but harmless fungus on lime leaves.

Hedychium Coronarium in the West Indies.

Considerable interest was aroused at the beginning of 1913 through the appearance in the *Kew Bulletin* of an article which showed that fibre can be obtained from the ginger-like plant, *Hedychium coronarium*, finer and stronger than Manila fibre and capable of making paper of special quality. This article was abstracted in the *Agricultural News* for January 18, 1913, and the subject was again referred to in this journal on June 21, 1913, in reference to the fact that in Queensland sisal hemp was stated to have proved as successful as twine for reapers and binders as Manila hemp for which fibre from Hedychium was thought to be the only known substitute.

The interesting plant under consideration is well known in the West Indies, and is in fact a common wild plant along the banks of streams in many of the islands. In British Guiana, the interest shown in Hedychium has been of a practical kind. In the recently issued number of *Kew Bulletin of Miscellaneous Information*, a note appears on successful results which have been obtained from an experimental planting of Hedychium in British Guiana. 'The first planting of *Hedychium coronarium* has produced 28 tons of stalk and leaves per acre as a five-months crop on dry land. On irrigated land (rice) the first trials have failed. On the tidal parts of the rivers above the brackish water sections the Hedychium grows on swampy land submerged twice in every twenty-four hours with great vigour, the stems attaining a length of 6 feet 6 inches as compared with from 2 feet 6 inches to 3 feet on dry soil.'

It may be of interest to add that the same issue of the *Kew Bulletin* contains another article on this notable species as regards its production near Calcutta. It is concluded that *Hedychium coronarium* will yield fibre of good paper-making qualities from whatever part of the world it is gathered and that any differences which may be met with must be attributed to lack of uniformity in the preparation of the raw fibre prior to shipment rather than to any inherent differences in the species itself.

Australia's Supply of Coffee.

The coffee-growing districts of Southern India are endeavouring to extend their trade with Australia in coffee. Recently the United Planters' Association of Southern India communicated with the Dominion Government respecting the prospects in regard to the export of the product under consideration. In their reply the Department of External Affairs for Australia enclosed statistics showing the imports and exports of coffee into and from the Commonwealth during 1909 to 1912. The imports of both raw and roasted coffee have shown a steady increase from a total of about £71,000 in 1909 to about £117,000 in 1912. It is stated that the local production being small, the average consumption may be fairly assumed to be the difference between the imports and exports. These in 1909 were about £4,000 and in 1912 about £5,000. Hence by far the greater part of the coffee imported is consumed locally.

The chief countries of supply are as follows: India, £47,541; Ceylon, £490; West Indies, £5,172; Abyssinia, £570; Arabia, £5,670; Brazil, £1,802; Costa Rica, £2,300; Java, £22,130; Guatemala, £2,115; Hawaiian Islands; £399; Venezuela, £329; United States of America, £156; other countries, £1,117.

The average wholesale price for ground coffee during 1912 is stated to have been 1*s.* 2½*d.* per lb., whilst in 1913 it was 1*s.* 3*d.* per lb.

Queensland Interest in Cotton.

The May issue of the *Queensland Agricultural Journal* continues to carry on that Department's recent policy of endeavouring to attract greater attention to cotton growing in certain districts of the State. It will be remembered that the British Cotton Growing Association's Report on Cotton Cultivation in Australia was summarized in the *Agricultural News* for December 6, 1913, and since then Australian comments on the possibilities of a revival of the industry in their continent have been regularly noted in this journal.

In reproducing the greater part of the United States Bulletin on the relation of cotton-buying to cotton-growing (see *Agricultural News* for July 4, 1914), the *Queensland Journal* states that it is imperative for cotton growers if they wish to meet the modern demand for uniform long-staple lint to see that their cotton fields are kept free from the admixture of types —a condition that has prevailed in the past. It is also stated that the Queensland Department of Agriculture is now prepared to buy cotton of good quality from farmers and the extended cultivation of the crop is urged on account of the short time it occupies the land. In reproducing some matter that appeared in the *Agricultural News* for February 14, 1914, on the world's production of cotton, the *Queensland Journal* says that that State 'can produce and has produced as good Sea Island cotton as any other country in the world, and a cotton expert from Texas, U.S.A., now in Queensland, has, after examination of the country in the Central districts given it as his opinion that there are tens of thousands of acres along the Central Western Railway Line and on the coast, which will produce Sea Island and Upland cotton to perfection.'

It is interesting to note that a sample of Sea Island cotton from Western Australia, though it proved to be coarser than ordinary Sea Island, was reported on during 1912 at the Imperial Institute as being of good colour and length and worth 13*d.* per lb. with choice Georgia at 12½*d.* per lb.

The Dominions Royal Commission on cotton growing in Australia stated (see *Agricultural News* for December 6, 1913) that 'it would appear that some of the high class varieties of American Upland cotton would be most likely to answer purposes in Queensland . . . . Sea Island and perennial cotton are to be ruled out at once.' No mention in this report is made to cotton growing in Western Australia at all. Since then, however, the whole question of cotton growing in Australia has apparently been re-investigated locally and in greater detail; and as the statements bearing upon the question appear in an official publication of the Queensland Government, they must be regarded as the latest authoritative information on a subject which is of considerable interest to the West Indies.

International Tropical Products Exhibition and Congress.

The International Rubber and Tropical Products Exhibition was formally opened at the Agricultural Hall, London, on June 24. In reporting the success of the Exhibition, the *West India Committee Circular* for June 30, 1914, calls attention to the fact that the West Indian exhibits on this occasion were far above the average as regards quality, and in the manner in which they were packed and put up. These exhibitions prove of great value in bringing home to shippers the fact that to fetch the best prices the minor products of the West Indies must be attractively put up.

The Congress of Tropical Agriculture, which was an entirely separate and distinct function, began its sittings on June 23 at the Imperial Institute under the Presidency of Professor Wyndham R. Dunstan, C.M.G., F.R.S. The names of the West Indian delegates to the Congress and the papers read concerning the West Indies were given in the last issue of the *Agricultural News*, and it is now merely necessary to conclude with a brief summary of the principal matters dealt with up to June 25,—five days before the conclusion of the Congress.

In the Presidential Address, Professor Dunstan laid stress on the importance attaching to the improvement of methods and conditions in the Tropics and the necessity for persistent effort to ensure development taking place along satisfactory lines. He dwelt on the need existing for the creation of a College of Tropical Agriculture situated within the Tropics. The establishment of a British Institute of Tropical Agriculture to assist development in this connexion for British possessions was also advocated. During the two days which followed the opening of the Congress papers were read and discussion conducted on the following subjects: technical education in the tropics; the work of the British Cotton Growing Association; sanitation and hygiene on estates in the tropics and legislation against plant diseases and pests; variation in the quality of plantation rubber; rubber cultivation in different countries; and, lastly, cereal crops and sugar-cane.

In connexion with the Congress several important social functions took place which included a reception by His Majesty's Government at the Imperial Institute in honour of the delegates.

INSECT NOTES.

INSECT PESTS OF SUGAR-CANE IN BRITISH GUIANA.

In the previous number of the *Agricultural News*, the report of the Government Biologist on Insect Pests in British Guiana was reviewed. In the present issue, it is proposed to devote the Insect Notes page to a review of a report by Mr. H. W. B. Moore, Entomologist for certain groups of estates in British Guiana. The report, which covers the year 1913, was issued in May 1914. Mr. Moore's report for 1912 was reviewed in the *Agricultural News* for August 16 and 30, 1913 (Volume XII, pp. 266 and 282).

Mr. Moore's report is of interest because it is an account of practical field work in applied entomology in which useful records are presented, and also because it is the only report of its kind issued in the British Colonies in tropical America, Mr. Moore being employed by the proprietors of certain groups of estates, while other workers in similar lines of work are Government officials. The report deals almost entirely with the insect pests of sugar-cane, those of rubber, the only other crop discussed, being few and of little importance.

SMALL MOTH BORERS (*Diatraea saccharalis* and *D. canella*).

Of the insects which attack sugar-cane in British Guiana, these are given the place of first importance.

The work of cutting out dead hearts and collecting caterpillars of the small moth borers was carried on during the year. The number of caterpillars recorded as captured on seventeen estates amounted to 25,583,987, an increase of more than 65 per cent. over the captures of the previous year. It is stated, however, that this increase is the result of more work and better work rather than of any marked increase in the degree of infestation by these insects.

The collecting of fresh egg clusters was continued during the year. The records given, show that 180,000 were collected on the twelve estates where records were kept, the largest number for one plantation being 64,442 at Plantation Enmore. The writer of the report states that these figures are not altogether reliable, since in certain instances eggs of other insects were included, and at one estate he observed a considerable collection of eggs that had already hatched. This appeared to be the work of a gang of inexperienced collectors.

The egg clusters that have hatched are white or pearly white in appearance and resemble minute fish scales or tiny bits of cast snake skin. These are of no importance and should not be collected. Egg clusters in which the eggs have turned black should be left in the field, since the black appearance is due to the presence of parasites in the eggs. The parasites emerge from these and attack fresh eggs, thus aiding in keeping down the numbers of the moth borer.

The egg clusters which have not hatched and which are not parasitized are the ones which should be collected. They are yellow-white, reddish or orange-coloured. Such egg clusters should be allowed to hatch after being collected, under such conditions that the caterpillars which come from them cannot find their way to growing canes. In the meantime any parasites which may be in the eggs will have an opportunity to complete their development and escape, when they will return to the cane field and attack other egg clusters. It is strongly recommended that all estates should regularly and persistently collect egg clusters, beginning as soon as the canes commence to shoot, thus saving a large proportion of the cutting out of dead hearts by causing the removal and destruction of many thousands of caterpillars before they damage the cane at all.

The use of trap lights for the capture of the moths in addition to the cutting out of dead hearts and the collection of the caterpillars that are in them is also recommended as a useful method of control, in spite of the fact that many of the insects caught are not moth borers; others are males, and many of the females may have already laid all or a part of their eggs.

In this report, stress is laid on the importance of the proper care of refuse cane-tops which, if left in the fields, are a source of a prolific infestation for the next crop.

Burial of such material is recommended as the best course to pursue for the destruction of the insects contained in it, when this is possible from the condition of the soil and the supply of labour. Where doing so is impossible, tops might be burned or soaked a few days in punts in the canals.

The parasites of the moth borer mentioned are a new species of egg parasites: *Aphanurus alecto*; two parasites of the larvae, *Iphiaulax mediannus* and *Cremnops parvifasciatus*. In addition, Dipterous parasites (flies of the family Dexiidae) have been bred from moth borer pupae found in the tunnels in the cane.

Several predatory insects have been observed, such as black ants devouring fresh egg clusters, the larvae of a click-beetle (Coleoptera, family, Elateridae), and the larva of a fly (Diptera, family, Stratiomyidae), and the parasitic fungus, *Cordyceps barberi*, has been found on larvae which apparently had been killed by it. None of these are considered to exert any appreciable effect on the numbers of the moth borer, however, although they are of interest.

In estimating the amount of the damage caused by the ravages of the small moth borers, Mr. Moore calculates that to collect the 25½ million caterpillars it was necessary to cut out at least 100 million dead hearts. In addition to the injured stalks cut out as dead hearts, there are greater numbers still, in which the injury is not severe enough to prevent their being sent to the mill. In these the injury is shown by a partial loss of juice, and by a defective quality of the juice expressed from them.

In Porto Rico, it has been estimated that the loss in sugar in the canes that go to the mill amounts to about ½-ton of sugar per acre, as a result of the loss of juice, the increase in the proportion of fibre and the deterioration in the quality of the juice obtained. It is stated that the damage to sugar-cane is greater in British Guiana than in Porto Rico, but if calculated at the same rate it would amount to about 20,000 tons of sugar per annum in British Guiana, on the canes that go to the mill, to say nothing of the loss that is represented by the millions of dead hearts cut out, and the much greater number of canes that are killed in the field.

TERMITES OR WOOD ANTS.

Next to the small moth borers, termites are considered the most damaging insects in the sugar-cane fields of British Guiana. The nests of these insects, principally of two species, *Eutermes costaricensis* and *Mirotermes nigritus*, were destroyed on eight plantations to the number of 460,000. These nests were collected and destroyed wherever and whenever found, and it is stated that this method persistently carried out results in markedly improved conditions as regards the degree of infestation.

THE GIANT MOTH BORER (*Castnia licus*).

Taken on the whole, the attacks of *Castnia licus* were not strikingly less in 1913 than in the preceding year.

The collections on seventeen estates during the year gave a total of nearly 600,000 moths and 1,375,000 caterpillars, a total of over 1,970,000 of both stages. In the previous year the collections amounted to about 346,800 moths, 761,500

caterpillars, with a total for both stages of about 1,108,000; the increases being some 78 per cent. in 1913. This increase is not due to a greater abundance of the giant moth borers but rather to much better work in the collecting.

The writer of the report was fortunate enough to be able to observe the act of oviposition or egg-laying by a female *Castnia ticus* in the field under natural conditions, and as this is the first record of this under these conditions it is of interest. Briefly stated, the Castnia female alighted on a cane shoot about 1 foot above the ground and worked her way rapidly backward down to the base, forcing the tip of the abdomen between the clasping base of a dry leaf and the cane stalk and deposited an egg there. The egg was obtained and it hatched in fourteen days.

The belief is expressed that it is necessary to push vigorously the continued collection of the moths and caterpillars of this insect and that this will reduce the numbers to a point where it will be able to inflict only a minimum of damage and will keep it there.

WEEVIL BORER HARD BACKS AND MEALY-BUG.

The weevil borer (*Metamasius hemipterus*) was abundant at certain seasons and on certain estates. The severest attacks appear to come on as a rule during the mid-year rainy months. On some estates the damage resulting from the attacks of the weevil borer was greater than that from those of *Castnia ticus*, although it is not usually considered a serious pest. The number of adults and larvae of the weevil borer collected during the year on six estates was reported as 1,952,480.

The palm weevil (*Rhynchophorus palmarum*) the larva of which is the gru-gru worm, was observed on one estate in small numbers. The hard back beetles were not of much importance during the year under review.

The pink mealy-bug (*Pseudococcus calceolariae*), the sugar-cane Aspidiotus (*Aspidiotus sacchari*), *Orthezia insignis*, and a species of Pulvinaria are mentioned as having occurred, the mealy-bug being the only one that was abundant.

FROGHOPPER (*Tomaspis flavilatera*).

During the long and serious drought of 1912 the froghopper almost completely disappeared, but in the more normal weather of 1913 it again made its appearance. Where observed, the froghoppers were feeding less on the cane roots than on the grass roots near the drains. They were not at any time during the year so abundant as to cause any alarm, but on account of the serious attack of the related species, *Tomaspis varia*, in Trinidad, it is realized that this insect should be regarded with suspicion and watched with care. The cane stool moth, *Aerolophus sacchari*, was not very abundant.

The grasshoppers, *Conocephaloides maxillosus* and *Schistocerca pallens*, were generally present, but not in destructive numbers. Several leaf-feeding caterpillars of moths and butterflies are recorded of which only two, the grass looper (*Remigia repanda*), and the corn ear worm (*Laphygma frugiperda*) were of any importance during the year.

One of the interesting results which is likely to become very useful from such work as that recorded in the report under review is the accumulation of information in regard to the natural enemies of insect pests. This information is most likely to be obtained in work which involves the handling and inspection of large numbers of insect pests in their different stages of growth. In the report under review there are records of parasites and predators attacking certain pests, and in certain instances information relating to habits and to secondary parasites. Such information accumulates slowly but with each addition becomes more valuable.

AGRICULTURAL ENGINEERING.

LECTURES ON EXPLOSIVES.

A recent publication of the Institute of Chemistry of Great Britain and Ireland, having the above title, may be of some general interest to agricultural scientists who are conducting trials with explosives for the purpose of improving soil conditions. The greater part of the information contained in the lectures is industrial and deals principally with the manufacture of explosives; but there are certain parts, as for example, those treating of the temperature and volume of the gaseous products of explosions which are of interest in relation to the effect of these phenomena on the soil. Agriculturally it would be interesting to know more about the effect of the gases produced in the soil as the result of the explosion of dynamite. It seems that carbon dioxide, carbon monoxide, hydrogen and nitrogen are the principal gases formed where there is insufficient oxygen for complete oxidation. It is stated in the publication that when an explosive is fired in a closed vessel under different densities of charge, that is, different quantities of explosives in the same volume, the volume and composition of the gas vary with the pressure developed with the explosion, the carbon dioxide and hydrogen increase, and the carbon monoxide in water diminishes as the pressure increases; at high pressures, considerable amounts of methane are formed. Carbon monoxide, unlike carbon dioxide, is an active poison, and it is worth considering what the effects of this gas are after its production by explosive changes in the soil.

The temperature developed by an explosive is of importance, and the following formula $t = \frac{q}{c}$ where q = the calories set free and c = the mean specific heat of the gases, should give the theoretical temperature developed by an explosive.

New Soil-Tiller.—The *Times*, in its issue for the 8th instant, describes a trial which has just taken place in Kent, near Farningham, of a new rotary soil-tilling machine, which combines the action of plough, cultivator and harrow all in one. The action of the machine resembles that of a potato digger, except for being backwards instead of transverse, and it leaves the land in an open, loose condition very favourable to subsequent cultivation. It is driven by a 30-h.p. petrol engine, and the largest of the three sizes in which it is obtainable weighs 2 tons. The cost is about £400, the other sizes being about £300 and £100 respectively, and the three widths are 7 feet, 5 feet, and 3 feet. The machine is capable of cultivating to a depth of from 2 inches to 12 inches; it can tackle hard land as easily as soft, the only difference being that of speed, which varies from 1 foot to 3 feet per second. The total cost of the operation varies from 12*s.* to 18*s.* per acre, and the effect considerably exceeds that at present obtained by implements already in use. (*Gardener's Chronicle*, June 13, 1914.)

It is stated in *The Board of Trade Journal* for June 4, 1914, that a motor tractor made in England has just passed successfully through searching tests in Siam, and is likely to prove useful in actual practice. The machine is of 20 h.p. with a drawback pull of 2,750 lb., and is capable of hauling a waggon with a load of 4 tons. The tractor and waggon travelled successfully over rough ground, through a big heap of burnt paddy ash, and finally climbed banks over 2 feet high. This machine may lead to the successful introduction of a motor plough suited to local conditions.

Le Bulletin du Jardin Botanique de Buitenzorg (No. XIII) contains an interesting account of new orchids of the Malayan Archipelago.

An article in the *Journal of the Department of Agriculture of Victoria* draws attention to the beneficial effect obtained in France by using sulphur as a manure for grape vines. The greater the quantity of organic matter in the soil, the more pronounced is the beneficial action of the sulphur.

An advertisement received, describes an efficient pocket gag for horses, which has been adopted by the English, French and German armies. It it is stated that this gag can be applied without twitching the horse, and without assistance. The instrument is made by S. Maw, Son and Sons, London.

Diplomatic and Consular Reports, No. 5283, Annual Series, on the trade of St. Thomas and St. Croix, D.W.I., shows that the exports of sugar from St. Croix during 1913 had a value of £35,216, whilst the rum exported was valued at £2,551. The total value of the cotton shipped was £39,895.

A general meeting of the Trinidad Horticultural Club is reported in the *Port-of-Spain Gazette* for June 23, 1914. At this meeting Mr. W. G. Freeman, Vice-President and Acting Director of Agriculture for Trinidad, delivered a lecture on the life-history of ferns. The membership of the society is rapidly increasing.

A copy of the Annual Report of the Chief Veterinary Officer of the Board of Agriculture and Fisheries, London, has just been received. Much of the matter contained in this publication is of general interest, particularly the information concerning the outbreaks and symptoms of certain contagious diseases like anthrax.

Tirucalli rubber is grown in Natal, and is the latex of *Euphorbia tirucalli*. It is interesting principally on account of the very low percentage of caoutchouc it contains and its high percentage of resin. It does not seem to be of much use as a source of rubber. (The *Agricultural Journal of the Union of South Africa* for May 1914.)

The issue of *Der Pflanzer* for January 1914 consists of an annual report on the Institute of Agricultural Biology, Amani, German East Africa. The section dealing with entomology refers to certain serious outbreaks of mealy-bug on mango, and of weevil on cotton. These epidemics are stated to have been directly connected with the dry weather experienced in 1913.

Nature for May 28, 1914, calls attention to the useful function that has been performed, during the past five years it has been in existence, by the International Institute of Agriculture, by publishing a *Monthly Bulletin of Agricultural Intelligence and Plant Diseases*. An article is reviewed on the statistics contained in the latest issue, showing the position as regards live stock in Great Britain.

In the *Incorporated Chamber of Commerce of Liverpool Monthly Magazine* for May 1914 appears a note on the rubber industry of Peru in which the kinds of rubber produced are described. The best Hevea rubber is said to come from trees on the higher ground, a fact which is interesting in view of statements to the effect that plantation rubber in the East does best when grown near water.

Chinese Galangal or ginger is the root stock of a plant known as *Alpinia officinarum*. The root is smaller than that of the ginger plant, *Zingiber officinale*, and the Chinese ginger has a peculiar taste resembling a combination of ginger and pepper. According to the *Journal of the Royal Society of Arts* (June 5, 1914) there has been a notable increase in its production and export from China during the last two years, the United States taking an unusually large share of the product.

H. M. Vice Consul for Hayti states, in *Diplomatic and Consular Reports*, No. 5288 Annual Series, 1913, that the complete stagnation of business in Hayti has caused a diminution of over 10 per cent. in the total imports in 1913. The export trade suffered a heavy blow from the fall in the price of coffee, and the partial failure of the crop. Moreover, political unrest has effectually paralyzed all other branches of agricultural activity. The export of logwood especially, has shown a considerable decrease during 1913.

The *Philippine Agriculturist and Forester*, Vol. III, No. 1, contains an article on the hybridization of tobacco. In the summary it is stated that there are three hybrid strains isolated from the Cagayan × broad leaf cross, and one from the Cagayan × Havanna. All of them are good wrapper types which produce twice as many wrappers as either parent has done here. By the luxuriance of growth and adaptability to the local environment of these hybrid strains, is indicated the possibility of raising high class wrapper in the Philippines.

At Cordoba a co-operative society has been formed for the sale of fruit. In view of the importance of fruit production in this province of Buenos Ayres, the society will be able to develop considerably and be of great benefit alike to the farmers and to the consumers. The Association has a large building, which will be utilized for exhibitions and shows, for which the Government has offered numerous prizes. Co-operative nurseries for fruit trees have also been formed. (*Monthly Bulletin of Economic and Social Intelligence*, April 1914.)

The unrevised statement published in the Grenada *Government Gazette* (June 15, 1914) shows that a satisfactory increase in value has occurred for some of the staple products exported from Grenada during the five months ended May 31, 1914, compared with the corresponding period in 1913. The total value of cacao for the five months last year was £194,451; for this year's period it is £209,052. In the case of spices, the value for last year's period was £4,736; for this year £5,582. The value of the cotton has shown some reduction.

STUDENTS' CORNER.

The subject of the use of carbon bisulphide in emulsion was asked about in the first question for preliminary candidates in this column for last issue, because of the article on this new idea of mixing carbon bisulphide with vegetable oils, which appeared in the previous issue of the *Agricultural News*. In a general way it will be remembered that carbon bisulphide is a volatile liquid, the fumes of which have powerful penetrating powers and are poisonous to most forms of insect and fungi. The second question for preliminary candidates called for information on the part of the student in regard to the dispersal of seeds in nature. It is not necessary here to mention the many common observations that might be made, but the attention of the student may be called to the interesting fruits of the Moringa tree, which appear to be pods but are not, whilst the seeds are provided with wings to allow of their distribution by wind. As regards seed distributed by mechanical means, reference may be made to the fruit of the sandbox tree, whilst coco-nuts afford an example of fruit distributed *in nature* by the agency of water.

The first question for intermediate students asked for information concerning the operations which will be carried on during the coming month in connexion with sugar-cane and cotton. The young cane crop will now be well established, but with the rains some attention will have to be given to weeding. In all the islands cotton will have been planted and be well up by this time. In St. Vincent, planting takes place later than in St. Kitts and Barbados, generally about June. In St. Kitts and Nevis cotton is planted sometimes as early as February so as to avoid the heavy rains at the end of the season. Such cottton will soon be in flower, and during the past and coming month a watch will have been kept for the appearance of the cotton worm. In places where the cotton is still young, singling and weeding will be in progress and possibly the application of artificial manures.

The second question on the use of certain substances as manures should afford the student considerable scope for displaying his knowledge of the composition and uses of fertilizers. Seaweed as a manure, because of the cost of collecting it, does not appear to pay in the West Indies, though it is a substance which is fairly rich in potash, and, moreover, it is an organic manure. Saman pods are largely used for mulching in Dominica and are rich in nitrogen. The use of lime as a manure is fully discussed in this issue of the *Agricultural News*, and we may therefore conclude a discussion of this question by calling the student's attention to the composition of nitrolim, which is calcium cyanamide and has been tried in manurial experiments in the Leeward Islands and in British Guiana with unsatisfactory results as regards its profitable employment as a manure for ratoon or plant canes.

Whilst discussing the question of manures it will be convenient to consider the objects underlying the first question that was set for final candidates. In this the views of the candidate were asked on phosphatic and potash manures generally for sugar-cane, and this question should have been answered in a broad critical way on the lines of the article published on the subject of potash manures for sugar-cane in the last issue of the *Agricultural News*. The last question set in the previous issue referred to the preparations that would be made before the coming in of the lime crop. This was to test principally the candidate's acquaintance with the working of a small lime juice plant such as one finds established in St. Lucia and Dominica. In this connexion the attention of the student is directed to an important article appearing in this number on the degree of concentration of lime juice according to whether open tayches or steam coil vats are employed.

Questions for Candidates.

PRELIMINARY QUESTIONS.

1. Describe the distribution and function of stomata in the sugar-cane.

2. What substances go towards making up the soil on the estate you are connected with?

INTERMEDIATE QUESTIONS.

1. Give the reasons for destroying all old cotton plants at the end of the season.

2. Write a short account of cacao budding in the West Indies.

FINAL QUESTIONS.

1. Write a short account of the loss in citric acid during the concentration of lime juice.

2. Give your views on the possibilities of implemental tillage in the West Indies.

THE PHILIPPINE EXPOSITION, 1914.

An interesting account of what has been an important exhibition appears in the April number of the *Philippine Agricultural Review*. The exhibition consisted of provincial exhibits and bureau exhibits. Of the latter, those of the greatest interest to readers of this journal are the exhibits of the Bureau of Agriculture. These consisted of fertilizers and farm implements and specimens of agricultural products—rice, fibres, coco-nuts, sugar, maize and tobacco. As regards coco-nuts, specimens of several varieties were shown, and the great contrast between copra produced by the different methods of drying was demonstrated. The kiosk was divided into sections, and in these were found steam-dried, sun-dried, and taphan-dried (smoked dried) copra side by side. As regards sugar, specimens of refined crystals were shown together with three grades of centrifugal sugar and muscovado. Specimens of a number of varieties of sugar-cane were displayed on the walls of the section examples of the different types, and sugar in various other forms were displayed on the tables, together with bottles containing samples of syrup, sugar, etc. taken at different stages of the process of sugar-making. Small quantities of the various kinds of material used in the different stages of the process were also shown in small bottles, making this table a magnet for those interested in the sugar industry. Sugar and syrup from the sugar palm, together with a specimen of this species of plant, were also exhibited in this section.

Turning lastly to the exhibits of the Bureau of Health, reference must be made to the huge models that were on show having true proportion and colouring, which represented flies, mosquitoes, bed bugs, cockroaches, fleas, etc. These models, of which illustrations appear in the publication under review, were also used in the carnival parade accompanied by signs with appropriate catchy legends and rhymes. The models of the insects were approximately 2 metres in length, and were carried on the backs of men. Such a demonstration has had an important influence in bringing the dangers to public health prominently before the eyes of the public.

FUNGUS NOTES.

A NEW FUNGUS ON LIME LEAVES.

In November 1912, Mr. Joseph Jones, Curator of the Botanic Station, Dominica, forwarded to the Commissioner of Agriculture a number of lime leaves from the Senhouse Estate bearing an abundance of examples of a small black star-shaped organism, which it was thought might possibly be a fungus parasitic on the scale insects which were also present on the leaves. The material was forwarded to Kew but proved to be unsuitable for diagnosis. Further supplies have been collected and sent on from time to time and these have afforded material for the recognition of the systematic position of the organism. A full description, with figures, is given by A. D. Cotton in an article in the *Kew Bulletin*, No. 2, 1914 pp. 54-63, from which the following information is extracted.

The star-shaped bodies resembled a lichen such as Collema in appearance, being gelatinous and swelling when moistened, after the manner of species of that genus. In structure, however, they showed a resemblance to certain members of the red algae, being composed of black moniliform filaments more or less held together in mucilage, loosely arranged in the centre and more compact towards the periphery. The general structure was utterly unlike that of an ordinary fungus, and from an alga the plant differed in the fact that the filaments were apparently devoid of colouring matter, while from a lichen they were equally distinct through the absence of gonidia—the algal cells characteristic of that group.

Additional supplies gave the necessary clue for identification. One of these samples provided the conidia-like spores and the other abundance of asci and ascospores. The presence of asci proved that the plant was not an alga, and the absence of gonidia being confirmed its place had to be sought amongst the fungi. Here it was ultimately traced to the genus Atichia.

The genus was founded by Flotow in 1850 and for half a century contained only one species; a small plant, supposed to be a lichen, occurring on leaves of conifers in Southern Europe. A Javan species bearing ascospores, was discovered about 1900 on various hosts. In 1904 the same plant was found in Polynesia and in 1906 another species was described from Tahiti on vanilla. Two species are also recorded from Central America and Chile respectively.

STRUCTURE. The Atichia thallus is either an irregular wartlike or coralloid mass, or a flattened more or less stellately branched body attached below by a small central point. It is composed of a system of torulose almost articulated filaments held together in mucilage. The filaments branch irregularly and probably anastomose; towards the periphery the branching is dichotomous and the cells smaller and more closely packed, so that a denser cortical layer results. These terminal cells are not, however, laterally united, but remain free. The thallus is colourless within, but externally it is black owing largely to the peripheral cells being dark in colour.

Three kinds of reproductive organs are known, ascospores, conidia-like cells which adhere in clusters (propagula), and pycnidia. With regard to the asci, no definite apothecia or perithecia are produced, but any part of the upper surface of the thallus may become fertile and develop asci between the moniliform filaments in the cortical layer. In some species the fertile portion is swollen in the form of cushion-like pads, which in extreme cases may almost amount to discoid branches. The asci are oval and contain two-celled hyaline or sub-hyaline spores. The conidial type of reproduction is even more unusual than the ascigerous. The spores do not occur singly but in clusters, each of which remains intact on liberation, and are produced in great quantities in cavities in the thallus.

LIFE-HISTORY AND BIOLOGY. With regard to the biology of Atichia the following items may be recorded. Of the early stages of the plant little is known, but the material forwarded from Dominica supplied a series of specimens showing all stages from the budding propagulum to the mature plant. Some of the leaves received were covered with the mycelium of one of the Sooty Moulds (Capnodiaceae), and on this the propagula had become entangled. In the earliest stages their triquetrous outline is still visible, but owing to successive budding this is soon lost and the mass becomes spherical. When about 50 microns in diameter these masses begin to assume, but on a compressed scale, the same type of structure as the mature plant, and show differentiation into a soft, loosely arranged, interior, and a denser cortical layer. These observations are important in showing that Atichia is a distinct fungus, and not a stage in the life history of Capnodium or other genus as some writers have thought. Proof of this, however, was not needed, as Mangin and Patouillard's researches place the question beyond doubt. The ray-like branches begin to protrude as lateral outgrowths when the plant is quite young (about 1 mm. in diameter), four or five rays first appearing, but others follow so that the mature plant may be 7-10 rayed. The rays, which are of unequal length, often remain simple, but occasionally they fork or produce short lateral branches. A considerable variation in form is thus found, even in specimens occurring close to each other; a point which should inculcate caution with regard to the use of external form in this genus.

From what has been said it will be seen that there is no necessary connexion between the Dominican fungus and the scale *Lepidosaphes beckii*, though as a fact it is often found attached to the latter. Some of the lime leaves forwarded were very badly attacked by this pest, and the effect is seen in the presence of sooty moulds and other fungi. The leaves of Raciborski's specimens are quite clean, and the fungus is sparsely scattered and attached directly to the leaf. The same is also true of some of the specimens from Dominica, this being particularly the case in the second batch forwarded.

The Dominica plant is described as a new species under the name *Atichia dominicana*, Cotton.

Conditions Favourable to the Development of Mildew.—From observations in France it appears that infection by mildew is due to (a) general causes; (b) secondary causes depending on the nature and vitality of the vine, and on its adaptation to local conditions, such as the composition and exposure of the soil; (c) accidental causes (such as manure, tillage, drainage of the soil, etc.).

As these general causes are bound up with atmospheric variations, meteorological observations are required to provide warnings and timely information. Preventive measures can always be successful in normal years when periods of infection do not overlap each other, as happened this year at Roussillon (Pyrenees Orientales).

For secondary and accidental causes, it is necessary to make researches into the variations in the development of the disease. For example, the variety Grand-noir will remain free from disease though surrounded by the Carignan variety badly infected; and the Carignan of Salanque (1), growing in soil of norman humidity, will be protected from infection by treatment with copper sulphate, owing to its adaptation to the local conditions. (*Monthly Bulletin of Agricultural Intelligence and Plant Diseases*, October 1913.)

DOWN THE ISLANDS.

ITEMS OF LOCAL INTEREST.

The Acting Agricultural Superintendent, St. Vincent, writes to say that the newly planted cotton throughout the island is germinating regularly as a result of the seasonal daily showers that have been received. The rainfall for June at the Botanic Station was 9·47 inches. The St. Vincent Cotton Growers' and Exporters' Association and the Local Agricultural and Commercial Society have held a meeting to discuss the prospects of establishing a cassava dried root industry, definite information concerning which has now been obtained. It is likely that an important trade in this product will be eventually established.

The St. Vincent *Government Gazette* for June 12, 1914, contains several official notices of local interest. In view of the existence of the disease called mal de caderas in British Guiana and other parts of South America, the importation of animals from these countries is prohibited. Further, in connexion with cattle, an amendment has been made of the bye-laws of the meat market principally in connexion with prevention of the sale of the flesh of sheep and lambs as goat meat. In regard to the Land Settlement Scheme in St. Vincent, notice is given that the Government will acquire certain rural lots for the construction of roads on Belair estate which has just been established as a Land Settlement. The Supervisor of the Government Cotton Ginnery in the same publication, makes known the prices that will be paid during the coming season on account of seed-cotton: 1st, white grade 6¼c. per lb.; 2nd, ditto 5c. per lb.; 1st, stained, 3c. per lb.; 2nd, stained 2c. per lb. For 1st grade Marie Galante cleaned and well prepared, 2½c. per lb. will be given, and for second grade under similar conditions, the price will be 2c. per lb.

Information received from St. Lucia states that in the Soufrière district considerable activity is being displayed by the peasants in regard to the planting of limes. The Government lime juice factory at Castries has now started a second year of operations, and there is every prospect that the results of the coming season will be even more encouraging than those experienced last year.

From Dominica Mr. Joseph Jones informs this office that the prospects ahead of the lime crop are good. During June, 8,799 barrels of fresh lime were shipped to North America. The price of concentrated lime juice continues to rise and the latest cable quotation is £41 per pipe. The Curator states further that an experimental shipment of grafted mangoes has been made to London and a further shipment of fresh limes has been forwarded to the Tropical Products Exhibition. The annual survey of the results obtained from the cacao manurial plots is nearing completion. It will be remembered that an important study of the results obtained from these plots during the period 1902 to 1912 appears in the recently issued number of the *West Indian Bulletin*, Vol. XIV, No. 2.

Mr. Shepherd, acting Superintendent of Agriculture for the Leeward Islands, in a report on a recent visit to Antigua, states that planters in that island are finding weeding machines and similar implements of material service. Another satisfactory feature of agriculture in Antigua is the likelihood that large areas may be successfully planted with coco-nuts in that island and in Barbuda, a matter, the possibilities before which, have frequently been pointed out by the Imperial Department of Agriculture for some time past. At present the weather conditions in Antigua are favourable and the young cane crop is in a promising condition.

Recent observations of considerable interest have shown in Montserrat that the unthriftiness of the lime trees in many parts of that island may possibly be connected with the soil grub of the beetle known as *Exophthalmus esuriens*. In this connexion it will be of interest to announce the forthcoming pamphlet dealing with soil grubs in the Leeward Islands which is shortly to be issued by this Department.

On July 1, Mr. Shepherd paid a visit to Nevis. With the good weather of the past two months, he states that the cotton crop has made remarkable progress and is looking perhaps better and more advanced than for many seasons past. The attacks of worms which are causing some damage in certain places are being adequately controlled by the employment of Paris green. The coco-nut cultivations in Nevis are making good progress and the trees are looking thoroughly healthy. Large shipments of nuts have been made lately, and it is likely that a neighbouring estate to Pinneys will be planted up this year so that it would seem that coco-nut cultivation in Nevis is likely to be greatly extended.

Rope and Its Use on the Estate.—Minnesota Station Bulletin, No. 136 describes briefly the materials, methods of manufacture, strength and use of rope in general estate work. It is reported in the *Experiment Station Record* that the following information is given as regards the strength of rope: Four-strand ropes have about 16 per cent. more strength than three-strand ropes. Tarring rope decreases its strength by about 25 per cent., because the high temperature of the tar at the time of its application injures the fibres. The breaking strength in pounds for new Manila rope may be found approximately by the formula, $S = D^2 \times 7,200$ and for hemp rope $S = D^2 \times 5,400$ where S = the breaking strength and D = the diameter in inches. The safe load is usually regarded as one-sixth of the breaking strength.

Other sections in the bulletin describe how to prevent ends of rope from untwisting, how to tie knots, loops at the rope's end, loops between the rope ends, hitches, halters, and the like.

Progress in Synthetic Rubber.—*The Times* reports that at a general meeting of the Synthetic Products Company last December it was said that with regard to synthetic rubber the small plant at the company's works was now in regular operation, and they hoped, by adding further units to the existing plant, to turn out sufficient quantities for practical tests. Already the small plant at the works had produced rubber of good quality. The directors proposed to issue an interim report during the coming year on the results of the tests of synthetic rubber.

Sir William Ramsay, one of the directors, said he wished to emphasize the fact that they had proceeded cautiously. Everything had been tried on a small scale, and when that was done any alterations that might show themselves to be necessary could be carried out quickly and inexpensively. Laboratory operations were being transferred to manufacturing operations, but still on quite a small scale. They did not wish to put up a large factory until they were sure of their points, and that would not take very long now. The units had not reached the final size. When a full scale unit was working well, plant would be put up to produce, say, half a hundredweight of rubber per week.

MARKET REPORTS.

London.—The West India Committee Circular, June 30, 1914; Messrs. E. A. de Pass & Co., June 19, 1914.

Arrowroot—1½*d.* to 4½*d.*
Balata—Sheet, 2/7; block, 2/0¾ per lb.
Beeswax—£9.
Cacao—Trinidad, 57/- to 64/- per cwt.; Grenada, 50/- to 56 ; Jamaica, 50/6 to 58/.
Coffee—Jamaica, 45/- to 74/6.
Copra—West Indian, £25 10*s.* per ton.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 17*d.* to 19*d.*
Fruit—No quotations.
Fustic—No quotations.
Ginger—Dull, 33/- to 60/-.
Isinglass—No quotations.
Honey—18/- to 21/6.
Lime Juice—Raw, 1/8 to 1/9; concentrated, £38 to £41; Otto of limes (hand-pressed), 8/6.
Logwood—No quotations.
Mace—1/8 to 2/6.
Nutmegs—4½*d.* to 6*d.*
Pimento—1⅞*d.* to 2*d.*
Rubber—Para, fine hard, 2/9¾*d.*; fine soft, 2/4½; Castilloa, 1/8 per lb.
Rum—Jamaica, 2/2 to 5/-.

New York.—Messrs. Gillespie Bros., & Co., June 26, 1914.

Cacao—Caracas, 11½c. to 13c.; Grenada, 11¼c. to 11½c.; Trinidad, 11c. to 11½c.; Jamaica, 10c. to 12c.
Coco-nuts—Jamaica and Trinidad, selects $26·00; culls, $13·00.
Coffee—Jamaica, 10¼c. to 14½c. per lb.
Ginger—7½c. to 10c. per lb.
Goat Skins—Jamaica, 47c.; Antigua and Barbados, 45c. to 48c.; St. Thomas and St. Kitts, 42c. to 45c. per lb.
Grape Fruit—Jamaica, $1·25 to $2·00.
Limes.—$5·00 to $6·00.
Mace—45c. to 53c. per lb.
Nutmegs—110's, 12½c.
Oranges—Jamaica, $1·50 to $2·00.
Pimento—4c. per lb.
Sugar—Centrifugals, 96°, 3·32c.; Muscovados, 89°, 2·88c.; Molasses, 89°, 2·67c., all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., July 6, 1914.

Cacao—Venezuelan, $11·10 to $11·30; Trinidad, $11·00 to $11·50.
Coco-nut Oil—92c. per Imperial gallon.
Coffee—Venezuelan, 13c. per lb.
Copra—$4·25 per 100 lb.
Dhal—No quotations.
Onions—$1·00 to $1·50 per 100 lb.
Peas, Split—$6·00 to $6·10 per bag.
Potatoes—English, $1·50 to $2·00 per 100 lb.
Rice—Yellow, $5·25; White, $5·25 per bag.
Sugar—American crushed, no quotations.

Barbados.—Messrs. James A. Lynch & Co., Ltd. June 27, 1914, Messrs. T. S. Garraway & Co. June 29, 1914; Messrs. Leacock & Co., June 19, 1914.

Arrowroot—$3·10 to $4·50 per 100 lb.
Cacao—$13·00 to $13·50 per 100 lb.
Coco-nuts—$17·00.
Hay—$1·60 to $1·75 per 100 lb.
Manures—Nitrate of soda, $65·00; Cacao manure, $48·00 to $50·00; Sulphate of ammonia $78·00 to $85·00 per ton.
Molasses—No quotations.
Onions—$2·25 to $2·75 per 100 lb.
Peas, Split—$6·00 to $6.25 per bag of 210 lb.; Canada, $4·35 to $4·40.
Potatoes—Nova Scotia, $4·50 per 160 lb.
Rice—Ballam, $5·35 to $5·75 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
Sugar—American granulated, $3·77 per 100 lb.

British Guiana. Messrs. Wieting & Richter, July 4, 1914; Messrs. Sandbach, Parker & Co., June 19, 1914.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	$7·00 to $8·00 per barrel of 200 lb.	——
Balata—Venezuela block	No quotation	——
Demerara sheet	65c. per lb.	——
Cacao—Native	12½c. per lb.	13c. per lb.
Cassava—	96c.	——
Cassava Starch—	——	——
Coco-nuts—	$16 to $20 per M.	$23 per M.
Coffee—Creole	15c. per lb.	16c. per lb.
Jamaica and Rio	15c. per lb.	16c. per lb.
Liberian	11c. per lb.	11c. per lb.
Dhal—	$5·00	$5·75 per bag of 168 lb.
Green Dhal	——	——
Eddoes	$1·44	——
Molasses—Yellow	None	——
Onions—Teneriffe	——	——
Madeira	3c.	3c. to 3½c.
Peas—Split	$6·00 to $6·25 per bag (210 lb.)	$7·25 per bag. (210 lb.)
Marseilles	——	——
Plantains—	16c. to 48c.	——
Potatoes—Nova Scotia	——	$2·50 to $2·75
Lisbon	$1·10	——
Potatoes—Sweet, B'bados	$1·20 per bag	——
Rice—Ballam	No quotation	——
Creole	$5·50 to $5·75	$5·75 to $6·00
Tannias—	$2·64	——
Yams—White	$2·16	——
Buck	$1·92	——
Sugar—Dark crystals	$2·07 to $2·25	$2·20
Yellow	$2·50 to $2·60	$2·75
White	$3·40	$4·00
Molasses	$1·90 to $2·00	——
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M.
,, Cordwood	$1·80 to $2·00 per ton	——

Publications on sale of the Imperial Department of Agriculture

FOR THE WEST INDIES.

The 'WEST INDIAN BULLETIN'. A Quarterly Scientific Journal.

Volume I. No. 1. Out of print. Nos. 2, 3, and 4, in original paper covers as issued, price 1*s.* each. Post free, 1*s.* 2*d*; Volumes II, III, IV, V, VI, VII, VIII, IX, X, XI, XII and XIII:—Price 2*s.* each ; Post free 2*s.* 8*d*, where complete. (III, 2. IV, 3; and V, 2 and 3 are out of print.)

Volume XIV, Nos. 1 and 2 No. 1 Containing Papers on PEASANT AGRICULTURE IN THE WEST INDIES: (1) Introductory paper—Efforts in Aid of Peasant Agriculture in the West Indies, by Francis Watts, C.M.G., D.Sc., F.I.C., F.C.S; (2) Government Schemes of Land Settlement in Grenada and the Grenadines, by Gilbert Auchinleck, B.Sc., F.C.S.; G. Whitfield Smith, F.L.S., and Walter Bertrand; (3) Method of Working Small Holdings under the Land Settlement Scheme in St. Vincent, by W. N. Sands, F.L.S.; (4) Agricultural Credit in the West Indies, by W. R. Dunlop; together with the St. Vincent Credit Ordinance, 1913, and Report on working of the same, by Robert M. Anderson.

PAMPHLET SERIES.

The Pamphlets are written in a simple and popular manner and the information contained in them is especially adapted to West Indian conditions. They contain, amongst other subjects, summaries of the results of the experiment work on sugar-cane and manures, the full official reports of which have only a limited circulation. The number issued up to the present time is seventy. Those mentioned in the following list are still available: the rest are out of print.

SUGAR INDUSTRY.

Seedling and other Canes at Barbados
in 1900. No, 3, price 2*d.*; in 1901, No. 13, price 4*d.*;
in 1902, No. 19, price 4*d.*; in 1903, No. 26, price 4*d.*;
in 1904, No. 32, price 4*d.*

Seedling Canes and Manurial Experiments at Barbados,
in 1903-5, No. 40, price 6*d* ; in 1904-6, No 44, price 6*d.*;
in 1905-7, No. 49, price 6*d.*; in 1906-8, No. 59, price 6*d.*;
in 1907-9, No. 62, price 6*d.*; No. 66, price 6*d.*

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in 1902-3, No. 27, price 2*d.*; in 1903-4, No. 33, price 4*d.*;
in 1904-5, No. 39, price 4*d.*; in 1905-6, No. 46, price 4*d.*;
in 1906-7, No. 50, price 4*d.*; in 1907-8, No. 56, price 4*d.*;
in 1908-9, No. 63, price 6*d.*; in 1909-10, No. 67, price 6*d.*

Manurial Experiments with Sugar-cane in the Leeward Islands,
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in 1904-5, No. 42, price 4*d.*; in 1905-6, No. 47, price 4*d.*;
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GENERAL.

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Insect Pests of Sugar-cane in Antigua and St. Kitts (*in the press*).

The above will be supplied post free for an additional charge of ½*d.* for the pamphlets marked 2*d.*, 1*d.* for those marked 4*d.*, and 1½*d.* for Nos. 40, 41, 44, 45, 49, 59, 62, 63, 67 and 69. Postage for No. 71, 4*d.*

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The 'Agricultural News' contains extracts from official correspondence and from progress and other reports; and, in fact, any information indicating what is going on in each colony, and the progress made in Agricultural matters throughout the West Indies.

The 'Agricultural News' is printed in time to be distributed, regularly, by each mail, and is on sale by the local agents of the Department at one penny per number, post free, 2*d.* The subscription price, including postage, is 2*s.* 2*d.* per half-year, or 4*s.* 4*d.* per annum. Volumes IV, V, VI, VII, VIII, IX, X and XI complete, with title page and index, as issued—Price 4*s.* each.—Post free, 5*s.* Some numbers of the early volumes are out of print and therefore these volumes can no longer be supplied complete. The scale of charges for ADVERTISEMENTS may be obtained on application to the Agents All *applications for copies are to be addressed to the Agents, not to the Department.*

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Tobago: Mr. C. L. PLAGEMANN, Scarborough.
St. Vincent: Mr. J. B. BONADIE, 'Times' Office.
St. Lucia: Mr. M. A. LAWRENCE, Botanic Station.
Dominica: Mr. J. R. H. BRIDGEWATER, Roseau.
Montserrat: Mr. W. ROBSON, Botanic Station.
Antigua: Mr. S. D. MALONE, St. John's.
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Printed at the Office of *Agricultural Reporter*, 4 High Street, Bridgetown, Barbados.

AGRICULTURAL NEWS

Vol. XIII. No. 320.] SATURDAY, AUGUST 1, 1914. [One penny.

Department of Science and Agriculture, British Guiana.

NOTICE.

AGRICULTURAL INSTRUCTOR.

Salary, $960 per annum rising to $1,200 by $72.

(NOT ON THE FIXED ESTABLISHMENT.)

APPLICATIONS are invited from candidates for the above post, who should be between twenty-three and thirty-six years of age. Knowledge of, and experience in, the growth of tropical products and of draining operations on low-lying land is of importance.

Candidates must submit with their applications, details of their training in Agricultural Science and in practical Agriculture accompanied, if feasible, by diplomas from the institution where trained or of certificates in Agriculture issued by the Imperial Department of Agriculture for the West Indies or the Department of Agriculture of any other tropical country, copies of satisfactory certificates of health and of character, together with copies of not more than three testimonials from their present and former employers.

2. *Duties.*—To give instruction in practical horticulture to farmers and settlers in the various districts of the colony, especially in connection with the cultivation of rice, rubber, cacao, coffee, bananas, and citrus fruit and the care of live stock generally; to assist in the inspection of gardens attached to primary schools and in the examination of their pupils in the elements of agriculture; to assist in agricultural experiments and in the control of the district agricultural stations; to assist in the nurseries of the Botanic Gardens; and to perform such other duties as may be assigned to him by the Director of the Department.

3. The selected candidate will be required to sign a form of agreement previous to appointment.

4. Applications should be addressed to the Director of Science and Agriculture on or before August 15, 1914.

J. B. HARRISON,
Director of Science and Agriculture.

July 3rd, 1914.

PUBLICATIONS

ON SALE

OF THE

IMPERIAL DEPARTMENT OF AGRICULTURE

FOR THE WEST INDIES.

The 'WEST INDIAN BULLETIN'. A Quarterly Scientific Journal.

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Vol. XIV, No. 1, containing papers on Peasant Agriculture in the West Indies, and No. 2 containing papers on soil chemistry, veterinary science, etc.

AGRICULTURAL NEWS.

The Fortnightly Illustrated Review of the Imperial Department of Agriculture for the West Indies.

The first number of the **Agricultural News** was published on April 25, 1902. Subsequent numbers have regularly appeared, on every alternate Saturday, in time for the outgoing mails.

The **Agricultural News** gives within a fortnight after their receipt, a digest of important articles in all branches of tropical agriculture, appearing in contemporary journals, that are considered likely to prove useful and interesting, primarily in the West Indies, but also in the Tropics generally.

The **Agricultural News** contains also extracts from official correspondence and from progress and other reports; and, in fact, any information indicating what is going on in each colony, and the progress made in Agricultural matters throughout the Tropics.

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ANNUAL REPORTS ON THE LOCAL DEPARTMENTS OF AGRICULTURE.

These interesting publications contain administration and progress reports on the agricultural organization and experimental work at Grenada, St. Vincent, St. Lucia, Dominica, Montserrat, Antigua, St. Kitts-Nevis, and the Virgin Islands.

The series has a limited circulation but copies may be obtained (price 6*d.* each) on application to the Agents of the Imperial Department.

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Nevis : Messrs. HOWELL, BROS. Charlestown.
Grenada : Messrs. THOS. LAWLOR & Co., St. George.

AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

OF THE

IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

VOL. XIII. No. 320. BARBADOS, AUGUST 1, 1914. PRICE 1d.

CONTENTS.

Canadian Exhibition, 1914.

ON the 19th of this month the Canadian National Exhibition will be opened at Toronto. At it will be represented most of the Colonies in the West Indies, and it may be of interest to those who are concerned if we present a review of the present position of West Indian trade with Canada and endeavour to indicate some of the ways in which the exhibition should serve as an effective educational and advertising medium for these colonies.

An examination of the statistics supplied by the Canadian Board of Trade and the various local West Indian Governments shows that on the whole the exports of produce from the West Indies to Canada have been less during 1913 than in 1912, the value of the exports of sugar alone in 1913 being at least $2,000,000 less than that recorded for the previous year. The principal cause for this reduction has been the severe drought experienced in the West Indies during the past three years, and the low prices which prevailed for sugar during the greater part of the year 1913. It will be readily understood that this reduction is somewhat unfortunate in more ways than one, particularly in view of the establishment last year of the Reciprocity Agreement between the West Indies and Canada; for the reduction in the value of West Indian exports makes it difficult, if not impossible to decide the advantages that have accrued from the agreement in question. But turning to products other than sugar we find signs of an increasing trade during the past year, the exports of hides and skins, coffee, cacao, coco-nuts, and crude lime juice being considerably in excess of those recorded for 1912. Hence it is to be expected that with favourable climatic conditions, exports from the West Indies to Canada next year will show a big all-round increase.

From the Canadian point of view, trade relations during 1913 have been generally satisfactory. The value of the flour imported into the West Indies has increased, and the present time sees most of this imported food-stuff of Canadian origin, and there is little doubt that as the outcome of the preferential tariff, Canada will soon be the sole supplier of flour to these Colonies. The second most important Canadian product shipped to the West Indies is lumber, which has also shown an increase in value. In connexion

with this product, a recent suggestion concerning trade with British Colombia is of interest. It has been considered possible that the opening of the Panama Canal may lead to the subsidization of a low freight service of steamships between Vancouver and these parts, which will bring down lumber and return with sugar, spices and other products from the West Indies. It will be seen that in the event of the institution of such a service there would be a circular steamer communication with Canada, and on the Western side a new source of demand would be touched, which, up to the present, the West Indies have not been in contact with.

A great deal of interest is being displayed at the present time in connexion with West Indian trade with Canada in the so-called minor products. It seems worth while referring to this section of the trade at some length, for it is a matter of certainty that the West Indies possess great chances of extending themselves commercially in the production of the so-called minor crops. It will be understood that the production of these commodities, like fruit and vegetables, which are carried on by the individual on a small scale, necessitates co-operation if it is desired to establish a permanent trade. A good example of what can be done is seen in the Antigua Onion Growers' Association — a society which buys locally grown onions, grades them and ships them to Canada where there are sold on well organized lines to special agents in touch with the Canadian market. There is no doubt that similar success could be achieved in regard to other products. For the past year or two attention has been given to the possibility of establishing a trade with Canada in cassava starch. Provided a sufficient amount of this were produced and sold co-operatively in marketable amounts, there seems little doubt that an important trade in this commodity too could be established with Canada where cassava starch has two special uses—in the manufacture of explosives and in the confectionery trade. Though rather opposite in nature, these uses are specialized ones and indicate that a particular demand exists for the material in question. It is interesting to note that in connexion with the employment of cassava in the making of explosives, the Canadian Government has recently introduced a special preferential tariff for the British grown material. Furthermore recent correspondence with Canada has shown that the prices which buyers are now prepared to offer for dried cassava are likely to be such as will make its cultivation and preparation in the West Indies decidedly popular. To some extent what has been said in regard to cassava holds good in the case of other starch producing plants like sweet potato. There is some likelihood that a trade may be developed in this article also. As regards fruit, there is already evidence to show that West Indian trade with Canada is quickly developing. The exports of green limes last year greatly exceeded those sent during the previous twelve months, and in view of the cold storage accommodation offered by the newly established Royal Mail Steamship Service between Halifax, St. John, and these islands, it may be expected that the more perishable fruits will be more extensively grown for export. We would particularly call attention to the suitability of mangoes, grape fruit, avocado pears and similar kinds of fruit, though it will have to be borne in mind, especially in regard to mangoes, that a high quality and uniform article only is likely to produce a regular and constant demand in the Northern markets.

The facts expressed in the above paragraphs may help to bring out some of the uses to which an exhibition like that of Toronto can be put for displaying the large variety of commodities other than sugar with which the West Indies can supply the Dominion more cheaply than most other Tropical countries. It is desirable that the possibilities of the West Indies and their resources and the good agricultural organization that exists, should be brought before the Canadian merchant and the Canadian consumer. No better opportunity for doing this effectively is afforded than by the National Exhibition. It is necessary to understand, however, that exhibits alone are not sufficient. There must be reliable, attractive and suggestive literature circulated, and what is perhaps more essential, there must be representatives at these exhibitions who have a personal knowledge of local conditions in the West Indies to answer enquiries concerning the samples displayed. It is hoped that this department's booklet entitled the West Indies in Canada may serve a useful purpose in this respect. As regards personal representation, the West Indies have to acknowledge the important assistance rendered by Mr. C. S. Pickford of the firm of Messrs. Pickford and Black, Ltd., and particularly that of Mr. Mousir, Secretary of the Canada-West India League. It would be well, however, if the West Indies were annually represented by West Indians, by agents whose interests were in the West Indies and who were familiar and in touch with the exact conditions of production and sale. The Imperial Department this year, as well as publishing the literature already referred to, has been in correspondence, at the suggestion of Mr. C. S. Pickford, with various West Indians now residing in Canada, in the hope of obtaining their services in the direction already indicated. Whether

this desirable object will be achieved this year is not at the time of writing definitely settled, but official authority has been granted by the Secretary of State for the nomination of a representative.

Lastly, in connexion with the Exhibition, we would call attention to its value as a form of advertisement in regard to the West Indian tourist trade. Here again there is evidence that the illustrated handbook of this Department serves a useful purpose: Canadian visitors to these islands frequently refer to this publication which they have obtained in Toronto the previous year. With a view to increasing this function of the publication, a larger number of more attractive illustrations have this year been inserted, and it is hoped that the booklet may further the desirable intercourse between the inhabitants of the West Indies in Canada which has so largely increased during recent years; that it may have some influence as an item of the Exhibition in the matter of attracting those who need or desire climatic change and rest; and that it may help to draw a larger number of those particularly desirable visitors who arrive in these islands with the object of combining their pleasure with business.

SHIPMENT OF BENGAL BEANS AS CATTLE FOOD.

Last year a sample of Bengal beans was sent from St. Vincent to the Imperial Institute for chemical and commercial examination. It was found that the beans constituted a feeding stuff of high nutritive value and contained no alkaloids or cyanogenetic glucosides. It contained 122 food units, which is higher than the nutritive value of undecorticated cotton seed cake (108).

During May of the present year a larger sample consisting of 290 lb. of beans was shipped from St. Vincent to Messrs. Gillespie, Bros. & Co. who have gone into the matter of its value for cattle food very carefully. This firm reports that on the London Corn market there is likely to be a demand for the beans at about £6 10s. to £7 per ton, c.i.f. London. On grinding the sample it was found that a very attractive looking meal was obtained though the admixture of the black testa of the seed is considered to somewhat spoil the appearance. A small feeding trial has been made in England with cows, and from this together with the analysis of the meal, it is considered that it forms a rich, wholesome foodstuff that should be a perfectly marketable article. Messrs. Gillespie, Bros. & Co. have advised the consignment, if possible, of say 15 to 20 tons to them, as they believe the meal would sell readily at about the price mentioned above.

In corresponding with the Acting Agricultural Superintendent on the matter, the Imperial Commissioner of Agriculture raised the point as to whether the price quoted is regarded by planters as reasonable in view of the estimated yield of the beans per acre. Readers will be familiar with the fact that in the West Indies, Bengal beans are grown primarily for their value as a green dressing, and planters in St. Vincent exercise care to prevent the beans seeding in the field since the dispersal of the seed would be likely to entail considerable expense in connexion with the weeding of the subsequent crop. In St. Vincent, the principal crops cultivated are cotton and arrowroot. As regards the effect of the beans upon subsequent cultivation in the case of cotton there seems to be little ground for anticipating much trouble by allowing the beans to flower and fruit, but in the case of arrowroot and similar crops of low growth, stray bean plants are apt to be troublesome and to form thick mats of vines over the crop proper. Were it not for this objection there would appear to be no difficulty in regard to the production of marketable quantities of Bengal beans in St. Vincent, and planters are of opinion that the price just quoted in London would pay. In view of the considerations put forward above it has been decided to try and supply the English market with some 20 tons of beans at an early date, and if these sell readily there is no doubt that planters in the West Indies will consider what special methods can be adopted to enable the important crop under consideration not only to improve the soil in its nitrogen and humus content, but to supply as well produce from which a direct profit can be obtained. It may be mentioned that the possibility that cassava in St. Vincent may be grown in the future more extensively than it is at present in some places as a substitute for arrowroot, is a possible solution to the difficulty, owing to the entirely different habit of the cassava plant which more or less resembles in this respect cotton. In any case the subject is worthy of careful consideration particularly in view of the fact that the demand for feeding stuffs in Great Britain is showing a tendency to increase. There is no doubt that in years to come the feeding of live stock in temperate countries will more and more depend upon the by-products of tropical crops, at any rate as regards concentrated food stuffs; and a highly rich, nitrogenous food-stuff like Bengal bean meal which can be grown cheaply and advantageously should stand an exceedingly good chance of establishing itself as an important article in the rations for dairy cows and fattening animals in temperate countries.

The Manuring of Bananas in Queensland.

Of some interest, from two points of view, is a short article which appears in the *Queensland Agricultural Journal* for June 1914. It gives the results of experiments that have been made in that country with regard to the manurial requirements of the banana - work that is of special interest, since it is stated to have been conducted in a reliable manner by the pupils of one of the Queensland State Schools.

Turning to the actual work done, it is stated that the following sets of manures were employed: incomplete—2 lb. dried blood, 1¼ lb. superphosphate; complete No. 1—2 lb. dried blood, 1¼ lb. superphosphate, 1 lb. sulphate of potash; complete No. 2 2 lb. nitrate of lime, 2lb. sulphate of potash, 4 lb. superphosphate. These quantities were supplied to stools every six months. In considering the table of results it appears that complete No. 1 gave by far the greatest gain per acre after paying for the manure. For complete No. 1 this is quoted at £53 3*s.* 11*d.*, for the incomplete manure, £18 3*s.* 7*d.*, for complete manure No. 2, £16 1*s.* 5*d.* The reason for the noticeably small gain in the case of complete manure No. 2, lies in the fact that the cost of the manure per acre was nearly twice as great as in the case of complete manure No. 1, which was just over £12.

SUGAR INDUSTRY.

THE SUGAR PALM.

In India, several species of palm trees are utilized as a source of sugar, and, in the *Agricultural News* for August 2, 1913, a brief account was given of the experimental work that had been conducted with the Palmyra palm (*Borassus flabelliformis*), a tree which in Bengal is systematically tapped for the sugar which its sap contains. It was found, however, in the course of the investigation, that the principal difficulty in obtaining the sugar was the great losses that occur through fermentation, but that this change could be greatly retarded by sponging the wounds with formaldehyde.

Work of a very similar nature has of late been done in the Philippines in connexion with the sugar palm known botanically as *Arenga saccharifera*. The results obtained will be found fully described in a series of special articles in the *Philippine Agricultural Review* for May 1914, from which the following notes have been extracted.

The sugar palm, mentioned in Sanskrit writings, is one of the oldest economic species used by civilized man as a source of sugar. The tree is not specially speaking a jungle species, and seems to prefer the banks of mountain streams, margins of forests, and partially open hillsides. The spread of its leaves is not quite so great as with the coco-nut, but the weight of the crown is much greater and the leaves are much longer and heavier, whilst the trunk is usually shorter but often thicker than that of the coco-nut. Unlike that of the coco-nut, the trunk is always vertical. It is stated in the article under review that a hectare of land containing from 150 to 200 trees should produce, under modern cultural methods, some 20 or more tons of marketable sugar per year over a period of ten to fifteen years. This yield, considering the extremely low upkeep expense, compares very well with that of the best sugar-cane. As soon as the flowers in the bunch open, the stem is severed at about the point where the first pedicels are given off, namely, 40 to 60 cm. from the trunk of the tree. Various methods are employed locally to prevent fermentation of the sap, but none appear to be as satisfactory as the methods devised as the outcome of experiments conducted by the Bureau of Agriculture.

One very peculiar fact connected with the sap of this tree in comparison with saps of other sacchariferous plants, is its extremely low acidity. Samples when fresh show only a trace of acid. When however untreated sap is exposed to air, it very readily ferments. Hence the experiments conducted with preservatives and in connexion with clarification for the purpose of determining the proper methods of handling the sap in the manufacture of sugar.

Formalin has answered well as a preservative as has also milk of lime. But in the clarification, the method which gave the best result was heating the sap to boiling point and then the addition of alcohol which had the affect of precipitating albuminous matter and pectin bodies which were very readily filtered off. The filtrate was then treated with milk of lime, and this was then carbonated to 0·3 acidity, which caused another precipitate to fall immediately, leaving a perfectly clear supernatent liquor. 'A beautiful light, clear massecuite of 86° Brix. was made from this sap which began to crystalize after three days, and at the end of five days was filled with short clear crystals and a very light-coloured molasses. This sugar was easily drained of the thin molasses and washed to a high grade sugar with very little clear water. The same method was then used in making syrup and gave a light-coloured heavy liquor of 56° Brix. with an excellent flavour.'

The secret of this method of clarification lies in the heating of the sap to boiling point or in treatment with alcohol, either having the effect of sterilizing the sap as well as precipitating impurities. Although the alcoholic treatment may be dispensed with, this will yet give excellent results whenever practicable to employ it.

Reference is made in the publication under consideration to the manufacture of alcohol and vinegar from the juice of the tree. Each litre of sap containing 14 per cent. sucrose gives 70 grammes of absolute alcohol, provided there is perfect oxidation and no loss, or about 80 cc. of 20 per cent. alcohol, namely, 28 litres for each tapping.

For further details as to yields per tapping under different conditions, etc., the reader is referred to the articles already acknowledged; but in concluding this account of the subject, the fact may be emphasized that the sugar palm is also of value as a source of fibre and starch. Ropes made from the fibre of this tree are said to endure alternate wetting and drying or continued exposure to either fresh or salt water better than any other rope material in the world.

DETERMINATION OF VARIETIES OF SUGAR-CANE BY MEANS OF STOMATAL CHARACTERISTICS.

Mr. Aguste de Villèle, Director of Agriculture for the Ile de la Réunion, puts forward an interesting discussion on the above subject in the *Revue Agricole* (May 1914). He begins by drawing attention to the difficulties of distingnishing varieties of plants and animals in general, and then proceeds to show that, in regard to varieties of sugar-cane, the confusion that exists in many places is particularly great. As an example, M. Villèle points out that in Hawaii the Lahaina cane is considered to be the same as the Louzier and as the Bourbon (which is known in Ile de la Reunion as 'la canne jaune'). It seems that in Mauritius and Ile de la Réunion there is circumstantial evidence to show that the varieties are distinct, but in order to arrive at a definite conclusion, an experiment has been started. Cuttings of the Lahaina variety have been obtained from Hawaii and these have been planted adjacent to plots containing Bourbon and Louzier, respectively. In this way it is expected that, by comparison at the time of harvest, it will be seen from the morphological characteristics —from the general appearance of the canes—whether they are in fact one or three varieties.

Since the appearance, however, of a paper in the *West Indian Bulletin* (Vol. XIII, No. 1) describing observations made by Mr. W. R. Dunlop of this Department on the stomatal characteristics of West Indian varieties of sugar-cane, the investigators in the Ile de la Réunion are hopeful that their work of discrimination may be shortened; that by examining the leaves microscopically, it will be possible to discover differentiating anatomical features, particularly in connexion with the stomata, before the canes reach maturity.

This suggested application of Mr. Dunlop's observations is of interest. The three varieties under consideration are not included in the list examined by him in the West Indies, but it is significant that two varieties which are not very dissimilar in general appearance may possess marked differentiating characteristics as regards their stomata. As an example, we may take the case of B.147 and D.116. Both these canes germinate indifferently; both are fairly stout and zig-zag in habit; both are greenish yellow in colour, and both have fairly large dark-green leaves, pendulous in habit. But the veins in the leaves of D.116 are much wider apart and

more parallel than those in a leaf of B.147, whilst the number of stomata per unit of area in a leaf of D.116 is very much less than that found in the case of B.147. As well, the individual stoma in a leaf of D.116 is larger than that to be observed in B.147. These facts tend to support Mr. Villèle's opinion that the stomata may be useful in the direction indicated by him.

But in concluding, it may be observed that an important feature for classification purposes is the eye-bud. As a matter of fact it is by the eye-bud that the two varieties just referred to B.147 and D.116—are best seen to be distinct forms, B.147 having a very small and adpressed bud: that of D.116 being large and bulging. On this subject, reference should be made to another interesting paper in the *West Indian Bulletin* (Vol. XII, pp. 378-87) entitled 'A Study of Sugar-cane Varieties with a view to their Classification', by C. N. Sahasrabuddhe.

THE YUCATAN SISAL OUTPUT.

The carefully worked-out suggestion made by Mr. Alfred Chatterton, C.I.E., Director of Industries, State of Mysore, that 'there is probably a million acres of unoccupied land in this Province more or less suitable for aloe or sisal cultivation' causes one to look up statistics regarding the outputs from Mexico, and to consider what chance such a large area as the one mentioned would have, if brought into direct competition with that old-established industry of the Indian and half-Indian population of Yucatan; an industry, too, that is run on lines that, even if it is not actual slavery, could never be allowed in Mysore. According to the *Boletin de Estadistica*, the official organ of the Hacendados Henequeneros, of Yucatan, last year was a record one as regards the total exports of sisal, which were:—

	Bales.	Tons. (1,000 kos.)
January 1 to December 31, 1913	836,950	145,280
" " " " 1912	814,610	139,902
" " " " 1911	680,990	116,547
" " " " 1910	558,996	94,789
" " " " 1909	567,427	95,756

Of this output 520,143 bales were exported during the second half of 1913, against 491,841 bales in 1912. As the total weight of the 1913 shipment was 90,651,183 kos., the average weight was 175 kos., or about 350 lb. Of the 520,000, one firm, that of Avelino Montes, exported 406,728 bales (71,466,000 kos.), Arturo Pierce coming in as a poor second with 86,741 bales (14,609,887 kos.), and the Cia de Hac Henequeneros was third with 18,817 bales (3,244,867 kos.). The average value of the sisal shipped during the last six months of 1913 was 28·145c. (100c. = 8*l* = 2*s*.) per kilo., against 20·882c. in 1912, so that the price was 7·263c. better per kilo. (2·204 lb.). The value of the 520,000 bales (July to December shipments) was $25,516,500 equal to £2,516,000.

Were India, therefore, to plant up even 100,000 acres with sisal, and that area gave a fair yield, it would be interesting to see how far the Indian output could affect the Yucatan planters, and how the combined outputs would affect prices. We fear they would be pulled down below the limit of profit yielding, as many centres to-day dabble in sisal and some have a fair out, but no one outside Yucatan seems to be growing rich out of the industry, and many seem extremely loth to have anything to do with the fibre. (*Tropical Life*, June 1914.)

LIME CULTIVATION.

GOVERNMENT LIME JUICE FACTORY, ST. LUCIA.

The above establishment re-opened for the purchase of limes and lime juice on June 22, 1914, according to arrangement made by the Agricultural Superintendent previous to his departure from the colony on leave. The prices to be paid on account, for produce, were:—

Sound ripe limes	3*s*. 9*d*. per barrel.
Pure raw lime juice	6*d*. per gallon testing 13 oz. and over.

In addition to these, a deferred payment and share of profits was to be made so long as the selling price of concentrated juice exceeds £24 per pipe, and the deferred payment was to be calculated on the actual selling price realized by the juice on the 201 equivalent.

Since the publication of the above notice in the St. Lucia *Government Gazette*, an amendment has been issued, in which it is stated that the price paid for the ripe limes will be raised to 4*s*. 8*d*. per barrel, and that 6*d*. per gallon will be given for 12 oz. raw lime juice as well as for that testing 13 oz. Although the present favourable state of market prices is no doubt responsible for the representations that have led to this amendment, the public should bear in mind that the cash payments at the factory are merely on account, and that by receiving the lower scale of payments on delivery at the factory, the vendors get no less in the long run than if they were obtaining the higher cash payments.

The favourable terms on which the factory conducts its business can be readily seen from the results of last season's work. The deferred payments that have recently been made on account of last year's crop were at the rate of 16·5*d*. per barrel of limes, and 15·7*d*. per 10 gallons of 12 oz. juice. In addition to this, the bonus paid in respect to the profit made by the factory was equal to 12·46 per cent. on the total amount paid for the purchase of the produce. The original cash payments at the factory together with the deferred payments and bonus, thus gave a total value to vendors during the past season of 8½*d*. per gallon of standard raw lime juice, and 5*s*. 8½*d*. per barrel of limes, corresponding to a market price of £32 per pipe for concentrated lime juice.

A few months ago the Imperial Commissioner of Agriculture communicated with the Assistant Director of the Royal Botanic Gardens, Kew, in regard to the alleged beneficial effect of smoke upon the growth of pine-apples in the Azores. No authoritative statement has been found as to the effect of smoke on pine-apples under glass. The flowering of pine-apples out of season stated to occur where bonfires have been lighted may perhaps be due to a temperature stimulus though except in the case of the plants immediately to windward, the distance would be too great for much effect to be felt. In the case of pine-apples in the Azores, it is certainly surprising that filling the houses with smoke for about two hours should bring about flowering. The authorities at Kew question whether some change in cultural treatment is not made before or at the time of the smoking. It appears that no such treatment is made.

COTTON.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date July 13, with reference to the sales of West Indian Sea Island cotton:—

About 200 bales of West Indian Sea Island cotton have been sold since our last report.

Spinners are indifferent buyers and prices are generally easier all round.

The sales include St. Vincent 16*d.* to 19*d.*, St. Kitts and Anguilla 16½*d.* to 17½*d.* and Barbados at 18*d.* Quotations reduced ½*d.* per lb.

In their last Report, Messrs. Frost & Co. intimated that during the summer months their Report on the American Sea Island cotton market would be issued only monthly.

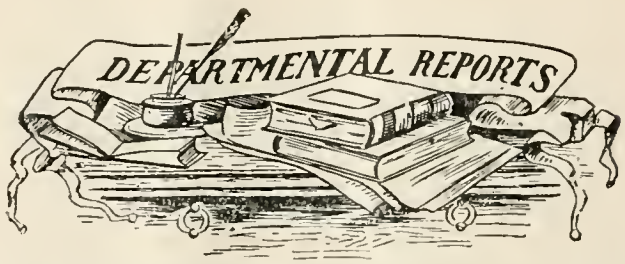
Identification of Wild Cotton Plants in St. Vincent.—The Acting Agricultural Superintendent, St. Vincent, has furnished this office with information concerning certain wild forms of cotton recently taken to Kew by Mr. W. N. Sands, Agricultural Superintendent, for identification. A cotton found by the Acting Agricultural Superintendent growing wild on the cliffs by Point de Jour at Canouan has been determined as *Gossypium punctatum*, var. Jamaica, Watt. The Carriacou Marie Galante has been stated by the Kew authorities to be *G. Peruvianum*, Cav. or a hybrid with that species. Other forms of cotton grown in Union Island and termed respectively silk cotton Marie Galante and ordinary Marie Galante are found to be both forms of *G barbadense*, Linn. As well as the above forms of cotton, an aroid observed by Mr. Sands in St. Vincent, and mentioned by him in an article on vanilla cultivation in St. Vincent published in the *Agricultural News*, Vol. XII, No. 286, page 116, has been determined as *Philodendron giganteum*, Schott.

PUBLICATIONS OF THE IMPERIAL DEPARTMENT OF AGRICULTURE.

The recently issued publications of this department include Vol. XIV, No. 2 of the *West Indian Bulletin* containing several articles on West Indian veterinary questions and an especially important paper which discusses the results of the Dominica cacao manurial experiments over a period of ten years. There has also recently been issued the 1914 edition of the West Indies in Canada, references to which will be found in other places in this issue of the *Agricultural News*.

Passing through the press are two pamphlets, one on cotton cultivation in the West Indies, and another on insect pests of sugar-cane in the Leeward Islands. The former publication will constitute a very comprehensive pamphlet and will include most of the information in the old edition fully revised and greatly extended on the basis of recent knowledge.

A convenient leaflet can now be obtained from the Agents of this Department which gives a complete list of the publications on sale, which include the *West Indian Bulletin*, the Pamphlet Series, the Annual Reports of the Local Departments of Agriculture, and the *Agricultural News*.



PROGRESS REPORT ON THE AGRICULTURAL DEPARTMENT, GRENADA, FOR THE QUARTER OCTOBER TO DECEMBER, 1913.

Recent changes in the staff of the Agricultural Department, Grenada, make it desirable to put on record in this journal, before the appearance of the usual annual report, the principal points dealt with in this quarterly report issued by the Grenada Department last January.

In the publication under review, the Superintendent of Agriculture draws attention to the satisfactory condition of the lime crop, and to its suitability to Grenada conditions. In Carriacou, the area under limes will be extended, and already orders for some 5,000 plants have been placed with the Department for 1914. In Grenada, the fruits yielded by the small plot at Morne Rouge are of excellent size and quality, and scale insect attacks, whilst always present, have not been a serious obstacle. Cautious trials with limes on the unoccupied lands of the island are recommended.

During the season under review there appeared to have been a marked increase of fungoid pod diseases of cacao, which was apparently the outcome of seasonal peculiarities.

In the laboratory, the work conducted during the period was of a varied nature, and included the examination of such diverse substances as sugars, manures, suspected base coins, as well as articles believed to contain poison. It is indicated in the report that in order to carry out this work satisfactorily, it will be necessary to increase the staff of the Department.

For the last year or two a systematic survey has been made of Grenada soils, and as already pointed out in the *Agricultural News*, they may be classed into the ashes and gravel of the coastal districts and laval soils of the central mountainous parts. It is remarkable that on some of the dry soils, notably in St. Patricks, pruning is more severely carried out than in the wetter parts of the island.

The position of the Land Settlements Scheme in Grenada is shown in the report in the form of a table. At Morne Rouge there are thirty-six lots, twenty-six of which have been sold at Morne Rouge South; and at Caliste there are twenty-seven lots, twenty of which have been sold; Westerhall and Calivigny contain 127, eighty-five of which have been purchased. In addition to these areas there is a proposed new settlement at the mountain lands at St. Cyr, which was purchased during the quarter by the Government, and which contains about 350 acres, fertile and well watered. With a proper road system, this area should gradually become a prosperous settlement of peasant agriculture, although it is not anticipated that much else than cacao and sugar-cane will be grown there. It was intended to open the settlement for occupation last June, and it was expected to be the means of providing 100 families with land.

As regards peasant instruction, the Agricultural Instructor has made an interesting trial with the pods of the plant *Cassia Fistula*. As the result of small shipments a good profit was made, even in face of the exceptionally heavy charges to be expected in the case of small shipments. As an

ornamental tree *Cassia Fistula* might be grown more widely, and a thrifty peasantry would no doubt be able, by means of these trees, to supplement their incomes.

The last section in the report deals with experiments. Trials in progress deal with the following questions: (a) improvement of cotton by selecting local types; (b) importation and trial of new types of these crops; (c) trials of imported varieties of sugar-cane; (d) perhaps budding and grafting and propagation by cuttings of cotton. In connexion with the Department, experiments are being carried on in regard to (a) selecting new and valuable types of cacao, (b) trials with imported varieties of cacao, (c) citrus fruits. In the report, the results of the cacao manurial experiments are given. The pen manure plot at Grande Bacolet gave 2,238 lb. of cured cacao per acre compared with 1,271 lb. from the no manure plot; but at Mount Horne the pen manure plot gave only 1,778 lb. of cured cacao per acre compared with 1,994 lb. from the no manure plot. In the first series mentioned, the mulched plot gave more than the no manure, but less than the pen manure plot, namely, 1,465 lb.; but at Mount Horne (second series) the mulched plot gave only 1,229 lb., which was less than the yield from either the no manure or the pen manure plot. It must be remembered, however, that these figures represent only the first year's working of the experiments, and different results will no doubt be recorded in future years, as the initial irregularity in the quality of the soils becomes eliminated.

DOWN THE ISLANDS.

ITEMS OF LOCAL INTEREST.

As pointed out in another article in this issue, the lime juice factory at Castries, St. Lucia, restarted operations on June 22. The oil engine has been installed in the factory and is working well. This season the limes are coming in better than last year and the factory grinds at the rate of about 10 barrels of fruit per hour. When this supply of fruit is fuller and more continuous it is estimated that the amount dealt with per hour will be still greater. The Officer-in-Charge of the factory states that there is a great lack of uniformity in the size of the fruit sent in. It is desirable that vendors should endeavour to present for sale limes of a normal size in good condition. With a view to bringing the matter directly to the notice of the peasants and others, the department has approached the Ecclesiastical authorities who by means of their contact with the people collectively have been able to advise the peasants personally.

At the Government Experiment Station at Réunion, affairs are progressing satisfactorily. Mr. Brooks, the Officer-in-Charge, notifies that 75,000 lime plants are ready for distribution. Already a considerable number has been sent out and the seedlings in the process of removal, lift nicely and are free from scale.

At last we are able to record the installation of the hydraulic ram in the river at Choiseul. This is now working satisfactorily, giving 2,000 gallons of water per twenty-four hours.

As soon as the seed is received, the cotton plots will be established at Choiseul. Seed has been ordered from St. Kitts, but in the event of its not arriving in time seed from St. Vincent ordered at a later date will be put in instead. The budding of oranges and mangoes was begun during the month and will be continued at favourable opportunities.

The Curator at Montserrat reports that since May 1, 8,000 bay plants have been distributed. Areas are being planted in bay trees in various parts of the island. The growth now being made by the plot of bay trees at Chateau is said to be very encouraging and the plot is in a more promising condition than ever. The cotton crop is now well established in the island, and it is reported to have made a better start than in any recent year. The cotton planted in February has commenced to open, and the total area planted is probably greater than that of last year and the cultivation, on the whole, is good. Except at the northern end of the island very little trouble seems to be occasioned by cotton stainers. The question is raised as to whether Bengal beans are a suitable crop to grow before cotton. There has been some indication that cotton planted after Bengal beans does not do as well, and a special experiment is now being tried to see whether the supposed effect is imaginary or real.

On June 1 a flashlight system of communication between Antigua and Montserrat was opened to the public by the Government. Messages are accepted from 10 a.m. to 6 p.m. the charges being 1½*d.* a word with a minimum fee of 9*d.* a message. (The Dominica *Chronicle*, June 10, 1914.)

On Friday July 10, a meeting was held in Antigua of the Agricultural and Commercial Society at which the question of an agricultural and industrial exhibition for 1915 was discussed. It was decided to hold the show early in the year and to approach the Government for the use of the Industrial School and grounds for holding the exhibition, and for the financial and other assistance usually given. It was also decided to write to the Imperial Commissioner of Agriculture with a view to obtaining the customary aid.

From Nevis, Mr. W. Howell reports that the cotton crop is, on the whole, looking very promising. Though cotton worms appeared in fairly large numbers in a few fields, they have been kept in check by the use of Paris green. Anxious enquiries come from certain localities concerning the peculiar curling of the leaves which is noticeable in the upper branches of some of the young cotton. Mr. Nowell, the Mycologist to the Imperial Department is now in Nevis investigating the matter. The area under cotton cultivation this season is about 3,000 acres—an increase of about 500 acres on last year's planting. Picking has begun in some of the earlier fields. It is to be regretted that old cotton is to be seen on certain estates. A matter for satisfaction is the establishment of the cotton manurial experiments. The plots which are in duplicate will receive respectively pen manure, basic slag, sulphate of potash and sulphate of ammonia, and cotton seed meal. The seed used for planting has been obtained from La Guérite in St. Kitts, and the germination has been very good and the plots on the whole are looking very promising. The coco-nuts at Pinneys estate continue quite healthy, and 29,500 nuts were shipped during the quarter, 7,000 of which were for planting purposes.

A reprint from the *Mining Journal* describes a useful portable steam mining pump known as Merryweather's Valiant. It is specially suited for up-country work where neither roads nor rails exist. It will pump through 3 miles of piping and can be arranged for burning wood fuel. No. 1 size (capacity 100 gallons per minute) weighs only 6½ cwt.; No. 2 size (capacity 200 gallons per minute) weighs only 11 cwt. The pump has given satisfactory results both in Northern Nigeria and in Siberia.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

Local Agents: Advocate Co., Ltd., Broad St., Bridgetown. *London Agents:* Messrs. Dulau & Co., 37, Soho Square, W.: West India Committee, Seething Lane, E.C. The complete list of Agents will be found on page 3 of the cover.

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Agricultural News

Vol. XIII. SATURDAY, AUGUST 1, 1914 No. 320.

NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number deals with the Toronto National Exhibition, 1914. It endeavours to show some of the ways in which the functions of the exhibition as an advertising and educational medium for the West Indies might be extended. A review is given also of West India-Canadian tradeduring 1913.

It is possible that Bengal beans will command a paying price as cattle food. On page 243 is an article describing what has been done in connexion with this matter in St. Vincent.

On page 244 will be found an interesting article which goes to show that it may be possible to distinguish varieties of cane in their young stages of growth, which are similar in general appearance, by means of the stomatal characteristics of the leaves.

The question of the price of lime juice and the sale of limes to the Government Lime Juice Factory, in St. Lucia, is discussed briefly on page 245.

An interesting note on wild cottons in St. Vincent appears on page 246.

An important article on root borers will be found under Insect Notes on page 250. On this page also is an article which shows that there is some possibility that unthriftiness in lime trees may be caused by nematodes or round worms.

Interesting notes connected with live stock, on page 251, deal with contagious diseases of cattle in Guadeloupe, and skin temperature and fattening capacity in oxen.

The Right Honourable Joseph Chamberlain M.P.

It is with a profound feeling of sorrow and loss that we place on record the death of the Right Honourable Joseph Chamberlain, which occurred on July 2, 1914.

As Secretary of State for the Colonies from 1895 to 1903, Mr. Chamberlain will be remembered as having shown an intense activity in all matters relating to the Empire, which was felt alike in the Dominions and throughout the Colonies.

For his practical interest in the West Indies the inhabitants of these islands will always feel a deep feeling of gratitude. The sense of his personal relationship with the West Indies was always present in a striking degree and evinced itself in many measures tending to relieve the depression that existed at the time of his assuming the office of Colonial Minister. At his instigation the West India Royal Commission of 1897 was appointed, the material outcome of which was the alleviation of these Colonies from considerable distress through various measures of financial relief; through the participation of the Imperial Government in the Brussels Convention and the consequent abolition of sugar bounties; through the institution of Land Settlement Schemes, and the establishment in the West Indies of an Imperial Department of Agriculture.

Export Trade of British Guiana with Canada, 1913.

With further reference to the Handbook entitled the West Indies in Canada, 1914, which is mentioned in the editorial to this issue, it should be pointed out that unfortunately the statistics for British Guiana exports to Canada had to be omitted owing to the belated arrival of the figures at this office from British Guiana after the publication in question had gone to press. It may serve some useful purpose however if the figures are published in these columns. They are of considerable interest and importance since they show an increase in the value of the commodities sent to Canada compared with 1912 and previous years. British Guiana seems to be the only case where the total exports to Canada in 1913 have exceeded those for 1912.

Articles.	Value, 1912. $	Value, 1913. $
Coco-nuts	380	4,622
Coffee	2,086	221
Lumber (Crabwood, etc.)	877	2,798
Molascuit and Cattle Foods	3,187	2,848
Cacao	108	804
Rum	44,417	39,821
Sugar	3,420,799	3,764,261
Timber	12	49,950
Total	$3,471,866	$3,865,325

Disintegration of Rice Grain.

In the *Agricultural News* (Vol. XIII, p. 153) a short account was given of a method for distinguishing the starches of different rices by a process of fractional liquefaction. In continuation of this note, Mr. F. J. Warth and D. B. Darabsett have described (Bulletin No. 38 of the Agricultural Research Institute, Pusa) a satisfactory means for disintegrating the grain without damaging the starch by means of dilute alkali. The action of alkali has been found to be regular and distinct for different varieties and it appears to be possible by means of it to distinguish roughly the different qualities of rice. It is believed that the method will be found particularly useful in studying the ripening of paddy, a subject which for the rice miller is one of some importance.

Wild Tamarind as a Soil Renovator.

This leguminous tree known botanically as *Leucæna glauca* is common in the West Indies and in other parts of the Tropics. According to a paper published in the *Philippine Agriculturist and Forester* (Vol III, No. 1) 'Ipil-ipil', as the tree is called in the Philippine Islands, might be employed profitably as a soil renovator on account of the large amount of nitrogen fixed by the bacteria living in symbiosis on the roots. It is stated that the value of the tree in adding nitrogen to the soil is about equal to its value for wood production which is 5500 pesos per annum per hectare. Since roots and tops both pay, it is suggested that the tree could be employed as a shade tree for young coffee, cacao and other delicate plants. A further and perhaps more practical suggestion, at least from the West Indian point of view, is that wild tamarinds might be planted on waste land where the trees would perform the double function of providing a financial return as well as improving the fertility of the soil.

The Outlook as Regards Pig Production in the United States.

The contents of Farmer's Bulletin, No. 575 of the United States Department of Agriculture, show that in regard to meat animals, the Department's estimate indicates an accumulated shortage since the last census year (1910) of approximately 19·2 per cent. of cattle, 11·6 per cent. of sheep and 5·2 per cent. of swine. The decline of swine is partly accounted for by the extensive prevalence of hog cholera, by high priced corn, by the deficient production of 1913 because of a severe long continuous and extensive drought, and because of the high prices of swine for slaughter. Notwithstanding the high price of swine for slaughter, the farmers found they could not profitably feed the high priced corn. At the same time, the price of hogs per 100 lb. was high relatively, although not as high as corn. In this situation hogs were often sent to market undersized. It is stated that the pork and lard consumption for 1909 presented an increase of 612,000 lb. for 1909 as compared with 1900, and amounted to 7,034,000,000 lb.

West Indian Awards at the Tropical Products Exhibition.

In connexion with the above International Exhibition the British Cotton Growing Association presented a Silver Trophy and three Silver Cups for competition, and the awards have now been made as follows:

Class A. A Silver Trophy for the best general exhibit of various varieties of cotton shown by any Government Department of Agriculture of any British Colony or Protectorate or of Egypt or the Anglo-Egyptian Sudan, such exhibit to have been grown during 1913 or 1914 on any farm or farms under Government supervision.

Trophy awarded to the Government Agricultural Department of Southern Nigeria.

Very highly commended—the Sudan Government Agricultural Department; Commended—Mr. Shepherd, Agricultural Superintendent, St. Kitts, West Indies; the Government Agricultural Department of Northern Nigeria; the Government Agricultural Department, Punjab, India.

Class B. Three Silver Cups, namely, one each for the West Indies, Nyasaland and the Anglo-Egyptian Sudan for the best type of cotton grown on any farm or plantation during the years 1913 or 1914.

West Indies. Silver cup awarded to Mr. Alexander Smith, St. Vincent; very highly commended—Mrs. Howes, Montserrat; highly commended—Mr. Shepherd, St. Kitts.

Nyasaland. Silver Cup awarded to A. L. Bruce's Estates Ltd., for Nyasaland Upland Cotton.

Very highly commended—Mr. James Dockie, Chirala Estates, for Assili Egyptian Cotton.

Sudan. Silver Cup awarded to Mr. C. H. Neville, for American quality cotton. Very highly commended Salim Bashur, for Assili cotton. Highly commended—Abdul Aziz Yehia for Assili cotton, Gwadwalla Haboosha for Assili cotton, Capato Estates for Affifi cotton. Commended—Mr. Geo. Alexander, for Affifi cotton.

The West India Committee also made special awards. The West India Committee Silver Cup for the best comprehensive display of tropical products exhibited by any of the Permanent Exhibition Committees participating: Awarded to the Permanent Exhibition Committee of British Guiana.

A Silver Cup offered by the West India Committee for the best individual exhibit of any article or articles of tropical produce: Awarded to St. Aroment estate, Dominica.

A Silver Cup offered by the West India Committee for the best sample of rubber from individual exhibitors from British Guiana, British Honduras or the West Indies: Awarded to Hills plantation, British Guiana.

A Gold Medal by Mr. F. N. Martinez: Awarded to the Permanent Exhibition Committee of St. Vincent for their exhibit of Sea Island cotton.

INSECT NOTES.

ROOT BORERS.

In the *Agricultural News* for June 20 last, (see Vol. XIII, p. 202) an article which had previously appeared in a Martinique newspaper was reviewed under the collective heading of Insect and Fungus Notes. The article dealt with certain experiments in Martinique in the use of carbon bisulphide in emulsion, for the control of soil-inhabiting grubs which attack cacao and limes when these were planted in lands formerly devoted to the cultivation of sugar-cane.

The insect principally concerned was stated, by Mons. G. Bordaz, the author of the original article, to be the 'larva of a handsome beetle very common in our colony,' *Diaprepes famelicus*. It was thought at the time that the review was prepared that the names *Diaprepes famelicus* and *Exophthalmus famelicus* were synonymous and that the Martinique insect would be the same as the Dominica one which has recently been identified as *E. famelicus*.

Specimens recently received at the Head Office of the Imperial Department of Agriculture from Mons. G. Bordaz prove to be the same as the Barbados root borer (*Diaprepes abbreviatus*).

A visitor to Barbados who is interested in the cultivation of sugar in Guadeloupe has recently informed the Entomologist on the staff of this Department that the Barbados root borer is the same as the root borer of sugar-cane in Guadeloupe. The local name for this insect in that island is 'jacquot.'

This information would seem to add these two localities, Martinique and Guadeloupe, to the known distribution of *D. abbreviatus*.

Exophthalmus famelicus is a small, plain, greyish weevil similar to, but smaller than, the Leeward Islands root borer (*E. esuriens*) and not at all, in its colour and markings, like the beautiful *Diaprepes abbreviatus*.

In the same number of the Agricultural News to which reference has been made above, a note appeared mentioning the unusual occurrence of *E. esuriens* in St. Kitts, attacking sugar cane, and in Antigua and Montserrat on limes.

Fig. 3. *Diaprepes abbreviatus*, The Adult (about 2½ times Natural Size.)

It may be of interest to add that this insect has recently (July 1914) been found in Barbados. This appears to be the first record of the occurrence of this insect in that island.

It was found on an estate, where systematic collections of *Diaprepes abbreviatus* were being made, by the boys employed for that purpose. They stated in answer to questions, that these insects were found among the canes in one field, but it afterward transpired that these boys with their eyes trained to search for Diaprepes had found the Exophthalmus weevils among the plants in the labourers ground at some distance from the canefields.

The present record of *Exophthalmus esuriens* in Barbados does not connect its presence with sugar-cane, but is of interest in adding another island to the list of those in which this insect is known to occur.

The many and variable forms of Diaprepes which belong to the two species *D. abbreviatus* and *D. spengleri* are now known to occur in Barbados, Grenada, St. Vincent, St. Lucia, Martinique, Guadeloupe, Dominica, Montserrat, Virgin Islandss, St. Croix and Porto Rico. The range of variety among these insects in all the islands mentioned seems to be very great, but it is possible that eventually they may be found to be all of one species.

Exophthalmus esuriens is now known to occur in Barbados, Dominica, Montserrat, Antigua, St. Kitts and Nevis.

THE CITRUS ROOT NEMATODE.

In the *Journal of Agricultural Research* issued by the United States Department of Agriculture, an article by Dr. N. A. Cobb, draws attention to the almost world wide-occurrence of a nematode worm which attacks the fine roots of citrus trees. This article also gives the known facts of the life-history of this worm, which has been named *Tylenchulus semipenetrans*, Cobb, and it presents several drawings illustrating the anatomy of the organism and the nature of the injury caused by it.

It appears that this nematode, first discovered in California, has since been recorded from Florida, Spain, Malta, Palestine and Australia. It is not known to attack any plants other than citrus although careful search has been made for it.

The adult female of *Tylenchulus semipenetrans* is of sufficiently characteristic appearance to be easily recognised by a specialist in this group of animals, but the larva and the male are distinguished only with difficulty from the same forms of other species, which are to be found in the soil in the vicinity of citrus roots. Dr. Cobb states that upwards 100 different species of nematodes have been found by him in examining material from various parts of the world.

Some of these forms are predaceous on others and it is probable that the pernicious effects of the most harmful species are somewhat mitigated by the efforts of their natural enemies.

The citrus root nematode is not capable of independent migration for any considerable distance. It is spread by the distribution of infested nursery stock, and, in the field or orchard, by the surface water of heavy rains.

It has been found that a temperature of 140°F. is fatal to this nematode, and as this is not a temperature which injures citrus nursery stock, the practice of dipping in hot water at about 140° should give a means of disinfecting such material and preventing the spread of the nematode.

The author states that it is too early to make positive statements as to the amount of the injury caused by *Tycenchulus semipenetrans* but that it seems to be a pest of which citrus growers in all parts of the world will have to take notice.

Nothing is known yet of its occurrence in the West Indies because no special investigations have been carried on for the purpose of finding out about it. It may be that careful search will reveal its presence, and that its attacks may help to explain some of the difficulties which have been puzzling up to the present time.

NOTES ON LIVE STOCK.

CONTAGIOUS DISEASES OF CATTLE IN GUADELOUPE.

An interesting communication has been received at this office from the Government of Guadeloupe with reference to two reports submitted to that government by the local Veterinary Officer in charge of a mission under the Pasteur Institute for the purpose of studying the contagious maladies, dealt with in this abstract.

Taking the first report, certain information concerning anthrax appears to be of interest. The nature and treatment of this disease is generally well-known throughout the West Indies and it is not necessary to discuss the matter in detail here. It is interesting to note, however, that the Veterinary Surgeon in Guadeloupe states that the disease as it shows itself amongst the cattle in that island is different to that described in Europe. At first the animals show a little fever together with trembling throughout the body; then they become insane and often endeavour to charge the persons seeing after them. They rest in this condition for several days and die eventually of apoplexy. These symptoms agree with those observed in other places. But in Guadeloupe there is no discharge of blood from the orifices nor is haemorrhage indicated in the urine nor at nose which in other countries characterizes anthrax. In post mortems, lesions have been found identical to those observed in animals in Europe. Vaccination has been adopted in Guadeloupe as regards prevention, but without success owing, it is believed, to the fact that the serum has been old and therefore not virile enough.

Turning to the second report dealing with special work conducted under the auspices of the Pasteur Institute, information of interest is given concerning Farcin d'Afrique (African farcy) and 'Farcin de boeuf' (cattle farcy). It is stated that the former complaint causes grave losses amongst the animals in Guadeloupe but it is stated to be curable. In this disease the lesions are larger and more massive than in the second complaint, and the lymphatic vessels are swollen so that they look like veritable cords. The second malady, 'farcin de boeuf', is caused by a streptothrix and is regarded as incurable. There does not exist at present any serum capable of curing the malady, but there is reason to believe that treatment with potassium iodide would give good results. Some of the symptoms of this disease apparently resemble bovine tuberculosis but it is stated that there is no connexion between the two diseases.

SKIN TEMPERATURE AND FATTENING CAPACITY IN OXEN.

The equivalent value of various foods employed in the fattening of animals such as sheep and oxen is frequently estimated in terms of what is known as the starch equivalent on the basis of the observation, 'that when starch is added to a maintenance ration it produces one-quarter of its weight of fat in the animal's body which corresponds to the utilization of between 50 and 60 per cent. of the starch. The remaining 40 to 50 per cent. of the starch is converted into heat.' On this basis, the starch equivalent of various foods can be be calculated, and from the data so obtained it has been attempted to state what increase in weight in fattening animals may be expected from the consumption of given quantities of various foods.

This work is largely associated with the name of Kellner, who is responsible for a considerable amount of valuable work and information concerning it.

British experimenters, however, do not find that close agreement between the starch equivalent of the food used and the increase in body weight that was expected on the above hypothesis. Professor T. B. Wood and Mr. G. Udnyis Yule* have therefore examined the results of a large number of recorded feeding experiments in order to see if the discrepancies admit of explanation.

As a result they show clearly that, in the process of fattening, the law of diminishing return holds good; that is to say, as the process of fattening goes on it takes larger and larger increments of food to produce equivalent increments of fat, and they state the conclusion, that in their opinions the divergence between Kellner's figures and the results of British feeding trials is due to the fact that in Kellner's experiments really fat animals were never used, whilst in British feeding trials, the animals were almost invariably fed until they were ripe for the butcher.

In the course of the analysis of the records of the experiments it was observed that the various animals differed, in some cases materially, in the manner in which they increased in weight with equivalent quantities of food, some animals being much more thrifty than others.

It was agreed that in these cases there must be corresponding differences in the amount of heat evolved by the animals; the thrifty animals storing up food largely in relation to the diet supplied, must give off less heat than the less thrifty which store less. The idea was therefore put forward, that thrifty animals should show a lower temperature than the unthrifty.

Preliminary experiments recorded in the second paper by these authors strongly support these views; it was found that the skin temperature of fattening animals differed considerably; that the animals which were making large increases had a lower skin temperature than those making small increases, the differences amounting to about 3°C. This paper gives the details of the manner in which the skin temperature is recorded, and its relation to the increases in the weights of the animals.

The foregoing affords interesting instances of the application of modern scientific methods to farming practice, and indicates how by such means it will be possible to increase efficiency, and to effect economies and, as a result, to improve the prospects of the farmer.

A communication received from Mr. P. T. Saunders, M.R.C.V.S., of this Department, who is now on leave in England, states that he has been asked by the Chief Veterinary Officer of the Board of Agriculture, England, to act as an Assistant Secretary in the French Section of the forthcoming International Veterinary Congress, noted on another page of this issue.

*See the *Journal of Agricultural Science*, Vol. VI, Part 2.

GLEANINGS.

A note in *The Times* for June 23 states that Parliament has made arrangements for the permanent representation of Great Britain on the Committee of the International Agricultural Institute at Rome.

Two reports of the Imperial Education Conference on educational system in Grenada and St. Vincent respectively have been received. Reference is made in these to the instruction in agricultural and scientific matters given in the secondary and primary schools of those colonies.

A useful account of Brazil appears in the *Bulletin de la Societé Belge d'Etudes Coloniales* for June 1914. The geographical characteristics of each State are dealt with fully, and a description is given of resources including cultivable land, banks and other commercial establishments, and the chief exports.

The *Queensland Handbook* for 1914 has just been received from the Emmigrants Information Office, London. Pages 12 to 14 contain useful information concerning the areas under cultivation in different crops. There have been large increases during recent years in the areas under bananas, pine-apples and oranges.

Volume XVIII, Part I, of the Contributions from the United States National Herbarium is devoted to a classification of the genus Anona with descriptions of new and imperfectly known species. The schemes of subdivision and the key to fruits and the known West Indian forms are of special interest, and the publication in conjunction with the other volumes of this series should be valuable as a source of reference.

In *Diplomatic and Consular Reports* No 5289, Annual Series, it is noted that although sugar-cane is on the average the most important crop in the Dominican Republic, cacao ranked as the most valuable one for 1913. The average price received showed an improvement on that of the previous year, but it is said that better prices would be obtained if planters could sell direct instead of through the local commission houses.

It is stated in *Diplomatic and Consular Reports*, No. 5190, Annual Series, that a law was passed in Cuba during 1911 compelling all manufacturers to put a national guarantee stamp on all boxes of cigars intended for export. Genuine Cuban cigars may therefore always be recognized by the Government stamp which is printed in green and bears the words 'Republica de Cuba, Sella de garantia nacional de procedencia. Para tobaccos torcidos y picadura'.

From a comparative statement in the Jamaica *Government Gazette* (May 21, 1914), showing the values of the produce exported from Jamaica during the quarter ended March 31, 1914, and the corresponding period for 1913, it is seen that the value of the coffee shipped rose from £55,754 in 1913 to £84,192 in 1914. The value of bananas increased from £74,966 in 1913 to £199,201 in 1914. There has also been a large increase in sugar and rum. Tobacco remains about the same.

A letter to *The Times* (June 27, 1914) contains the suggestions of the Committee for the Economic Preservation for Birds in England as regards protection. Amongst other suggestions it is advocated that absolute protection during the breeding season should be extended to all breeding birds of whatever kind. It is held, further, that there should be absolute protection for all birds found upon enquiry to be either verging upon extinction, highly localized, or of determined benefit in agricultural centres.

It is stated in the *Wealth of India* for May 1914 that at the Midnapur District Co-operative Conference it was urged that the scope of co-operative societies should be extended to include functions other than those of sale and credit; for instance, in the preservation of village roads, the excavation of old tanks, the distribution of quinine to people of malaria stricken areas. It is possible that if the scope of co-operative societies were in this way extended it would be easier, particularly in the West Indies, to establish co-operative credit societies.

Amongst the inventory of the seeds and plants imported by the Office of Foreign Seed and Plant Introduction of the Bureau of Plant Industry, United States Department of Agriculture, during July to September 1912, reference is made to Soudan grass obtained from the Inspector of Agriculture in Egypt. This plant known as *Holcus sorghum* (L. *Sorghum vulgare*, Pers.) is an annual closely resembling ordinary Johnson grass in appearance but entirely lacking the root stocks which make that plant undesirable. Soudan grass is apparently the wild half domesticated form of cultivated sorghum, and it crosses readily with the various varieties of sorghum.

The *Veterinary Record* for June 27, 1914, contains a list of the arrangements made in regard to the Tenth International Veterinary Congress that is being held this month in London (August 3 to 8). There are seven general meetings devoted to the discussion of important matters like foot and mouth disease, tuberculosis, epizootic abortion, public control of milk supply. There are various sectional meetings to be held, section V being devoted to Tropical Diseases. This will include diseases transmitted by ticks, their classification, treatment and prevention; diseases transmitted by winged insects, also considered from the same aspects. There is an extensive programme of receptions, and altogether the Congress is likely to be of exceptional interest. The Veterinary Officer on the staff of the Imperial Department of Agriculture is attending as an official delegate for the West Indies.

STUDENTS' CORNER.

The first preliminary question in the last issue was: Describe the distribution and function of stomata in the leaves of the sugar-cane. A short article in the present issue will show that this subject is of considerable interest and importance; the distribution and number of stomata, apart from their physiological significance, are likely to be of value as a means of identifying certain varieties which are difficult to determine from their general characteristics alone. In referring in his answer to the function of stomata the student should clearly indicate the relationship between respiratory changes and assimilation and indicate the conditions under which transpiration occurs. The second question which dealt with the soil, asked for an account of the composition of the soil on the estate the student is connected with. The answer to this question naturally depends upon local conditions, but reference will be made to the humus content of the soil and to whether the land is rich or otherwise in calcium carbonate. In a general way information will be given to show the origin of the soil, whether transported or formed *in situ*, whether derived from volcanic ash or from coral or other formations occurring in the West Indies. From a chemical point of view some reference will be made to any striking characteristics as regards chemical composition as for instance the presence of iron compounds in the red soils of Barbados or the deficiency of potash in the lighter soils of the Leeward Islands.

There are several reasons for destroying old cotton plants at the end of the season, a matter which was questioned upon in connexion with the intermediate candidates. The principal reason is to preserve a close season for the purpose of interrupting the life cycle of various pests, particularly the leaf blister mite, and to ensure the destruction of infested material. A close season also leads to the production of more uniform cotton at a time favourable for its co-operative sale. The second question which asked for an account of cacao budding in the West Indies will be answered by those who have not had practical experience in the matter on the basis of an editorial and a special article on the subject which appeared in the *Agricultural News* a short time ago.

In the final questions information was asked for concerning the concentration of lime juice. The process of concentration whether carried on in open tayches or in steam-heated vats is always accompanied by loss owing to a charring effect which naturally becomes greater as the higher degrees of concentration are reached. The loss is greater in the case of juice heated in open vats. The main object in concentration is to reduce the volume of the juice so as to lessen correspondingly the cost of package, freight and other charges. But from the fact that a loss always occurs, it is necessary to know the most economical stage to which to carry the operation. This optimum point, as it may be called, is that at which the loss in concentrating exceeds the gain by saving of charges. These matters will be found fully discussed in Chapter XI of Pamphlet No. 72 issued by the Imperial Department of Agriculture under the title of Lime Cultivation in the West Indies.

As to the views of the student on the possibilities of implemental tillage in the West Indies these need not have been limited by the extent of his actual experience in connexion with the subject. In a general way the student will appreciate certain circumstances which are of special interest in the West Indies in regard to the matter. In the mountainous islands, implemental tillage is more or less out of the question, but in the flatter colonies like Antigua there is a considerable possibility that implemental tillage already employed will become extended if labour conditions cease to improve. In larger places like Trinidad and British Guiana, the possibilities before implemental tillage are very great, and indeed in all tropical continental countries where fresh land has to be opened up and where dangers of disease have to be faced it is frequently found more practicable to employ motor power for transport and cultivation than men and animals which require greater care and attention. In regard to the mechanical sources of power for cultivation purposes, do not forget explosives.

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) How do non-leguminous crops, used as green dressings, benefit the soil? Give three examples of such crops.

(2) What are the chief grasses used in your district for fodder? How are they respectively affected by dry weather?

INTERMEDIATE QUESTIONS.

(1) Describe how you would proceed to plant out an acre of cleared land in limes.

(2) Explain 'feed unit', 'albuminoid ratio', and 'digestible constituents.'

FINAL QUESTIONS.

(1) Write a short essay on the present prices of lime products.

(2) What precautions do you take on your estate with a view to the prevention of plant disease and insect attack?

Circular No. 113 of the University of California College of Agriculture, announces the institution of correspondence courses in agriculture. These courses are designed for farmers in the States, or persons expecting to take up land in California who desire specific and detailed information regarding the production of certain farm crops or animals. Two lessons are to be sent to each student as soon as enrolled in a course, with questions upon each lesson. On completing the first lesson, the answers to the questions should be dispatched and the second lesson begun. A third lesson will be mailed after the receipt of answers to questions on lesson I, with corrections of the same. On receipt of answers to questions on lesson II, a fourth lesson will be sent, and so on to the end of the course, the student being constantly supplied with a lesson to be studied.

The *Board of Trade* has received, through the Foreign Office, copy of a despatch from H.M. Ambassador at Washington, reporting that an International Dry-farming Congress and Soil-products Exhibition will be held at Wichita, Kansas, from October 7—17, 1914. (The *Board of Trade Journal* for June 18, 1914.)

Mr. H. A. Tempany, B.Sc., Superintendent of Agriculture for the Leeward Islands who attended the recent International Rubber and Products Exhibition has furnished this office with copies of some small pamphlets issued for distribution at the exhibition describing the various Presidencies in the Leeward Islands. The publications will no doubt have served a useful purpose in the matter of bringing resources of the islands described before the visitors to the Exhibition.

FUNGUS NOTES.

PURCHASE AND USE OF LIVER OF SULPHUR.

Liver of sulphur (potassium sulphide) is a valuable fungicide for the treatment of mildew of various plants and is used to replace Bordeaux mixture in circumstances where the spotting of leaves or fruit by that fungicide renders its use undesirable. The results obtained from the use of liver of sulphur have sometimes been reported as very unsatisfactory, and it is probable that these failures are explained by the results of certain experiments made in the laboratory of the British Board of Agriculture and reported in the Journal of that body for June 1914, pp. 236-41.

Liver of sulphur, as sold commercially, is a mixture of several chemical compounds. It is obvious that its value as a spraying material will depend upon its content of such substances as have a fungicidal action; and it is also clear that the proportion of these substances present might possibly vary according to the method of preparation of the liver of sulphur by the manufacturers and also according to the way in which the liver of sulphur is stored subsequent to manufacture, as other compounds may be expected to be formed on exposure to the air.

Foreman's experiments* with weak solutions of each of the various compounds found in liver of sulphur on the germination of spores of *Botrytis Cinerea* and *Sphaerotheca mors-uvae* appear to show that sulphur in the form of sulphides (hydrosulphide, sulphide and polysulphide) is the valuable fungicidal agent in liver of sulphur. On this assumption,† it has been shown, as the result of analyses conducted at the Government Laboratory on behalf of the Board, that the efficiency of liver of sulphur may vary widely and that the term may mean anything from a worthless to a very valuable article. Some of the samples analysed were obtained by the Government Laboratory direct from large chemical manufacturers, but the bulk were purchased for the Board in different parts of the country during June and July, the season in which liver of sulphur is required for spraying purposes. The results of the analyses are all the more interesting, since, owing to the divergence in the method of packing the samples for dispatch to the Government Laboratory, the degree of exposure to the air differed greatly. To test the conclusions as to the effect of exposure due to inefficient storage, investigations on the point were also carried out at the Government Laboratory. It will be convenient, however, to consider first the variation due to difference in the method of preparation.

VARIATION IN CONTENT OF 'SULPHIDE' SULPHUR DUE TO DIFFERENCES IN THE METHOD OF PREPARATION.

The following were the results of the analyses of the samples purchased by the Government Laboratory direct from large chemical manufacturers:—

Origin.	Price per lb.	Content of 'sulphide' sulphur per cent.
	s. *d.*	
Berlin	1 6	21·53
London	8	19·83
London	6	26·07
London	4	27·64
London	4½	30·08
London	4	23·57

These figures show fairly wide variation in 'sulphide' sulphur content.

In the case of the samples purchased for the Board locally, taking only those samples which were dispatched properly packed in tins or bottles, the 'sulphide' sulphur content of twelve samples was found to vary from 4·90 per cent. to 37·94 per cent. Two of these samples contained 6·71 and 4·90 per cent. respectively of 'sulphide' sulphur, and while one of these was insecurely closed, it is quite possible that the other was 'weathered' before purchase. However, the fact that the remaining ten samples varied from 25 to 38 per cent. in content of 'sulphide' sulphur (these ten samples being all among those most nearly resembling freshly made liver of sulphur) taken in conjunction with the results obtained from the samples purchased direct from large chemical manufacturers, makes the conclusion tolerably certain that, as manufactured, liver of sulphur varies widely in value.

Although it is possible that the results of the analysis of samples which were forwarded to the Government Laboratory packed in paper have not the same value, the evidence afforded by them corroborates the above results. Thus the 'sulphide' sulphur content of twenty-three samples so dispatched varied from 0·88 per cent. to 31·44 per cent.

The absence of any connexion between the price and the efficacy of the fungicide which is evident from the figures in the above table, was also found in the samples purchased in different parts of the country, the prices of which varied from *5d.* to 4*s.* per lb.

VARIATION IN CONTENT OF 'SULPHIDE' SULPHUR DUE TO DIFFERENCES IN METHOD OF STORAGE.

Exposed to the air in a solid form liver of sulphur rapidly absorbs water and carbonic acid, turns from a liver brown to a greenish yellow colour, and evolves sulphuretted hydrogen. The change can be seen by breaking a lump of the substance that has been exposed to the air. The face of the fracture shows on the extreme outside a ring of greenish grey colour, within this a band of yellow, and in the centre the liver brown colour of the original substance. Exposed to the air for a longer time, the whole of the substance becomes of a grey colour, crumbles readily to a powder, and no longer evolves sulphuretted hydrogen. When a solution of liver of sulphur is allowed to stand in contact with the air, sulphur soon begins to separate and gas is produced. These reactions appear ultimately to convert the sulphides into sulphur, carbonates, and sulphates.

This effect of exposure to the air was actually found in the analyses of the samples purchased for the Board locally, the content of 'sulphide' sulphur varying, as already stated, from 4·90 to 37·94 per cent. in the case of samples properly packed and from 0·88 per cent. to 31·44 per cent. in the case of samples packed in paper. A complete statement of the results of the analyses, however, gives a much better idea of the difference in the sulphide content in the two cases.

* *Journal of Agricultural Science*, Vol. III, page 400.

† Apart from this, the proportion of 'sulphide' sulphur gives the best indication as to whether liver of sulphur has been prepared according to the usual method and is in a fresh condition.

'Sulphide' Sulphur Content.

Packed in bottles and tins. Per cent.		Packed in paper. Per cent.	
(1) 37·94	(1) 31·44*	(13) 4·45	
(2) 37·90	(2) 26·48*	(14) 4·13	
(3) 34·51	(3) 21·85	(15) 3·37	
(4) 30·16	(4) 24·62	(16) 2·24	
(5) 29·82	(5) 23·47	(17) 2·05	
(6) 28·83	(6) 22·57	(18) 1·94	
(7) 28·79	(7) 12·89	(19) 1·85	
(8) 27·87	(8) 10·64	(20) 1·42	
(9) 26·77	(9) 7·87	(21) 1·41	
(10) 25·38	(10) 7·12	(22) 1·35	
(11) 6·71†	(11) 7·00	(23) 0·88	
(12) 4·90†	(12) 5·74		

With a view of obtaining further information as to the rate at which liver of sulphur undergoes decomposition, ten samples were selected from those examined in the first investigation, these samples being representative of different varieties of liver of sulphur and of different conditions of storage. Some of these samples were in the original receptacles in which they were forwarded to the Laboratory; others were in screw-capped bottles in which they were placed after removal from the original paper packet or receipt. It was necessary in the first place to make a re-examination of the selected samples to ascertain what change had occurred since the first examination; after which, the samples were exposed in open bottles for various periods of time.

A table is appended** showing the amounts of sulphur as sulphide in the samples (1) as originally examined in the first investigation, (2) at the time of the re-examination in January after storage of from four to seven months, and (3) after exposure to air in open bottles.

The conclusions to be drawn from this last investigation are that storage for a prolonged period of from four to seven months produces no change in liver of sulphur provided the receptacle is air-tight and completely full. These conditions obtained in the case of samples (a), (b), (c), (e), and (f), while sample (d) lost all its sulphide because stored in a corked bottle only about one-third full.

As fresh air is admitted each time a bottle or tin is opened, it would obviously be an advantage to horticulturists to pack and store the liver of sulphur in bottles or lever-topped tins of small capacity, of say ½-lb. to 1 lb.

It will be seen that the result of direct exposure to the air was a rapid loss of 'sulphide' sulphur. At the end of fourteen to twenty-three days no 'sulphide' sulphur remained except in the case of sample (f), and a trace in sample (b).

The point to be emphasized from the foregoing results is that *great care should be exercised in storing liver of sulphur, otherwise its fungicidal value may fall to a very low point.*

A good sample of liver of sulphur should dissolve in water without separation of sulphur. If it does not smell of sulphuretted hydrogen, decomposition has proceeded so far that no 'sulphide' sulphur remains.

SOLUTIONS OF LIVER OF SULPHUR.

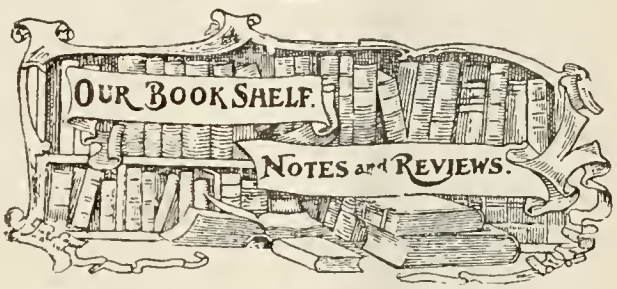
Further experiments were made at the Government Laboratory to ascertain whether solutions of liver of sulphur could be kept without undergoing change. Solutions of the samples were prepared and the 'sulphide' sulphur estimated. The solutions were then placed in vessels and covered over but not corked. The vessels were allowed to stand on a shelf for eight to eighteen days, the liquid not being stirred during the time. Sulphur was deposited from all the liquids and ultimately no 'sulphide' sulphur remained in solution.

It is evident, therefore, that *solutions of liver of sulphur should be prepared just before use, or the solutions if made beforehand should be kept in full, tightly corked bottles.*

* It might be thought that in these cases paper had afforded sufficient protection against air, but this was not so. The samples consisted of large lumps of liver of sulphur, and only the outside of the lumps had become 'weathered'. Usually, samples were in the form of small pieces or of coarse powder.

† (11) and (12) should probably be ignored.

** The table has been omitted in this article.—Ed. *A.N.*



MAKERS OF MODERN AGRICULTURE. By William MacDonald, D.Sc. *Macmillan & Co., Ltd.*, London, 1913. Price 2s. 6d.

Under the above title Dr. Macdonald has brought together a series of short sketches of the lives of five men who have been prominent in the advancement of agriculture. These sketches have already appeared in various journals, but assembled here they form convenient and instructive reading, though it may be urged that each record is disappointingly short.

The advancement of British agriculture owes far more to individuals than it does to the State, and it would be well, as indeed it is the duty of modern agriculturists, to make themselves familiar with the lives of those pioneers such as Jethro Tull, Arthur Young, John Sinclair, and Cyrus McCormick, whose work has had a lasting influence from the fact that they were the introducers of certain fundamental ideas which underlie the cultivation of the soil at the present day.

COCO-NUT CULTIVATION. By Messrs. Coghlan and Hinchley. *ALL ABOUT COCO-NUTS.* By Messrs. Roland Belfort and A. J. Hoyer.

Mr. T. Petch, in the *Tropical Agriculturist* for May 1914, reviews these two of many recent volumes on coco-nuts. Both of the publications would appear to be written for the benefit of the investor, and every care has been taken to put forward the information in an attractive guise. It would appear that many of the illustrations as regards accuracy are open to criticism, particularly in the second volume. In this connexion Mr. Petch says: 'with regard to the illustrations the majority are from (technically) very good photographs; but the seed nut after germination is a "fake" and the copra photograph is not copra, and the drawings of the rhinoceros beetle have not a remote resemblance to the actual insect and larva. The palms in the illustration "coco-nut palms vigorous at 60" are really about twenty years old, the authors adhering to the fallacy that two leaf scars are produced per annum.'

In a book whose function it is to stimulate the investment of capital, estimates constitute the important feature, but even in this connexion, according to the notice under review, the authors have endeavoured to present for the benefit of those who are unacquainted with tropical conditions, figures that are in many instances to a large extent wide of the mark.

MARKET REPORTS.

London.—The West India Committee Circular, July 14, 1914; Messrs. E. A. de Pass & Co., July 3, 1914.

Arrowroot—1½*d.* to 4½*d.*
Balata—Sheet, 2/5½; block, 2/0½ per lb.
Beeswax—£8 15*s.* to £8 17*s.* 6*d.*
Cacao—Trinidad, 57/- to 64/- per cwt.; Grenada, 49/6 to 56/-; Jamaica, 49 - to 58/-.
Coffee—Jamaica, 54/- to 70/6.
Copra—West Indian, £25 5*s.* per ton.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 16*d.* to 18*d.*
Fruit—No quotations.
Fustic—No quotations.
Ginger—Dull, 33/- to 60/-.
Isinglass—No quotations.
Honey—19/- to 31/-.
Lime Juice—Raw, 1/4 to 1/10; concentrated, £39 to £41 10*s.*; Otto of limes (hand-pressed), 9/-.
Logwood—No quotations.
Mace—1/6 to 2/4.
Nutmegs—4½*d.* to 6*d.*
Pimento—1¾*d.* to 2*d.*
Rubber—Para, fine hard, 2/10½*d.*; fine soft, 2 3¾; Castilloa, 1 9½ per lb.
Rum—Jamaica, 2 2 to 5/-.

New York.—Messrs. Gillespie Bros., & Co., July 10, 1914.

Cacao—Caracas, 11½c. to 13c.; Grenada, 11c. to 11¼c.; Trinidad, 11¼c. to 11¾c.; Jamaica, 10c. to 11c.
Coco-nuts—Jamaica and Trinidad, selects $22·00 to $23·00; culls, no quotations.
Coffee—Jamaica, 10c. to 14c. per lb.
Ginger—7½c. to 10c. per lb.
Goat Skins—Jamaica, 47c.; Antigua and Barbados, 44c. to 47c.; St. Thomas and St. Kitts, 41c. to 44c. per lb.
Grape Fruit—Jamaica, no quotations.
Limes.—$3·00 to $6·00.
Mace—45c. to 53c. per lb.
Nutmegs—110's, 11¾c.
Oranges—Jamaica, $1·00 to $1·50.
Pimento—3¾c. per lb.
Sugar—Centrifugals, 96°, 3·32c.; Muscovados, 89°, 2·88c.; Molasses, 89°, 2·67c., all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., July 20, 1914.

Cacao—Venezuelan, $11·10 to $11·30; Trinidad, $11·00 to $11·50.
Coco-nut Oil—85c. per Imperial gallon.
Coffee—Venezuelan, 13c. per lb.
Copra—$4·00 to $4·10 per 100 lb.
Dhal—No quotations.
Onions—$1·00 to $1·50 per 100 lb.
Peas, Split—$6·00 to $6·10 per bag.
Potatoes—English, $2·00 to $2·50 per 100 lb.
Rice—Yellow, $5·35; White, $4·80 to $4·90 per bag.
Sugar—American crushed, no quotations.

Barbados.—Messrs. James A. Lynch & Co., Ltd. July 25, 1914, Messrs. T. S. Garraway & Co. July 27.

Arrowroot—$3·50 to $4·50 per 100 lb.
Cacao—$12·00 to $13·00 per 100 lb.
Coco-nuts—$17·00.
Hay—$1·60 to $1·65 per 100 lb.
Manures—Nitrate of soda, $65·00; Cacao manure, $48·00 to $50·00; Sulphate of ammonia $78·00 to $85·00 per ton.
Molasses—No quotations.
Onions—$1·70 to $2·50 per 100 lb.
Peas, Split—$6·00 to $6.25 per bag of 210 lb.; Canada, $4·00 to $4·25.
Potatoes—Nova Scotia, $3·35 to $4·50 per 160 lb.
Rice—Ballam, $5·35 to $5·55 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
Sugar—American granulated, $3·77 per 100 lb.

British Guiana. Messrs. Wieting & Richter, July 18, 1914; Messrs. Sandbach, Parker & Co., July 17, 1914.

Articles.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot St. Vincent	$7·00 to $8·00 per barrel of 200 lb.	——
Balata Venezuela block	No quotation	——
Demerara sheet	65c. per lb.	——
Cacao—Native	12½c. per lb.	13c. per lb.
Cassava—	96c.	——
Cassava Starch—	——	——
Coco-nuts—	$16 to $20 per M.	$23 per M.
Coffee—Creole	14½c. per lb.	16c. per lb.
Jamaica and Rio	15c. per lb.	16c. per lb.
Liberian	10c. per lb.	11c. per lb.
Dhal—	$4·75 to $5·00	$5·60 per bag of 168 lb.
Green Dhal	——	——
Eddoes—	$1·44	——
Molasses Yellow	None	——
Onions—Teneriffe	——	——
Madeira	2½c. to 3c.	3c
Peas—Split	$6·00 to $6·25 per bag (210 lb.)	$7·25 per bag. (210 lb.)
Marseilles	——	——
Plantains—	16c. to 48c.	——
Potatoes—Nova Scotia	——	$2·50 to $2·75
Lisbon	$1·10	$1·20 to $1·30
Potatoes—Sweet, B'bados	$1·20 per bag	——
Rice—Ballam	No quotation	——
Creole	$5·50 to $5·75	$5·75 to $6·00
Tannias—	$2·64	——
Yams—White	$2·16	——
Buck	$1·92	——
Sugar—Dark crystals	$2·05 to $2·20	$2·20
Yellow	$2·40 to $2·50	$2·50
White	$3·40	$4·00
Molasses	$1·90 to $2·00	——
Timber Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M.
,, Cordwood	$1·80 to $2·00 per ton	——

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The Pamphlets are written in a simple and popular manner and the information contained in them is especially adapted to West Indian conditions. They contain, amongst other subjects, summaries of the results of the experiment work on sugar-cane and manures, the full official reports of which have only a limited circulation. The number issued up to the present time is seventy-three. Those mentioned in the following list are still available: the rest are out of print.

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Printed at Office of *Agricultural Reporter*, 4 High Street, Bridgetown, Barbados.

AGRICULTURAL NEWS

Vol. XIII. No. 321.] SATURDAY, AUGUST 15, 1914. [One penny.

AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

OF THE

IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

VOL. XIII. No. 321. BARBADOS, AUGUST 15, 1914. PRICE 1*d*.

CONTENTS.

Commercial Standardization in Tropical Agriculture.

IN the production of every class of raw material that has to undergo manufacture before being sold to the consumer, it is very desirable, and indeed necessary, that scientific methods should be available for the precise determination or standardisation of the so-called commercial grades. The introduction of a system having this object is particularly favourable to the interests of the producer or grower, for it assists him in forming a true judgement of the market value of consignments, and enables him to frame a definite idea of the class of material he should aim at producing. On the manufacturer's side, also, benefit accrues, from the fact that he is more likely to be supplied with the particular grade he is in need of, and this in uniform quantities.

Throughout the range of tropical agriculture the importance of standardization is everywhere evident. In the case of sugar, it will be remembered that in the old days the refiners depended upon such characteristics as colour as a means of fixing a value, exemplified by the expression 'Dutch colour standard': but it was soon found, as the industry grew, that dependence on such an arbitrary and inaccurate system loosely based on physical characters was entirely out of the question, and the final result was the introduction, and world-wide use of the polariscope. The valuation of sugar was placed upon a scientific basis.

In the case of other crops, in spite of a similar need being experienced, little progress has as yet been made in the direction of standardization. Cacao growing, for instance, is a typical instance where the valuation of the produce is left to 'rule of thumb' and 'personal fancy'. At present it is difficult to decide what the laboratory can do to assist in the standardization of cacao beans, and it is generally agreed that in the meantime planters should make a point of adopting uniform methods of estate manufacture (e.g. fermentation), and further make every endeavour to grow uniform varieties—an object which in all probability could be achieved with practical success by establishing future plantations with budded cacao and not from heterogenous seed.

Rubber production affords another interesting case. When most of the rubber used in the manufactures was Fine Hard Para, that is to say, when Hevea rubber was obtained from Brazil only, the grade was uniform and the expression 'Fine Hard Para' was adequate for the purpose of the market. But now that the Eastern source of supply has appeared, 'Fine Hard Para' is almost as unscientific in the rubber industry as 'Dutch colour standard' was in the sugar trade, because it is undoubtedly the case that some, at least, of the Malayan rubber is of quite as good quality as the material exported from the Amazon. And another aspect to be considered is that the modern rubber industry varies from one manufacturing concern to another as to the exact kind of rubber it wants, so that obviously any classification which is not based on the factors that the manufacturers pay attention to in turning out their goods is extremely unsatisfactory to both grower and manufacturer.

This situation has, in regard to rubber production, led the Malayan authorities to institute at Kuala Lumpur a standardization plant consisting essentially of a volcanisation apparatus—for it is the manner in which crude rubber unites with sulphur that largely determines in a general way its value for commercial manufacture. By means of this plant—and it may be added that another of a similar kind has just been installed at the Imperial Institute, London—the Government will be able to assist the growers and inform each estate as to the real commercial value of the rubber it produces. This, in cases where the produce is found to be inferior, or observed even to fluctuate, will lead to the introduction of improved or only perhaps merely more uniform methods of coagulation and other kinds of treatment, and eventually result in an entirely new state of affairs where the consignments will be shipped commercially graded—not merely agriculturally graded and with that protection as regards its sale which standardization obviously supplies.

A part of the subject of standardization which more immediately concerns us at the moment in the West Indies is its relation to the growing and selling of cotton. Mr. J. W. McConnel in a paper read recently before the International Congress of Tropical Agriculture, has suggested that the principle of commercial standardization should be similarly applied to cotton. In his own words: 'I suggest that arrangements ought to be made, either at the Imperial Institute or in Manchester (perhaps preferably in Manchester) so that small quantities of cotton can be practically tested under conditions resembling those of an ordinary mill. In experienced hands a trustworthy test can be made with a pound weight of cotton, or even less. If some such practical testing were regularly available, it would greatly assist the scientific graders and laboratory workers in cotton-growing countries, because they would not only be able to send small samples to be submitted to the test—they would also be enabled to bring their laboratory experiments on single bolls and single fibres into closer relation with mill practice than is now possible.'

The difficulty with cotton at the present time is the liability on the part of growers to create false standards, due to their imperfectly understanding the real needs of the spinners. Difficulties, too, arise from a misunderstanding of the terms used in the grading of cotton: frequently these terms are not self-explantory: for example, strength and fineness may from the manufacturers standpoint, include factors other than actual strength and small diameter of fibre. It is obvious then that Mr. McConnel's suggestion provides a means that should assist the growers very much. It should be of very great value first and foremost in the selection of cotton, and secondly such a standardizing plant as the one referred to should, as in the case of rubber, enable the grower to form a fairly accurate estimate, say on the basis of the selling price of American Upland cotton, as to what any particular consignment should bring per lb. on the open market.

It may be agreed then that the adoption of the method would serve several useful purposes, but it is a matter for consideration whether each cotton growing country might not possess its own testing station. It may be granted that the Imperial Institute would in many ways be a good centre, but if directly under the control of local Governments in the colonies, the testing stations would no doubt be more fully and efficiently employed for selection work on the estates, since the testing authorities and the growers would be in close contact. It is, however, largely a question of expense. No estimate is yet available as to what a cotton-testing plant would cost: but if, as Mr. McConnel says, so small a quantity as 1 lb. can be used, the size of the machine would be small and therefore probably not prohibitive in price. It will be interesting to have further information on the subject, and as Mr. McConnel intends to take action in the matter, we shall in all probability in the course of a few months be able to furnish readers of this journal with further details.

SUGAR INDUSTRY.

RECENT PROGRESS IN THE CULTIVATION OF THE SUGAR-CANE.

An abstract of the report of the Committee on the cultivation and fertilization of unirrigated plantations appointed by the Hawaiian Sugar Planters' Association has just been issued and is abstracted in the *International Sugar Journal* for July 1914.

Dealing first with the application of manures, it is stated that on one plantation it used to be the custom to apply fertilizers in large amounts at a time, but this year (1913) the dose has been reduced and given more often, with good results. The ratoons, having a larger root formation, were able to stand the larger quantity to advantage. Whereas in previous years it was customary to give a first dose of 500 lb. to plant canes, the first application has now been reduced to half that amount, namely 250 lb. with an additional 500 lb. on hilling up. It is being found useful to apply tankage at the time of planting and in treating ratoons after the plant canes are taken off as much as possible of the tops and trash is ploughed in to increase the humus.

The subject next dealt with in this summary is that of spraying machines for weed destruction. The Director of the Station originated the idea that a mule-drawn appliance consisting of a spraying outfit so constructed that the liquid would be prevented from coming into contact with the canes, while playing on the middles between the rows, would prove an effective weed destroyer when charged with a destructive solution. An effective spray has been found to be a very weak solution of arsenite of soda. After some preliminary experiments, a sprayer of simple construction which gave satisfactory results, was designed, and from small trial tests namely, 15 to 20 acres, it has been shown that the method might be applied on a large scale thereby reducing the present cost of weed destruction to less than one-half of the present amount. It remains, however, to be positively shown that no harm results from the application of arsenic to the soil. The application of 6 to 7 lb. of arsenic per acre to a ferruginous soil in a wet climate should not give rise theoretically to any harmful results. The cost of the application per acre for labour and chemicals is calculated to be approximately 65c. A fairly detailed account of the machine is given in the issue of the *International Sugar Journal*, from which this information has been obtained.

The methods of soil cultivation in Hawaii are largely concerned in principle, at least on the unirrigated lands, with the increase of humus by ploughing in organic matter. Ploughing in or 'rotting back' the trash on the ratoon fields has been practised sometimes with good results and at other times with apparently the adverse effects: on the whole, the practice together with liberal liming is beneficial, provided that the fields are reasonably clear of injurious pests and diseases.

The view is expressed that there is no crop, leguminous or otherwise, that is equal to cane as a soil enricher, provided advantage be taken of all the residues left in the field after the crop has been carried. This, of course, is more theoretical than practical because of the difficulty of turning in the trash in round-ploughing for planting; but it is said that this has been overcome by employing the Spaulding deep-tiller plough. 'If it were possible to store the heavy piles of trash left by the crop between the rows, the pile would act as a blanket and prevent evaporation. With the ever increasing speed at which water levels are sinking in the district, it behoves the irrigator to cast about for some means to make a little go a long way: and it may be predicted that by persisting in rotting back all residues, in ten years as good, if not better crops will be grown with 50 per cent. of the water at present used'.

Labour economy in field operations is dealt with next and in connexion with cutting it is said that there are times when burning does not represent true economy. It is maintained that cutting can be accomplished much more economically when cane has had a stripping. It is found also that stripped cane is always less harmed by burning than unstripped. 'Stripped leaves being bedded down and invariably more or less moist, burn more slowly and therefore less intensely. In fact there is frequently a considerable amount of trash left unburned, while a burn on unstripped at the same time would make a clean sweep.'

A NEW MANURE: ELECTRO-POTASH.

In the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases* for May 1914, is published the following information concerning the experiments carried out by H. G. Soderbaum at Stockholm with regard to this new fertilizer.

The price of German potassic salts is much higher in Sweden than in other countries, and the writer reviews all the trials which have been made to utilize felspars, or other potassic rock constituents in Sweden, for the preparation of potassic fertilizers.

Up to the present all attempts have failed, but a new method recently invented by two Swedish workers, A. Lindblad and L. Yngström appears promising. The raw material is a common rock in Central Sweden called 'leptite' or 'eurite' similar in chemical composition to a gneiss or felspar, and may contain up to 11 per cent. of potash. Leptite is mixed with coal and iron filings, and treated in an electric oven provided with carbon electrodes at a temperature of 1,800 C. approximately. At this temperature the silicic acid in the rock is partially reduced to silicon; this combines with iron to form a silicic iron, which collects in the bottom of the oven under a layer of slag consisting chiefly of potassium and aluminium silicate and more soluble than the silicates in the original leptite. The slag, when cold and finely ground forms a grey powder and is sold under the name of electro-potash ('electrokali').

The principal product, silicic iron, is easily disposed of as an alloy for various metallurgical uses, but in order that the manufacture should prove remunerative, a market must also be found for the electro-potash. The latter was analysed at the Central State Experimental Station and was shown to contain about 11 per cent. of potash, of which 10 per cent. is soluble when the material is treated on the water bath with 20 per cent. hydrochloric acid, while shaking the material with 2 per cent. hydrochloric acid for twelve or twenty-four hours dissolved out 6 and 6·5 per cent. respectively.

The writer carried out some pot cultures in which the new manure was tested against sulphate of potash, both being supplied at the rate of 180 lb. of potash per acre. The results show that the electro-potash pots yielded 78 per cent. of the crops obtained on the sulphate of potash pots which is fairly satisfactory as a first experiment. Moreover as it was found possible to increase the solubility of the slag during the year 1913, it does not seem improbable that further trials will yield still better results, so that this new method of using native resources for fertilizing the soil may prove an economic possibility.

FRUIT PRODUCTS.

THE QUALITY OF COFFEE.

The following abstract taken from the *Experiment Station Record* for January (1914) is interesting because it demonstrates the fact that the quality of agricultural produce, as far as the consumer is concerned, does not rest entirely with the grower nor even with the manufacturer. As regards the case in point—the quality of coffee—it will be seen that it is possible for the consumer to form an erroneous estimation of the initial quality of this produce simply through its preparation for consumption.

This paper, read before the convention of the National Coffee Roasters' Association, November 1913, discusses the general subject of coffee brewing with special reference to the results of the analysis of coffee infusions prepared by different methods.

Stress is laid on the importance of fresh granulation and accurate methods of measuring materials and temperatures. A mixture of Bogota and Santos coffee, medium roast in both medium ground and pulverized form, was used in the experiments. Seven tablespoonfuls of coffee (80 gm. of medium and 82 gm. of pulverized coffee) were used to six cups of water (750 cc.), which is the usual household allowance. The coffee was prepared in four different ways, namely, boiling, steeping, percolating, and filtration.

Boiled coffee was made by placing medium ground material in cold water, heating it to the boiling point at which it was maintained for five minutes, and then adding a little cold water to cause the grounds to settle. Steeped coffee was made in the same way, except that it was settled and poured off directly the boiling point was reached. Finely ground coffee was used for the percolated preparations and the directions provided by the manufacturers of the percolators were followed. Filtered coffee was prepared from finely powdered coffee berries enclosed in a muslin bag over which vigorously boiling water was poured.

The amounts of total solids, tannin, and caffein in coffee by each method were carefully determined. It was found that the general strength of the brew (amount of total solids present) depended rather on the fineness of granulation than on the length of time which the coffee and water were cooked together. Lengthening the cooking period (as in boiling or percolating) tended to extract more tannin in proportion to caffein and other bodies on which the desirable flavour seems to depend. In percolators, water far below the boiling point in temperature is sprayed for a considerable period over the coffee, with the result that the flavour is not well extracted though the tannin is, a fact, according to the author, contrary to the claims of many manufacturers. On the whole, filtration was found to produce coffee giving best results as regards both flavour and low tannin content.

The amounts of tannin found in a cup of the various infusions were as follows: boiled, 2·44 grains; steeped, 2·40 grains; percolated, 2·21 to 2·90 grains; filtered 0·20 to 0·25 grain. The amounts of caffein are: boiled, 2·50 grains; steeped (medium ground), 0·75 grain; steeped (finely ground), 1·75 grains; percolated, 2·75 grains; filtered, 2·50 grains.

LIPASE IN THE COCO-NUT.

The enzyme known as lipase is a substance which causes fats to become rancid. Lipase is thus the direct cause of rancidity of butter and lard and is one of the factors in the deterioration of old copra. Apart from these undesirable changes, lipase plays a useful part in the germination of oil seeds. The presence of the enzyme in the seed of the coco-nut has for some time been a matter of dispute, for although it was stated by Dutch and German workers in the East to occur in the germinating seed, Walker of the Philippine Bureau of Science failed to establish its presence. The discovery of new methods has led the Philippine workers to repeat their investigation, and according to a paper in the *Philippine Agriculturist and Forester* (Vol. III No. 2), this has led to an agreement that the enzyme is present in the coco-nut. The following is a summary of the results obtained:—

(1) Lipase is present in the germinating coco-nut, both as an enzyme and as a zymogen, which can be activated by dilute acids.

(2) It is found mainly in the outer part of the foot, or haustorium: smaller amounts occur in the water of the coco-nut and the inner surface of the endosperm.

(3) Potassium cyanide and sodium arsenite, when used in a concentration of 0·4 per cent., stop the action of the enzyme.

(4) Thymol can be used in as high a concentration as 5 per cent. without any noticeable effect on the action of the enzyme.

(5) Boiling weakens but does not destroy the enzyme.

(6) Coco-nut lipase works best in the condition created by the addition of magnesium oxide: that is, in a practically neutral medium.

(7) Attention is called to the use of magnesium oxide in the study of lipase, as constituting a valuable improvement over former methods of investigation.

THE RIPENING COCO-NUT.

A paper dealing with the changes occurring during the ripening of the coco-nut appears in the *Philippine Agriculturist and Forester*, (Vol. III, No. 2). In this, changes in size, weight and colour of the nut, and the chemical changes in the milk and solid endosperm, are dealt with principally. The ripening of the coco-nut is divided into three periods:—

During the first period there is an accumulation of invert sugar and amino-acids in the milk or watery portion. The meat is still absent, the shell and husk are soft and watery, and the nut as a whole has its greatest diameter along the main axis.

During the second period of growth, sucrose appears in the milk, and the specific gravity of the latter is high. During all this time water is lost from the coco-nut, though its total weight continues to increase. The nut has meantime changed its shape, and begins to acquire its greatest diameter in a direction at right angles to the main axis.

During the closing period of ripening there is a sudden rise in the content of oil in the endosperm. The specific gravity of the milk falls at the same time, owing to the transfer of nutrient materials or to respiration. In the meantime, the shell has become impervious, and the drying out of the husk results in a loss in weight, which overbalances the gain in weight due to other changes.

The coco-nuts on which this work was undertaken are in no way representative of really good nuts. The soil on which they grow is shallow, and the trees are poor individuals. The analyses are therefore not expected to be representative of average coco-nuts.

LAND SETTLEMENT.

ST. LUCIA GOVERNMENT SMALL HOLDINGS SCHEME.

In December last, regulations were made by the Governor-in-Council for the sale of certain portions of the Réunion Estate, for the purpose of establishing a peasant settlement in the Choiseul district, where the bulk of the land is owned by larger proprietors.

The land selected for this purpose consists of about 165 acres of undulating land, suitable for the cultivation of such crops as sugar-cane, cotton, tobacco, Indian corn, pine-apples, bananas, vanilla, ground-nuts, cassava, arrowroot, peas and ground provisions. All these crops are eminently suited to peasant methods of cultivation, and, being annual, bring in a ready return.

Forty-seven lots, ranging from two to five acres, have been surveyed and roads made throughout providing each allotment with a right of way for moving produce.

The settlement being within a quarter of a mile of the local market and shipping point, offers greater inducement than would have been the case had the produce to be conveyed from the interior.

By referring to the Regulations which will appear in the Report on the Agricultural Department St. Lucia for 1913-14, it will be seen that no restrictions of any kind have been placed upon the allottees so far as the actual working of the land is concerned.

A wise clause has however been inserted to protect the peasant from allowing his holding to fall into the hands of money-lenders for at least a period of ten years, and it is expected that by the end of this period he will be sufficiently self-reliant to prevent this happening.

The lots were valued individually and advertised for sale in June at prices varying from £5 to £7 10*s.* per acre. The purchase money is payable in ten annual instalments *free of interest* and is below the normal annual rental.

Allotment commenced in June, and up to July 31, thirteen lots had been sold and others applied for.

The following table shows the progress made to date:

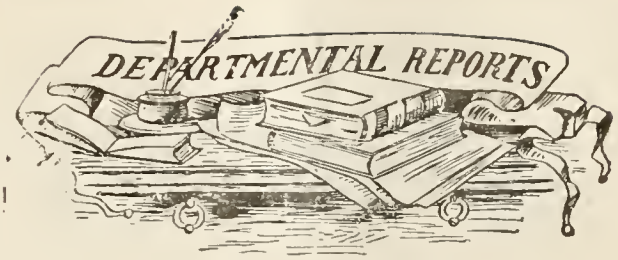
No. of lots sold.	Total area.			Instalments paid.			Total value.		
	a.	r.	p.	£	s.	d.	£	s.	d.
13	47	2	5	40	1	9	342	7	0

Work has commenced and sugar-cane, cotton, cassava coco-nuts, potatos and peas are being rapidly planted. Some of the allottees have already commenced to erect houses on their holdings to enable them to develop the land quicker, and others are erecting cattle shelters and preparing pastures.

Advantage is being taken of the close proximity of the Agricultural Experiment Station, and advice is freely sought from the Resident Agricultural Officer.

Now that a good start has been made it is hoped that it may be possible in the near future to obtain the assistance of the Imperial Department of Agriculture in initiating the formation of an Agricultural Credit Society such as was founded by the Imperial Commissioner of Agriculture recently in the Soufrière district.

Such a scheme would enable the peasants to obtain small sums at a reasonable rate of interest for the purchase of manures and seed etc. and would assist them to overcome any temporary financial difficulty while their holdings were being developed, and would tend to stimulate a spirit of co-operation.



VIRGIN ISLANDS: REPORT ON THE EXPERIMENT STATION, TORTOLA, FOR THE QUARTER ENDED JUNE 30, 1914.

During the period with which this report deals, considerable attention was given to the extension and improvement of the decorative borders in the Experiment Station, and to the propagation of ornamental plants in the nursery. But the greater part of the activity at the station was directed to the preparation of the various experimental plots.

In describing tha condition and progress of the plots in general, it is stated first, that in the case of the lime plots, the season's results indicate some falling off in yield. The experimental area reserved for the trial of sweet potato varieties now contain forty-five different kinds, thirty of which were recently received from Antigua. So important is the sweet potato as a food crop to the peasantry that the introduction of a heavier yielding variety would seem to be justified from this point of view alone.

In regard to the experimental work with cotton, interesting experiments have been started to prove the difference in the yield obtained from planting imported and locally produced seed, respectively. The imported seed consists of St. Kitts and St. Vincent seed. Up to the time of writing, St. Vincent local has made most growth.

In referring to the cotton industry, the Curator states that the purchase of cotton at the Government factory is now nearly over, and that there is a small decrease compared with last year's crop owing to the very unfavourable weather experienced during the early part of last year: but recent climatic conditions have been favourable, and at the time of writing, many cotton fields are well established. The cotton industry in the Virgin Islands is an important feature of the agriculture of the Presidency, and in the near future there is every possibility of a great improvement in the quality of the lint exported, on account of the extensive cotton selection experiments which have been instituted by the Government in order to ensure the planting by the peasants of uniform well-graded seed.

Stimulating efforts are being made at the Experiment Station to encourage the cultivation of minor crops like papaws and pine-apples; but the most important line of activity, and one along which most material success has so far been achieved, is the extension of coco-nut cultivation.

The coco-nuts in the demonstration plot that was started last year have made excellent growth and the plants are now well established. Further areas of land are being prepared for the establishment of more coco-nuts, and from the fact that during the quarter 535 germinating nuts were distributed for planting on private properties, it will be seen that a large amount of attention is being given to a crop which is a paying one well suited to the conditions obtaining in the Virgin Islands.

COTTON.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date July 27, with reference to the sales of West Indian Sea Island cotton:—

About 200 bales of West Indian Sea Island cotton have been sold since our last report, chiefly St. Vincent 17*d.* to 19*d.*; and Stains at 7¾*d.*

Prices are fairly steady, but spinners are well supplied for some time ahead and are therefore not eager purchasers.

The sales also include some super-fine St. Vincent at 32*d.* to 37*d.*

The Secretary of State for the Colonies in a presidential address to the cotton-growing section of the International Congress of Tropical Agriculture spoke on cotton growing in the British colonies and Protectorates and the modern functions in this connexion of the Colonial Office. Reference was made to the future of Somaliland as a new country for cotton growing, and it was expected that a valuable industry would be built up in this territory similar to that which has been achieved in the neighbouring Protectorate of Nyasaland. The principal products of Somaliland at present appear to be Dervishes, camels and Mullahs. (*The Times*, July 1, 1914.)

PROCEEDINGS AT THE THIRD INTERNATIONAL CONGRESS OF TROPICAL AGRICULTURE.

A concise account of the general discussions carried on and conclusions drawn at this Congress, which sat during June 23 to 30, is given in *Nature* for July 9, 1914. It is stated, first, that the number of Governments and societies represented by delegates was forty-two and forty respectively, and the total number of members and delegates was about 100. In these respects, and also as regards the number and quality of the papers read, the London Congress showed a very great advance on the previous Congresses, held in Paris and Brussels.

At the opening of the Congress a very pronounced interest was shown in the subject of education and research in tropical agriculture—a subject which was ably dealt with by the President in his address, and in papers by Dr. Francis Watts, C.M.G., Imperial Commissioner of Agriculture for the West Indies, by Mr. G. C. Dudgeon, Agricultural Adviser to the Government of Egypt and others. The necessity for better organization in education and research was strongly emphasized, and the Congress has appointed a committee to collect precise information on the subject. Similar action has been taken by the Congress in regard to co-operative credit and other social and economic questions, and a report on the working of co-operative societies in tropical countries will shortly be issued. On the second morning, an important discussion was that which had relation to the Phytopathological Convention of Rome. A considerable number of Entomologists and Mycologists working in agricultural departments in the Tropics were present, and some of them were of opinion that the Convention was not altogether suitable for adoption in the Tropics.

The greater part of the time during which the Congress sat was occupied with the reading of papers on technical problems. This part of the proceedings is reported on in *Nature* as follows:—

'The tropical crops which chiefly claimed the attention of the congress were rubber and cotton, one day being devoted wholly to the former and one and a half days to the latter. A good deal of discussion took place with regard to the alleged variation in the properties and quality of plantation Para rubber. The discussion made it clear that at present each manufacturer seems to have set up for himself an empirical standard of quality for plantation rubber, and that it is very desirable that some generally accepted standard should be adopted. A number of papers on the cultivation of Ceara, Castilloa, and other rubber-yielding species in various countries were also read, and Messrs. Petch and Green contributed interesting and useful papers on the tapping of Hevea and on the insect pests of Hevea respectively.

'A series of papers on cotton was read dealing with almost every phase of this important subject, such as the breeding of new cottons, the selection of cotton-seed, the technical qualities which manufacturers require in new cottons, the methods of investigating cottons, and so on. One of the most interesting contributions on cotton was that by Lord Kitchener describing the successful reclamation of a large area of salt land in the Egyptian delta and its utilization for cotton growing. Equally useful was the address delivered by Mr. Harcourt, Secretary of State for the Colonies, describing the work of the Imperial Institute, the British Cotton Growing Association, the Colonial Departments of Agriculture and other bodies, which under the direct control of the Colonial Office, or with its active sympathy and support, now further in every possible way the cultivation of cotton within the Empire.

'The various subjects alluded to above occupy such an important place in every tropical country that a large proportion of the time of the congress was devoted to them, but time was also found for the discussion of a number of subjects which are of special importance to certain countries. Thus Professor Carmody of Trinidad, contributed a most interesting account of the experiments on cacao cultivation and preparation now in progress in that island, and useful contributions of this subject were also made by Messrs. Johnson, Tudhope, van Hall, Booth, and Knapp and others.

'Wheat is as yet scarcely regarded as a tropical crop, and Mr. A. E. Humphries's paper on the possibilities of wheat production in the tropics, no less than that of M. Baillaud on the wheats of Tunis and Algeria, was a revelation to many members of the congress of new and unsuspected areas suitable for wheat cultivation.

'Herr Hupfield's paper on the oil palm in the German colonies was another contribution of which special mention may be made, since it gave an authentic account of the actual operation of European machinery in West Africa in the extraction of palm oil, an innovation which is likely to revolutionize this immense industry which has hitherto been conducted by natives using most primitive and wasteful methods'.

PLANT NUTRITION.

FURTHER EXPERIMENTS WITH BACTERIZED PEAT.

The well known English seed merchants Messrs. Sutton and Sons of Reading, have recently enabled an interesting series of trials to be made in their grounds with a view to determining the practical value under English conditions of Professor Bottomley's bacterized peat. There were two series in the experiments, one in which the manurial value of the new substance (for an account of which, see the *Agricultural News*, Vol. XIII. p. 198) was tested on plants growing in the open ground, and another in which the plants were developing in pots and boxes.

The fact is strongly emphasized that in the outdoor experiment, results have been considerably upset through the occurrence of a drought while the trials were in progress. It is not necessary in this article to describe the procedure adopted in the experiments in detail—an account of these matters will be found in the *Gardener's Chronicle* for June 4, 1914; it will be sufficient to state that in the out-door experiments it was difficult to draw any definite inference as to the beneficial effect produced by bacterized peat owing to the limiting factor already mentioned, namely, the restricted water-supply.

But when artificial watering was adopted in order to compensate for the lack of rain, very different results were obtained. In the first experiment with lettuces and radishes grown in ordinary garden soil and manured with different substances which included guano and bacterized peat, the results showed these two substances to be of about equal value. But the most interesting series of trials and the one which seemed to show conclusively that bacterized peat is of value was that in which radishes (96 per box) were grown in ordinary soil in boxes 1 yard square and treated as indicated in the following table:—

Control.	Roots. lb	oz.	Tops. lb.	oz.	Total lb.	Weight. oz.
Two boxes (average)	0	11	0	8½	1	3½
Farmyard manure, small dressing	0	12	0	12	1	8
Guano (½-oz. before sowing and ½-oz. top dressing)	0	14	0	8½	1	6½
A well-proved fertiliser (1½ oz. before sowing and 1½ oz. top dressing)	1	0	0	11	1	11
Nitrolim (3 oz. per box before sowing)	1	3	0	12	1	15
Bacterized peat (4 oz.)	1	8½	0	13½	2	6
Bacterized peat (8 oz.)	1	5	0	11	2	0

The Editor of the *Gardeners' Chronicle*, who has seen the experiments, says:—

'The result is remarkable in several ways. It shows, first, that bacterized peat is of high manurial value; second, that the increase affects both roots and tops (leaves) but the former more than the latter; and, third, that—as has been observed in other experiments—a lighter dressing of bacterized peat is somewhat more effective than is a heavier dressing. Incidentally, the experiment goes to show that nitrolim—containing, as it does, both nitrogen and lime in combination, is a fertiliser which deserves a good trial on garden crops.

'To sum up: The thorough and careful experiment carried out by Messrs. Sutton leads to the conclusion that whereas bacterized peat, used in the relatively small quantity in which it can be used effectively, does not appear to exercise a beneficent action on the water-holding capacity of the soil, it has valuable manurial properties, and these properties do not appear to be limited to the provision of nitrogen.

'Those who have most experience with the carrying out of experiments will be most careful not to attach undue weight to any single experiment. More trials are wanted before a final pronouncement can be made as to the manurial value of bacterized peat. Nevertheless the evidence obtained by Messrs. Sutton confirms and extends the results reached by the earlier experiments at Kew and elsewhere, and gives ground for the conclusion that bacterized peat is destined to prove of value to horticulturists.

'Into an account of the experiments which Messrs. Sutton and Sons are conducting with radio-active substances we cannot now enter; suffice it to say that so far as those experiments have yielded results it does not appear that the influence of these substances is very considerable.'

MIXED DRESSINGS OF CYANAMIDE AND SUPERPHOSPHATE.

According to the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases*, May 1914, Mr. H. Koppen, in Berlin, has carried out some experiments with the object of ascertaining the advisability of mixtures of cyanamide and superphosphate.

Considering it from a purely theoretical point of view it might be expected that, both bodies being very susceptible to chemical reactions, changes might take place in their chemical compositions.

With regard to the nitrogen, the experiments have demonstrated that mixing the two fertilizers does not decrease the active form of this element. With the phosphoric acid, however, the case is different, for it has been found that in the mixture of the two artificials, the total amount of water soluble phosphoric acid of the superphosphate retrogrades to the citric acid soluble form, which means a notable decrease of the value of the superphosphate. The phosphoric acid is thus deprived of its most valuable property, namely that of distributing itself over a large area, and by the use of such a mixture no better distribution of phosphoric acid in the soil is obtained than by the use of basic slag.

For this reason the writer considers that the preparations and use of cyanamide superphosphate mixture is not advisable.

A publication has just been received entitled: Babylonian Dates for California, by T. P. Popenoe. It is stated in this that the early ripening varieties of dates secured by David Fairchild in 1903 have practically been the making of a date growing industry in California, since the best varieties from Algeria matured at a time at which the crop was usually ruined by rain. This is a point worth consideration in connexion with date growing in the West Indies. In further connexion with the subject of date growing, the reader is referred to an interesting article on the advantages of hand pollination which appear in the *Queensland Agricultural Journal* for May and June 1914.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

Local Agents: Advocate Co., Ltd., Broad St., Bridgetown. *London Agents*: Messrs. Dulau & Co., 37, Soho Square, W.: West India Committee, Seething Lane, E.C. The complete list of Agents will be found on page 3 of the cover.

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Agricultural News

Vol. XIII. SATURDAY, AUGUST 15, 1914. No. 321.

NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number, on the subject of Commercial Standardization in Tropical Agriculture, shows the necessity for introducing precise methods for the standardization of the so-called commercial grades of cotton.

Under the heading Fruit Products, on page 260, will be found short articles dealing with coffee and coco-nuts, principally from a chemical point of view.

On page 261 several official matters of interest receive attention under the headings of Land Settlement and Departmental Reports.

On page 263, a second article appears on bacterized peat, a substance which appears to have important manurial properties.

Insect Notes on pages 266 and 267 consist of a review of a pamphlet on Sugar-cane Pests of the Leeward Islands which has just been issued by this Department.

Live Stock Notes appear on page 270 in this issue; whilst on page 271 will be found items of local interest.

The War and Locally-grown Foodstuffs.

In view of the disturbed nature of existing circumstances it may be prudent to urge planters and others to consider the advisability of planting as much available land as possible with quick growing food crops. Apart from any immediate shortage of food supply that may occur, it would seem only good business policy to endeavour to profit by the higher prices that must eventually arise as a natural result of the disturbed conditions resulting from the war in Europe.

From the peasant's point of view an adoption of the policy is very essential in order that he may find himself as little dependent as possible upon imported food supplies, the prices of which will no doubt continue to range high so long as the consumers' demand remains urgent.

It is fortunate that the corn crop is now soon to be reaped: but fresh seed should be sown as soon as possible so as to have another supply in three months' time. Bonavis beans which ripen in six weeks, are likely to constitute a useful crop at the present time, and indeed most of the beans and peas as well as sweet potatoes and guinea corn may with advantage be planted even though they may reduce the area under cotton and similar crops grown for export purposes.

The 'Colonial Journal' and the West Indies.

The issue of the *Colonial Journal* for July 1914 devotes considerably more space than usual to West Indian matters. In the course of the Editorial Notes, reference is made to the effect of the Reciprocity Agreement with Canada on the trade of Fiji as well as Mauritius, and it is not supposed that the traffic with Fiji or Mauritius and Canada will have any appreciable effect on the West Indies. Turning to the present position in Antigua, various agricultural matters of interest are noted upon including the successful establishment of a kiln-drying apparatus for maize and the investigation that is being made as to the possibilities of irrigation on sugar plantations. This colony's 'Model Village', it is stated, is a great success, and the Government's action in taking charge of the schools hitherto managed by the various religious denominations has led to a reduction of their number without any decrease in efficiency.

Attention is also given to agricultural affairs in St. Vincent and St. Lucia. The central cotton ginnery in the former island receives complimentary reference, and for St. Lucia it is said that the most promising sign is the growth of the lime industry which has been rendered more stable, particularly as regards the smaller owners, through the establishment of a government lime juice factory. 'Such factories' it is stated, 'when they provide ready and convenient markets for the peasants are a very great help, as they are set up security for the industry and at the same time act educationally in the way of improving the product.'

Numerous other references are made to the West Indies particularly amongst the Business Notes where West Indian cotton and orange oil receive mention. In conclusion, it may be added that the name of the

publication under review has just been changed from the *Colonial Office Journal* to the *Colonial Journal*.

Whether correlated with this change or not, the increased amount of attention which is now given in the publication to agricultural matters throughout the tropical colonies is a trend which will undoubtedly increase the interest and usefulness of the publication both in London and amongst the readers residing abroad.

A New Publication on the West Indies.

Part II of the 'Future of Tropical America' (Part I was reviewed in the *Agricultural News*. Vol. XII. p. 328) gives an illustrated account of the general features and products of the West Indies. Under the name of each colony information is given under the headings of Government, Towns, Education, Physical Features, Climate and Products. Although essentially a publication intended to serve purposes of advertisement, it will not only in this respect meet the commercial interests of the Tropical Exploitation Syndicate Ltd. (the Publishers) but will in a general way make the West Indies better known in England and America. Some of the illustrations are exceedingly good, but they are best as a collection providing as such a strikingly exact impression of what the West Indies are really like. There may, however, be one or two exceptions in this connexion. For instance, no general view of any kind is given of Dominica, except an outline map showing the situations of the various estates, which perhaps might create the impression that this colony is considerably flatter than it really is.

A West Indian Pearl Oyster Industry.

The suggestion put forward in the *Canada-West India Magazine* (July 1914) that there is considerable possibility before the founding of a pearl oyster industry in the British islands, calls to mind the fact that an old bed still exists on the windward coast of Barbados at Worthing. Although attempts in the past to establish an industry in this island have not been successful, it has probably been due to want of knowledge, for it is understood that a very thriving industry exists at the Danish Island of St. Thomas. The need for investigation is the principal requirement to which the *Canada-West India Magazine* calls attention. In a general way, the prospects appear to be good and the conditions should be suitable in most of the islands for the growth and propagation of the pearl oyster. Mr. Prest, a well known Canadian authority, in an article in the magazine under notice says: 'The conditions prevailing in most of the islands are sufficiently similar to those obtaining in Ceylon to justify the importation of the Ceylon pearl oyster which is one of the most highly productive kind. An abundance of microscopic food is required by the animal and also an absence of competing organisms. The sea bottom should have an uneven, mixed, rocky and sandy surface interspersed with broken coral and weeds, to prevent over-crowding and the drifting of sand. There must also be in existence a gentle current for the conveyance of fresh food, and the temperature must be equable and warm.'

As regards the return to be expected, it is stated that in Ceylon $100 worth of pearls per 1,000 shells is regarded as a profitable industry. The Bahrein fisheries yield over two million dollars of pearls annually, employing over 800 boats. In Ceylon the fisheries are even more valuable, and it is evident that the establishment of this industry in the West Indies would enormously strengthen the finances of the colonies, provide labour for those who are not required on the estates, and be a source for obtaining revenue from natural sources not connected with the soil.

Exhibits for the Toronto Exhibition.

Most of the islands have this year contributed a collection of exhibits to the Canadian National Exhibition at Toronto. Information has just been received from St. Kitts which shows that a very representative collection has been forwarded from there. Altogether there were seventeen specimens of sugar products sent including rum and molasses, as well as five samples of cotton, specimens of vanilla beans, beeswax, various fruit products in brine and other preserves. In addition two bunches of coco-nuts and one bundle of sugar-cane were forwarded for decoration together with a good collection of photographic views of the Presidency.

Agricultural Openings in Foreign Countries.

Several of the *Diplomatic and Consular Reports* for 1913 contain interesting information in regard to the scope for development that exists in several of the foreign tropical or sub-tropical countries.

As regards Haiti, it is stated that the country is physically capable of immense development, and only awaits the establishment of a stable and moral administration. On the French Ivory Coast (see No. 5,235, Annual Series) the enormous value of the forest products are referred to, particularly mahogany. There are, however, great difficulties in the way of exploitation, owing to poor communication. In Mexico, (according to No. 5,281, Annual Series) there seems to be a steady and ever increasing demand for land suitable for coco-nuts, oil nut, and bananas, and foreigners of various nationalities are continually coming to the district (Colima) with the idea of purchasing such properties.

In Report No. 5,226, on the trade and agriculture of Togoland, German West Africa, it is stated that the development of the hinterland will rapidly follow the completion of the fourth railway line. A network of roads through the hinterland, unsurpassed for cheapness and excellence of construction anywhere else in West Africa, act as feeders to these railways, and all this good work and development was started a little over twenty-five years ago with a working capital of £4,000.

INSECT NOTES.

SUGAR-CANE PESTS OF THE LEEWARD ISLANDS.

During the early part of last year there appeared a series of articles in the *Agricultural News* (see Vol. XII, pages 106, 122, 138, 154, 170 and 186) entitled 'Root Borers and Other Grubs in West Indian Soils', and the information there presented was afterwards brought together and issued as Pamphlet No. 73, with a considerable number of illustrations added.

Under the heading which appears above, information in regard to certain of these pests and other sugar-cane insects has been issued as Pamphlet No. 75. This pamphlet furnishes an example of the manner in which information with regard to a certain subject may be accumulated over a long period of time: at first new facts appeared slowly and later with greatly increasing frequency.

The body of the pamphlet is divided into two parts, the first which is introductory and historical, consists of a brief statement of the pests of sugar-cane which were known to occur in the Leeward Islands previous to and for a short time after the establishment of the Imperial Department of Agriculture. The remainder of the pamphlet, which comprises the larger part of it, deals with insects which have recently come to be known as pests of sugar-cane in those islands.

The pests which are dealt with in the first part of the pamphlet are the moth borer, the shot borer, the weevil borer the cane fly and the mealy bugs. Those which are dealt with as more recent pests of sugar-cane are the following:—the Antigua brown hardback, the St. Kitts brown hardback, the Leeward Islands root borer and termites. Mention is made of the Barbados brown hardback, the Barbados root borer, the ordinary black hardback and certain parasitic wasps because of the bearing which a knowledge of their life history and habits would have in the consideration of the Leeward Islands pests.

The Antigua brown hardback (*Lachnosterna* sp.) has been known in Antigua for several years, principally by the injury caused by its grubs to certain crops, and from the occurrence in the soil of fields in which the growing plants were sickly in appearance. This has resulted in the opinion being formed that this insect is connected with the unfavourable conditions observed.

The Antigua brown hardback is a beetle of the ordinary hardback type, light brown in colour, about ½-inch in length and about ¼-inch in width; the legs are moderately long and slender, the eyes are large and black, the hind end of the body has the appearance of having been cut off square across. The larva of this beetle is a white grub of the ordinary type; when full grown it attains a length of about an inch. The head is brown; there are three pairs of slender legs; the body is widest just behind the head, somewhat narrower a little behind that, while the end of the abdomen is large and swollen. This insect is known to occur only in Antigua at present.

It is in the larval or grub stage that this insect causes the greatest amount of damage, feeding upon the small roots of sugar-cane and Indian corn, and attacking onions and potatoes. It is as a pest of Indian corn that this species of *Lachnosterna* causes the most injury, although it is a cane pest of some importance. It is suggested that Indian corn may be used as a means of reducing the numbers of this pest in agricultural lands, especially where it is proposed to grow sugar-cane and other crops known to be attacked by it.

It has been found that when Indian corn is planted at such a time that the crop reaches maturity during December or January, considerable numbers of the Lachnosterna grubs are congregated about the roots of the plants. These can easily be collected by pulling the plants and searching the soil among the roots and in the near vicinity. Trials of this method which have been made in Antigua have shown that, in cases of moderately severe infestation, an average of five or six grubs per plant has been found, and these have been collected at the rate of about 1,000 per acre, and at a cost of 1*d.* per hundred, or 10*d.* per acre.

The application of such a method of control as this is exceedingly simple. It is necessary to remember that the grubs of this insect, so far as known at present, all come to maturity about the same time, which is at the beginning of the year. Fields which are known or suspected to be infested may be planted with Indian corn at such a time that it will ripen at the time when the grubs are nearly full grown. The corn should then be pulled and careful search made for the grubs which should be collected and destroyed when found. It should be borne in mind, however, that this method of control is of value only when care is exercised to destroy the grubs at the proper time.

The St. Kitts brown hardback (*Lachnosterna patruelis*) is, in general, similar to the Antigua form, but is much smaller. This insect has been known in St. Kitts only since 1912, when it was discovered in considerable numbers in the soil of cane fields in that island. It is not known how much injury it causes and it is to be regarded perhaps more as a potential pest than one whose capabilities for harm have been definitely proved. *Lachnosterna patruelis* is known to occur in Haiti, San Domingo, St. Kitts and Dominica.

A similar insect which occurs in Barbados is very efficiently held in check in that island by a small parasitic wasp. This is the Barbados brown hardback (*Phytalus smithi*) the parasite being *Tiphia parallela*. This same beetle has been introduced into Mauritius where without the controlling influence of the parasite, it has developed into one of the most serious of sugar-cane pests. The same parasite occurs in St. Kitts where it is believed to attack *Lachnosterna patruelis* and it is probably due to the effect of this parasite that the St. Kitts brown hardback is not more generally known as a sugar-cane pest. In Antigua, no parasite is known to attack the brown hardback and careful search in the vicinity of infested fields has failed to reveal the presence of the parasitic insect which is common in Barbados and St. Kitts.

The Leeward Islands root borer (*Exopthalmus esuriens*) is an insect which has been generally known throughout the Leeward Islands for many years: but it is only within the last two or three years that it has been known to be a pest of sugar-cane and other crops. In fact it is only during the the present year, 1914, that the relationship between certain grubs attacking the underground portions of cane stools and this dark grey weevil has been definitely established. Mr. F. R. Shepherd, Agricultural Superintendent, St. Kitts, has reared the adult form of the insects from grubs in the cane stools. As already stated, *Exophthalmus esurions* has been for a long time a well known insect in the Leeward Islands. Although it is a weevil, that is to say an insect in which the head is prolonged into a snout or beak, this insect is often called a hardback, a term which leads to a good deal of confusion in those islands.

The larva of this insect is a white, fleshy grub without legs which lives in the soil and bores into the base of a cane plant. The adult is most commonly to be found hiding among the foliage of such plants as pigeon pea, castor, French silk cotton and others growing in or near the sugar-cane fields. In certain instances in St. Kitts where cotton has been grown alongside of cane fields these beetles have been found in enormous numbers among the leaves of the cotton plants.

It may be added that formerly *Exopthalmus exuriens* was known from the adult or beetle form which was found commonly in such plants as those already mentioned and in districts where limes were grown. It is remarkable that following on the discovery that the larva of this insect was a root borer which attacks canes there should be unusual occurrences of them in great numbers. For instance, in St. Kitts early in the present year fields of cane on one estate were discovered to be seriously injured by some form of root trouble which proved on examination to be a severe attack of Exopthalmus. About this time these beetles became so numerous in an adjacent field of cotton that 40,000 of them were collected with very little trouble in a few days. In Antigua a few weeks later these beetles became extremely numerous in a lime cultivation where some 28,000 were collected in four days and later this number went to over 10,000. An examination, made after the appearance of the beetles, led to the discovery that the grubs were abundant in the soil about the roots of the lime trees where they were probably causing a considerable amount of damage by their feeding. About the same time, also, this insect appeared in great numbers in Montserrat, where it is believed that the grub has been injuring the roots of lime and other trees.

The insect is very similar in habit to the Barbados root borer (*Diaprepes abbreviatus*), and like that insect, it appears not to be attacked or controlled by any parasite. It may also be mentioned here that the Leeward Islands root borer, *Exophthalmus exuriens*, has been recently discovered in Barbados, having been reported from two separate points in that Island in July of the present year.

For several years on one estate in St. Kitts, termites have been the cause of considerable trouble to sugar-canes. These are principally of one species, which is now known to be *Leucotermes tenuis*, which is a South American insect, known to occur in Brazil, Trinidad, Barbados, St. Kitts and St. Helena. This termite does not build any nest or covered galleries either in St. Kitts or in Barbados, where it has also been under observation. The insects are small and whitish: generally three kinds or castes are found in the community, that is, in the tunnels formed through the soil and in the interior of the canes which they have eaten out. The soldiers are small and slender, the head being proportionately large, the mandibles long and pointed; the workers are slightly larger, and the winged forms, which are often to be found, are about the same size as the workers, but their long narrow wings make them appear larger than they are.

These insects attack sugar-cane cuttings newly planted in the field, often completely destroying them, and make it necessary to replant the fields in order to get a satisfactory stand. They also attack the ripening canes which they sometimes completely destroy over considerable areas.

The remedy to be employed for this pest consists in the complete destruction of all termite infested material in the cane fields, the exercise of great care in planting only cuttings quite free from termites and by a rotation of crops. Fields in which termites are known to occur should not be ratooned and the canes should be followed by cotton for two or three years.

In Antigua, and sometimes also in St. Kitts another species of termites attacks sugar-cane in the field. This is *Eutermes haitiensis*, an insect which builds a large rounded nest and covered galleries through which the individuals travel. So far as present knowledge goes this insect appears to attack sugar-cane only as cuttings, newly planted out. It has caused some damage in this way, but is not a serious pest to anything like the same degree as the *Leucotermes tenuis* already mentioned.

The remedial measure to be adopted in this instance is the destruction by burning all their nests wherever found, and all infested bits of cane found in the field after the crop is harvested. Care should be exercised, of course, to see that no infected cuttings are planted. It sometimes happens that the nests of this species are concealed amongs rocks or in the hollow trunks of trees but they can almost always be located by the covered galleries which the termites build. If these galleries are broken open and living termites found in them, that can be taken as an indication that there is a nest somewhere in the vicinity which should be found and destroyed. These measures carefully followed out should result in practically exterminating this species of termite in any given district.

NOTES ON CO-OPERATION.

The *Wealth of India* for June 1914 reproduces the main conclusions set out in an article on co-operative credit in the West Indies (see *West Indian Bulletin*, Vol. XIV, No. 1) and concurs with the view that the success of the co-operative movement in India may be ascribed to (1) the existence of a central Government to lay down general principles and local governments to carry them into affect in detail, (2) to the individual organization and missionary work of the Registrars, (3) Government advances, (4) the regard shown for human nature, for customs and local circumstances, (5) honorary assistance both in regard to organization and semi-philanthrophy.

The rules and regulations of the People's Co-operative Bank, Limited, Jamaica, show that every new member shall be required to pay a fixed entrance fee and take a certain number of shares in the Society. Shares are not withdrawable, but a share or shares may be transferred with the consent of the Committee of Management to any person who shall be or become a member of the Society. The number of shares which a member may hold is limited. The management of the society is entrusted to a Committee whose duties are to elect members, appoint salaried officers, to fix rates of interest, to hear complaints, to deal with applications of loans and to receive and check the accounts of the officers appointed to receive and disburse monies belonging to the Society. The Society has a reserve fund formed out of entrance fees, and part of the profit and is the property of the Society.

GLEANINGS.

A large amount of Government aid is being given to the agricultural population in Hungary. Various courses and lectures have been instituted, and the authorities have distributed gratuitously, or at cost price, a great number of appliances for fruit growers, as well as over 500,000 nursery fruit trees at reduced prices.

A useful publication for reference, and as a guide to prices, is the Special Supplement to the *Chamber of Commerce Journal*, July 1914, entitled 'Trade Products of the British Empire.' It is a statistical account of the resources of the British Empire as a supplier of foodstuffs and of raw materials for British industries.

An article on co-operative credit in the *Tropical Agriculturist* for May 1914 deals with the problems that have to be faced at the present time in Ceylon. The Ordinance now in force in this colony is framed on the Indian Act No. 2 of 1904, and the ordinance is stated to be such that it can be applied to all kinds of trades and occupations.

Guinea grass has recently been introduced into the Philippine Islands, and according to the *Philippine Agricultural Review* for May 1914, has been found to be superior to the local grasses as green forage. In one yield experiment, the rate of production in round numbers was 72 metric tons in 183 days from $\frac{3}{10}$-hectare.

It is reported that Sir John Anderson, Under Secretary of State for the Colonies, has made a recovery from his recent accident met with when returning from one of the meetings of the Rubber Growers' Association. Although the accident necessitated an operation, and was accompanied by complications, it is understood that the recovery has been complete.

A copy of the Eighth Announcement (1914-15) of Macdonald Agricultural College, McGill University, Quebec, has been just received and should prove of interest in the West Indies where many of the educational institutions have sent students to this college. Macdonald College has a staff of nearly sixty lecturers and a number of students amounting on an average to about 500.

Mr. Roosevelt's Brazilian Expedition is referred to in *Nature* for June 25, as follows: 'there is no doubt that the expedition has accomplished a valuable piece of work, and it has, in Mr. Roosevelt's own words, placed a river comparable in size to the Elbe for the first time on the map. It is probably the most important achievement in river exploration in Tropical South America since 1880.

A limited number of the 1914 edition of the 'West Indies in Canada' is available at this office for distribution locally for educational purposes. In view of the fact that the publication fully describes the products and exports from the West Indies with particular reference to Canada, the booklet should prove of value in the teaching of geography in the secondary schools of the West Indies and Canada.

The *Experiment Station Record* (Vol. XXX, No. VI) states that in the *Memoirs of the Natural Academy of Science* XI (1913) is given in tabular form an analysis of the geographical distribution of Agave in the West Indies, and a discussion of the specific characters of the trunk, leaves, flowers, fruit and bulbils. A synopsis is followed by botanical descriptions of eight groups including fifty-six species.

Reference is made in *Nature* for June 25, 1914, to the latest five-yearly supplement of the *Index Kewensis*. Certain introduced improvements are noted, and it is pointed out that in view of the periodical appearance of supplements, the question naturally arises as to the intercolation of the supplements with the original work. Though the desirability of achieving this object is agreed upon, it is suggested that the onus of such a work should hardly be expected to be the unaided task of the Royal Gardens, Kew.

The preliminary announcement of the Ninth International Congress of Applied Chemistry to be held during the period July 26 to August 14, 1915, at St. Petersburg has just been received. This contains a list of the tentative rules for papers and publications, and the rules on sectional procedure. Agricultural Chemistry constitutes Section VII. The Secretaries for this section are V. Leontieff, Zdanowka, 31-33; and N. Leontevsky, Demonstrator of Agronomy at the Laboratory of the University of St. Petersburg, V.O. 16th Line 29.

The *India Rubber Journal* for July 11, 1914, contains a brief account of the exhibits from the British West Indies at the recent rubber exhibition held in London. British Honduras, St. Vincent, Dominica and British Guiana combined to make the excellent exhibit which represented the British West Indies. British Guiana naturally attracted most attention and the greater part of the notice under review contains information regarding rubber growing in this colony which is familiar in a general way to most readers of the *Agricultural News*.

In the Trade Products of the British Empire, (mentioned in another note on this page) reference is made to fish meal as a supplementary food for cattle, hogs and fowls. It is said to be coming into more general use in Germany. In the first test with this article it was found that this class of feed increases the appetite and consequently the weight of the animal. Opinion of investigators seem to differ as to the influence of such feed on the taste of milk and butter, but it is said that lard obtained from hogs fed with fish meal is quite free from the odour of fish, and that no fishy taste is noticeable.

STUDENTS' CORNER.

Green dressings, other than those of the leguminous kind, principally benefit the soil owing to the fact that they increase the supply of humus. This subject was questioned upon in the last issue and the student was asked to give three examples of such crops.

As regards the second question concerning the chief grasses used in various districts for fodder, the student should refer to the *Agricultural News* for April 12, 1913, in which number the editorial deals with the improvement of West Indian pastures and mentions useful annuals like *Eragrostis abyssinica* (teff) and *Panicum colonum* both of which occur in the West Indies; also well-known perennials like *Panicum maximum* (Guinea grass), *Sporobolus indicus* (bed grass), *Paspalum conjugatum* (sour grass), *Panicum muticum* (Para grass), and—most nutritious of all—*Andropogon caricosus* (hay grass).

Information as to how one would plant out an acre of cleared land in limes can best be got from local sources of of information. In answering a question like this the actual practical operations should be described concisely. The answer to the 'feed unit,' 'albuminoid ratio,' and 'digestible constituents' question can be got from text-books on agricultural chemistry.

The first final question which asked for a short essay on the present prices of lime products offered scope for showing what the various products are and their respective values, and also what knowledge the student has in regard to the Sicilian sources of supply. It would also be well to bring into the answer to this question any facts available concerning the demand in different places for lime products. What, for instance, is the position in Canada?

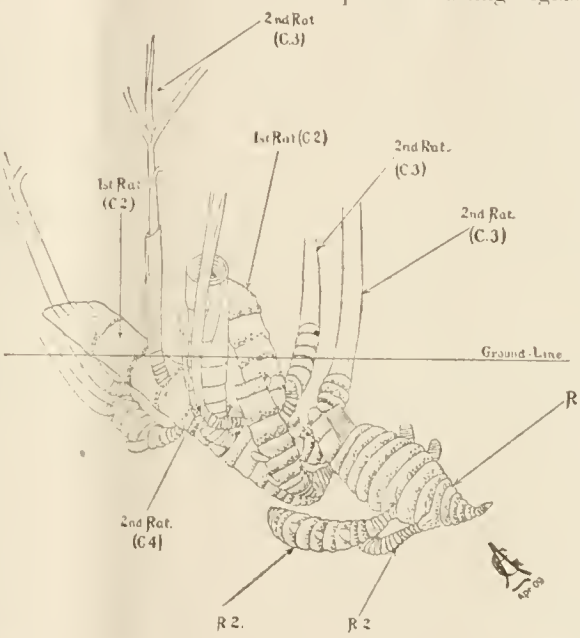

Fig. 1. Underground System of the Sugar-cane.

In the last question of all the student was asked what precautions are taken on the estate he is connected with, for the prevention of plant disease and insect attack. It should have been understood in approaching this question that general principles and information derived from text books will not suffice. The answer must consist of an account of what is actually being done on the estate the student is acquainted with. It will follow of course, that if no efforts are made to prevent plant disease and insect attack, the question cannot be answered.

The illustration on this page shows the structure of the underground system of a stool of sugar-cane. This illustration was published in connexion with an article in the *West Indian Bulletin*, Vol. X, p. 117, and is intended to show the general rule that the degree (First Second, etc.) of any ratoon is not necessarily the same as the degree of the buds (primary, secondary, etc.) of which it is the development. Hence the expression 'first ratoon' is simply a popular term to describe the stems which happen to be ripe for reaping two seasons after cuttings have been planted. In the drawing it will be seen that the first bud, or primary bud, did not develop owing to injury, and so the first ratoon crop consisted of no buds of an earlier order than secondary ones. The drawing also shows that the rhizome of the sugar-cane is like (Rh). It is a short, often pear-shaped structure, with very short internodes, and an immense supply of roots. Rhizomes of the cane plant are capable of growth when severed from the parent, being in every way similar to the rhizomes of other plants belonging to the class of monocotyledons, such as ginger, the bamboo and cardamoms. Several other similar rhizomes will be seen in other places in the drawing.

The essential point to realize is that the sugar-cane is naturally an underground plant as regards development, and only sends up such aerial parts as are necessary to obtain carbon dioxide from the atmosphere. When the bud on a planted cutting begins to develop, the first thing it does is to form a rhizome at its base and to live as an independent plant. It is principally for this reason that circumstantial support is given to the opinion that the fungus *Colletotrichum falcatum*, causing red rot of the sugar-cane, is not transmitted by cuttings, because the bud can quickly sever itself from infected material and live an independent life.

It would be well for the student to refer to the *Bulletin* reference mentioned above, and also to an article on the red rot of the sugar-cane in the *Agricultural News*, Vol. XII, No. 288. It may be further urged that the student himself should dig up a stool of ratoon canes, and endeavour to make out the structures which are shown in the drawing on this page. It will be necessary to wash carefully the material, and especially to remove with care the large number of rootlets which surround the rhizomes and under ordinary conditions prevent their recognition. It may be added that the present time of year is favourable for investigating this matter, and it will well repay the trouble involved if the student carries out at once the suggestion which is here put forward.

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) Explain the difference between a physical and chemical analysis of the soil. How would you determine the water holding capacity of a soil?

(2) Describe how the nitrogen in the air is made available to plants (a) naturally, (b) artificially.

INTERMEDIATE QUESTIONS.

(1) Write in the form of a diary an account of the work on a lime estate during the past month.

(2) Describe the planting and yields of any three provision crops which are early-maturing. What do you know concerning quick-growing strains of the plants you mention?

LIVE STOCK NOTES.

RHODESIA'S DEVELOPING CATTLE INDUSTRY.

The report of the Director of Agriculture in the *Rhodesia Agricultural Journal* for June 1914 shows that the cattle industry is rapidly assuming the position of importance which has long been prophesied by those conversant with the country. Considerable returns are now being obtained and will continue to be derived from the cultivation of such crops as maize and tobacco; but it is cattle-raising that the people look to in the future as their substantial source of income.

Owing to the efforts of the veterinary staff of the Department of Agriculture and the system of prevention and control which is enforced, as well as the growing popularity of the dipping tank, a sense of security against contagious diseases now exists, and little fear is felt that the success of the industry in the future will be hampered by outbreaks of disease that have from time to time occurred in the past.

The strong desire to own cattle has had the natural effect of causing a rise in the price of breeding stock. The sources of supply of plantation stock are limited to South Africa, and are further restricted by the unfortunate necessity of imposing an age limitation as a precautionary measure against the introduction of lung sickness and tuberculosis.

An estimate of the number of cattle in Southern Rhodesia at the present time has been prepared. A conservative estimate puts the number of cattle at 600,000 head of which 230,000 are owned by Europeans, and 370,000 by natives.

A feature of cattle raising in Rhodesia is the low average mortality. Neglect, accident, prejudice and ignorance and individual cases of Coast fever may lead to loss, but these are exceptional circumstances, and apart from them the general mortality has been trifling.

Periodic public stock sales established at suitable centres throughout the territory are proving most successful. There is, however, an unsatisfied demand for pure-bred bulls, especially for North Devon, Hereford, Sussex and Afrikander-bred animals. The Government, in order to try to meet the dearth, has had in contemplation the breeding of pure-bred cattle, and a distribution of young locally raised sires which are naturally inoculated on the veld. This if carried into effect should prove a useful measure.

The remaining part of the report shows that sheep are receiving more and more attention, that the health of live stock in general is good and that measures are being taken to prevent the advent of disease from other parts of Africa, and altogether it would appear that the optimistic views expressed in the report as regards the future of Rhodesia's live-stock industry are likely, in a few years time, to be fully realized.

STAMPING-OUT CONTAGIOUS DISEASES IN GREAT BRITAIN AND CANADA.

During last July, Sir Stewart Stockman, Chief Veterinary Officer to the British Board of Agriculture, addressed a large meeting at Reading concerning the curing of swine fever. The speech was especially interesting because it reflected the policy of the Board of Agriculture in regard to vaccination. In *The Times*, where the address is reported at some length, it is stated that in practice inoculation possesses several drawbacks with regard to swine fever, and although it is by no means a desirable 'stamping-out method' to adopt under all conditions of the farm, it is nevertheless warrantable where commercial advantages can be derived from it and where infected areas can be located with reasonable accuracy. The danger attendent on inoculation and the expense were referred to as an important disadvantage, and Sir Stewart Stockman was of opinion that as a State measure for controlling swine fever the combined serum and virus method—vaccination—gave most promise of producing a general advantage.

Another interesting announcement, also dealing with the question of stamping out contagious diseases, is contained in the *Agricultural Gazette of Canada* for June 1914, issued by the Department of Agriculture at Ottowa. In this issue, there appears an Order in Council containing regulations relating to tuberculosis. The Government of Canada will assist any city or town which shall have signified in writing to the Veterinary Director General its desire to have the aid of the Department of Agriculture in controlling bovine tuberculosis in the cows supplying milk and cream to the city or town in question. The dairies in which milk or cream are produced for sale therein shall be licensed, and no license shall be issued unless the dairy conforms to the required standard. After two years from the date of the first test of the cattle of any dairy, the sale of milk or cream shall be prohibited, unless the said herd shows a clean bill of health from the veterinary inspector. Following an examination and test of diseased cows, provisions are made for the slaughter of reactors, and for giving compensation on the following basis: one-half the appraised value of the cow if destroyed as a case of open tuberculosis, one-third the appraised value of the cow if destroyed as a reactor at the request of the owner; valuation shall be made by the inspector, and shall not exceed the maximum valuation for cattle as specified in Section of the Act. Various other provisions are made which space will not allow our going into, including the important regulation that no compensation will be paid to the owner unless he assists as far as possible in the eradication of the disease by following the instructions of the inspector.

According to the Barbados *Official Gazette* the General Board of Health has approved of the recommendation that a rule should be framed prohibiting the landing of any animal for breeding purposes from Great Britain, Canada, United States of America or the Argentine Republic, unless the same shall be accompanied with a certificate in English from a Government Veterinary Inspector, or if from a foreign country, from the British Consul, certifying in the case of cattle, (a) that they have been tested and found free from tuberculosis, (b) that they have been rendered immune from red water and (c) that they have not come from a herd in which contagious abortion exists; and in the case of swine, that such are from a herd not infected with swine fever, hog cholera or swine plague. It is not stated in the Gazette whether any rule has yet been issued.

Owing to the prevalence of East Coast fever, the quantity of live stock in Zanzibar is inconsiderable, the ailment in question carrying off 50 per cent. of the calves born. During the last two years, however, the Government has given this disease attention with a view to its suppression, and as there are extremely good native stock and pasture land in this country, cattle-raising in the future should tend to become more popular. (*Diplomatic and Consular Reports*, No. 5176, Annual Series).

DOWN THE ISLANDS.

ITEMS OF LOCAL INTEREST.

TOBAGO. According to the *Port-of-Spain Gazette* for July 24, 1914, the staff at the Botanic Station, Tobago, is to be credited with a considerable amount of activity during the last year or two. Reference is made more especially to cotton growing efforts in the island, lime cultivation, and as regards experimental work, to the beneficial effects of forking and mulching Tobago soils, and to various work in connexion with cacao. To the Botanic Station also credit is due for the recent development of tobacco-growing in the island, which has now become quite a large and important industry.

ST. VINCENT. From information received recently from the Acting Agricultural Superintendent, it appears that work in the Botanic Gardens has of late included the fumigation of 3,000 coco-nuts, the sowing of nearly 200 cotton selections, and the planting out of all the manurial plots of cotton. On the estates throughout the island, the cotton crop has germinated regularly. Consideration is still being given by the planters to the establishment of a dried cassava root industry. The rainfall during June has been seasonable.

ST. LUCIA. The Acting Agricultural Superintendent from this island states that in view of the seasonable rains, matters are in a satisfactory condition at the Experiment Station, Réunion. Seventeen thousand lime plants were distributed during July and a ½-acre of St. Vincent cotton seed (to which reference was made on this page in last issue) has been sown. Apart from one or two difficulties of a temporary nature, work has been proceeding satisfactorily at the Government Lime Juice Factory. At the end of July, 6 casks of concentrated lime juice had been prepared, which in view of recent events is nearly £200 worth of juice.

MONTSERRAT. Routine work at the Botanic Gardens in this island, according to a recent report by the Curator, has included the distribution of a large number of bay, lime and pine-apple plants. On the estates, the condition of the cotton crop is very promising and good yields are looked for during the coming season. The bulk of it was planted in April and reaping is expected to be in full swing this month. During July rather high winds were experienced and the same thing occurred also, it may be added, in St. Vincent where, in the Botanic Gardens, a large mahogany tree was blown down. The lime crop in Montserrat is still in many places in an unsatisfactory condition. A form of 'chibble' or 'curly' leaf of cotton has been observed in Montserrat similar in appearance to the condition recently reported on from St. Kitts and Nevis, and lately investigated by Mr. Nowell. The rainfall in this island has been well distributed during June, and for growing cotton has been ideal.

ANTIGUA. From this Presidency the Superintendent of Agriculture reports that the cotton for grafting has been planted and that considerable amount of routine work was done during June in connexion with the experimental plots at Skerrets. A large number of coco-nuts, Eucalyptus, limes and other plants including sweet potato cuttings were distributed during June. In certain parts of the island small patches of last year's cotton plants are still to be seen in the fields; it is imperative that planters should take every care to have the old crop destroyed in future. A special effort of the Department has been the shipment of a small quantity of tomatoes to Canada. The proceeds from the sale of onions is now being distributed to the members of the Onion Growers' Association, the price received being 1*d.* per lb. net. During June 2·30 inches of rain fell. In a later report for July the Superintendent of Agriculture states that the condition of the cane crop is very satisfactory and that the fields of young cotton are healthy. A fair proportion of the cotton crop was planted during the month though no large increase in area of this crop is anticipated this year. Special work of the Department has included the packing of exhibits for the Canadian Exhibition. Special attention has also been given to the preparation of the land at Fort James for the planting of coco-nuts. A general meeting of the Agricultural and Commercial Society and several committee meetings, were held during the month. The Agricultural Superintendent says that the weather experienced during July was all that could be desired from an agricultural point of view.

ST. KITTS. The weather during the month has been more favourable for sugar making and the muscovado estates have made better progress. The cotton crop in St. Kitts though fairly satisfactory on the whole, promises no more than an average yield owing to somewhat unsatisfactory climatic conditions. The early planted cotton just picked has given good yields. During June, a meeting of the Agricultural and Commercial Society was held with a view to considering the draft Ordinance as to marks on bales of cotton. The draft was approved of by the Society. Notice was given that the Secretary of State for the Colonies had approved of the appointment of a veterinary surgeon by the Government. The rainfall for the month was 3·19 inches.

NEVIS. The coco-nut plantations in this island continue to bear well and maintain a healthy condition, but it is reported that there is scope for greater attention with regard to drainage. Although the coco-nut is not harmed by a wet soil this only holds good where the water is not stagnant. A water-logged soil is most unsuitable for the healthy growth of coco-nuts. It is satisfactory to be able to announce that considerable success has been obtained on one at least of the estates in this island with vanilla growing. The planting of this crop in the higher lands has been very considerably extended, a large number of plants are bearing and with good cultivation and especially if accompanied by proper curing, this crop should turn out to be a very paying one and well-suited to the conditions obtaining in the upper lands of the Presidency.

DEPARTMENT NEWS.

Mr. W. Nowell, D.I.C., Mycologist on the Staff of the Imperial Department of Agriculture, returned to the Head Office on Wednesday, August 5, by the R.M.S. 'Trent'. Mr. Nowell had been in Nevis and St. Kitts investigating a condition of the cotton plant known in those islands as 'curly leaf'.

It is stated in *Diplomatic and Consular Reports*, No 5,176, Annual Series, on the trade and commerce of Zanzibar, that owing to the abundance of fibre-producing plants which overrun the fertile portions of the islands wherever the ground is not cleared for cloves, an excellent opportunity presents itself for the development of a coir and fibre industry. For the cultivation of fruits, Zanzibar possesses facilities which are probably unequalled on the east side of Africa.

MARKET REPORTS.

London.—The West India Committee Circular, July 28, 1914; Messrs. E. A. de Pass & Co., July 17, 1914.

Arrowroot—1½*d.* to 4½*d.*
Balata—Sheet, 2/6; block, 1/11 per lb.
Beeswax—£8 15*s.*
Cacao—Trinidad, 56/- to 64/- per cwt.; Grenada, 49/ to 55/; Jamaica, 49/- to 57/-.
Coffee—Jamaica, 37/- to 60/6.
Copra—West Indian, £25 5*s.* per ton.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 17*d.* to 19*d.*
Fruit—No quotations.
Fustic—No quotations.
Ginger—Dull, 33/- to 60/-.
Isinglass—No quotations.
Honey—19/- to 32/-.
Lime Juice—Raw, 1/4 to 1/10; concentrated, £41; Otto of limes (hand-pressed), 10/.
Logwood—No quotations.
Mace—1/6 to 2/4.
Nutmegs—1½*d.* to 6*d.*
Pimento—1¾*d.* to 2*d.*
Rubber—Para, fine hard, 2/11¼*d.*; fine soft, 2/4½; Castilloa, 1/10 per lb.
Rum—Jamaica, 2/2 to 5/-.

New York. Messrs. Gillespie Bros., & Co., July 24, 1914.

Cacao Caracas, 11½c. to 12c.; Grenada, 11c. to 11½c.; Trinidad, 11¼c. to 11⅜c.; Jamaica, 10c. to 11c.
Coco-nuts—Jamaica and Trinidad, selects $20·00 to $21·00; culls, no quotations.
Coffee—Jamaica, 9¾c. to 13½c. per lb.
Ginger—7½c. to 10c. per lb.
Goat Skins—Jamaica, 46c.; Antigua and Barbados, 43c. to 46c.; St. Thomas and St. Kitts, 40c. to 43c. per lb.
Grape Fruit—Jamaica, $1·75 to $2·50.
Limes.—$3·75 to $4·50.
Mace—45c. to 53c. per lb.
Nutmegs—110's, 11¾c.
Oranges—Jamaica, $2·00 to $2·50.
Pimento—3⅞c. per lb.
Sugar—Centrifugals, 96°, 3·26c.; Muscovados, 89°, 2·88c.; Molasses, 89°, 2·61c., all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., August 3, 1914.

Cacao Venezuelan, $11·10 to $11·40; Trinidad, $11·00 to $11·50.
Coco-nut Oil—80c. per Imperial gallon.
Coffee—Venezuelan, no quotations.
Copra—$4·00 to $4·10 per 100 lb.
Dhal—No quotations.
Onions—$1·50 to $2·00 per 100 lb.
Peas, Split—$6·25 to $6·40 per bag.
Potatoes—English, $2·50 to $3·25 per 100 lb.
Rice—Yellow, $5·35; White, $4·80 to $4·90 per bag.
Sugar—American crushed, no quotations.

Barbados.—Messrs. James A. Lynch & Co., Ltd. July 25, 1914, Messrs. T. S. Garraway & Co. July 27.

Arrowroot—$3·50 to $4·50 per 100 lb.
Cacao—$12·00 to $13·00 per 100 lb.
Coco-nuts—$17·00.
Hay—$1·60 to $1·65 per 100 lb.
Manures—Nitrate of soda, $65·00; Cacao manure, $48·00 to $50·00; Sulphate of ammonia $78·00 to $85·00 per ton.
Molasses—No quotations.
Onions—$1·70 to $2·50 per 100 lb.
Peas, Split—$6·00 to $6.25 per bag of 210 lb.; Canada, $4·00 to $4·25.
Potatoes—Nova Scotia, $3·35 to $4·50 per 160 lb.
Rice—Ballam, $5·35 to $5·55 per 100 lb.; Patna, no quotations; Rangoon, no quotations.
Sugar—American granulated, $3·77 per 100 lb.

British Guiana. Messrs. Wieting & Richter, August 1, 1914; Messrs. Sandbach, Parker & Co., July 31, 1914.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	$7·00 to $8·00 per barrel of 200 lb.	——
Balata—Venezuela block	No quotation	——
Demerara sheet	65c. per lb.	—
Cacao—Native	12½c. per lb.	13c. per lb.
Cassava—	96c.	——
Cassava Starch—	——	——
Coco-nuts—	$16 to $20 per M.	$23 per M.
Coffee—Creole	14½c. per lb.	16c. per lb.
Jamaica and Rio	15c. per lb.	16c. per lb.
Liberian	10c. per lb.	11c. per lb.
Dhal—	$4·75 to $5·00	$4·75 per bag of 168 lb.
Green Dhal	—	—
Eddoes—	$1·44	——
Molasses—Yellow	None	——
Onions—Teneriffe	—	——
Madeira	2½c. to 3c.	3c
Peas—Split	$4·00 to $6·00 per bag (210 lb.)	$7·25 per bag. (210 lb.)
Marseilles	——	——
Plantains—	16c. to 48c.	——
Potatoes—Nova Scotia	——	——
Lisbon	$1·10	$1·30 to $1·50
Potatoes—Sweet, B'bados	$1·20 per bag	——
Rice—Ballam	No quotation	——
Creole	$6·00	$5·75 to $6·00
Tannias—	$2·64	——
Yams—White	$2·16	——
Buck	$1·92	——
Sugar—Dark crystals	$2·05 to $2·30	$2·20
Yellow	$2·50	$2·50
White	$3·40	$4·00
Molasses	$1·90 to $2·00	—
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M.
,, Cordwood	$1·80 to $2·00 per ton	——

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FOR THE WEST INDIES.

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The Pamphlets are written in a simple and popular manner and the information contained in them is especially adapted to West Indian conditions. They contain, amongst other subjects, summaries of the results of the experiment work on sugar-cane and manures, the full official reports of which have only a limited circulation. The number issued up to the present time is seventy-three. Those mentioned in the following list are still available: the rest are out of print.

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The 'Agricultural News' contains extracts from official correspondence and from progress and other reports; and, in fact, any information indicating what is going on in each colony and the progress made in Agricultural matters throughout the West Indies.

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Printed at Office of *Agricultural Reporter*, 4 High Street, Bridgetown, Barbados

AGRICULTURAL NEWS

Vol. XIII. No. 322.] SATURDAY, AUGUST 29, 1914. [One penny.

AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

OF THE

IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

Vol. XIII. No. 322. BARBADOS, AUGUST 29, 1914. Price 1*d*.

CONTENTS.

Legislatory Protection of Plants and Animals.

IT is a well recognized fact that the world's area under cultivated plants is rapidly extending. This circumstance necessitates a considerable amount of responsibility being taken by Agricultural Departments for the prevention of diseases that are likely to follow as a result of the derangement in the balance of nature. Under certain circumstances the danger of the loss of crops by disease is occasioned by the destruction of the natural flora and fauna which necessarily follows the extension of cultivated areas. This extermination may lead to the destruction of natural enemies of pests and natural sources of food supply, and consideration has been given to the question as to whether the preservation of wild flora should not be taken into account in this connexion. But the greatest efforts which have been directed towards the preservation of wild plants and animals have been prompted by educational principles rather than by purely scientific ones, because the extermination of wild plants removes a useful source of educational material and lowers the interest of a country from a natural history standpoint.

As already indicated, the spread of cultivation is the principal factor which leads to the extermination of wild growth, but there is also to be considered the effects of manufacturing centres. Smoke and other atmospheric impurities have a pronouncedly harmful influence upon vegetative growth. There is also in connexion with the industrial centres the effect of building, drainage and sport on natural plant associations, as well as professional plant collecting and nature study operations. It will be remembered that the value of vegetation in industrial centres is very great because of the purifying effect which vegetable growth has upon the atmosphere. It has been endeavoured in some places to regulate these exterminating factors. Prussia possesses a well-organized State Department for the protection of wild plants, and in England also, although the Government exercises no control in the matter, the Selbourne Society now has a special committee for the prevention of the destruction of the natural flora. In discussions concerning the maintenance of natural plant life, the question of forest

reserves always receives consideration because of its climatic significance, but the fact remains that in many countries the question of wild plant life as a whole is now receiving careful thought from every point of view.

Amongst the islands of the West Indies we find a considerable amount of variation in the proportion of wild land to cultivated. Barbados is perhaps the chief example of a place where nearly the entire surface is, or has been at one time brought under the plough; Dominica on the other hand affords an instance where by far the greater portion of the land is under forest; whilst Antigua is a case where a fair amount of the land is under bush. In these places the considerations given in the preceding paragraphs apply to some extent, and there can be no doubt that in Dominica where the wild flora and fauna so largely predominate, that they exert a safe-guarding action upon the cultivated plants in the matter of maintaining a satisfactory balance of nature. Naturally the elevated forests in that island rising in places to a height of 5,000 feet ensures a fully adequate rainfall which has an important influence upon the parasitism of cultivated crops. But even though indirect it will be seen that the natural vegetation has a useful and important influence upon cultivation. The question of the effect of buildings, drainage, etc., upon wild growth does not have to be taken into consideration to so great an extent in these colonies as the subject does in industrial countries. But at the same time it is very desirable that the growth of trees in tropical towns should be encouraged and the maximum space allowed as sites for residences.

Although there are several reasons, as indicated above, which make it desirable to limit the extent to which a wild flora should be sacrificed, it is difficult to legislate in this direction except in the case of forests and certain associations of plants like those inhabiting sand dunes which have special protective functions. In connexion with the preservation of the natural flora one has to bear in mind, moreover, the question of weeds which must be considered in all proposals bearing upon the protection of wild plants.

It is in the case of cultivated crops that most legislation has been enacted for their protection. This important subject has been dealt with from time to time in this journal, and it may be interesting to give a review of the various kinds of legislation adopted in various tropical or sub tropical countries for the maintenance of health amongst crops. Perhaps the most interesting case of recent years has been the action taken in Mauritius in regard to the attacks of hardback grubs upon sugar-cane. In this case, as in most of the others, the protection lies in the adoption of efficient quarantine regulation which for the sake of convenience may be called external legislation, in contra-distinction to ordinances affecting the actual cultivation of crops, which may be described as examples of internal legislation. In Mauritius, the importation of soil or organic matter containing plants or not is absolutely prohibited. Likewise the importation of grape vine cuttings is not allowed unless accompanied by a certificate of health from the local authority in the country of origin.

This prohibition was enforced because of the fact that the hardback beetles appear to have been imported into Mauritius in soil containing sugar-cane cuttings. It may be pointed out that in Barbados the pest under consideration is parasitized by a wasp which prevents the hardback grub becoming a serious enemy in that colony. Numbers of these parasites have been imported into Mauritius, where it is hoped they will establish themselves, and act as a check upon the ravages of the hardback grub. This, of course, is beside the point as regards the quarantine law, the object of which is not to attempt to remedy the plague, but to ensure that a similar imported pest does not arrive again in the future.

A particularly good example of what has been lost through belated legislation is afforded by the case of the American cotton boll weevil. This is regarded as the most destructive pest known, being responsible, it is said, for an annual loss amounting to over £5,000,000. Methods have been enforced for keeping down this pest, but in spite of strenuous efforts it continues to spread particularly when the climatic conditions are such as to favour the attacks of the insect. Authorities state that if the growing of cotton in the originally small infected area had been prohibited from the commencement, the pest would have been confined to a small area bordering on the Rio Grande, whereas now the pest prevails over thousands and thousands of square miles. It is not surprising that in the face of an experience like this the United States Department of Agriculture is especially prompt in legislating, not merely to stop but to prevent the introduction of new pests. The plant quarantine service in California, for example, is notably efficient. At San Francisco and other ports of entry even passengers' baggage is examined with a view to detection of pests and diseases (especially the fruit fly); insect-

infested material is fumigated or destroyed: and what the Governments of other countries should take to heart, this inspection is done by competent entomologists and mycologists and not by untrained customs officials.

Turning our attention from the United States to Ceylon we find that in this colony, the conditions of which are more comparable with those obtaining in the West Indies, there is a system of legislation which is in its own way exemplary. The external part deals of course with the question of quarantine and is more or less straightforward in its application. The internal legislation, however, requires for its execution—as in every country—the employment of much tact and determination, for it is only natural that the inconvenience occasioned by plant ordinances is felt unequally by the different planters who are affected by it. The objection to government interference has been minimized in Ceylon by the maintenance of a close association between the planters and the Plant Pests Board on which the local estate owners are represented. The planter, as it were, is encouraged and given the power to become his own legislating biologist.

The biggest move in the direction of plant legislation has been the recent International Phytopathological Conference at which the signatory states have undertaken to admit only plants accompanied by phytopathological certificates. The schedule of diseases is to be confined to those which are epidemic in character and is not to include those which are widely distributed. The efficiency of the system is open to criticism. Experience in some places has been that the reliability of certificates depends a good deal upon those who issue them, and it is to be feared that an International Phytopathological Convention will have to be accompanied by an international service of competent biologists if it is to give satisfactory results. Moreover provisions of legislation which apply to temperate countries may not hold good for tropical ones, and this view seems to have been held by delegates at the recent International Congress of Tropical Agriculture held in London last month, where it was decided that a special committee should be appointed to consider how far the international conference regulations are suited to the requirements existing in the Tropics.

This article will be continued in the next issue of the *Agricultural News* in connexion with legislatory protection of domesticated animals and public health on plantations and estates.

COTTON.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date August 10, 1914, with reference to the sales of West Indian Sea Island cotton:

About 150 bales of West Indian Sea Island cotton have been sold since our last report, including Barbados 17*d.* to 18½*d.*, a few superfine St. Vincent 26*d.* to 28*d.*, Jamaica, Montserrat, and St. Lucia at 12*d.* and Stains at 7½*d.* to 8½*d.*

Owing to the war, no business is passing in Sea Island cotton.

We are afraid that as a consequence of the war, prices of Sea Island cotton will rule low next season, as not only is Sea Island yarn used very largely in France and Belgium, but the demand for lace and other such luxuries will be much curtailed.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending August 1, is as follows:—

Since our circular of June 27 the sales have been 11 bales leaving a stock of 41 bales composed of 39 bales Reliance and 2 bales Little Bobs, crops. The remainder of the Little Bobs crop is held on plantation.

We have had to add 9 bales to the island stock for corrections.

This report shows that the total export of Sea Island cotton from the United States to Liverpool, Manchester and Havre, up to August 1, 1914, were 4,391 bales, 6,803 bales, and 4,091 bales, respectively.

Exports of West Indian Sea Island Cotton for the March Quarter, 1914.

Colony.	Bales.	lb.	Value.
Barbados	302	148,299	£ 8,651
St. Vincent	448	159,208	12,618
Antigua	472	103,960	5,425
Montserrat	450	147,954	7,583
St. Kitts	307	152,917	9,557
Nevis	471	184,225	11,515
Anguilla	290	83,851	5,241
Virgin Islands	93	20,773	1,385
	2,833	1,001,187	61,975

Exports for the June Quarter, 1914.

Colony.	Bales.	lb.	Value.
Barbados	130	64,097	£ 4,273
St. Vincent	537	188,189	14,899
Antigua	246	49,280	2,566
Montserrat	33	15,346	1,247
St. Kitts	61	30,500	1,906
Nevis	33	12,463	780
Anguilla	46	10,521	658
Virgin Islands	20	4,551	303
	1,106	374,947	£26,632

Besides the above quantity, there was exported from Grenada 1,015½ bales containing 304,282 lb. and from St. Vincent 116 bales containing 44,442 lb. Marie Galante cotton valued respectively £8,875 and £1,852.

WEST INDIAN FRUIT.

THE CULTIVATION OF THE PAPAYA.

In the Philippines increased attention is being directed to the production of papaws, and the following are some of the directions issued in connexion with this cultivation in the *Philippine Agricultural Review* for June 1914:—

From the grower's point of view there are three kinds of papaya: The hermaphrodite papaya, the flowers of which are perfect; the pistillate, or, as it is commonly called, the female papaya; and the staminate, or male, papaya. Of the two following kinds, the hermaphrodite is preferable to the female since it is usually sweeter and better flavoured; a very great point in its favour is the fact that it is more apt to reproduce itself true to seed than the female.

The hermaphrodite papaya is distinguished by its more or less oblong or pear-shaped form, sometimes, in its best types, approaching the shape of a cucumber. The female papaya is recognized by its more roundish shape, prominent 'nose', and a large seed cavity that frequently is filled with seed.

PROPAGATION. The seed bed should be prepared by thoroughly pulverizing the soil by spading or hoeing the ground well and clearing away all weeds and trash. The seed should be sowed thinly, about 1 to 2 centimetres apart, and covered not more than 1 centimetre deep with soil, and the bed then watered thoroughly. In the dry season it is well to make the seed bed where it is shaded from the hot midday rays of the sun, for example, under a tree; or, it may be shaded by the erection of a small bamboo frame covered with grass or palm leaves. If the seed is sown during the rainy season a shed should always be put up over the seed bed to protect the seed from being beaten down by the rains.

Transplanting the seedlings in the seed bed, setting them about 7 to 10 centimetres apart, when two or three true leaves have appeared, will very materially aid in the successful transfer of the seedlings to the field.

TRANSPLANTING TO THE FIELD. When the plants have attained a height of about 7 to 10 centimetres, they are ready for transplanting to their permanent places in the garden or the orchard.

Unless the transplanting has been preceded by a good rain, the plants should be thoroughly watered before they are removed from the seed bed. In order to reduce the evaporation of water from the plants until they are well established in their new quarters, about three-fourths of the leaf blades should be trimmed off.

In transplanting, take up the plants with a large ball of earth so that as few roots as possible are cut or disturbed. Do not set the young plant deeper in the new place than it grew in the nursery; firm the soil well around the roots, making a slight depression around the plant to hold water, and then give it a liberal watering.

In order to protect the tender plant from the sun until it is established, it is well to place around it a few leafy twigs at the time of planting. Unless the seed is of unusually good strain it is also a good plan to set out two or three plants to each 'hill'. This gives the grower a better opportunity to discard male and undesirable female plants without destroying the 'stand,' than if only one plant is set out in each place.

If the plants cannot be set out in the field at the time indicated, transplant them from the seed bed to the nursery, setting the plants 30 to 40 centimetres apart in rows 1·2 metres apart, or more, to suit the convenience of the planter. While the best plan is to set out the plants in the field before they are more than 30 centimetres tall, the plants may be transplanted from the nursery to the field with safety even after having attained a height of 2 metres, *provided that all except the young and tender leaf blades are removed, leaving the entire petiole or leaf-stalk attached to the plant*, and provided that in those regions where the rains are excessive during the wet season the work is performed during the dry season. If the entire leaf-stalk is left on the plant it withers and drops, and a good leaf scar has formed before the fungi have had time to work their way from the leaf-stalk into the stem of the plant. As the tissue of the papaya plant is exceptionally favourable for the rapid development and spread of fungi, if the leaf-stalk is cut off *close to the stem* the fungi invade the stem from the remaining short petioles, and the plant dies.

Papayas should be planted 4 metres apart each way, on land of average fertility; on very rich land it may be desirable to set out the plants 4·5 metres apart.

CULTURE. While the plants are small the intervening space may be planted to some upright-growing cover crop, such as mangos or cowpeas, but when the papayas come into fruiting the best plan is to keep the land clean cultivated during the dry season. For the best success it is essential that the plants are irrigated whenever the leaves show signs of wilting, and being of exceedingly rapid growth, the papaya requires more water than most plants. In order to reduce evaporation and irrigation expense, the land should be cultivated as soon as it is in condition for cultivation after the flooding. The harrowing may be repeated once or twice before the field is again irrigated.

During the rainy season, special attention should be given to see that there is no stagnant water in any part of the papaya plantation, and that all surface water drains off rapidly.

REJUVENATION OF OLD PLANTS. When a plant has grown so tall that it is difficult to gather the fruit, which also at this stage grows small, cut off the trunk about 0·75 to 1 metre above the ground. A number of buds will then sprout from the stump and in a surprisingly short time the old stump will have been transformed into a papaya plant in full bearing. These sprouts, except two or three, should be cut off, for if all are permitted to grow the fruit produced will be undersized.

SEED SELECTION. Seed should be saved from the best fruits only. By this is meant not so much a large fruit as one that is *sweet and well flavoured*, with a small seed cavity and few seeds. Oblong should be preferred to round fruits in saving seed, since they grow on plants having both stamens and pistils in the same flower, and these being very largely self-pollinated, the seeds produced from such flowers are more likely to reproduce their kind than the seed from round or melon-shaped fruits, which grow mostly on female plants.

All male plants should be promptly destroyed wherever they appear, as not only are they unproductive, but by their pollen being carried to others which are fruiting they tend to produce degenerate plants when these are grown from the seed obtained from plants growing in the vicinity of the male plants. There is no need to fear that the others will not fruit if the male plants are destroyed, for the reason that there are always plants near by having *perfect* flowers which provide sufficient pollen for the pollination of the females.

SUGAR INDUSTRY.

THE TOPPING OF SUGAR-CANE.

In cutting sugar-canes the planter has a fairly clear idea of the extent to which it is desirable to remove the immature portion of the top, especially where he himself is also the manufacturer of the sugar and particularly where muscovado sugar is made. When, however, canes are sold to a factory there is a not unnatural desire to sell the maximum weight and there is a tendency to include immature portions, a tendency that has been evident to a considerable extent in some places and has been the cause of considerable complaint in the past season.

The question of the distribution of sugar in the individual stalk of cane has been studied by Geerligs, Went and others, and Geerligs in his text-book on Cane Sugar and Its Manufacture gives an interesting account of the mechanism of the distribution and storage of sugar. He shows that in the youngest joints, bearing immature leaves not yet assimilating, the joint contains no sugar but only starch which is consumed as the leaves attached to these joints become capable of assimilating; reducing sugars now collect, consisting of glucose and fructose, but little or no sucrose is present. At the time when the joint is full-grown in point of size, it contains little sucrose and much glucose and fructose; after this ripening sets in, the glucose and fructose steadily diminish in quantity and the sucrose increases.

While it is difficult to frame a definition that will meet all cases, it may be said that there should be removed from cane offered to the factory all that part of the top which is immature as judged by either whiteness or paleness in colour and in softness of rind. It may be stated that nothing should be sent to the factory above the point where the leaves are mature and are readily detached from the cane so that a cane showing attached leaf sheaths may be regarded as having undesirable 'top.' These points are easily recognized and well known to planters, though not easy to define.

In the contracts for the supply of canes to the Antigua and St. Kitts factories it is specified that all canes shall be of usual fair quality of Antigua (St. Kitts) canes and shall be sound and fully matured so as to give good produce; they shall be stripped of their portions not containing sugar and shall be free from tops, roots and trash.

Such a contract affords a basis for mutual understanding between planters and factory on the lines above indicated.

Now that the matter has assumed importance it should not be impossible for the scientific officers of the factories and Experiment Stations to make observations upon which a scientific standard of the quality of the portions of the top of the cane may be based for purposes of acceptance or rejection by the factory: this matter is commended for their consideration in the coming season.

Went has ascertained the distribution of the sugars in the different parts of canes of various ages, his results are summarized by Geerligs (*loc. cit.* pp. 58-61). Taking the case of fully ripe canes planted in July and analysed (a) on June 30 and (b) on July 6, and considering only the upper parts of the cane, it is found that reckoning from the top of the cane the results were as follows:—

(a)

No. of the joint.	Weight, grams.	Sucrose per cent.	Reducing sugar per cent.	Glucose ratio.
1 to 6	39·5	5·0	1·1	22·0
7 and 8	34·5	8·0	1·0	12·5
9 „ 10	33·0	10·2	0·6	5·9
11 „ 12	34·0	10·7	0·5	4·7
13 „ 14	38·5	12·5	0·34	2·7
15 „ 16	48·0	13·5	0·32	2·4
17 „ 18	63·5	14·5	0·17	1·2
19	11·5	15·6	0·19	1·2

(b)

No. of the joint.	Weight, grams.	Sucrose per cent.	Reducing sugar per cent.	Glucose ratio.
1 to 9	43·5	5·7	0·8	14·0
10 „ 13	37·0	9·9	0·6	6·1
14 „ 16	43·5	11·6	0·4	3·4
17 and 18	37·5	13·0	0·29	2·2
19 „ 20	44·0	13·5	0·27	2·0
21 „ 22	64·0	15·7	0·29	1·8

The rapid diminution of the glucose ratio would appear to afford a good criterion of maturity, and as a provisional hypothesis it may be suggested for the consideration of investigators that probably the top should be cut off not higher than the point where the glucose ratio is 10.

Observations may show that the condition of the bud may serve as a guide to the ripeness or unripeness of the individual joints.

The whole subject is one which may well commend itself to the careful consideration of planters and sugar makers, and the scientific workers associated with them.

Solidified Molasses.—Solidified molasses is attracting the attention of a goodly number of scientists according to a paragraph from a recent exchange. Mr. J. J. Hazewinkel has made some experiments and has discovered that in the concentration of molasses a considerable loss of dry substance takes place. In Java experiments were carried on that showed that through the dilution of the product the inversion of the sucrose was hastened perceptibly. When thickened to certain density it will not invert, when heated to 134°C. so long as it is neutral or alkaline. It only caramelizes all the sugar and gradually diminishes with a consequent loss of dry substance. The process of hardening molasses can be divided into two periods, before and after reaching the limit of concentration. During the first, inversion only takes place with no loss of the dry substance while in the last period sucrose and reducing sugars are replaced by pure caramelization losses. (*Louisiana Planter*, July 25, 1914.)

The Queensland Field Assistant's Reports of the sugar experiment bureau says that in the Mount Larcon district the principal varieties of cane grown are: D. 1135, Rappoe, Striped Singapore, M. 1900 and also small amounts of B. 208, Badila, Maladar, and others. Of the new varieties of cane that have been lately introduced along the Machine Creek valley are H. Q. 285, Malagasche, Mohono Kew 116, M. 1900, M. 33, Ng. 24a and D. 1135. (The *Australian Sugar Journal* for June 4, 1914).

AGRICULTURAL BANKS.

CO-OPERATIVE CREDIT SOCIETIES IN INDIA FROM 1904 TO 1912.

Credit legislation is of considerable interest to the West Indies in view of the St. Vincent Ordinance and the contemplation of similar legislation in other colonies. The following article, which is taken from the *Monthly Bulletin of Economic and Social Intelligence* for May 1914, provides a valuable insight into the present position of co-operative credit in India. It may be remembered that in the *West Indian Bulletin* (Vol. XIV. No. 1) under the title of 'The West Indies and Co-operative Credit' an account of the Indian Co-operative Credit Societies Act, 1904, was given. This Act has now been repealed. As stated in the following summary, a new Act came into force in July 1912, the provisions of which are of a very comprehensive nature and will be described in the next issue of the *Agricultural News*.

The development of co-operation in India may be said to begin with the passing of the Co-operative Credit Societies Act in 1904, and the repeal of that Act, in June 1912, marks the close of one period in the history of the movement.

Progress must be pronounced to have been extraordinarily rapid, even when allowance is made for the fact that India has profited by the experience of other countries. In 1905, when the Act had been a year in operation, there were forty-one co-operative societies in existence; in 1912 there were 8,177. In the former year the total working capital was only £3,608; in the latter year it was £2,238,000, and there were more than 403,000 members in co-operative credit societies. Even so, to quote the words of the official report, 'the movement has touched only the fringe of the vast population concerned.'

The real progress of the movement cannot be represented adequately by figures alone, since progress has to be estimated qualitatively as well as quantitatively, but there is every reason to believe that it has been sound as well as rapid. The Provincial Registrars appointed under the 1904 Act were instructed to act cautiously and progress gradually. They have concentrated their efforts on consolidating the movement and have consistently opposed the tendency towards undue expansion. The Act laid down broad, general principles and left to the local Governments and the Registrars the task of drawing up rules adapted to local conditions. The Act itself was framed on lines already tried and proved sound in European systems of co-operative credit, and the persons responsible for guiding the movement in India have welcomed criticism and been very willing to accept advice from specially competent persons in other countries.

The Registrars hold Annual Conferences to discuss questions affecting the welfare of the societies, and the resolutions passed by the various Conferences have served to a very appreciable extent to direct the whole movement on sound lines.

Whenever possible the registrars seek the co-operation of non-official persons. Voluntary workers often possess a knowledge of local conditions which makes their advice and assistance of inestimable value, and their connexion with the movement should safeguard it against the danger of becoming officialized. The Registrars look to voluntary helpers to accomplish much of the work of propaganda and instruction, and what is still more important, to exercise a general supervision over the transactions of the local societies.

The Act of 1904 laid down that a society should consist of persons residing in the same town or village, or the same group of villages, or subject to the approval of the Registrar, of members of the same tribe, class or caste. In 'Rural' societies it was required that four-fifths of the members should be non-agriculturists, and in Urban societies that the same proportion should be non-agriculturists. Except with the consent of the Local Government, liability in the case of Rural societies was to be unlimited; in Urban societies, liability might be limited or unlimited. Loans were to be made to members only, or, with the approval of the Registrar, to Rural societies.

Societies of both kinds were required to provide for building up a reserve fund. Limitations were placed on the interest which might be held in a society by any member and on the transfer of shares, and provision was made for compulsory audit and inspection by the Registrar.

As was anticipated, the development of co-operative credit has proceeded on somewhat different lines in different parts of India, but in general two main problems have presented themselves, relating to the difficulty of securing funds, and to the even greater difficulty of providing for the adequate supervision of all societies. It cannot be said yet that either problem has been solved, and it is for this reason that the Registrars have followed a policy of consolidation rather than extension, but there is at least general agreement as to the lines upon which they must be solved. Central societies have been created in every Province for the purpose of lending to other societies, and have already proved their ability to attract outside capital.

The question of finances is now largely one of regulating the relations between local societies and central banking institutions. The solution of the problem of supervision is being sought in the formation of societies into Unions which will assume much of the work of examination, audit and inspection. Already in the United Provinces and the Central Provinces the Government staff is outnumbered by the staff of inspectors, auditors and clerks entertained by the societies themselves. At the same time there is no intention of relaxing official supervision and control. Some of the Unions act also as central banks; they serve, that is to say the double purpose of supervising affiliated societies and financing them.

The majority of the co-operative credit societies in India are agricultural societies. In 1912, out of a total of 8,177 societies, no less than 7,562 are classed as Rural. A few societies have been formed among the members of a single trade or profession.

There is a general desire to associate the co-operative movement with the technical and economic development of agriculture, and this has led to the formation of a small number of societies for co-operative purchase and sale. The necessity of providing for the development of all forms of co-operation led to the passing of a new Act which came into force on July 1, 1912.

It is reported in *The Board of Trade Journal* for June 25, 1914, that in New Zealand a company has been formed with a capital of £30,000 to carry on dredging operations for the recovery of Kauri gum which exists in large quantities in many of the swamps in the northern peninsula. A gold dredger has been purchased and will be adapted for gum dredging. If the operations prove as successful as is anticipated, the swamps after being dredged, will be drained, and should then make an excellent dairying country.

RE-ACTION TO STIMULUS.

PLANT SENSIBILITY AND ITS REVELATION.

For many years it has been an open question whether there is any fundamental unity in the response of plants and animals to external stimuli. In the case of certain plants it has been known for many years that these are able to respond in a marked degree to various forms of treatment but as to whether it is rhythmatic and whether in degree it holds good for all plants had not been definitely established until Professor J. C. Bose investigated the subject a few years ago.

In *Nature* for July 23, 1914, there appears an article entitled Plant Autographs and their Revelation, in which the ingenious apparatus used by Professor Bose for obtaining an answer to the various questions regarding rhythmatic sensibility, and the results which had been obtained in the investigation are fully described and illustrated.

By the invention of different types of recorders it has been possible to make the plant itself write an answering script to a testing stimulus. First attempts to obtain these answers were made with a comparatively simple recorder and in principle the method is as follows. In the case of the Mimosa plant, which has been the principal subject of investigation, an electric current is passed through the plant by the tendrils, the leaf being attached by thread to one arm of a lever to which is fixed a writing index that traces on smoked glass the responsive fall and recovery of the leaf induced by the electric shock. In attaining the actual record of this movement in plants many serious difficulties are encountered, the principal one being that the movements which may be induced will not always overcome the friction of the apparatus. This difficulty was overcome by making an intermittent instead of a continuous recorder. The possibility of this lay in rendering the writer tremulous, this being accomplished by an invention depending on the phenomenon of resonance. Expressed in the simplest terms, the index writer and a reed are tuned to the same pitch. In accordance with the well-known law of acoustics if a note is sounded on the reed, the index will vibrate in sympathy and in consequence will deliver on the recording plate of glass a succession of taps many hundred times a second. By means of this it is not only possible to get rid of the error due to friction, but make the record itself measure time as short as may be desired. The extraordinary delicacy of the instrument may be understood when by its means it may be possible to record a time interval as short as the thousandth part of the duration of a single beat of the heart.

The first subject which received investigation was the so-called 'sleep of plants.' In order to find out whether Mimosa, a plant which exhibits sleep movements, shows diurnal variations of sensibility, a specimen was made to answer to uniform questioning shocks repeated every hour of the day or night. The amplitude of the answering twitch gave a measure of the wakefulness of the plant during twenty-four hours. The results obtained were quite unexpected and are described by Professor Bose in the following words: 'The plant is found to keep up very late and fall asleep only at the early hours of the morning. It makes up for its late hours by gradually waking up by noon. It then remains in a condition of uniform sensibility all the afternoon. This period of uniformity is chosen for investigations on the effect of changed external conditions on excitability.'

As regards the effect of air, food and drugs, it has been demonstrated by means of plant autographs that the plant may be suffocated if the air contains a large percentage of carbonic acid gas and the autograph published in the article under review clearly shows what Professor Bose calls the 'gasp of relief' when fresh air is introduced. Only in the presence of sunlight is this effect modified by photosynthesis. In contrast to the effect of carbonic acid, ozone renders the plant highly excitable. Sulphuretted hydrogen, even in small quantities, is very fatal, and alcohol gives rise to a deliberate unsteadiness of gait.'

Interesting though these results undoubtedly are, it is even more instructive to know that it has been established that they are common to all plants. Moreover the autographs obtained show that there is a latent period between the application of the stimulus and the first sign of response which is a characteristic phenomenon in regard to the response to stimuli in men and animals.

The determination of the speed of impulse in plants has received attention, and it has been shown that the time for the excitation to travel through a distance of 50 millimetres in a plant is 1·5 seconds, the velocity being 20 millimetres per second. The velocity of nervous impulse in the plant is slower than those of higher, but quicker than those of lower animals. The speed of the impulse is, however, subject to variation under different conditions. One significant result that came out was that, while a plant carefully protected under glass from outside blows looks sleek and flourishing, yet as a complete and perfect organism it proved to be a failure. Its conducting power was found to be paralyzed. But by the continued application of stimuli its nervous impulses became very much quickened after a time.

It is a very interesting fact that temperature has been found to affect the rate of nervous transmission. In the case of the plant it seems that the velocity is doubled by a rise of temperature through 9°C. When a portion of the conducting petiole if subjected to cold, the speed of conduction is retarded. Excessive cold temporarily abolishes the conducting power. It is a suggestive fact that the normal conditions of a plant can be restored by subjecting the sterilized portion of the plant to a measure of moderate doses of electric shock.

As well as the various phenomena already described as having been shown to exist, Professor Bose claims that by means of an oscilating recorder or 'pulse recorl', he can show the existence of spontaneous pulsation in plants similar to that exemplified in animals by the beating of the heart. For instance the leaves of a plant *D. gyrans* have been shown to grow in a state of perpetual vibration. As a continuation of this discovery remarkable parallelisms were found to exist in regard to the effect of anesthetics, all of which tend to show that there is a strong relationship between the sensitiveness of plants and that of animals.

Lastly the methods of investigation on which the results outlined above are based have been used successfully to measure with great accuracy the rate of the growth in the plant. Although by calculation it can be computed that it would take an average plant 200 years to cover the short distance of a mile, the extreme slowness of the development is a serious drawback to an accurate scientific determination. Professor Bose, however, claims that difficulties have been overcome by his invention of a crescograph which records the absolute rate of growth in a time so short as a single beat of the pendulum. The actual rate of growth and its variation under the action of nutrients, various electrical and other forms of stimuli are thus recorded in the course of a few minutes. The great importance of this method of investigation in agriculture is sufficiently obvious.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

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Agricultural News

Vol. XIII. SATURDAY, AUGUST 29, 1914. No. 322.

NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number deals with the subject of legislatory protection of plants and animals. This has special reference to the quarantine methods that have been adopted in various parts of the Tropics for the protection of cultivated crops.

Cotton Notes, on page 275, contain the latest Market Reports (August 10, 1914), and a statement showing the exports and value of West Indian Sea Island Cotton for the March and June quarters, 1914.

On page 277 will be found an important article dealing with the question of the topping of the sugar-cane.

An interesting account of recent discoveries in connexion with the sensibility of plants will be found on page 279.

In this issue, Insect Notes, on page 282, deal with the sprays known under the names of Paranaph and Scalo.

Fungus Notes, on page 286, comprise information on the bud-rot of coco-nuts in India.

Agricultural Colleges for the Tropics.

As noted in the last issue of the *Agricultural News*, the need for colleges was the dominant note in the proceedings at the recent International Congress held in London. With a view to giving further publicity to the educational requirements of the Tropics, the Editor of *Tropical Life* (Mr. H. Hamel Smith) publishes a leading article on the subject in the issue of that journal for June 1914, which reviews the discussions that took place at the Congress, and furthermore makes an appeal to the Home Government for official encouragement and financial support. It would seem clear that all are agreed that at least two colleges are wanted: one in the East and another in the West. Their establishments rests entirely upon the provision of adequate funds, which for the present are not likely to be forthcoming.

When one considers the comparative unimportance of British agriculture as a source of revenue and food for Great Britain compared with tropical agriculture it seems remarkable that Great Britain should be supplied with over twenty agricultural colleges of university standing whilst the many millions of square miles of tropical territory are devoid of even one such institution. The value and claims of the British tropical colonies will no doubt be more fully appreciated in England during the course of the next year or two and the necessity for aiding their development by the encouragement of education and research may eventually receive the attention and support that it is deserving of.

Technical Education and the Sugar Industry.

Some instructive considerations are put forward in regard to the value of technical education in the sugar industry by Dr. C. E. Coates in the *Louisiana Planter* for July 25, 1914. Referring to Java, it is maintained that the value of science is seen from the fact that the study of various workers in connexion with technical problems has made the Java cane-sugar industry both stable and profitable. In Louisiana, too, the introduction of scientific control has led to vast improvements.

Before any industry can be placed under scientific control it becomes necessary first, of course, to train the men to undertake this work. Attention is given to the circumstance that in the past the so-called sugar chemist was frequently nothing more than a polariscope reader. Nowadays it is necessary to find a man who is able to pass chemical judgment on the various processes in vogue in the sugar industry, an officer thoroughly trained in the chemical engineering of sugar and one who can interpret laboratory results in terms of factory practice. In order to train workers to fit the post of a sugar chemist, special courses of instruction are necessary, and it must be admitted that in the British Tropics there is a sad want of an institution capable of providing such a training in its best and broadest sense.

The above considerations refer to technical education in the sugar factory: outside in the field the application of science is equally necessary. Although a well-trained sugar chemist should be able to give advice on scientific matters connected with the estate it is generally advisable to have additional scientific advice in connexion with the plantation for two reasons: (1) it is more satisfactory because the interests of the sugar chemist are not always those of the estate (2) because the factory chemist specializes in engineering chemistry and is not well fitted to advise on agricultural problems.

At the present time in most tropical countries scientific advice on the estate is generally obtained from Government agricultural departments, but in large concerns, planters have found it advisable to employ their own scientific officers. Apart from the questions of who should appoint these officers is the fact that there is great need for institutions wherein they can be trained.

New Tariff Changes and Other Trade Notices.

The issue of *The Board of Trade Journal* for July 16, 1914, notifies the fact that the Australian Government prohibits the importation into that country of any plant (including any roots, cutting or seed) of the family Cactaceæ, though the Minister for trade and customs may permit under certain conditions the importation of the flowering or ornamental varieties of the said plant. It will be remembered that attention has been called in the *Agricultural News* to the spread of cactus on to cultivated land in Australia. In the British Solomon Islands, the exportation of the plumage of certain wild birds is prohibited and every person guilty of an offence against the regulation will be liable to a penalty not exceeding £5. From *The Board of Trade Journal* it is also learnt that maize is now being admitted duty free into Mexico through an increased number of ports; whilst in Guatemala the Government suspends for a period of six months the collection of a duty on rubber exported from this Republic. In Nicaragua it is stated the duty on common and refined sugar imported through ports on the Pacific Coast and through San Juan del Norte (Greytown) on the Atlantic coast has been reduced from 0·04 peso to 0·03 peso per kilogramme.

The section of the same publication which deals with information on shipping and transport says that the survey for the railway to Nyasaland from a point on the mainland, a few miles from Mozambique has been completed.

In regard to agricultural and forest products —the next section in the journal containing matter of interest to the West Indies —a statement is made to the effect that the crushing and decortication of ground nuts at Marseilles continues to increase. The imports into Marseilles during 1913 amounted to 241,882 tons of decorticated kernels and 138,985 tons of ground nuts in shells, as compared with 239,195 tons and 120,100 tons, respectively, in 1912.

Towards the end of May, the publication under review states that an International Rice Congress was held at Valencia and that the British delegate to the Congress reports that amongst the papers read was one on fertilizers and another on the implements used in rice cultivation. The section of the congress dealing with the commerce in rice, adopted resolutions proposing to organize an active propaganda regarding the uses of rice by distributing pamphlets, samples and recipes. It is said that the yield of rice in Valencia, owing to the excellent system of irrigation—a legacy of the Moors—is about four times as great as that obtained in many of the good rice growing districts of India.

A New Publication Devoted to Applied Biology.

Under the editorship of Professor Maxwell Lefroy—at one time Entomologist on the staff of the Imperial Department of Agriculture for the West Indies, and now Professor of Economic Entomology in the Imperial College of Science, London—the Association of Economic Biologists has just started to issue an Official Organ known as the *Annals of Applied Biology*. In this journal papers dealing with a wide range of subjects connected with economic biology are to be published, but there will be no place for purely systematic work which is amply provided for elsewhere. In the editorial to the first number it is stated that the Association is endeavouring to form a link between biological workers in Great Britain and in the Dominions and Colonies, and a publication of the journal is likely to have a great influence in the achievement of this object.

The Association contemplates the formation of a library, and requests workers in the Colonies and Dominions to forward copies of papers they have published relating to biological science, and also any books they can spare. Lately a wide appeal has been made for membership, and it is hoped that this appeal may be felt not only in Great Britain, but in the Colonies, with satisfactory results.

It may be of interest to present a brief outline of the contents and scope of the *Annals of Applied Biology*, Vol. I, No. 1. Professor F. W. Gamble, F.R.S., contributes an instructive article on impending developments in agricultural zoology, in which he emphasizes the importance of a study of worm life in the soil, as well as of protozoa living under the same conditions. In another paper the important subject of the action of Bordeaux mixture on plants receives attention, whilst another deals with pollination in orchids. A paper of considerable, practical interest is that dealing with the caterpillars attacking oaks of Richmond Park, with an account of experimental spraying with lead chromate. In combating this pest one of Merryweather's spraying machines was used, and the operators are enabled to bring the hose near the region of the foliage by the employment of fire brigade ladders. Various other papers of equal interest are to be found in this publication, but sufficient has been said to show that the new journal has a wide and interesting bearing upon agriculture, and will no doubt meet with a warm and well deserved reception.

INSECT NOTES.

PARANAPH AND SCALO.

Petroleum oils used in various ways have for a number of years past been considered useful insecticides, and there have appeared from time to time different formulae calculated to provide a mixture of these oils with water as sprays and washes.

The ordinary kerosene emulsion consists of kerosene, paraffin or illuminating oil, as it is called in different places, mixed with a hot solution of soap and water, the intimate mixture or emulsion being brought about by violent agitation or churning.

Mr. H. H. Cousins, M.A., in his book *The Chemistry of the Garden* (London, 1899) mentions the value of paraffin (kerosene) emulsion as an insecticide, and gives directions for preparing it. Following this, Mr. Cousins makes the following statements under the heading Paraffin Naphthalene emulsion: 'The idea occurred to the writer that a substance which was soluble in both soap and paraffin might greatly assist in the production of a paraffin emulsion of a kind and perfection superior to that obtainable with paraffin and soap alone.

'As the result of exhaustive experiments *naphthalene* proved to have the desired properties, and it was found that a saturated solution of naphthalene in paraffin oil combined with boiling soft soap with great ease. A semi-solid product can thus be easily prepared, which readily dissolves in water, and at a strength of 1 to 1½ parts to 100 parts of water has proved a most effectual and sound remedy for sucking insects.

'If properly made this compound will keep indefinitely, and when dissolved in water gives an emulsion of such fineness that no visible separation of oil takes place even after standing for weeks in the open air.

'The materials are cheap, and for home use this remedy can be prepared at a cost of 1*s.* to 1*s.* 2*d.* per 100 gallons of the wash as used.

'In using this, as with all washes for sucking insects, the one essential for success lies in the production of a liquid capable of lathering freely, and of thoroughly wetting the foliage and the adherent insects.

'The proportion of soap should be such as to secure a good lather, and on this account the proportion of paraffin in the solid product should not exceed 20 per cent.'

In a circular issued by the Jamaica Department of Agriculture, by Mr. Cousins (the Director) an account of the use of the paraffin naphthalene emulsion is given with special reference to its suitability as a spray wash for the killing of cattle ticks. In this circular it is stated that this substance was invented and patented in England by the writer in 1895 under the name Paranaph, and the following formula for its preparation is given: 'To 56 lb. of the best soft soap (the Chiswick Imperial is recommended) add 2 gallons of water. Simmer over a fire with constant stirring until all lumps have disappeared, and a perfectly uniform melt has been obtained.

Add 6 lb. naphthalene. Stir until dissolved. Remove from the fire and add 2 Imperial gallons of ordinary kerosene oil. Stir until uniform. The finished product is semi-solid and dissolves readily in cold water so as to give a milky emulsion.'

This amount of material makes about 80 lb. of Paranaph containing about 17 lb. of kerosene or about 29 per cent. The patent on this substance has since lapsed and any one is free to make and use the emulsion.

In the *West Indian Bulletin*, Vol III, p. 319, published in March 1903, an article appeared by Mr. H. M. Lefroy, M.A., entitled Crude Oil and Soap, a new general insecticide. In this article Mr. Lefroy describes his experiments in the preparation of an emulsion of the crude petroleum, at that time being produced in Barbados, with whale oil soap in the attempt to prepare a mixture comparable with the heavy oil sprays at that time coming into very general use in the United States.

In this account it is stated that the idea of using naphthalene to aid in bringing about a combination between oil and soap originated with Mr. Cousins. The suggestion to use napthalene for the purpose mentioned is an important one which has had the effect of producing a more effective series of insecticides. For this suggestion Mr. Cousins deserves considerable credit. Mr. Lefroy experimented with the Barbados crude oil and found that a very satisfactory emulsion could be obtained by the use of 10 lb. whale oil soap heated to the boiling point, or, if it contained much water, boiled for a time to drive off the excess. In the boiling soap, 4 ounces of naphthalene were dissolved; the 5½ pints of crude Barbados oil were added and the mixture accomplished by vigorous stirring. This produced a semi-solid substance containing some 30 per cent. of crude oil and 60 per cent. of whale oil soap.

This mixture proved to be a very useful insecticide, easily dissolved in water and efficient in killing scale insects on plants.

The production of Barbados oil has ceased, however, and as a result this mixture is no longer obtainable.

More recently Mr. J. C. Moore, Agricultural Superintendent, St. Lucia, carried out experiments in making a modification of Paranaph and Lefroy's mixture and produced a substance to which he gave the name Scalo. This differs from Paranaph in that it contains a much greater amount of kerosene, about 50 per cent. It was expected that this increase of kerosene would increase the efficiency of the spray mixture and while no comparative tests between the two emulsions appear to have been carried out, it has been found that Scalo is very efficient in treating the more common scale insects. Scalo is made as follows:—

Whale oil soap	56 lb.
Water (2 gallons)	20 ,,
Naphthalene (crude)	6 ,,
Kerosene, one case of 8 Imperial gallons	65 ,,

making 147 lb. containing about 50 per cent of kerosene. The whale oil (or fish oil) soap being of itself an insecticide of considerable value tends to increase the value of the mixture over that prepared by the use of soft soap.

The whale oil soap and water are heated until the soap is dissolved and the naphthalene is added. This mixture while boiling vigorously is taken away from the fire and half the kerosene oil added and stirred in with a flat paddle. By the time the oil is well stirred in, the mixture will be cool and it will be necessary to heat it again to the boiling point in order to work in the remainder of the oil. Care must be exercised in this part of the process that there is not a sufficient amount of free oil present to take fire.

It will be seen that this mixture, Scalo, possesses some of the points of both Paranaph and Lefroy's mixture using the essential principal of one *viz.* the combining properties of the naphthalene and the whale oils (or fish oil) soap, which in itself is an efficient insecticide, to take the place of the ordinary soft soap.

Kerosene emulsion, Paranaph, Lefroy's mixture and Scalo are used for the same purposes. They are emulsions of mineral oils and soaps suitable for use against a great variety of sucking insects on plants, ticks on cattle and dogs, and they may even be used against biting insects if these live exposed and are sufficiently soft-bodied to be susceptible to a contact poison.

The chief advantages of the kerosene—naphthalene—emulsion over the original kerosene emulsion is to be found in the more intimate mixture of the soap and oil and the greater stability of the stock solution which remains unchanged for a long time.

The improvement which it was expected to obtain over Paranaph in the Scalo mixture was greater efficiency resulting from a larger content of kerosene and from the use of whale oil soap.

Paranaph has been recommended for use in Jamaica for ridding houses of fleas, for destroying ticks on dogs, for killing scale insects and green fly, and as a wash for ticks either by itself or in a mixture with an arsenical tick killer.

Paranaph has been kept in stock at the Government Laboratory where it has been sold at the rate of *2d.* per lb. It is used at the rate of 1 lb. to 4 gallons of water and from that to 1 lb. to 6 gallons at either the weaker or the stronger mixture it makes a cheap wash costing ½*d.* or less per gallon. It is stated that it is not thoroughly effective for such a resistant insect as the orange snow scale (*Chionaspis citri*) but is thoroughly effective when used against the more vulnerable scales and the green fly, or aphides of different kinds.

As a tick wash or spray it seems to be of great value, especially when mixed with a special tick preparation. The following is stated to give good results:

Paranaph	5 lb.
Cooper's Dip	5 oz.
Water	3 gallons.

The Paranaph is dissolved by stirring with a stick, or the hand, in $2\frac{3}{4}$ gallons of water. The Cooper's Dip (in the form of a powder) is dissolved separately in 1 quart of water and added to the Paranaph. The Cooper's Dip contains arsenic and must be kept constantly stirred while being applied.

In a recent number of the *Journal of the Jamaica Agricultural Society* (May 1914, p. 217) a note on ticks contains the statement that 1 oz. of commercial arsenite of soda may be used in place of the 5 oz. of Cooper's Dip with equally good results.

It is advised to use a hand syringe with an Abol nozzle, for the application of this mixture to tick infested cattle, using from 1½ to 2 quarts to each cow. When used as directed and with care to reach all parts of the skin of the animal, this mixture is stated to kill all the ticks on the animal at each application.

Scalo has been produced in the attempt to obtain a more efficient spray material for the control of scale insects than Paranaph and so far it has been used chiefly if not entirely against these insects. Paranaph was however the basis for the trials which led to the production of Scalo, the latter being merely a modification of the former.

The combination of very high percentages of oil and of whale oil soap ought to be of value for this purpose, and so far as trials have been made up to the present time, this has proved to be the case. Like ordinary kerosene emulsion and Paranaph, Scalo possesses good qualities of wetting, that is, the mixture when sprayed on to plants attaches to the leaves and bark, and spreads instead of forming globules and dropping off.

Scalo is effective in use against such resistant insects as the orange mussel or purple scale (*Lepidosaphes beckii*) which is one of the most difficult to deal with, and even when used at the rate of 1 lb. to 1 gallon of water, no injury is reported to the foliage of orange trees, even though applied when these were making young growth of leaves and shoots.

VEGETABLE OILS,

PALM OIL IN THE GERMAN COLONIES.*

The oil palm, the most important cultural plant of tropical West Africa, extends eastwards only as far as the Great Lakes. Accordingly it is only of subsidiary importance to German East Africa, but of very great importance for Togo and the Cameroons. In Togo compact masses are to be found in the southern and central districts, and in the Cameroons there are very many of them in the virgin forests of the lowlands.

The most valuable products of the oil palm for the native are palm wine, palm kernels, and palm oil, the two latter being at the same time important articles for exportation. The method hitherto employed by the natives for obtaining palm oil and palm kernels is most primitive: the oil as a rule, contains over 20 per cent. of fatty acid, and is therefore not suitable for use in Europe as a foodstuff, but only for soap manufacture.

As palm kernels are for the most part only obtained in connexion with palm-oil extraction, and are only used to a small extent by the natives themselves, the actual exportation of palm kernels supplies data for estimating the minimum quantity of palm oil produced in the districts open to trade. From this it appears that both in Togo and the Cameroons more than four-fifths of the total quantity of palm oil is consumed by the natives themselves, and barely one-fifth is exported.

The export of palm oil from the Cameroons steadily remains about 3,000 tons, whereas in consequence of periodically occurring periods of drought the exportation from Tago fluctuates between 400 and 4,000 tons. It cannot be ascertained whether the market price affects the extent of exportation.

An increase in exportation may be attained by the following measures:—

(1) An extension of the districts capable of exporting by improvements in the means of communication (construction of railways).

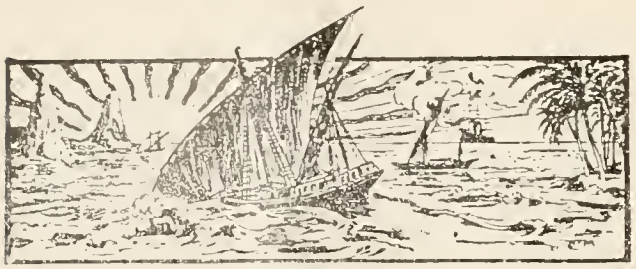
(2) A more intensive utilization of the existing palms through better methods of cultivation.

(3) A better utilization of the crops obtained through improved methods of preparation.

(4) An increase in the existing number of palms by increased activity of the present producers or the introduction of fresh producers (European plantation cultivation).

The methods of preparing the crop by machinery that have been elaborated within the last decade are of special interest, among which the process employed at the Agu plantation in Togo supplies the best palm oil obtained at the present time, containing only 5 to 6 per cent. of fatty acid. Only these recent methods make it possible for the cultivation of the oil palm to be taken up in the form of European plantations.

*Abstract in the *Journal of the Royal Society of Arts* for July 17, 1914, of a paper read by Direktor Fr. Hupfeld, at the Third International Congress of Tropical Agriculture, London, 1914.



GLEANINGS.

According to the *Gardeners' Chronicle* for July 11, 1914, an Anglo-American Forestry Congress was held at Shepherd's Bush, London, on July 16. Papers were read by Sir W. Schlich, Professor Henry, and others.

Venezuela, according to *The Board of Trade Journal* for July 23, has provided for the duty free importation into the Republic of certain articles which are destined exclusively for use in manufacturing sugar. These articles include the various appliances employed in Central Sugar factories.

The *Board of Trade Journal* for July 2, 1914, publishes a copy of an order passed in Australia, stating that no objection will be raised by the customs authority as regards the importation into the Commonwealth of lime juice containing sulphur dioxide in the proportion of not more than 2 grains per pint.

The Yearbook of the Royal Colonial Institute, 1914, is a publication which will be found useful for reference in the colonies. The section at the end containing statistics of the British Empire for 1913 shows the area, population, imports, exports, revenue and expenditure of each Dominion and Colony for 1913.

It is stated in the *Board of Trade Journal* for July 23, 1914, that a quarantine order has been issued by the United States which prohibits the importation into that country from all foreign countries, living canes of sugar-cane or cuttings or parts thereof. This notice does not apply to Hawaii and Porto Rico.

In the Annual Report on the Botanic Gardens, Singapore and Penang, for the year 1913, it is stated that the following species of Araucaria, the well known coniferous trees of great economic importance and ornamental beauty, have been planted to form an avenue near the main gate: *A. cookii*, *A. Bidwillii* and *A. excelsa*.

An article on sex characters in plants appears in *The Times* for July 20, 1914. This refers to Professor Bateson's work at the John Inne's Horticultural Institution in Surrey, England. A point is made in this article of the colouration experiments, colour factors having been correlated with certain chemical pigments, for example, apigenin and luteolin.

In the *Geographical Journal* for July 1914, an interesting paper appears describing the geology and geography of the East African trough in the neighbourhood of the soda lakes. It is believed that the origin of a part of the soda in these deposits is due to the action of plutonic water charged with carbon dioxide which decomposes sodium silicate into sodium carbonate.

According to a note in *Nature* for July 23, 1914, it has been established in America that the rings of a tree are a measure of its food supply. A connexion has been found thereby between tree growth and rainfall because in the dry climate of the Plateau of Arizona, where the exhaustive and laborious investigation was conducted, forest food supply depends largely upon moisture.

In the *Louisiana Planter* for July 4, 1914, it is stated that a want is being felt in the Philippines for Government-aided sugar factories, such as those that have been so successful in Queensland and Australia. At present, in spite of heavy yields, the sugar exported from the Philippines is not of high quality, and growers are selling at a disadvantage to refiners, who are now asking for 96° crystals.

The report of the Government Botanical Gardens, Saharanpur, Allahabad, contains the information that an attempt is being made to grow limes in this part of India. Already seventeen varieties are under cultivation at the economic station including the Dominica spineless lime. A large amount of work has been done at Saharanpur concerning observations on the growth of different species of Eucalyptus.

According to the *Philippine Agricultural Review* for June 1914, a new method for preparing seeds for mailing consists in washing them in a weak solution of carbolic acid and then packing them in moist charcoal that has been disinfected with carbolic acid. Mangosteen seed treated in this way gave a germination of 50 per cent. after being shipped from Singapore to New York and from thence returned to Singapore.

A catalogue has been received from the Darlington Fencing Company, Limited, of Lloyd's Avenue, London, E.C., in which is described the various types of wire mesh fencing sold by that Company. The publication by means of photographs shows the large number of different uses to which this fencing can be put, including ordinary employment for field enclosure purposes, the wiring of tennis courts and the screening of machinery and windows.

In the corn experiments described in the Annual Report of the Guam Agricultural Experiment Station 1912, No. 576, a hard smooth-grain yellow corn from the island of St. Vincent, and No. 589 a similar variety of corn from St. Lucia are promising. No. 576 has produced fully as heavy yield as the common native variety, and the corn of the former was matured in a season thirty days shorter than the period required to ripen a crop of the ordinary native corn.

A useful move has been made by the Lancashire Education Committee in the direction of improving the rural industries of that country. A definite agricultural department has been instituted and a scheme of agricultural education is to be carried out in connexion with the County Council farm and agricultural school situated near the town of Preston. The nature of the scheme is dealt with in a publication issued by the Education Department during May 1914.

STUDENTS' CORNER.

Owing to lack of space it was found possible in the last issue to give only four questions for candidates. The first asked for an explanation in regard to the difference between physical and chemical analysis of the soil. The methods employed for making these determinations as well as the water-holding capacity of the soil will be found described in a simple manner in Watts' 'Nature Teaching'. The second two questions do not call for any special comment; the last one, however, which asked for a description of the planting of the three provision crops with special reference to early maturity may be specially noted. In the economic experiments at many of the Agricultural Stations it has been found that the different strains of sweet potato vary very considerably as regards yield, cooking qualities, and even in connexion with the time of maturity. These matters should receive the careful consideration of the student who will find a considerable amount of information on the subject in the Annual Reports of the various Botanic Stations in the Leeward Islands.

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) What are the three essential conditions for germination? What methods have been tried for accelerating the rate of germination?

(2) Of what use is carbon dioxide, (a) in the soil (b) in the air?

INTERMEDIATE QUESTIONS.

(1) Describe any methods you are familiar with for storing provision crops?

(2) How would you proceed to obtain an approximate idea of the feeding value of any foodstuff?

FINAL QUESTIONS.

(1) Prepare a statement showing the cost, in your district of producing either (a) a ton of sugar or (b) a pound of cotton.

(2) Write a short essay (of about 400 words) on the composition and uses of insect sprays.

Method of Hatching Eggs in China.—Certain of the Chinese in the interior districts adjacent to Amoy employ an ingenious method for hatching both hens' and ducks' eggs. The breeder first takes a quantity of unhusked rice and roasts it, cooling it down by fanning or allowing the wind to blow through until it is lukewarm. He then spreads a 3-inch layer of the rice in a wooden tub and places about 100 eggs thereon; another layer of rice, this second and subsequent layers being but 2 inches in thickness, is spread over the eggs. Each tub will have six layers of rice and five layers of eggs, so that there will be 500 eggs in each tub. The rice is heated once every twenty-four hours, the eggs being taken out at such times. When the eggs are again put in the rice, the bottom layer is placed on top, and each of the other layers one row lower down, while the eggs previously in the centre of the tub are placed at the edge. The entire tub is covered with a cotton mattress. One of the great difficulties with this method is the inability to tell just when the eggs will hatch, which, of course, renders the smothering of the young ones very possible. The measure of success of the breeder depends largely upon his ability to care for the chicks at this time. (*Journal of the Royal Society of Arts* for July 17, 1914.)

AGRICULTURE IN QUEENSLAND.

The agricultural industry has made very rapid progress in Queensland during the past few years, more particularly in the Southern portion of the State. Thirty years ago the greater part of the now famous Darling Downs was entirely devoted to the raising of sheep and cattle. To-day a large area of the 16,249,000 acres is peopled by prosperous farmers engaged in agriculture and dairying. Along the coastal country, east of the great dividing ridge, sugar-growing is flourishing, particularly in the Bundaberg, Mackay, Proserpine, Herbert, and Cairns districts. The total area under all crops in 1912 was 668,483 acres; under cultivation, 844,420 acres. The total value of the agricultural production in 1912 was £4,276,235.

Along the coastal districts all classes of tropical products, such as sugar-cane, rubber, coffee, tea, cacao, ginger, cassava, cardamoms, pepper, vanilla, yams, etc., are grown successfully. Fruits, such as the banana, orange, lime, lemon, pine-apple, mango, persimmon, granadilla, papaw, and passion fruit grow to perfection: while one of the most delicious fruits, the cape gooseberry, is indigenous. In the same district, maize, potatoes, rice, cotton, millet, sweet potatoes, pumpkins, and all kinds of vegetables are raised.

On the higher table lands west of the main range, in addition to the crops grown on the coast, we find wheat, oats, rye, barley, etc. The fruits of temperate climes, such as the grape-vine, apples, pears, plums, peaches, cherries, strawberries, etc., grow to perfection.

CASSAVA FOR PIGS IN QUEENSLAND.

In Queensland cassava is used as food for pigs with success, and is found to be a good substitute for the potato. The pig eats the cassava either raw or cooked, and digests it equally well in both cases, and uses all the hydrocarbonic matter, amounting to about 80 or 90 per cent. of the total quantity consumed. All that is needed is to soak the tubers for some hours in cold water, to obtain a food ready for immediate consumption, a food, the nutritive value of which is equal to barley or rice meal. At the same time, cassava must not be considered as a complete ration, as it is necessary to supplement it for young animals, at least, with food containing the phosphates and nitrates wanting in cassava. For this purpose oil cake and ground green bones are used, or, better still, degelatinized bones powdered.

South African farmers are appealed to through Leaflet No. 13, 1914, of the Union Department of Agriculture in regard to the importance of selecting their corn for planting not from the crib or store house, as is usually done, but from the plant itself in the field. Ears should be selected, it is urged, from plants upright in growth, of normal size, with ears correctly placed, and the plants should not show susceptibility to rust, neither should there be any marked stooling habit. Ears should not be selected from near the sides or edges of the field as these will be more liable to be crossed. The ears should be kept separate and should be stored away from the other ears to undergo a further selection, as time will permit, being selected for the various characters already enumerated.

FUNGUS NOTES.

COCO-NUT BUD ROT IN INDIA.

Further information respecting bud rot of coco-nut palms in Malabar is contained in two recent papers by F. J. F. Shaw and S. Sundararaman in the *Agricultural Journal of India* (Vol. IX, pp. 111-117) and *Annales Mycologici* (Vol. XII, pp. 251-262).

While diseases sufficiently alike in their general symptoms to be described as bud-rot occur both in the West Indies and in India, there has been a strong tendency for mycologists working in the former region to attribute the disease occurring there to bacteria, and for those in the latter country to definitely associate the Indian form with fungi, a difference of results which becomes sharper as investigations proceed. Although it cannot be said that the causation of the West Indian disease has been proved to be confined to any one particular bacterium, yet consideration of the work of Johnston, Rorer and others (see *Agricultural News*, Vol. XI, pp. 94 and 110) makes it appear quite certain that the disease can be and is produced without the intervention of a fungus. It seems to be the case that there are at least two distinct diseases with similar symptoms, the one bacterial and the other, as will be seen, due to *Pythium palmivorum*. The latter has not yet been met with in the Western Tropics. We cannot speak so definitely with regard to the non-occurrence of the West Indian form of disease in the East, in view of the description by Petch of a bacterial bud-rot in Ceylon, which may or may not be the same.

Two palm diseases in India have previously been made the subject of detailed investigation, one a disease of the Areca palm (*Areca catechu*) due to *Phytophthora omnivora*, var. *Arecae* (see *Agricultural News*, Vol. X, p. 206) and the other a bud-rot of the Palmyra palm (*Borassus flabelliter*) due to *Pythium palmivorum*, Butl. (*Agricultural News*, Vol. X, pp. 14 and 30). Each of these diseases has made serious ravages in certain districts.

The papers now before us deal with an extension of the Palmyra disease to coco-nut palms. In the Godavari district, where the epidemic on the Palmyra is most severe, it had been noticed that coco-nut palms were liable to be attacked, but not to any serious extent—a result attributed to the more woody nature of the latter.

In the year 1912, a serious disease of coco-nuts in Malabar began to attract attention, and has been since found to be common in the district, affecting coco-nut palms of all ages. The disease appears to be of about ten years standing, and its progress is slow.

The first notable symptom is the collapse of the central leaf, which turns brown and dies. The older leaves droop and fall off as the disease progresses. A characteristic sign of the disease is the presence of a row or rows of brown spots stretching across a leaf, produced by the fungus eating its way through the folds of the leaf while it is still in the bud.

The fungus *Pythium palmivorum* is abundant in all the diseased tissues, and produces abundant sporangia, the spores from which are washed down by rain and spread the infection. Inoculation experiments from pure cultures have established a causative connexion between the fungus and the disease, and have further shown that the condition of successful infection is a state of saturation of the bud and the surrounding air with water.

The climate of Malabar in the months of June, July and August is such as to amply satisfy this condition. As measured at one station the average rainfall for twelve months is 169 inches, of which 128 inches fall in the three months named above. The climate of the Godavari is much drier and this is regarded by the authors as the reason for the relative freedom of coco-nut palms from the disease in that district, in spite of its abundance on the more easily infected Palmyra.

No treatment of the diseased trees is regarded as feasible; their vigorous and ruthless destruction is advocated as the surest and cheapest means of dealing with the outbreak.

CACAO CULTURE IN THE BELGIAN CONGO.

In the *Bulletin Agricole du Congo Belge* for June 1914, an interesting and important article, by Mons. J. Claessens, appears, dealing with the cultivation of cacao in the region of the Belgian Congo known as Mayumbe. At present in this territory there are 3,500 hectares under cacao one to sixteen years of age; this is approximately 8,500 acres in young cacao, and since it is further shown in the article under review that planting is still going on, one is led to suspect that, like the Gold Coast, the Belgian Congo may in time become a formidable competitor* on the cacao market, and one more to be feared by the West Indies.

The first few pages of the article contain information relating to the climatic conditions under which cacao grows in Mayumbe. The mean temperature is 24·56° C. and the annual rainfall was for 1913, 1,123·2 mm. which is somewhat below the average. Wind intensity is also referred to, and attention is called to the question of humidity. The atmosphere generally contains considerable moisture, and it is said that it is owing to this circumstance that the cacao can exist through four to five months of dryness which is experienced every year. After describing the characteristics of the soil, the article proceeds to discuss the clearing of land and the provision of shade. In cutting down the forest trees, the plan is adopted of saving the more useful trees, like oil palms; and those trees like Eriodendron, which have a very high habit, are also saved for the shade and shelter they provide. In discussing the question of shade, it is agreed that this is necessary for young cacao, but as soon as the trees themselves have covered the soil, artificial shade is then dispensable. This is the general view held in most parts of the tropics. It will be admitted, however, that the presence of shade trees on cacao estates performs more than a single function, *i.e.*, the reduction of temperature. On wet land shade trees act as drains, and in windy places afford shelter. These factors, though not discussed in the article under review may, nevertheless, be taken into consideration in connexion with the views therein expressed, as may also the correlative circumstance that certain shade trees like 'Pois doux' which in estate parlance 'suck the land' and are therefore undesirable where the soil is at all liable to dry out.

The variety of cacao cultivated in Mayumbe is the Amelonada, a variety that originated in San Thome. It is said to be very productive and resistant to pests and diseases, the principal ones being *Sahlbergella singularis* and *Phytophtora Faberi*.

Considerable space is devoted to the subject of fermentation. This process, or rather series of processes, lasts five to eight days. The beans are dried directly they are brought in. Washing has been tried but abandoned. The planters of Mayumbe use several methods for drying (a) in the sun, on

* The exportation of cacao beans from Mayumbe has risen from 14,500 kilos in 1902, to 967,800 kilos, in 1913 (1 kilo = 2·2 lb.)

various kinds of tray arrangements (b) by artificial means by an oven arrangement which seems to be peculiar to Mayumbe. This system consists essentially of a vault under which is a cement floor where the cacao is placed to dry. The canopy is pierced on the sides and bottom by a number of holes ingeniously combined which lead the heat under the vault where the cacao is being continually stirred.

The last and longest section of the article summarizes the principal imperfections in the culture of cacao in Mayumbe. Much of this is of purely local interest bearing upon local conditions, but the following points have been selected as likely to be of general interest and significance:—

(1) Enough care is not taken to plant on deep and permeable soil.

(2) In clearing forest land planters do not conserve a mantle of forest on the summits of the hills for purposes of soil protection and water-supply.

(3) Planters often omit to plant immediately after the last burning, a quick-growing leguminous crop.

(4) Want of care in judging the distance of planting according to soil and other conditions of the locality.

(5) Failure to use the banana as a shade plant for young cacao.

(6) Planters make the mistake of endeavouring to save forest trees for shade purposes. It is best to cut down the forest completely and plant shade trees separately.

DOWN THE ISLANDS.

ITEMS OF LOCAL INTEREST.

GRENADA. The Land Officer's Report for the months of June and July state that at the beginning of the first month the St. Cyr Mountain estate in the parish of St. Andrews, purchased by the Government for the extension of the Settlement Scheme, has now been formally taken over and a ranger put in charge. The estate is about 300 acres in extent, of which about 60 acres are in cacao cultivation and the remainder untilled. The sub-division surveys are now in progress and as soon as these are completed allotment will be proceeded with. The roads through this Settlement are being considerably improved. During June on the established settlements, the peasants' time was occupied largely in planting corn and sugar-cane and in the following months the settlers were engaged in weeding and planting ground provisions. At the time of writing (August 12, 1914) the Land Officer states that the corn crop is a promising one and that a high yield is expected. This refers to the condition of the crop at Waterhall: at Morne Rouge, the corn crop has suffered from the attacks of caterpillars—in several instances the fields were completely wiped out and had to be replanted. By the end of July it is stated that the caterpillar pest which had also turned its attention to sugar-cane had entirely disappeared. It is satisfactory to report that the lime plot at Morne Rouge has fruited splendidly and several barrels of ripe limes are being reaped.

Acting on the advice of the Imperial Commissioner of Agriculture, the Colonial Secretary has brought before the Agricultural Society a request that consideration should be given at once to the necessity of planting up all available areas in provision crops.

ST. VINCENT. Agricultural matters appear to be in a normal condition in this island with the exception that some anxiety has been felt, as in other islands, in regard to the possibility of an inadequate supply of foodstuff on account of the war. Previous to receiving advice on the subject from the Imperial Commissioner of Agriculture, advice had been given to all concerned in the island that quick-growing provision crops should be planted as extensively as possible.

ST. LUCIA. In his departmental notes for July, the acting Agricultural Superintendent in this island states that the cacao crop is flowering freely but that the extension of cacao planting and interest in cacao generally, has been checked by the greater attraction for lime cultivation. This last named crop is coming in well. At the Government Lime Juice Factory, after considerable discussion, the amount to be paid on account for limes has been fixed at 2*s.* 6*d.* per barrel. The total crop of last season has been surpassed in the first four weeks of working, and at the time of writing (August 14) the actual output has been more than double of the whole of the last crop. Five hogsheads of concentrated juice has been shipped and seven more are ready. The cane crop appears to be suffering from drought in the southern districts but it is stated that the area will be probably increased as prices are likely to advance. From the Experiment Station during July over 13,000 plants were distributed, which included 12,800 lime plants, 400 of which were distributed free to Crown lands holders. In this island also attention has been directed to the desirability of planting as big an area as possible in provision crops. It is reported that free tenures of land have been made on the Government Land Settlement to all labourers employed on the Réunion estates. This land will only be held for the period required for the growth of one crop of provisions.

DOMINICA. According to the *Chronicle* for July 29, the Roseau Town Board has passed a milk by-law which has been approved by the Executive Council and published in the *Official Gazette*. Briefly this by-law lays down that no person shall in the town of Roseau or within one mile thereof, dispose of any milk unless he shall have first obtained a license to do so from the Board. Persons engaged in the sale of milk will be required to wear a badge and such persons will be required to accompany to the office of the Board, any agent who may demand an explanation of the condition under which milk is being sold at any particular time. The by-law contains regulations also in regard to the proper keeping of milk under conditions of cleanliness.

ST. KITTS. The Agricultural Superintendent reports for July that the reaping operations are now concluded at the Basseterre factory. Actual figures are not to hand but the returns are not quite up to those of last season. At the time of writing the muscovado estates were still at work, but the returns were stated to be falling off owing to the lateness of the season. The young cane crop is well advanced and the ratoons have improved with the showers of the last month. The picking and ginning of cotton from the earlier planted fields is in full swing. The returns are not as good as expected owing to the plants growing to bush from the abnormal rains of May. The later planted fields on the whole look well but in the case of these also a tendency is shown to develop leaves and branches at the expense of bolls. The Agricultural Superintendent has carried out an experiment with root borer grubs and found the adult weevil of these forms to be *Exophthalmus esuriens*. This is a result of considerable importance as the insect was not definitely known before to be a pest of sugar-canes in St. Kitts. An experiment has also been made to find out where the eggs are laid, and they were successfully discovered on the split leaves of the sugar-cane. These investigations are being continued with a view to obtaining further information as regards the local habits of this pest.

MARKET REPORTS.

London.—The West India Committee Circular, August 11, 1914.

Arrowroot 1¾*d.* to 4¾*d.*
Balata—Sheet, 2/5; block, 2/0½ per lb.
Beeswax—No quotations.
Cacao—Trinidad, 60/- to 62/- per cwt.; Grenada, 60/-; Jamaica, 53/- to 57/6.
Coffee—Jamaica, no quotations.
Copra—West Indian, £24 15*s.* per ton.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 12*d.* to 28*d.*
Fruit—No quotations.
Fustic—No quotations.
Ginger—Quiet.
Isinglass—No quotations.
Honey—No quotations.
Lime Juice—Raw, no quotations; concentrated, £41; Otto of limes (hand-pressed), 9/9.
Logwood—No quotations.
Mace—1/6 to 2/4.
Nutmegs—4½*d.* to 6*d.*
Pimento—Quiet.
Rubber—Para, no quotations.
Rum—Jamaica, 2/2 to 5/-.

New York.—Messrs. Gillespie Bros., & Co., July 24, 1914.

Cacao—Caracas, 11½c. to 12c.; Grenada, 11c. to 11½c.; Trinidad, 11¼c. to 11¾c.; Jamaica, 10c. to 11c.
Coco-nuts—Jamaica and Trinidad, selects $20·00 to $21·00; culls, no quotations.
Coffee—Jamaica, 9⅞c. to 13½c. per lb.
Ginger—7½c. to 10c. per lb.
Goat Skins—Jamaica, 46c.; Antigua and Barbados, 43c. to 46c.; St. Thomas and St. Kitts, 40c. to 43c. per lb.
Grape Fruit—Jamaica, $1·75 to $2·50.
Limes.—$3·75 to $4·50.
Mace—45c. to 53c. per lb.
Nutmegs—110's, 11¾c.
Oranges—Jamaica, $2·00 to $2·50.
Pimento—3⅞c. per lb.
Sugar—Centrifugals, 96°, 3·26c.; Muscovados, 89°, 2·88c.; Molasses, 89°, 2·61c., all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., August 17, 1914.

Cacao—Venezuelan, no quotations; Trinidad, no quotations.
Coco-nut Oil—80c. per Imperial gallon.
Coffee—Venezuelan, no quotations.
Copra—No quotations.
Dhal—No quotations.
Onions—$3·00 per 100 lb.
Peas, Split—$6·75 to $7·00 per bag.
Potatoes—English, $3·90 per 100 lb.
Rice—Yellow, $6·00; White, $7·00 per bag.
Sugar—American crushed, no quotations.

Barbados.—Messrs. James A. Lynch & Co., Ltd. July 25, 1914, Messrs. T. S. Garraway & Co. July 27.

Arrowroot $3·50 to $4·50 per 100 lb.
Cacao—$12·00 to $13·00 per 100 lb.
Coco-nuts—$17·00.
Hay—$1·60 to $1·65 per 100 lb.
Manures—Nitrate of soda, $65·00; Cacao manure, $48·00 to $50·00; Sulphate of ammonia $78·00 to $85·00 per ton.
Molasses—No quotations.
Onions—$1·70 to $2·50 per 100 lb.
Peas, Split—$6·00 to $6.25 per bag of 210 lb.; Canada, $4·00 to $4·25.
Potatoes—Nova Scotia, $3·35 to $4·50 per 160 lb.
Rice—Ballam, $5·35 to $5·55 per 100 lb.; Patna, no quotations; Rangoon, no quotations.
Sugar—American granulated, $3·77 per 100 lb.

British Guiana. Messrs. Wieting & Richter, August 15, 1914; Messrs. Sandbach, Parker & Co., August 14, 1914.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	$7·00 to $8·00 per barrel of 200 lb.	——
Balata—Venezuela block	No quotation	——
Demerara sheet	65c. per lb.	——
Cacao—Native	12½c. per lb.	13c. per lb.
Cassava—	96c. to $1·20	——
Cassava Starch	——	——
Coco-nuts	$16 to $20 per M.	$23 per M.
Coffee—Creole	14½c. per lb.	16c. per lb.
Jamaica and Rio	15c. per lb.	16c. per lb.
Liberian	10c. per lb.	13c. per lb.
Dhal—	$5·00 to $5·25	$5·25 per bag of 168 lb.
Green Dhal	——	——
Eddoes	$1·44	——
Molasses—Yellow	None	——
Onions—Teneriffe	——	——
Madeira	5c.	5c
Peas Split	$6·00 to $6·50 per bag (210 lb.)	$7·25 per bag. (210 lb.)
Marseilles	——	——
Plantains	24c. to 48c.	——
Potatoes—Nova Scotia	——	——
Lisbon	——	$1·60
Potatoes—Sweet, B'dos	——	——
Rice—Ballam	No quotation	——
Creole	$6·25	$6·25 to $6·50
Tannias—	$3·00	——
Yams—White	——	——
Buck	——	——
Sugar—Dark crystals	$3·00 to $3·50	$2·85 to $3·00
Yellow	$3·50	$3·50
White	——	——
Molasses	——	——
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M.
,, Cordwood	$1·80 to $2·00 per ton	——

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Printed at Office of *Agricultural Reporter*, 4 High Street, Bridgetown, Barbados.

AGRICULTURAL NEWS

Vol. XIII. No. 323.] SATURDAY, SEPTEMBER 12, 1914. [One penny.

Department of Science and Agriculture, British Guiana.

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3. The selected candidate will be required to sign a form of agreement previous to appointment.

4. Applications should be addressed to the Director of Science and Agriculture on or before August 15, 1914.

J. B. HARRISON,
Director of Science and Agriculture.

July 3rd, 1914.

AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

OF THE

IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

VOL. XIII. No. 323. BARBADOS, SEPTEMBER 12, 1914. PRICE 1*d*.

CONTENTS.

Legislative Protection of Plants and Animals.

II.

As well as instituting control in connexion with the diseases of crops, legislative authorities have of recent years done much to protect the health of domestic animals. This part of the subject is of very vital concern because it has immediate relation to the preservation of human health. Particularly instructive in this respect are the various Orders in regard to tuberculosis and anthrax, because as most persons know, the causative organisms of these fatal maladies are communicable to man. The spread of tuberculosis is intimately bound up with milk supply. In England, the local authorities are empowered to inspect herds of dairy cows and may order the slaughter of any animal that shows evidence of the presence of the disease, or even of any diseased condition of the udder. Compensation is given by the Government on the sliding scale system, the amount granted varying with the degree of infection as determined by a post-mortem examination. It will be evident that this system must tend to eliminate infected sources and result in an improved state of affairs as regards the production of wholesome milk.

In certain parts of Africa, the Government endeavours to check the spread of tuberculosis in another way. In Rhodesia, for example, an Act is in force which prohibits the introduction of breeding animals below a certain age, the reason for this being that, although a young animal may show no evidence of tuberculosis, it may possess an inherent susceptibility for the disease and develop it at a later date. In the West Indies, although bovine tuberculosis is very prevalent, no definite measures are adopted for enforcing its eradication, the principal difficulty being the want of a veterinary organization.

Anthrax, the second disease that has been specially mentioned, comes under the Contagious Diseases Ordinances in most countries. It may be observed here that in the past, most of those maladies which are sudden in their attack have received, and only naturally so, the careful attention of legal authorities; but it does not follow that a less violent disease like tuberculosis is less deserving of biological intervention by law: on the contrary, it is the more insidious affections that call for compulsory measures of eradication most, because the losses are not so strikingly apparent.

In the West Indies, especially in St. Vincent, anthrax has in the past been a serious menace to the cattle-raising industry, but by means of vaccination, introduced by the Government, the malady has now been placed under control. No case has come under observation in this Colony since 1911. The compulsory disposal of infected carcasses has also been an important factor in the suppression of anthrax in St. Vincent.

The health of live stock is very carefully guarded in many places by quarantine, just as the healthy condition of crops is protected in this way. The outbreak of Mal de Caderas in British Guiana has recently emphasized the importance of quarantine, and most of the Colonies are alive to the dangers of admitting animals, even though they appear healthy, from disease-infested territory. Several islands, for example Barbados and Grenada, have taken special legislative action to prevent the introduction of Mal de Caderas from South America.

It is generally admitted that the most elaborate animal quarantine service in the world is that of the United States of America. Animals imported into New York, for instance, are first quarantined on an island before being allowed on to the mainland. Cattle from Europe are regarded with particular suspicion and are generally quarantined for thirty days. This is because of the inability of European countries to control adequately foot-and-mouth disease.

Some years ago a large stock owner in Texas approached the Government with a view to importing a number of Zebu cattle from India. Amongst Indian cattle there is prevalent a very fatal disease known as surra, which does not occur in the United States, and consequently the Bureau of Animal Industry refused to entertain the Texas stock owner's representations. Eventually, however, it was agreed that the cattle might be imported under specially strict quarantine conditions, under the following circumstances. The importer was to proceed to India in company with one of the United States Government Veterinary Inspectors and select the requisite number of healthy animals personally in Bombay and obtain evidence that, as far as was known, they had not been near any source of contagion. As well as this it was laid down that the blood of each of the animals was to be examined microscopically in India, to make sure that the parasite which causes surra was not present in a latent condition in the animal's system. Also it was stipulated that during the voyage from Bombay to New York, the animals were to be daily examined in the same way by the officer accompanying the cargo. All this was done, and the animals were brought to New York where they were immediately placed under quarantine in wired stables, the wiring being necessary because surra is a disease which is disseminated by biting flies. Although apparently sound on their arrival, it was only a few days before three of the animals showed symptoms of surra and were immediately slaughtered. Not until after a prolonged quarantine of five months under screens were thirty-three of the original herd of fifty-one cattle released and sent to their destination in Texas. Eighteen out of a herd of fifty-one had been destroyed in quarantine.

This remarkable case has been described in order to show what devolves upon the biologist in quarantine work, and the necessity for his existence. It also demonstrates the elaborate thoroughness of the American system. It is the same with the tick eradication work in the United States: neither time nor money is spared to control the parasitism and, on the evidence of the stock owners themselves, enormous savings have accrued from the suppression by systematic spraying and quarantine, of a pest that threatened to cripple one of the largest, if not the largest, agricultural industry, from the point of view of capital, in the United States.

In concluding it may be fitting to call attention to the necessity for organized action of the same kind in regard to the tick problem in the West Indies. The health of West Indian stock as a whole is intimately bound up in this question, and there is little doubt that a more extended use of cattle sprays in place of the casual attempts to eradicate ticks at present in vogue would lead to a great appreciation in the value of one's stock. At this point, reference may be made to papers by the late Veterinary Officer on the Staff of this Department in the *West Indian Bulletin*, Vol. XIV, Nos. 2 and 3. The information contained therein will be found useful and very significant, in connexion with the principles set out in the present article.

In leaflet No. 15, 1914, of the Department of Agriculture, Union of South Africa, it is said that the condition of the horse's health is good when the following points may be observed: skin and hair unbroken; coat sleek, shiny, lying close down to the skin; body surface warm and of equal temperature; cool feet; bright eyes; moist mouth; sweet breath; mucous membrane rosy pink; and so on. Disease is indicated by such symptoms as lack of appetite, shivering, abnormal respiration, pulse or temperature, and the like. The leaflet is instructive and will no doubt serve a useful purpose as an aid to those who are unaccustomed to horses.

MANURES AND MANURING.

THE SUPPLY OF POTASH.

The cessation of exports from the Stassfurt Mines in Germany, which constitute the principal and practically the only source of ordinary potash manures, raises the question as to what substitutes can be employed in the near future, and from what quarters these can be obtained.

For many years a considerable amount of work has been done in the United States and elsewhere with a view to rendering available the potash which is contained in certain well-known and widely distributed varieties (e.g. orthoclase) of the mineral called felspar. It will be remembered that this substance is a common constituent of many soils as well as occurring in vast quantities in certain rocks like granite. Trials have shown that it is not a paying operation to manufacture available potash from felspar for the sake of the potash alone. The discovery, however, that Portland cement can be obtained by the treatment of felspar with lime as well as available potash as a by-product, has of recent years rendered the idea practicable and indeed, several factories have been established for carrying out these operations. At the same time the unit price of potash from this artificial source is greater than that of the mineral obtained from natural mines, and up to the present this artificial supply has been altogether inconsiderable. There is reason to suppose now, however, that, owing to the complete cessation of the German supply which, as already intimated, has held a world monopoly, some possibility exists that a rise in price may render the artifical production of potash fertilizers feasible, —a circumstance of importance to those who are engaged in the production of certain crops.

Another alternative in the present situation might be to take advantage of the Indian supply of saltpetre (potassium nitrate). In 1906-7, India exported principally by way of Bengal, 353,378 cwt. of nitrate of potash, valued at Rs. 4,152,527 (£276,168). The largest quantities of this amount were distributed in order of nomination to the United States, United Kingdom, China (Hong-Kong) and Mauritius. The average value per hundredweight of Indian nitrate of potash for the five years preceding 1907 was 14·5*s*.

In connexion with the information just given it may be of interest to add a few words on the chemistry of nitrate of potash. It is obtained in India in the form of an efflorescence at the surface of the soil, and the conditions for the formation of the salt are briefly as follows: Supplies of nitrogenous organic matter; climatic conditions favourable to the growth and action of nitrifying bacteria which convert urea and ammonia successively into nitrous and nitric acid; the presence of potash; and meteorological conditions suitable for the efflorescence of the potassium nitrate at the surface. This necessary combination of characters is to be found in a marked degree in various districts in the Indo-Gangetic tract.

It is well known that nitrate of potash has an important use in the manufacture of explosives, and it is a further point to anticipate whether the Indian Government has not already prohibited the exportation of nitrate of potash under the category of contraband of war, in which case it would seem that agriculturists will have to look to either artificial mineral supplies as dealt with in the first paragraph of this article, or rely upon the practice of carefully returning plant débris and wood ashes to the soil. Careful attention to this latter procedure should ensure adequately all necessary demands for potash. It may be noted, however, that there are one or two by-products of tropical crops in existence which are very rich in potash and may possibly come into use as an organic-potash manure, for example, Senat seed from the Soudan, the ash of the husks of which is rich in nutrients containing as much as 42 per cent. of potash (K_2O). Material of this kind as well as sea-weed (also rich in potash) should prove very valuable.

Nitrate of potash is not used largely as a manure as it is rather expensive. For sugar-cane in Barbados, however, and in other islands where the soil has to be kept rich in available plant food, nitrate of potash has proved useful and possibly economical because nitrogen being required as well as potash, the planter has in this manure two essential elements in a readily available form. Owing to the richness of nitrate of potash, its purity and complete availability, it is necessary to use only small quantities per acre, for example ½-cwt., which is significant as regards freight.

The usual guarantee for nitrate of potash is 17 per cent. nitrogen and 40 per cent. of potash, the unit prices for which are quoted at 14*s*. 6*d*. and 3*s*. 9*d*., respectively.

GROUND LIMESTONE.

When discussing the subject of liming, confused ideas are occasionally met with in regard to the question of limestone *versus* slaked lime or quicklime. Perusal of an article in the *Journal of Agriculture*, of New Zealand (April 20, 1914), will show that all the good effects resulting from the employment of quick or slaked lime on the soil may be produced with greater safety by ground limestone. The effective nature of ground limestone naturally depends to a large extend upon its mechanical condition: the finer the crushing the better the results. Chemically, limestone, like lime, is alkaline, and tends to destroy the sticky nature of soils. It further supplies a base for the formation of nitrates in the soil and liberates potash from the insoluble soil silicates and prevents potash fertilizers from passing into an unavailable condition. Limestone furthermore has a favourable influence on the availability of phosphates in the soil.

In the article referred to, mention is made of the fact that material containing limestone may also contain a high percentage of clay or other so-called impurities. It is quite possible that under some conditions these impurities are an advantage, as for instance, when limestone is to be added to light soil. As regards the amount that should be applied per acre, experimental work in England and America indicates the reversion to the old-time custom of applying limestone in large rather than in small quantities at a time—by the ton rather than by the hundredweight. Two tons of limestone per acre is said to be the smallest amount that should be tried on an experimental scale at first. It may be noted here that in the case of very tenacious clays, it may be found advisable to begin with a dressing of quicklime because the action of this substance is more active than that of limestone.

There is a call in New Zealand for more experiments with lime; it is suggested that demonstration plots should be laid down to show the relative efficiency of ground limestone of varying grades of fineness, and therefore of varying cost; to show the effect of varying quantities; varying methods of application; caustic lime in varying forms; the effects of these in combination with phosphates on various crops, and so on. In these as in all other manurial experiments, a number of years will be required before really decisive conclusions can be drawn as to the beneficial effects derived under the various conditions.

It may be added that in the West Indies also similar experiments are wanted, and in connexion with this requirement the reader is referred to an article that appeared recently in the *Agricultural News*, Vol. XIII. p. 226.

FRUIT AND FRUIT TREES.

COCO-NUT EXPERIMENTS IN CEYLON.

In the West Indies there is at the present time a considerable want of accurate information concerning the manuring and cultivation of coco-nuts. Such information, to some extent applicable under West Indian conditions, is contained in Bulletin No. 10 of the Department of Agriculture, Ceylon, entitled, Coco-nuts: Experiments at Peradenyia. The trials which this Bulletin describes constitute a continuation of those dealt with in Bulletin No. 2, published in December 1912, and brings the results of three years' experimenting up to date. The work has been concerned principally with the question of manuring, and the coco-nuts that received the treatments were all old, growing on a quartzy loam at an elevation of about 1,600 feet and situated about 51 miles from the sea in a direct line. The average rainfall in this district is just over 83 inches, but the precipitation varied from 62 inches in 1908 to 120 inches in 1913. The climate is hot, and February to August are usually the dry months, when the soil becomes hard and unworkable. It will be seen that the climatic conditions differ from those under which large areas of coco-nuts are grown in the West Indies, but the results will no doubt be to some extent applicable under conditions obtaining in Trinidad and British Guiana.

The chief object of the experiments was to ascertain how far old coco-nut palms can be improved by means available to most cultivators. Also the effect of the chief manurial constituents alone and in combination on the development and formation of nuts.

In reviewing the results obtained it may be stated first of all, in order to indicate the general value of these experiments, that those trees which received no treatment of any kind showed a gradual falling off in yield.

Plot 1 in the manurial experiments received common salt, and the number of matured nuts per pound steadily decreased, though the number of nuts per candy of copra was found to be very high, namely 1,900. The percentage of oil showed some falling off, and it is concluded that salt alone as a manure for coco-nuts has apparently not that value usually ascribed to it. On plot 2, sulphate of potash was used. Here the number of matured nuts per tree showed some increase and the number of nuts per candy of copra was high, but there was a falling off in the percentage of oil. The fronds of the palms looked more healthy than those on trees which had been treated with common salt. One of the most disappointing plots in these interesting trials seems to have been that which was dressed with nitrate of soda. The palms still showed weak, yellowish, and small bunches of nuts. The percentage of matured nuts to flowers fell off heavily, but the number of nuts per candy of copra still remained very high. Plot 4 was dressed with phosphoric acid at the rate of 200 lb. per acre. The palms all looked healthy and vigorous as a result of this treatment and showed a marked improvement. The number of matured nuts per tree increased, but the percentage of matured nuts to female flowers fell nearly 10 per cent. In the green manure plots (No. 5) the percentage of matured nuts to flowers exhibited a falling off, and as this manure mixture supplied all the chief mineral constituents required, it is believed that the high proportion of immature nuts is probably due more to climatic effects than to want of plant food; but this point requires further investigation. A marked improvement in the appearance of the trees and some improvement in yield per tree was obtained by digging in green manure with basic slag and sulphate of potash. In this plot the percentage of oil increased, which did not occur in the case of the previous plots; but the nuts were small.

A very interesting form of treatment was that employed on plot 8 where the soil was ploughed twice annually. Here the number of matured nuts per tree increased from 29·2 in 1911 to 44·5 in 1913—the most satisfactory increase of all the plots. The number of nuts per candy of copra was, however, the poorest of all—a fact that is difficult to explain. The percentage of oil fell slightly. Soluble manure was applied to plot 9 and gave fairly satisfactory results. In plot 10, to which lime was applied at the rate of 300 lb. per acre, followed by the general mixture of plot 5, there was no very marked improvement. In the next plot the green dressing *Tephrosia purpurea* (for some time under trial in the West Indies) was dug in with basic slag and sulphate of potash with unsatisfactory results. Cattle manuring practised in the case of plot 12 gave fairly satisfactory results, the fact of most interest being that there was a considerable increase in the percentage of oil.

The control plot No. 14, which was unmanured, is naturally of special interest in considering the results of these experiments. It showed a distinct falling off in yield of matured nuts from 30·6 in 1911 to 25 in 1913, and there was very little increase in the total amount of flowers and the percentage of matured nuts, which were small. But the percentage of oil increased from 50·5 to 64 per cent. in 1913—an observation of some interest. Plot 15 was also used as a control. In this case also there was a falling off in yield. A comparison of the number of matured nuts from the manured and cultivated plots and the unmanured plots respectively, since the experiments were begun in 1911, shows that the unmanured plots yielded rather more than the manured plots the first year, and then steadily decreased, the only manured plot falling off in the same way being No. 1 manured with 500 lb. of common salt per acre per annum.

The results of these experiments will be more valuable as time passes, but meanwhile they tend to show that: (1) 'ploughing twice a year is as beneficial as manuring'; (2) 'tying cattle in 1911 and 1912 had an immediate effect lasting over two years, no cattle having been available for tying in 1913'; (3) 'the application of a soluble mixture twice annually and a general mixture annually produced a steady increase maintained during 1913'; (4) 'green manure with basic slag and sulphate of potash showed a marked improvement, which, however, was not fully maintained during the wet season of 1913'; (5) 'the application of salt or nitrate of soda has had no beneficial effect during the three years' experimenting'; (6) 'no treatment of any kind results in the gradual falling off in yield'.

A critical examination of the numerical results raises several interesting points that undoubtedly require further investigation, one of the most curious being that whilst the total number of mature and immature nuts increased annually, the proportion of female flowers that produced mature fruits showed a steady decrease during the same period.

Appended to the interesting information abstracted above are the tables containing figures to show the amount of fertilizers applied and the various yields of nuts and flowers in detail. This is well worth careful reference by those who are concerned with the cultivation of coco-nuts, and the publication under consideration may be said to contain valuable and fairly conclusive information, which is somewhat rare at the present time in connexion with coco-nuts.

VETERINARY NOTES.

GENERAL CONCLUSIONS REGARDING THE INTRADERMAL METHOD OF TUBERCULIN TESTING CATTLE.

Tuberculosis appears to be increasing amongst live stock in California. According to Bulletin No. 243, issued by the University of California Press, vigorous efforts are being made to eliminate the disease by means of the tuberculin test and, what is of special importance from the best Indian point of view, the intradermal method of applying this test rather than the subcutaneous is being successfully used under the hot climatic and other conditions obtaining in the Southern States.

The intradermal method of tuberculin testing cattle as first applied by the French investigators Moussu and Mantoux and as used under California conditions by Ward, Baker, Longley, and others has many advantages over the usual method. Since the reaction to tuberculin when injected intradermally depends upon a swelling at the point of injection and not on a rise of temperature, it is to be preferred to the subcutaneous under all conditions that are liable to modify the tuberculin temperature curve, such as unusual surroundings, very hot weather, or fatigue from a long journey. It can be satisfactorily applied to young calves and wild range cattle and is especially useful in testing cattle during the hot season in the interior valleys of this state under conditions that render the subcutaneous method of testing unsatisfactory. It excels the subcutaneous method in economy of time, labour and materials.

From our observations in applying 4,926 intradermal tests, including retests, to 4,001 head of cattle, 1,614 of which reacted, the results being checked by 1,000 subcutaneous tests and 341 autopsies, we conclude that under average dairy conditions the intradermal equals the subcutaneous method in accuracy, provided a 5 per cent. or stronger, solution of alcoholic precipitated tuberculin is used and the test is performed by an experienced operator. We do not advocate the substitution of the intradermal for the subcutaneous method by a veterinarian until he has become skilled in its use by practice and observation. The practitioner can easily accomplish this in the routine of his work by applying the two tests simultaneously. Such a procedure cannot injure the accepted subcutaneous method in any way, although it may modify the local intradermal swelling to some extent.

Tuberculous cattle usually react thermally, as well as locally to intradermal injections, even when very small doses of tuberculin (1 to 10 milligrams) are used. If temperatures are taken at two-hour intervals from the eighth to twentieth hours following the intradermal injection it will be found that most of the cattle which react locally will also react thermally.

Since neither the intradermal, the subcutaneous, nor the ophthalmic method will detect every case of tuberculosis when applied independently, the maximum number of reactors can only be detected by applying the combined tests. This may be done by applying the intradermal and subcutaneous tests simultaneously or by administering the intradermal test alone and retesting all of the non-reactors after an interval of at least seven days. The ophthalmic test may also be advantageously combined with either or both of these tests. The ophthalmic test alone is unsuitable for use under the average California dairy conditions, except when only a few animals are to be tested and they can be kept confined under shelter. For official tuberculin testing where a high degree of efficiency is necessary a combination of the three tests would be desirable. The intradermal method is especially adapted to the testing of swine.

FOODSTUFFS AND STORAGE.

A New Bean.—The food value of *Stizolobium pachylobium* beans is dealt with in the *Trinidad and Tobago Bulletin* for July 1914. A chemical examination showed that these beans, which are marbled in appearance and are rather flat, and measure about 19 by 13 by 6·5 millimetres, do not contain poisonous substances. This result was confirmed by feeding experiments with guinea pigs. As regards nutritive value, the sample under consideration was found to be somewhat superior in feeding value to French, Lima or Java beans, and that like these beans its nutritive properties are principally due to a high content of carbohydrates and proteins. Owing chiefly to its low percentage of fat, its value is considerably less than that of soy beans. An interesting comparison was made between beans of *Stizolobium pachylobium* and *Stizolobium aterrimum* (Bengal bean), both grown on the same estate in Trinidad in the same season. The two species yield beans which are almost identical in the quality and quantity of the constituent substances. But the interesting point is brought out that the *Stizolobium pachylobium* bean is slightly preferable, principally on account of its larger size. Since the skins or testas are of a similar thickness, the larger beans give a meal containing a smaller quantity of indigestible crube fibre, which is almost entirely derived from the skin. This latter fact is of considerable commercial importance not only from a nutritive standpoint, but also as regards the appearance and palatability of the meal. It will be remembered that a sample of *Stizolobium aterrimum* meal recently examined on the London corn market was commented on with regard to the speckly appearance produced by the pieces of black testa, though the product, on the whole, was very highly commended.

According to the *Hawaiian Forester and Agriculturist*, June 1914, to keep sweet potatoes in good condition they must be well matured before digging, carefully handled, well dried or cured, and kept at a uniform temperature after they are cured. It is necessary in storing the tubers to have the outsides perfectly clean. It would be interesting to carry out experiments with a view to determining the value of formalin and other disinfectants in the storage of tubers in the tropics.

The process of drying bananas which constitutes an industry of importance in Jamaica and Mexico is referred to at some length in the *Queensland Agricultural Journal* for July 1914. It is stated that Queensland is concerned only with the sun drying of bananas for which the climate is particularly suitable. In parts of Mexico where the climate is very dry, the ripe fruits are exposed to the sun till the skin begins to wrinkle. They are then pealed, and again exposed until an efflorescence of sugar appears on the surface. They are then pressed in masses of 25 lb. each.

COTTON.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date August 25, 1914, with reference to the sales of West Indian Sea Island cotton:—

Since our last report sales of West Indian Sea Island cotton are confirmed and confined to 16 bales of St. Vincent at 16*d.* to 17*d.*

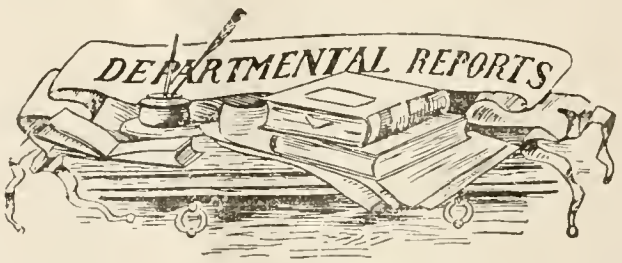
Owing to the war, this growth is at present quite unsaleable, except at ridiculously speculative prices. We are afraid that it will be a considerable time before the market will be established again on a proper basis, as, not only are the mills which use Sea Island yarn situated in France and Belgium in the region of the present hostilities but there will be a tendency not to use any luxuries, and we therefore think that lace will suffer as much as any article of this class. We see no hurry for planters to push their new crop forward, as there is no possible enquiry here at the present, and planters will probably be able to hold their cotton in the West Indies at less expense than if consigned to England. The only offer which we have obtained since the war is 12*d.* per lb. for several hundreds of bales, all of which were selling a few months ago at prices ranging from 15*d.* to 20*d.*

NOTE ON NEW COTTONS.

According to the *Bulletin of Miscellaneous Information*, No. 5 of 1914, published by the Royal Botanic Gardens, Kew, a fine series of specimens of Canto cotton had been received from Jamaica. It is derived from a tree which is found wild in the Canto district of Cuba. Mr. W. Harris, Superintendent of the Public Gardens and Plantations, Jamaica, who forwarded the specimens, says that the plant is a perennial, and according to present information is likely to prove of considerable agricultural value for cultivation in dry districts, of the Tropics. The 2 acres planted at the garden contains plants which are only six months from seed but are now bushes up to 10 feet high. In Jamaica the areas which are at present under trial with this plant in various parts of the arid southern districts afford evidence that in spite of the drought that has been experienced, these cotton bushes are likely to produce crops estimated to yield at least 1,200 lb. of seed-cotton per acre, and as this cotton has been sold at prices varying from 18c. to 20c. per lb. in the American markets, it will be seen that the Canto cotton is a plant of much promise for lands that are now producing nothing but shrub.

'The specimens sent [to Kew] agree in most of their technical characters with *Gossypium brasiliense*, Macf., from which they differ, however, in the seeds being free from one another. In view of the statement that Canto cotton is wild or semi-wild in south-eastern Cuba, it may possibly represent the wild stock of *G. brasiliense*; and having regard to its close agreement with that species, apart from the free seeds, it has been provisionally named *Gossypium brasiliense*, var. *apospermum*, Sprague (var. nov.), as it seems desirable to have a definite name for such an important economic plant. At the same time the possibility of its being a hybrid of *G. brasiliense* with some other species cannot be entirely excluded.

'The study of its behaviour under cultivation may perhaps throw light on this point.'



DOMINICA: REPORT ON THE AGRICULTURAL DEPARTMENT FOR THE YEAR ENDING MARCH 31, 1914.

In issuing this report certain improvements in the form have this year been introduced: namely, single headings immediately under the number of each page, and a table of contents on the first page. This should facilitate reference considerably.

The general manner in which the information is presented is similar to that adopted in previous years, with the exception that the work in connexion with the cacao plots and the newly established lime cultivation plots is published as an appendix: in this section, also, is brought together information on agricultural education in Dominica.

Reviewing the publication from the beginning, the first section on work in the gardens and observations on plants contains many facts of local interest, especially that concerning the identification of a leguminous tree which is common along the banks of the Indian River at Portsmouth, and which proves to be *Pterocarpus officinalis*, Jacquin. A note is given on the trees that have flowered in the garden for the first time last year, and a list of interesting plants added to the collection during the same period. The next section, referring to the work done in the nurseries, describes the experiments with budded oranges, and shows, as regards plant distribution, that although the number sent out was not quite so large as for the previous year, nearly 60,000 plants were distributed during the year under review, most of which were lime plants for establishing plantations in various parts of the island. In the portion of this section dealing with plant importation, reference is made to *Aleurites Fordii*, the wood oil tree of China, and it is considered probable that this tree will not be found to thrive well in Dominica. Mention is also made of a newly imported Sapucaia nut, and the Shea butter tree, attempts to raise plants of which have not in the past proved successful in Dominica but concerning which some success has now to be recorded. It is noted further that *Hedychium coronarium*, a source of material for paper making, occurs commonly in Dominica, and that during the year a single specimen of the Gutta percha tree was received from Kew.

The plot experiments at the Botanic and Experiment Station are dealt with in the next section, which contains amongst other matters the results of the tapping of *Castilloa elastica* up to date, and an interesting note concerning an investigation into the grasses of Dominica. Up to the present time forty-one species of Dominica grasses have been identified as a result of the work of Mr. A. S. Hitchcock, Systematic Agrostologist of the United States Department of Agriculture, and the Assistant Curator in Dominica, who collected the specimens. The main portion of the section under review deals with the budding of cacao. The Curator's views on this subject would seem to be well worth careful consideration by planters and others interested in the establishment of cacao estates. The necessity for research as regards selection of budding material is pointed out, and the general advantages of budding

and grafting, respectively, are discussed in detail. This part of the report has been considered of sufficient interest to justify its reproduction in the *West Indian Bulletin*, Vol. XIV, No. 3, which is shortly to be issued. It is therefore unnecessary to make further reference to it in the present review.

It is always a satisfactory feature of the Dominica Annual Reports that one of the smallest sections is that dealing with insect and fungus pests. Dominica crops are remarkably free from the attacks of parasites, and last year the only matter of any moment was the revival of the pest attacking oranges. It seems that this can be kept under control by the employment of arsenate of lead.

Since lime cultivation is the principal industry in Dominica, it is to be expected that the section dealing with progress in the chief industries should be composed principally of information dealing with the production of lime juice products. The lime crop for the past five years has continued to increase steadily, and it is also to be observed that the exports have also grown. During the year there was a considerable falling off in the export of raw lime juice owing to the fact that a decreased demand existed in Canada. Reference is made in a report to the alleged adulteration of West Indian lime juice in the Dominion by the addition of water and of dye. It is unnecessary to add that this adulteration was practised outside Dominica. Some consideration is given next to the keeping qualities of lime juice and it is shown that under equal conditions a weaker juice will deteriorate at a more rapid rate than a stronger one. Compared with 1912 there was a considerable increase in the output of citrate of lime, but the production is still below that of the years 1910 and 1911. The trade in fresh limes continues to expand. As regards otto of limes, prices have continued to range at a high level, though the market rates for distilled oil of lime ruled low. The following table will be of interest, showing the exports of lime products from Dominica during 1913:—

Product.	Quantity.	Value.
Concentrated lime juice	158,974 gallons	£60,842
Raw lime juice	336,728 ,,	15,083
Raw juice cordial	4,654 ,,	319
Green limes	43,832 barrels	39,298
Pickled limes	616 ,,	231
Citrate of limes	4,753 cwt.	17,026
Essential oil of limes	5,370 gallons	3,625
Otto of limes	1,505 ,,	6,208
	Total	£142,662

The increase in values over the crop of 1912 amounted to £15,989.

Amongst the minor industries the future before cocoanut cultivation appears to be satisfactory; a large amount of planting is in progress and the fact that there has been a slight falling off in the exports of nuts shows that a large number are being used for planting up estates locally. Considerable quantities of oranges, orange oil, bay leaves, bay oil, starches, coffee and hardwood were shipped during the year.

The appendix, which was referred to earlier in this article is divided into three parts, dealing with manurial experiments with limes, cacao, and agricultural education, respectively. The lime manurial experiments have only just been instituted. The erection of an experiment station devoted to the study of problems connected with limes is of great interest, for knowledge concerning limes and lime products is scanty and it is expected that the experiment station will have the effect of adding considerably to the information available as the work connected with cacao at the Botanic Station has already done. In the cacao manurial experiments, although there has been some general falling off in yield, there is continued evidence of the great superiority of mulching. In 1913-14 additional manurial experiments with cacao were laid out. For an interesting review of the work connected with the manuring of cacao the reader should refer to the *West Indian Bulletin*, Vol. XIV, pp. 81-119.

The system of agricultural education in Dominica will, by reference to the report, be seen to be now in a condition of great efficiency, serving the requirements of all the various sections of the agricultural community. At the Botanic Station there is a system of training pupils, and the account of the field work done during the year, which will be found on pages 32 and 33 of the report, shows the highly useful instruction that these pupils are receiving. There is, accompanying this practical work, theoretical instruction in the class room, and every year the pupils are examined externally by officers on the Staff of the Imperial Department of Agriculture. Another system at the station is the cadet system, already described on previous occasions in the publications of this Department. Outside the Botanic Station, but an important part of Departmental work, is the prize holdings competition for the small holdings. So successful have those competitions proved that the Assistant Curator is able to state: 'the stage has been reached in this district similar to that in La Plaine where it is not necessary again to offer money prizes. Annual visits by an agricultural officer whom they now welcome, will, I am of opinion, be sufficient to keep the people, whether former competitors or not, on sound agricultural lines.' Overseers and others on the plantations are also catered for as regards education by means of the courses of reading and examinations in practical knowledge arranged by the Imperial Department of Agriculture and carried into effect by the Assistant Curator. As well as these, another section of the agricultural community, composed of the Grammar School boys, is provided with instruction in that institution in practical chemistry and botany, and it is expected that in the near future an agricultural class will be arranged which will enable the boys to take agricultural science as a section in the Cambridge Local Examinations. Those who have done this are exempted from taking the Preliminary examination in the Reading Courses mentioned above. Hence it will be seen that the various systems of agricultural education in Dominica, whilst serving different sections of the community bear a relationship to one another, and as a whole may be considered to constitute one of the most efficient and least expensive educational arrangements now existing in the Tropics.

A note on the red clay soil of Porto Rico appears in the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases* for June 1914. This soil is widely distributed in the island and is characterized by the high percentage of iron and aluminium, the absence of carbonates and its acidity, and deficiency in organic matter. These soils respond to manuring, particularly with lime; but certain areas, which have been continuously under sugar-cane are in a sick condition and respond to neither manuring nor liming. The reason for this is unknown, although an examination of the organic matter of these soils has been carried out by the United States Department of Agriculture.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

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Agricultural News

VOL. XIII. SATURDAY, SEPTEMBER 12, 1914. No. 323.

NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number deals principally with veterinary legislation and constitutes a continuation of the editorial in the last issue.

On page 291 will be found an article of considerable interest dealing with potash manures, the supply of which has been cut off owing to the situation in Europe.

Useful and instructive information dealing with the effects of manures on coco-nuts will be found on page 292.

On page 294, the recently published Annual Report on the Agricultural Department, Dominica, is reviewed.

Important information concerning Canadian sugar duties is given on page 297.

Insect Notes, on page 298, describe the habits of the Barbados Acrobat Ant.

The second article on agricultural credit in India appears on pages 298 and 299.

The effect of grass on the growth of fruit trees is dealt with under Fungus Notes, on page 302, owing to the importance of the pathological aspect of the subject.

Forests and Floods.

Under this heading a letter in *Nature* (July 16, 1914) discusses the significant circumstance that tilled soil absorbs more rainfall than earth that has laid untouched. As an experiment, water was poured into soil contained in pots consisting of two series: (a) in which the soil was consolidated, (b) in which the soil was broken up and loose. It was observed that the water entered the soil of the undisturbed pots more slowly than the other, and that the water more quickly passed through the soil in these pots than the other. After having taken necessary precautions that the soil had been entirely wetted throughout, the pots were weighed and showed that the disturbed soil held a much greater amount of water than the consolidated soil.

It may be asked: What connexion has this with forests and floods? In the letter under consideration, it is maintained that the soil in which trees are growing is looser than that which is bare; consequently it is in its best condition for absorbing and retaining the rainfall. It is maintained further that the decaying vegetation on the surface under trees has also a beneficial effect, as it absorbs water and acts as a mulch, preventing drying.

It would seem to us that the conditions obtaining in the pots are not perfectly comparable to the characters of a forest or bare hill-land soil. The presence of a covering of decaying vegetable matter in the forest introduces factors not involved in the pot experiments. The main point brought out, however, is illuminative, and well worth bearing in mind.

New Kinds of Motor Ploughs.

Several interesting forms of implements were exhibited at the General Agricultural Show, Paris, 1914, and the more noteworthy of these are briefly described in the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases* for June 1914. Amiot's Motor Plough which seems especially worthy of remark is an implement in which the plough is situated behind the motor and the three-furrow Flemish shares can be lifted by a kind of crane worked by the motor itself: thus one man can drive and work the whole machine from his seat. In the case of another plough the shares are placed at the side of the frame between the steering and driving wheels, so that the plough is pushed instead of being hauled. One man seated above the middle of the frame is sufficient to drive the machine. It is built in two sizes, 16 to 20 h.p. and 40 to 50 h.p. The engine of the Amiot's motor plough is 40 h.p. An improvement not connected with motor ploughs particularly, but which is well worthy of comment is the movable equilibrium counterweight which is known as Bajac's invention. Planters know that it is extremely fatiguing for the ploughman, when using the heavy two- or three-furrowed, double Flemish ploughs, to turn them round at the end of the furrow. In order to obviate this drawback, Bajac fits a sliding cast iron weight on to a horizontal bar attached to the forepart of the plough. By moving this weight the ploughman is more easily able to manipulate the implement in the ways referred to.

A somewhat unusual form of motor plough is described in the *Journal of Agriculture* of New Zealand for April 1914. The machine referred to is the latest model of the Wyles motor plough. This machine differs from most in that there are only two wheels for carrying the frame and engine. In fact the implement strikingly resembles in general appearance an ordinary plough, for it possesses stilts which are handled with the object of guiding the machine by the ploughman in the usual way. It would seem that the machine under consideration is much more likely to prove a practical success than the more cumbersome and intricate appliances which endeavour to dispense entirely with the skill of the agricultural labourer.

Agricultural News Market Reports.

We regret that the disturbed trade conditions at present existing have interfered with the publication of current prices for West Indian products. For many products on the London market no quotations are given, whilst Messrs. Gillespie Bros.' report from New York has not been received.

In Barbados owing to legislation prohibiting the exportation of foodstuffs, the usual quotations have not been handed in by Messrs. Jas. A. Lynch & Co., Ltd., and Messrs. T. S. Garraway & Co.

It has been considered advisable to allow the unrevised figures to stand, and it is hoped that it will be possible to bring these up to date in our next issue.

Canadian Sugar Duties.

The Canadian Trade Commissioner (Mr. E. H. S. Flood) has furnished this Office with a schedule notifying recent changes which have been made in the Customs' Tariff of Canada, on account of the war. Some of the items affect products from the West Indies, particularly sugar. All sugar above No. 16 Dutch Standard in colour, and all refined sugars of whatever kind testing not more than 88°, were previously taxed 72c., 93c. and 93c., for British preferential, intermediate and general tariff, respectively. These duties have now been increased to $1·52, $1·93 and $1·93. It will be seen that this constitutes an important rise, though it is accompanied by a considerable preference increase. The *West India Committee Circular* published the following information received by cablegram from Ottawa: 'On raw sugar testing 96° the general duty is raised from 57½c. to $1·37½, and a preferential from 40¾c. to $1·03¾; and on refined sugar the general duty is raised from $1·09 to $2·07¾, and a preferential duty from 84c. to $1·63.'

The duty on lime juice has also been raised. Lime juice and fruit juices containing more than 25 per cent. of proof spirit have been raised from $2·40 to $3·00.

The above changes, especially those in regard to sugar, will doubtless affect the planter in the West Indies, especially where the merchant buys sugar on the basis of all costs included. It is obvious as well that the Canadian consumer will have to bear the burden of a high retail price, especially in view of the fact that the shipment of white sugars from Europe to Canada is entirely suspended.

International Commission on the Chemical Analysis of Soils.

According to *Nature* for August 6, 1914, a meeting of the International Commission on the Chemical Analysis of Soils was held at the Forestry Research Station, Munich, on April 23-4.

The first discussion centred round the relative merits of Hilgard's method, and the members finally decided to unite in their efforts to obtain a standard method, and to investigate thoroughly the different methods side by side for their particular types of soil. Great interest was shown in the discussion on the estimation of the easily soluble soil constituents. The remarkable part about this discussion was that no method involving the use of organic acids such as citric acid was even mentioned. The methods of Hall and Dyer, and the American official method, used almost exclusively in England and America, respectively, appeared to be very little employed on the Continent. It was unanimously decided that for the purposes of the Commission, members for the present should confine their work of extraction with water and CO_2.

At the meetings in the laboratory a large collection of soils of Bavaria and other German States, as well as from the colony of Togoland, were shown to the visitors.

The Utilization of Local Minerals.

An article in the *Philippine Journal of Science* for February 1914, contains some suggestive information in connexion with the manufacture of Portland cement from local minerals. A simple type of horizontal stationary kiln is described, heated by a powerful gasolene burner which seems very successful for the experimental burning of cement. The results obtained show that the Philippine material examined, produced good cement when used in the ratios for silica, alumina, lime, and oxide of iron which are successfully used in other countries. The quantity thus experimentally produced was sound and of high specific gravity and tensile strength, and demonstrated that Philippine minerals are well adapted to the manufacture of Portland cement.

These experiments prompt one to enquire whether it may not be equally possible to utilize the material existing in the West Indies, capable of making Portland cement; particularly in colonies such as Trinidad where fuels such as petroleum and natural gas may serve as sources of fuel.

In a more general but no less important way, the investigation is suggestive as regards the manner in which the industries and welfare of a colony, other than those purely agricultural, may be advanced by the existence of scientific institutions such as those associated with the University of the Philippines.

INSECT NOTES.

THE ACROBAT ANT.

There is in Barbados a small black ant which often carries its abdomen turned up over the thorax or, as it is commonly described, it walks with its tail turned up. This is the acrobat ant, which belongs to the genus Cremastogaster. There are probably several species of ants of this genus in the islands of the Lesser Antilles, and it may be that the small, shining, black one, so common in Barbados, occurs in other islands. This ant does not invade houses, as a rule, but is to be found on all out-buildings, verandahs, fences, walls and palings, and trees, on roots and in the ground. It will be found to have nests, that is, groups of ants with larvae and pupae, under bits of bark on tree trunks and wherever any pieces of board have been nailed together or nailed to a tree. They live inside the stems and branches of dead plants both fallen and standing, and are to be found even inside living wood. They become so numerous in places, that it is impossible to touch the plants, vines, and trees, or fences, etc., where they occur without getting a good many of them.

The acrobat ant is not a stinging ant, but it is able to inflict a feeble bite, and when one is subject to the combined bites of several hundred of them at the same time, they are very noticeable.

It is not quite certain what this insect eats. It is almost always to be found on plants infested with scales, mealy-bug and aphis, and these probably, in some manner, provide them with food. They have also been observed gathered about any injury on a plant where sap was exuding in such a way as to give the impression that they were drinking it.

Some time ago a lime tree was pruned and a cut left without being tarred. This was about 1 to $1\frac{1}{4}$ inches in diameter, and should have healed over readily, but instead of doing so it died back some 6 inches, and the cut end was covered over with a woody material much like that of which termites build their nests.

When this dead portion of the branch was cut off and split open, it was found to be hollow at the centre, inhabited by the acrobat ant, and there were mealy-bugs inside. Examinations of this and many others since, indicate that this ant is injurious to plants, chiefly because it prevents cuts and wounds in the bark from healing over. Perhaps the cambium at the point where callus is being formed is an attractive food for the ants. At any rate, they seem to prevent all wounds from healing over, and in this way they are causing a considerable injury to trees of all kinds.

In addition to the injury to trees, they seem to hasten the decay of timber. When they occur in large numbers in the joints of the timber in out-buildings, fences, etc., these appear to rot more quickly.

It seems to be the general belief that the acrobat ant has been introduced into Barbados recently. It has been well-known for some fifteen to twenty years, but has become more abundant, and perhaps more generally distributed within the last few years. This is likely to be a difficult insect to control, for on account of its habit of living in small communities where the young are reared, it is not possible to treat the nests satisfactorily. In one instance, where a fair trial of this method was made, no good result was obtained. Thousands of nests were destroyed by kerosene, but so many of the same kind of nests were not found that the diminution in numbers of the ants was very slight.

Poisoning so far has given no results. A trial was made of a weak poison such as is used with success for the Argentine Ant (see *Agricultural News*, Vol. X, p. 346). This was a poison bait of sugar and arsenic, but it did not attract the ants. Fresh meat was quickly attacked by them, but when this was boiled with a poison it was not eaten.

Planters and others in these islands interested, should make observations on the acrobat ants as to whether they are injurious to trees in the same way as the Barbados species, and care should be taken not to introduce them into any locality where they do not at present exist.

AGRICULTURAL CREDIT.

THE INDIAN CO-OPERATIVE SOCIETIES ACT, 1912.

The state of co-operative credit in India up to the time of the passing of this Act was dealt with in the last issue of the *Agricultural News*. The following article, taken from the *Monthly Bulletin of Social and Economic Intelligence*, compares the provisions of the 1912 Act with those of the Act passed in 1902:—

Experience in the working of the earlier Act had shown the desirability of widening its scope and amending some of its detailed provisions. The Act was accordingly repealed and replaced by a new Act entitled 'The Co-operative Societies Act, 1912', which came into force on July 1, 1912. The earlier Act is entitled 'The Co-operative Credit Societies Act, 1904', and the difference in the titles of the two Acts marks the first change. The new Act provides for the registration of any Society 'which has as its object the promotion of the economic interest of its members in accordance with co-operative principles or any Society established with the object of facilitating the operations of such a Society.' All forms of co-operation, therefore, are recognized, including co-operative credit. The distinction between urban and rural societies is dropped, but the provision that agricultural credit societies shall generally be founded on unlimited liability, is retained. A new feature of the Act is the recognition of societies, the members of which are other co-operative societies, and a sharp distinction is drawn between societies composed exclusively of individuals and societies in which any one member is a registered society. The changes already enumerated, as well as some amendments of minor importance, may be shown by comparing certain clauses in the new Act with the corresponding clauses in the old, arranging the text in parallel columns.

Act 1904.	Act 1912.
SUB-TITLE.	
An Act to provide for the constitution and control of Co-operative Credit Societies.	An Act to amend the Law relating to Co-operative Societies.
CONSTITUTION OF SOCIETIES.	
A society shall consist of ten or more persons above the age of eighteen years.	No society, other than a society of which a member is a registered society, shall be registered under this Act which does not consist of at least ten persons above the age of eighteen years and, where the object of the so-

(a) residing in the same town or village or in the same group of villages; or (b) subject to the sanction of the Registrar, consisting of members of the same tribe, class or caste.	ciety is the creation of funds to be lent to its members unless such persons (a) reside in the same town or village or group of villages; or (b) save where the Registrar otherwise directs, are members of the same tribe, class, caste or occupation.

LIABILITY OF MEMBERS.

The liability of each member of a society for the debts of the society shall be as follows:— (a) in the case of a rural society such liability shall, save with the special sanction of the Local Government, be unlimited; (b) in the case of an urban society, such liability shall be limited or unlimited, as may be provided by the by-laws or by any rules made under this Act.	Provided that unless the Local Government by general or special order otherwise directs— (1) the liability of a society of which a member is a registered society shall be limited; (2) the liability of a society of which the object is the creation of funds to be lent to its members, and of which the majority of the members are agriculturists, and of which no member is a registered society, shall be unlimited.

RESTRICTION ON LOANS.

A society shall make no loan to any person other than a member: Provided that, with the consent of the Registrar, a society may make loans to a rural society.	A registered society shall not make a loan to any person other than a member: Provided that with the general or special sanction of the Registrar, a registered society may make loans to another registered society.

INVESTMENT OF FUNDS.

A society may deposit its funds in the Government Savings Banks, or with any banker or person acting as a banker, approved for this purpose by the Registrar.	A registered society may invest or deposit its funds (a) in the Government Savings Bank, or (b) in any of the securities specified in section 20 of the Indian Trusts Act, 1882, or (c) in the shares or on the security of any other registered society, or (d) with any bank or person carrying on the business of banking, approved for this purpose by the Registrar, or (e) in any other mode permitted by the rules.

DIVISION OF PROFITS.

(1) No dividend or payment on account of profits shall be paid to a member of a rural society, but all profits made by such a society shall be carried to a fund (to be called the reserve fund): Provided that when such reserve fund has attained such proportion to the total liability of the society, and when the interest on loans to members has been reduced to such rates as may be determined by the by-laws or rules made under this Act, any further profits of the society, not exceeding three-fourths of the total annual profits, may be distributed to members by way of bonus. (2) Not less than one-fourth of the profits in each year of an urban society shall be carried to a fund (to be called the reserve fund) before any dividend or payment on account of profits is paid to the members or any of them.	No part of the funds of a registered society shall be divided by way of bonus or dividend or otherwise among its members: Provided that after at least one-fourth of the net profits in any year have been carried to a reserve fund, payments from the remainder of such profits and from any profit of past years available for distribution may be made among the members to such an extent and under such conditions as may be prescribed by the rules or by-laws: Provided also that in the case of a society with unlimited liability no distribution of profits shall be made without the general or special order of the Local Government in this behalf.

Both Acts give power to the Local Government, that is, to each Provincial Government, to exempt any society from any of the conditions laid down as to registration, and from any of the provisions of the Act. The object of granting such power of exemption is to enable the Act to be extended to certain societies already established in some of the Provinces, and which differ somewhat from the type of society contemplated by the Acts.

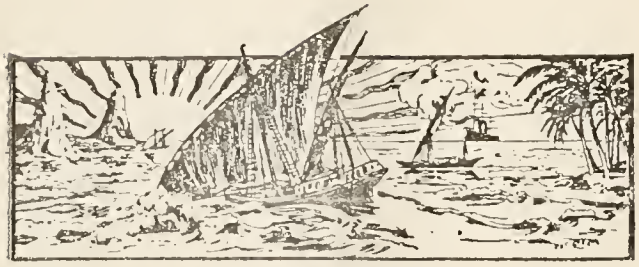
The new Act contains a provision which prohibits any person other than a registered society, from carrying on business under any name or title of which the word 'Co-operative' is part, which was not in use on the date of the coming into force of the Act, without the sanction of the local Government.

The Act of 1904 is repealed, but societies registered under it are deemed to be registered under the new Act, and their by-laws need only be altered or rescinded in so far as they are inconsistent with the express provisions of the new Act.

A New Fibre Decorticator.—The advantages of a new machine for scutching sisal, flax, hemp, ramie, Hibiscus, jute, banana and other fibres are presented in the *Queensland Agricultural Journal* for July 1914. The machine is known on the market as 'La Française', and it is stated that all information may be obtained from Mons. F. Michotte, 45, Avenue Trudaine, Paris.

The advantages claimed for this machine are very briefly as follows: It is adaptable for all sizes of leaves or stems; it can be set up to work in the field; it is not complicated in construction nor does it require skilled attention; the work performed is said to be perfect, rapid and economical, the leaves or stalks are treated by direct attack, and the decortication is effected in one passage through the machine; the leaves or stalks have not to pass through the beaters several times as is the case with other machines; and a peculiarity of the machine is that no preliminary hand labour is required to remove the leaves, as is often the case in connexion with ramie. The motor power is economical.

'La Française' will treat about 2 700 lb. of dried leaves or stalks and 5,620 lb. of green in a day of ten hours, producing about 337 lb. of dry fibre. Consequently it is equal to decorticating in five days the crop of 2½ acres of hemp, representing 27,000 lb. of stalks or leaves. The price of the machine (at the works) complete is £58 10s.



GLEANINGS.

According to the *Louisiana Planter* for August 8, 1914, Europe produces nearly 9,000,000 tons of beet sugars. Already up to the time of writing (August 8) Great Britain has taken some 200,000 tons from Cuba this season.

The *Louisiana Planter* for August 8, 1914, says that during the season now ending Cuba has produced over 2½ million tons of sugar which has found better appreciation as the result of the situation in Europe than was ever expected.

It is reported that some 83,000 tons of Philippine sugars are on their way to the United States in British vessels, coming through the Suez Canal, which will certainly be delayed in reaching their destination and may possibly be diverted into other courses. (*Louisiana Planter*, August 8, 1914.)

Under the heading of An Unknown Colony, the *Morning Post* (July 14, 1914) refers to the need for advertising the latent resources of British Honduras. It is maintained that an immigration scheme is needed, and the larger investment of capital is also held to be justified by the very valuable nature of the native products.

According to the *India Rubber Journal* for August 8, 1914, a possible effect of the present situation in Europe will be to render difficult the financing of rubber plantations, particularly as regards the regular payment of labour. As regards German plantation interests, these are disorganized owing to the impossibility of getting through communications and cash.

The official programme as well as the majority of the papers to be read at the Tenth International Veterinary Congress, London, have been received, but since the meetings were to be held between August 3 and 8 it is probable that the proceedings were cancelled. In the next issue of the *Agricultural News*, those papers bearing upon tropical veterinary hygiene will be noted.

An interesting letter, and comment on the same, appear in the *Louisiana Planter* for July 11, 1914, showing the origin and the date of the introduction of the polariscopic test of sugar. This occurred on March 1, 1883, and from that date the higher grades of sugar were imported in largely increasing quantities, a proceeding which was previously prohibited by the Dutch colour standard test.

The *India Rubber Journal* for July 18 and 25, 1914 publishes abstracts of several important papers read at the recent International Rubber Exhibition. These include the determination of bitumen in rubber mixing, wild and plantation rubbers, the influence of temperature on the physical properties of rubber, the effects of ashes and alkalis in rubbers, balloon fabrics, and proteids in rubber.

It is stated in the *Journal of the Royal Society of Arts*, for August 7, 1914, that experiments have been conducted in Japan with a view to producing camphor of commercial value from leaves and branches of the camphor tree. Experiments have been carried on for some time, but on too small a scale to ascertain the commercial possibility of the process. Four hundred pounds of leaves are required to produce 317 gallons of distillate.

The latest official handbook of New South Wales has been received from the Emmigrants' Information Office, London. The section dealing with agricultural resources shows that the tropical crops cultivated in this State include tobacco, sugar-cane and citrus fruits. Owing to the cheapness of labour in other sugar growing countries, the production of this product in New South Wales is not as profitable nor as extensive as it was.

A very interesting and graphic description of the Gold Coast and its dependencies appears in *United Empire* for August 1914, in the form of a paper by His Excellency Sir Hugh Clifford, K.C.M.G., Governor of the Colony. In a discussion which followed the reading of the paper, Professor Dunstan, Director of the Imperial Institute, observed that over one-fifth of the world's supply of cacao was produced by the Gold Coast, and that that was only a beginning.

According to the South African *Agricultural News* for June 15, 1914, enquiries made recently by the Mauritius Government have shown that 75 per cent. of the estates use the whole of their molasses on the land while nearly all the rest use a part. Only one estate replied that it sold all its molasses, and as over 41 per cent. of the cane crushed last crop was purchased from planters, it follows that those forty-six estates returned to their land considerably more molasses than was produced from the cane grown on it.

The world's record for the output of sugar for any one factory is held by Chaparra in Cuba which has brought its 1913-14 crop to a close with a production of slightly above 611,000 bags, or 87,300 long tons of sugar, polarizing very close to 96. The *Louisiana Planter* (August 1, 1914) says that this will most likely stand in no grave danger of being passed for some time to come. As a matter of fact the case just quoted is only one of the several records that have been made in Cuba on the 1914 crop.

A note in the *Gardeners' Chronicle* for July 11, 1914, states that pollen can be preserved by cold storage, and that it keeps best if it be protected from an excess of moisture. For preserving pollen for hybridization purposes, the following procedure is recommended: In a small cylindrical glass tube place a few grains of dry calcium chloride, and cover with a thick wad of cotton wool. Put the ripe pollen in a small thimble made of flexible cardboard. Cork the tube and keep it in a cool place—if possible in cold storage.

STUDENTS' CORNER.

DYNAMICS OF A PLOUGH.*

The direction of the various forces at work in drawing and resisting the plough are in general little understood. The result is that, though a plough is one of the simplest of machines, implement makers have probably more trouble over the ploughs they make than they have over all their lines of manufacture. These troubles are multiplied by the great divergence in soils, as to both type and condition, to be dealt with, the varying depths and widths of furrows ploughed, and by the different methods adopted for the yoking of the horses and the variation in number of these employed.

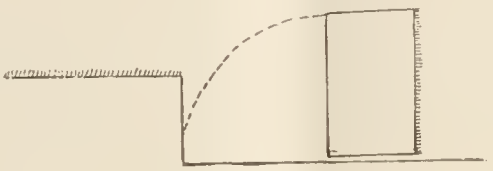


Fig. 5.

In endeavouring to explain the dynamics of a plough I shall in the first place, for the sake of simplicity, deal with a single-furrow lever plough of the New Zealand type, having three wheels, and shall assume that it is being used in ploughing lea land in good, firm condition, and that the furrow is 11 inches wide by 6½ inches deep.

A plough may be considered as a kind of a planing tool, the share and coulter forming the cutters, these shearing off from the ground a ribbon of soil the furrow; the mould-board and the upper surface of the share combined forming a twisted wedge whereby this ribbon is rolled over, firstly on its lower right-hand corner until it has completed a quarter of a revolution and reaches the vertical position as shown in Fig. 5, and secondly, by rolling it still further over upon what was originally its right-hand upper corner till it lies at an angle shown in Fig. 6.

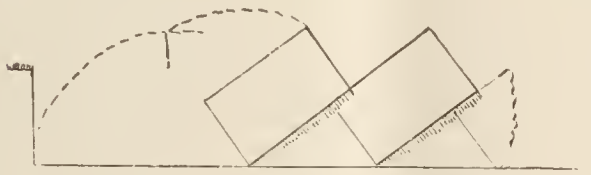


Fig. 6.

The resistances to the above work are many, but the three principal are: (1) that of the coulter making the vertical cut; (2) that of the share cutting off the sole of the furrow; and (3) that of the mould-board, which lifts, stretches, and rolls the furrow over until it falls by gravity into its place against the preceding furrow at the angle incidental to its depth and width.

The circular coulter, having to cut through the tough roots near the surface from the solid, opposes the advance of the plough when at work by an upward and backward thrust. The proportion of the total draught of the plough required to overcome this resistance (resistance=a force acting in opposition to another force) is probably about 20 per cent. The share is also a cutting-tool, but as in this case it is 6½ inches below the surface it meets with fewer roots than the coulter. In addition to cutting the sole of the furrow the share acts as the advance guard of the 'twisted wedge' and it has to lift about 50 per cent. of the weight of the furrow some 3½ inches or 4 inches until it reaches the forward end of the mould-board. The share opposes the advance of the plough when at work by a thrust backwards, downwards, and to the right. A fair estimate of the share resistance is 40 per cent. of the total draught, leaving another 40 per cent. to the mould-board in raising, twisting, stretching and pushing over the furrow. The mould-board's pressure in opposition is backwards, downwards at the front, and to the left throughout the remaining length. These proportions are estimated only; there are no means of separating them to ascertain their actual amounts. Their relative amounts will vary largely under different circumstances.

This article will be continued in the next issue of the *Agricultural News*.

*From the *Journal of Agriculture* of New Zealand for June 20, 1914.

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) Why is the soil round a tree, under ordinary conditions, higher than the surrounding soil?

(2) Why does recently germinated corn possess a sweet taste?

(3) How do pod-bearing plants help to enrich the soil in nitrogen?

INTERMEDIATE QUESTIONS.

(1) Describe the structure of any root that you have examined.

(2) Give an account of the exports of the colony in which you live.

(3) State how you employ published agricultural matter in connexion with your work.

FINAL QUESTIONS.

(1) Give your experience of the employment of a nursery on an estate.

(2) From a consideration of the imports of the colony in which you live, show how the conditions may be improved by a greater local production of useful foodstuffs.

(3) Discuss the usefulness of agricultural literature to the planter.

The *Rhodesia Agricultural Journal* for June 1914 contains an illustrated account of a maize reaper and binder at work in that country. The machine certainly seems to perform its work efficiently if one can judge from the photographs. The introduction of this class of machinery, though possibly not in itself an economy, will undoubtedly facilitate the better working of the Rhodesian farms since the present methods lead to a delay of ploughing. When the crop is cut with a reaper and binder it is said that the ploughs can follow immediately and the land being still moist, deeper ploughing can be practised and the soil moisture thereby conserved.

FUNGUS NOTES.

THE EFFECT OF GRASS ON FRUIT TREES.

Information as to the harmful effect on trees of the growth of plants near or under them should be of great interest to all growers of permanent crops, and the question of such an effect often arises in a practical form in the earlier stages of the formation of coco-nut, cacao and citrus plantations. The investigations outlined below, which have been carried on since 1895 by the Duke of Bedford and Spencer U. Pickering, have had reference principally to the effect of grass on temperate fruit trees, but as will be seen, the authors have recently extended the scope of their experiments so as to raise the whole question of the influence of one growing crop upon another. The information concerning the researches has been obtained from the Thirteenth Annual Report of the Woburn Experimental Fruit Farm, and from a paper in the *Journal of Agricultural Science* for May 1914 (Vol. VI, pp. 136-151).

THE NATURE OF THE EFFECT.

It is found at Woburn that trees whose roots are situated in soil which is allowed to remain, or to become, grassed over are in some way very adversely affected, with the result that their growth is checked or even entirely arrested.

The reality and intensity of the effect have been established by a long continued series of experiments, in which the growth of the trees in grassed and ungrassed plots has been measured in respect of the size of the leaves, the weight of the trees as a whole, of the prunings, and of the crops.

The following table summarizes observations made for six years in the case of cherries, pears and plums, and seven to ten years in the case of apples. The figures are relative to a value of 100 in the case of trees in tilled soil.

	Leaf-size.	Prunings.	Crops.
Cherries	88	32	8
Pears	72	21	0
Plums	72	7	1·5
Apples	68	—	6

In appearance the affected trees, apart from their deficient growth, show at an early stage leaves which are light and unhealthy in colour, and in the case of apple trees fruits which are yellow or red when they should be green; fruits from trees which are feeling the full effect are small and ill-developed.

Trees subjected to the influence in their earlier growth may be permanently stunted even though the grass may be subsequently removed.

It is important to note that the effect varies greatly in different soils, and apparently the conditions at Woburn are particularly favourable for its manifestation, but the authors question whether it is totally absent in any case. It is most pronounced in soils which are shallow, difficult to aerate and not very rich, least so in soils whose characters are the reverse of these.

It is not necessary for the development of the effect that the whole of the roots should be under grass: it becomes evident when a proportion of the roots penetrate beyond a tilled area to a grassy one, and recovery begins as soon as some of the grass is removed or some of the roots grow beyond it.

It was thought possible that the effect of the grassing of well established trees would be slight as compared with that which results when they are in grass from the time of planting, but trials showed that the deleterious action became noticeable in the first season, and very strongly marked in the subsequent ones.

INVESTIGATION OF POSSIBLE CAUSES.

The explanation eventually adopted has not been directly reached, but appears to be the only one remaining when other suggested explanations have been tested and have failed. These included questions of the influence of the grassy covering on the aeration of the soil, the amount of carbonic acid in it, the soil moisture, the food supply, the alkalinity of the soil, and its physical condition.

With regard to considerations of water supply, it is pointed out that the effect is produced in dry years and in wet ones, and that the trees show none of the usual signs of suffering from drought. Further, determinations of soil moisture have shown that no unfavourable difference in this respect exists, while the artificial supply of water to trees growing in pots did not cause any diminution in the effect of grass planted around them.

The question as to food supply has been tested by manuring in various ways and it has been shown that the effect cannot be due to any impoverishing of the soil.

THE TOXIN HYPOTHESIS.

These and the other possible factors having been eliminated by exhaustive and apparently conclusive experiments, the authors claim that the facts are best explained by assuming that the grass has a directly poisonous effect on the roots of the trees, not necessarily by means of an excretion, but possibly by means of some substance produced or set free by the decay of the débris of the growing grass roots.

In apparent contradiction of the toxin theory it was found that the watering of plants in pots with the leachings from grass growing in sand, so far from being deleterious actually had a beneficial effect upon them. When however the grass was grown in trays with gauze bottoms, which were in contact with the soil beneath but prevented the grass roots from penetrating into it, the ill effects were nearly if not quite as marked as when the grass was grown in the ordinary way. This suggested a comparison with the effect of partial sterilization of soil by heat, which results in an immediate condition very unfavourable to plant growth, followed by a condition very distinctly more favourable than the original one. This could be accounted for by assuming the formation of a substance which is poisonous in itself, but which is converted by oxidisation into another which is highly beneficial. Such a hypothesis would equally well explain the action of the leachings from the grass. Owing to the assumed fugitive nature of the toxin it would be very difficult of identification, and it has in fact not been isolated.

As correlative evidence it may be mentioned that the effect of grass growing at such a distance that it is not actually over the roots is a beneficial one.

EXPERIMENTS WITH HERBACEOUS PLANTS.

In their later paper the authors discuss the results of several series of experiments for the investigation of the effect of grass and of clover, grown in trays, on tobacco, tomatoes, barley and mustard grown in the pots beneath. Further, the influence of grass, clover, and mustard, grown in the trays, on the same crops grown in the pots beneath has been examined. In five out of six series the effect was unfavourable, often highly unfavourable.

So far the results are parallel with those obtained with the grassed fruit trees, but a further development ensued which from a practical point of view puts a somewhat different complexion on the matter. Hitherto the crops grown in

the pots without and with grass had been removed and compared at the same time, but it was found that if the latter were given extra time to mature they eventually gave a larger yield than the former. This is explained on the lines previously indicated as due to the eventual overpowering of the action of the toxin by the influence of its own oxidisation products. This, it must be remembered, is in the case of herbaceous plants in pots. The absence of such a recovery in the case of the Woburn fruit trees is explained as being due to the permanence throughout the life of a hardwood plant of the effect of a severe check received in its early years. This explanation seems scarcely adequate, since the earlier paper gives evidence of the possibility of at least partial recovery in the case of trees from whose roots the grass is removed.

WEST INDIAN CONDITIONS.

It is of course impossible to say how far such results are to be expected in the very different conditions obtaining in the tropics, but it is obvious that the whole subject is of great practical importance and is worthy of close attention. It may be, as is often the case in such matters, that there already exists amongst experienced planters practical knowledge bearing on the subject. It should be worth the while of local officers to collect such information as a basis for possible experiments.

DOWN THE ISLANDS.

ITEMS OF LOCAL INTEREST.

ST. VINCENT. According to information received from the Acting Agricultural Superintendent, 5,500 coco-nuts and 2,000 lime plants together with a large number of seeds and planting material of different kinds were fumigated during the month of July. Cacao plants numbering 1,500 were distributed. Two plots of cassava were planted in the Experiment Station for the purpose of comparing their yield with those of plots planted earlier. As regards the condition of cotton on the estates, it is said that the crop has come up regularly and has grown well except on a few estates where the bronze beetle has again been troublesome. A very slight attack of cotton worm was reported from one estate, but the outbreak has been suppressed. A special effort of the Department has been the establishment of a lime nursery at Bequia and Union. The rainfall during the month has been satisfactory.

DOMINICA. During July in this island, work in the Experiment Stations has included weeding and cutlassing in the lime plots and picking, recording yields, and selling limes in same. An interesting innovation has been the establishment of a plot of camphor and a row of shea butter trees. Other work has consisted in mulching young limes, sowing green dressings and applying cotton seed meal to an additional manurial plot of old limes. In regard to the crop, limes were coming in rapidly towards the end of July, but the shipments of green limes relaxed. The total for the month was 8,500 barrels. It may be noted that the cable quotation for concentrated lime juice at the end of the month was £11 10s. per pipe. Special work on the part of the Agricultural Officers has included the experimental shipment of mangoes to New York and Canada. As regards agricultural education, an examination of agricultural pupils was held on the 3rd instant. Three new boys entered the classes for a two years' course of training. Plant distribution during the month was as follows:—limes 12,050; budded citrus, 109; cacao, 100; grafted mangoes, 25; Para rubber, 25; nutmegs, 16; camphor, 18; vanilla, 20; Eucalyptus, 8; miscellaneous, 67; total, 12,433. The rainfall for the month was 11·83 inches.

MONTSERRAT. The Curator in this island states that the low rainfall during August will affect adversely the cotton crop. Picking is now fairly general and the fields which were planted in April, having had good weather, will be satisfactory. Some trouble has been occasioned by insect pests on various crops, but the position in this respect is no worse than usual and is receiving careful attention. In a short time the selection of cotton plants will be the most important work in hand, and particular attention will be paid to the new St. Kitts seed.

ANTIGUA. The *Sun* for August 27 gives an account of a meeting of the Agricultural and Commercial Society to receive and listen to an address by Dr. Marshall, the International Health Commissioner of the Rockfeller Institute. Dr. Marshall dealt principally with the hook worm, a disease which is an important factor involved in the efficiency of estate labour not only in Antigua but in other islands. The Society decided to do all they could in the matter of rendering Dr. Marshall facilities for making observations.

ST. KITTS. In this island during August the earlier planted cotton matured and picking commenced on many of the estates. At this stage, the dry weather has benefited the crop in bearing, though the younger and later cotton requires rain for its development. At a meeting of the Agricultural Society held on August 25, notes on root borers affecting sugar-cane were read by Mr. Shepherd, and specimens of canes growing in tubs were shown with eggs of the root borer (*Exophthalmus esuriens*) laid on the leaves. Specimens of the adult beetle were also exhibited. The rainfall for the month was 2·05 inches.

VIRGIN ISLANDS. Information has been received from the Acting Curator, Tortola, to the effect that exhibits have been forwarded from that Dependency to the Toronto Exhibition. The articles shipped include cotton, rum, cacao, arrowroot, cassava, and coco-nut oil. This is the ninth consecutive year in which the Virgin Islands has participated in the Canadian National Exhibition.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture left Barbados on September 3, 1914, by the S.S. 'Guiana' for the purpose of paying an official visit to St. Lucia, where the Commissioner intended to remain for one week. Dr. Watts will then proceed by Royal Mail to Antigua, and from there return to Montserrat, arriving back in Barbados on or about September 23.

In connexion with the action of copper and other metals on rubber insulation, the *India Rubber World* (August 1, 1914) states that the following conclusions have been arrived at in a recent investigation: (1) the composition of the rubber insulations must be such that a quick and reliable combination of the sulphur and rubber results; (2) the vulcanization should be a quick one, a high temperature being resorted to if necessary; (3) the tin plating on the copper wire must be uniform; (4) under-vulcanization, even with a subsequent after-vulcanization, is not permissible.

MARKET REPORTS.

London.—The West India Committee Circular, August 25, 1914.

Arrowroot—2*d.* to 4¾*d.*
Balata—Sheet, 2/7; block, 2/2 per lb.
Beeswax—No quotations.
Cacao—Trinidad, 59/- to 64/- per cwt.; Grenada, 51/- to 58/-; Jamaica, no quotations.
Coffee—Jamaica, no quotations.
Copra—West Indian, £24 per ton.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 16*d.* to 17*d.*
Fruit—No quotations.
Fustic—No quotations.
Ginger—Quiet.
Isinglass—No quotations.
Honey—No quotations.
Lime Juice—Raw, 2/- to 2/6; concentrated, £44; Otto of limes (hand-pressed), quiet.
Logwood—No quotations.
Mace—No quotations.
Nutmegs—No quotations.
Pimento—Quiet.
Rubber—Para, fine hard, 3/0½; fine soft, 2/6; Castilloa, 1/7-.
Rum—Jamaica, 2/2 to 5/-.

New York.—Messrs. Gillespie Bros., & Co., July 24, 1914.

Cacao—Caracas, 11½c. to 12c.; Grenada, 11c. to 11½c.; Trinidad, 11¼c. to 11⅜c.; Jamaica, 10c. to 11c.
Coco-nuts—Jamaica and Trinidad, selects $20·00 to $21·00; culls, no quotations.
Coffee—Jamaica, 9⅞c. to 13½c. per lb.
Ginger—7½c. to 10c. per lb.
Goat Skins—Jamaica, 46c.; Antigua and Barbados, 43c. to 46c.; St. Thomas and St. Kitts, 40c. to 43c. per lb.
Grape Fruit—Jamaica, $1·75 to $2·50.
Limes.—$3·75 to $4·50.
Mace—45c. to 53c. per lb.
Nutmegs—110's, 11⅜c.
Oranges—Jamaica, $2·00 to $2·50.
Pimento—3⅞c. per lb.
Sugar—Centrifugals, 96°, 3·26c.; Muscovados, 89°, 2·88c.; Molasses, 89°, 2·61c., all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., August 31, 1914.

Cacao—Venezuelan, no quotations; Trinidad, no quotations.
Coco-nut Oil—No quotations.
Coffee—Venezuelan, 13c. per lb.
Copra—No quotations.
Dhal—No quotations.
Onions—$3·25 per 100 lb.
Peas, Split—$6·75 to $7·00 per bag.
Potatoes—English, $3·90 per 100 lb.
Rice—Yellow, $6·50; White, $7·00 per bag.
Sugar—American crushed, no quotations.

Barbados.—Messrs. James A. Lynch & Co., Ltd. July 25, 1914, Messrs. T. S. Garraway & Co. July 27.

Arrowroot—$3·50 to $4·50 per 100 lb.
Cacao—$12·00 to $13·00 per 100 lb.
Coco-nuts—$17·00.
Hay—$1·60 to $1·65 per 100 lb.
Manures—Nitrate of soda, $65·00; Cacao manure, $48·00 to $50·00; Sulphate of ammonia $78·00 to $85·00 per ton.
Molasses—No quotations.
Onions—$1·70 to $2·50 per 100 lb.
Peas, Split—$6·00 to $6.25 per bag of 210 lb.; Canada, $4·00 to $4·25.
Potatoes—Nova Scotia, $3·35 to $4·50 per 100 lb.
Rice—Ballam, $5·35 to $5·55 per 100 lb.; Patna, no quotations; Rangoon, no quotations.
Sugar—American granulated, $3·77 per 100 lb.

British Guiana. Messrs. Wieting & Richter, August 29, 1914; Messrs. Sandbach, Parker & Co., August 28, 1914.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	$7·00 to $8·00 per barrel of 200 lb.	——
Balata—Venezuela block	No quotation	——
Demerara sheet	65c. per lb.	——
Cacao—Native	12½c. per lb.	13c. per lb.
Cassava—	96c. to $1·20	——
Cassava Starch—	——	——
Coco-nuts—	$16 to $20 per M.	$23 per M.
Coffee—Creole	14½c. per lb.	16c. per lb.
Jamaica and Rio	16c. per lb.	16c. per lb.
Liberian	10c. per lb.	14c. per lb.
Dhal—	$5·50	$5·40 to $5·50 per bag of 168 lb.
Green Dhal	——	——
Eddoes—	$1·44	——
Molasses—Yellow	None	——
Onions—Teneriffe	——	——
Madeira	6c.	7c.
Peas—Split	$6·50 to $7·50 per bag (210 lb.)	$7·50 per bag. (210 lb.)
Marseilles	——	——
Plantains—	24c. to 48c.	——
Potatoes—Nova Scotia	$3·50	$1·40
Lisbon	——	——
Potatoes—Sweet, B'bados	——	——
Rice—Ballam	No quotation	——
Creole	$6·00	$6·00
Tannias—	$3·00	——
Yams—White	——	——
Buck	——	——
Sugar—Dark crystals	$3·00 to $3·10	$3·00
Yellow	$3·50	$3·50
White	——	——
Molasses	——	——
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M.
,, Cordwood	$1·80 to $2·00 per ton	——

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Printed at Office of *Agricultural Reporter*, 1 High Street, Bridgetown, Barbados

AGRICULTURAL NEWS

Vol. XIII. No. 324.] SATURDAY, SEPTEMBER 26, 1914. [One penny.

JUST ISSUED.

WEST INDIAN BULLETIN.

Vol. XIV, No. 3.

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AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

OF THE

IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

VOL. XIII. No. 324. BARBADOS, SEPTEMBER 26, 1914. PRICE 1*d*.

CONTENTS.

Seed-control Stations.

IN view of the interest which has recently been shown in Great Britain, in the question of seed testing, the Board of Agriculture of England felt that it would serve a useful purpose if an enquiry were made into the working of seed-control stations in certain European countries. An officer of the Board was therefore instructed to visit nine of the more celebrated and representative stations, viz., at Copenhagen, Hamburg, Berlin, Breslau, Munich, Budapest, Vienna, Zürich, and Wageningen. The result of this tour is the publication by the Board of a very interesting supplement bearing the title that has been given to this article. The publication is well illustrated with photographs of the different institutions and their laboratories, and contains full details as to methods, financial expenditure and receipts.

It has on several occasions been pointed out in the *Agricultural News* that a characteristic feature of tropical agriculture, in contradistinction to the agriculture of temperate countries, is that reproduction by vegetative means is very widely employed. This observation, howbeit true, has not been made with the idea of underestimating the importance of seed as planting material in the Tropics. In the case of certain crops like rice, tea, coffee, cacao, coco-nuts and cotton, the question of seed is a very important one, though it will be admitted that in the case of cacao the importance of seed will possibly become less as the practice of budding and grafting becomes greater, as it is likely to do in the near future.

In the case of most crops where seed is sown for the direct production of field or orchard cultivations, it should be remembered that the general practice at present is for each planter to rely upon his own supply or at least upon that of the local agricultural station. Hence, although it cannot be claimed that tropical countries have the same need for Government seed control, as a form of public protection, as in temperate countries where large businesses, extensive commercial transactions are carried on in regard to seed, it is nevertheless a matter for consideration whether there is not some necessity for the standardization of seed in the Tropics

In support of this suggestion, special reference may be made to the supply of coco-nuts for planting. There is undoubtedly much variation in the germination capacity, the varietal quality and the source, that is the estate or even the territory in its relation to any particular consignment of coco-nut seed, and it is believed that by bearing this in mind during the course of the following brief review of the aims and methods employed on the Continent in the case of temperate seed, some suggestive ideas will arise that may prove to be of agricultural importance in the Tropics

The extent to which the various continental countries have taken advantage of the State seed-control is shown in three directions. Firstly, by the development in size of the institutions within recent years (for example, the Hamburg station, a very beautiful building completed in 1907 is now being extended to twice its original size); secondly, by the number of samples sent in by the public, that is by the agricultural section; and thirdly, by the extent to which merchants have taken advantage of this opportunity for selling their seed under a guarantee. It is clearly evident from the publication under review, that in all the continental countries the seed-control stations confer a distinct and important national benefit. It will be convenient to consider here the extent to which the analytical work is supported by legislation. In the case of the Hamburg institution there is no special legislation regulating the seed trade, which simply comes under the common law for fraud; but in the case of the Budapest station, the Hungarian rural Police Acts relate amongst other things to seeds. The former imposes a penalty up to £8 6*s*. 8*d*. on any person who offers for sale certain seed of the small kind, like clover, which is not absolutely free from the seed of the well known parasite, Dodder. The second Act, amongst other things, imposes penalties to the extent of two months' imprisonment and a fine of £25 for certain offences—for adulterating or selling adulterated agricultural products, and so on. It will be understood that legislation of this kind has resulted in much increase in the work of the seed stations. The verdicts of the stations are generally final, but occasionally disputes arise. In Holland, when the two parties involved in the buying and selling of seed differ as to the accuracy of an analytical examination, the right to demand a fresh examination is accorded to them; but both parties must accept the average of the two results; that is, when the difference between the two results is not too great to establish an average.

The methods employed in the analyses of seed on the Continent naturally vary in the different institutions, but in general the principal objects of determination are common to all. These may be summarized as follows: (1) genuineness and place of origin (the place of origin is important owing to the fact that the value of a sample of seed depends to a large extent upon where it is grown); (2) purity; (3) moisture content; (4) weight of 1,000 fresh seeds; and (5) germinating capacity and energy of germination. In the course of perusing the publication under consideration, it appears that the question of method is dealt with especially comprehensively in connexion with the Wageningen station in Holland, and it is therefore proposed to confine remarks on the subject with reference to this section.

The decision of the place of origin is arrived at by special enquiries based upon established variation between samples of seed of the same species obtained from different countries. One of the most important points in the analysis is that of purity, and this investigation resolves itself into (a) the determination of the harmless impurities such as damaged seed and residues, and (b) the determination of harmful impurities such as weed seeds, conveyors of plant disease like Sclerotia, and insects. In Holland there are various special methods adopted in regard to purity for the more important farm seeds, but it is unnecessary to enter into these here. For the determination of the germinating capacity and energy of germination, there is a general test on pure seed previously separated in the purity test. It is hardly necessary to state that in principle, germinating capacity is determined by counting each day the number of seeds which germinate out of, say, 100 originally started with, the number taken for the test depending to a large extent upon the size of the seed. But as well as the general test, there are at least eight methods used for carrying it out in the control station in Holland, the one selected depending upon the kind of seeds to be used. The account of these tests is very interesting, but further elaboration on the subject would be out of place in this general article. Enough has been said in regard to methods to show that the practice of seed-control is considerably in advance of the standard given it in text-books—at least English text-books and publications on agricultural botany.

Finally, a note may be added as to the cost of having samples of seed examined. This, like the methods or rather with them—varies. Roughly speaking, the

cost of having any one point determined varies between 1s. to 2s., according to the size of the seed, and a complete test varies between 6s. and 12s., which is considered exceedingly moderate, bearing in mind the importance of the resulting information.

We may now enquire into what are the possible applications of this system under tropical conditions. It appears that in India, where large areas of tea and cotton are grown, Government control is exercised, as is also the case in Egypt and the West Indies in regard to cotton. But control scarcely expresses the assistance rendered by these Governments, since ordinary commercial transactions are not involved. The control relates principally to the supply of reliable seed rather than to the problem of safeguarding the public in regard to outside supply, which at present is generally unnecessary. Yet even in the places mentioned, there is a considerable trade done in tea, cotton, rubber and coco-nut seed, and where this trade is at all extensive and competitive, it is, or will be necessary to adopt definite methods of control such as are employed in Europe. Facilities in most tropical countries are already available at the Botanic Stations for enabling this control to be exercised; and in places where seed goes from one estate to another, it is highly desirable that a sample should pass through the hands of the local botanical authorities, not only that a business guarantee may be given, but also that a check or control may be exercised which will ensure the planting of good material, and hence maintain a high standard of quality amongst the colony's crops. Ideas as to methods and systems for the stations to adopt will be found in the publication we have reviewed in the course of this article.

Several interesting matters are noted in the Demerara *Daily Chronicle* (September 11, 1914) in regard to agriculture in British Guiana. A new feature is the advocacy that Dhal, the Indian provision plant, should be intercropped with rice, especially in view of the present conditions of food supply. Another suggestion is that Demerara should grow arrowroot, not with a view to competing with St. Vincent or Bermuda but to supply local requirements.

According to a publication lately received from Manila, the University of the Philippines is quickly assuming increased importance as a centre of education and research. Its flourishing college of agriculture had in its second year ninety-five students, in its third 175, in its fourth 253. There are now 294 students.

FRUIT PRODUCTS.

Pine-apple Vinegar.—In the canning of pine-apples there results an enormous waste of juice, which amounts to hundreds of thousands of gallons per annum. Some of the juice is utilized for making syrup, and, to to a limited extent, for preparing bottled pine-apple juice.

Attempts to convert the juice into vinegar with the rapid vinegar process were made, but the results were not entirely satisfactory. 'On an average, the vinegar obtained contained an acetic acid content of about 3·8 per cent., which is considerably below the legal standard. Occasionally it was possible to obtain vinegar of approximately 4·5 per cent.' Difficulty was experienced in obtaining a good degree of alcoholic fermentation of the juice, as various other types of fermentation took place simultaneously with it.

The price obtained for the finished product did not warrant further investigation of this problem, but it may be continued at some future date. (*Experiment Station Record*, Vol. XXX, No. 9.)

Utilization of Waste Oranges. In addition to the material previously noted (*Experiment Station Record*, Vol. XXX, p. 316), this bulletin describes the preparation of orange vinegar and orange wine from waste oranges, and reports analyses thereof.

In preparing orange vinegar it is recommended that the juice before fermentation be treated with potassium metabisulphide. After standing for twenty-four hours the clear juice is drawn off and fermented with pure cultures of yeast. The finished juice is stored in well-filled, closed barrels or tanks until required for converting into vinegar.

Strong vinegar, equal in amount to about one-fourth the volume of the fermented juice, should be added to the orange wine to prevent the growth of wine flowers and promote the development of the vinegar fermentation. The vinegar fermentation must take place in containers that allow a good surface of the vinegar to be exposed to the air. The vinegar may be cleared by filtering.

Orange wine may be made by defecating the fresh juice after the addition of moderate amounts of potassium metabisulphide to prevent fermentation for a short time, fermenting the clear juice with pure yeast, and filtering the finished wine to clear. This cleared wine may be turned into sparkling orange wine by the addition of a small amount of sugar, and by subsequent fermentation in bottles.

The Dominica *Chronicle* for August 12, 1914, calls attention to the Brooks' grinding law of the State of New York, which specifies the size of a barrel for fruit export. A barrel, according to the New York law, shall represent a quantity equal to 4·08 cubic feet (7,056 cubic inches). The receptacle must also conform to fixed dimensions. It is pointed out that this law, after July 15, 1914, will be strictly enforced by the Commissioners of Weights and Measures, and it is very necessary that its provisions should be complied with to avoid seizure of shipments.

In connexion with vanilla cultivation, information is required most in the West Indies in regard to methods of curing. Useful facts concerning this branch of the subject will be found in the *West India Committee Circular* for July 28, 1914. Amongst other matters the Mexican or sun process and the Bourbon or hot water process are fully described.

SUGAR INDUSTRY.

UTILIZATION OF BY-PRODUCTS.

The following extracts have been taken from an interesting article entitled The Utilization of Bagasse and Molasses, appearing in the *International Sugar Journal* (August 1914):—

MOLASSES AS A SOURCE OF ALCOHOL.

As preliminary data it is assumed that the molasses amount to 2·5 tons per 100 tons of cane. Experiments made by one of this committee* in conjunction with Mr. S. S. Peck indicated that 31·2 lb. of molasses afford 6·6 lb. of absolute alcohol. From 2·5 tons, or 5,000 lb. of molasses, 1,058 lb. of absolute alcohol are obtainable.

From the experience of a member of the committee, this quantity of alcohol can be easily produced when using a regenerative still with the consumption of 500 lb. of coal, or, say, 2,000 lb. of bagasse, adopting in this statement a standard of no great efficiency. Previously, a surplus of 19,300 lb. of bagasse has been found over and above the wants of a heat-efficient sugar factory so that a surplus of 17,300 lb. of bagasse still remains. The residue obtained from the distillation of the wash, which has a well-known manurial value, will require for its reduction to commercial dryness the removal of about 12 tons of water per 100 tons of cane; in this case there is no question of the effect of high temperature evaporation, and a sextuple effect working with the last cell at atmospheric pressure and high pressure steam could be used. The consumption of steam may then be taken per 100 tons of cane as

$$\frac{12 \times 2{,}000}{6} = 4{,}000 \text{ lb. of steam or } 1{,}538 \text{ lb. of bagasse}$$

which may be increased to 2,000 lb. of bagasse to be on the safe side. The bagasse still remaining unutilized is then 15,300 lb.

COST OF PRODUCTION OF ALCOHOL.

The cost of producing alcohol in connexion with a sugar house will be very small; it has been shown above that the fuel can be supplied by the bagasse, and the molasses in many cases here is of no value; even when sold to mainland operators the net profit is only 0·30 cent per lb., from which should really be deducted the value of the fertilizing agents in molasses which, according to Peck and another, amount to 0·32 cent per lb., so that it is in a sense always legitimate to disregard the value of the molasses.

A member of this committee has had no small experience of distilleries operated as annexes to cane sugar factories, and he is able to state that the cost of operating is very low.

USES OF ALCOHOL.

The uses to which alcohol is put are too numerous to mention, but one obstacle to our production of alcohol for sale in the world's markets is our decentralized position and remoteness from industrial centres. There are two uses to which alcohol can be put locally: lighting and power. As regards lighting, it is only necessary to mention that the whole of the Prussian State Railways are lighted by alcohol. It may also be mentioned that as long ago as 1901 a not inconsiderable business had developed in Mauritius in connexion with public lighting and domestic lighting and cooking with the use of alcohol. For a number of years it has been felt that a local outlet for locally produced alcohol could be found in connexion with the locomotives and power-operated cultivation implements used on plantations. It may not also be amiss to mention that, estimating the automobiles in these islands as 1,500, and allowing 10 lb. alcohol per day per machine, an annual consumption of 1,800 tons is indicated.

UTILIZATION OF BAGASSE FOR PAPER MANUFACTURE.

Before this subject can be looked into it is necessary to estimate the cost of running the sugar factory proper with substituted fuel. As in all previous deductions based upon experimental determinations, a maximum efficiency is adopted. The data adopted are: 1 barrel of oil weighs 335 lb., and costs at the furnace mouth $1·10, or 0·33 cent per lb.; the thermal value of this oil is taken as 18,800 B.T.U., and it is taken as burnt with an efficiency of 75 per cent., whence it will afford 14·5 lb. of steam per lb. of oil.

Per 100 tons of cane adopted as a standard from previous calculations the steam required is: (a) Economical factory, no treatment of molasses or re-melting 81,929 lb. = 5,050 lb. oil; (b) Economical factory, molasses worked up no remelting 91,129 lb. = 6·280 lb. oil; (c) Economical factory, molasses worked up and sugar re-melted 104,413 lb. = 7,210 lb. oil.

Oil costs delivered to factory 0·33 cent per lb., so that the cost of oil to substitute for bagasse is per 100 tons of cane, (a) $18·65; (b) $20·72; (c) $23·79. Hence, since the work done *at present* in a factory by the bagasse can be done for $18·65, the value of bagasse as fuel is 0·75 cent per ton. This estimate may seem very low, but it must again be insisted that it is based on the highest degree of efficiency.

BAGASSE AND PAPER.

The committee has no knowledge whatever of paper technology, and as a substitute therefor gives the following conclusions of Mr. William Raitt:—

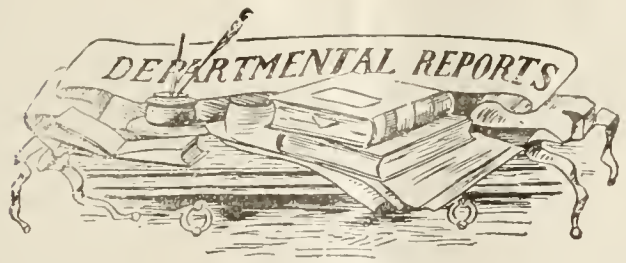
100 tons of cane give 25 tons of bagasse or 11·1 tons of coarse unbleached paper, which costs $45 per ton to make, and sells for $64·20, leaving $19·20 per ton profit, or $213 per 100 tons of cane. Deducting the cost of oil to substitute for bagasse, say $20, there remains $193 profit at the factory.

On other hand, we are severely handicapped by remoteness from the world's industrial centres and we have no opportunity to find a local mrket. Suppose it costs, however, over all, $15 a ton to cover marketing expenses, or $170 per 11·1 tons of coarse unbleached paper, there still remains a profit of $23 per 100 tons of cane.

An interesting article appears in the *International Sugar Journal* entitled A Microphotographic Study of the Boiling Process. By means of microphotographs it is shown in what way crystallization progresses in the course of boiling. It is the art of the pan-man to avoid the formation of new grain during the process, and to promote the growth of the crystals first formed.

It appears from the Report on the Progress of Agriculture in India for 1912-13, that the potential value of West Indian sugar-canes in India is still increasing. It will be remembered that Dr. Barber, who was formerly in the West Indies, is in-charge of the principal sugar-cane variety work in India. A recent decision has been to take up an area of 10,000 acres for the experimental cultivation of sugar-cane by steam-ploughing.

*On the Manufacture of Sugar and Utilization of By-products.



NYASALAND PROTECTORATE: ANNUAL REPORT ON THE DEPARTMENT OF AGRICULTURE, FOR THE YEAR ENDING MARCH 31, 1914.

The chief industry in this Protectorate is cotton growing. In last year's report it was recorded that the planters in the highlands had a successful year, whilst those with estates at lower elevations experienced a disastrous one. The position is now diametrically opposite, and the unfortunate failure of the crop in the Shire highlands has meant failure to nine-tenths of the European planting community. This was occasioned by unfavourable climatic conditions accompanied by a heavy attack of boll worm, especially the red boll worm (*Biparopsis castanea*, Hamps.). The low yields which were the natural result, were accompanied this year by a marked reduction in the length of staple, which led to a reduction in the average price obtained. It is gratifying to be able to state that the question of unsatisfactory baling has practically disappeared, and planters are now availing themselves of the advantages of the hydraulic presses established in various parts of the country. The exported crop in 1913-14, in bales of 400 lb. of lint, amounted to 6,003 as against 8,093 bales in the previous year, and the acreage under European cultivation was 25,697. The local valuation of the crop was £65,486 as compared with £80,938 for 1912-13. This shows a decrease of approximately £15,452 for the year under review.

Whereas cotton growing on the larger estates will be seen to have been temporarily disappointing, that on the native holdings is shown to be in a condition of permanent advancement. The native crop for the year under review shows an increase of 153½ tons of seed-cotton, or an increase in lint amounting to 685 bales of 400 lb. each. The export of native cotton has risen from 196 bales in 1908-9 to 1,811 bales in 1913-14. Although the transport of the product is rendered difficult by the want of extended railways and roads, the marketing of the crop has been vastly improved by the establishment of a system of Government cotton markets, which were in full operation during the year under review. These are to be pronounced an unqualified success; and this can be well appreciated by the reader who is familiar with the success that has attended the Government sale of cotton and other products for the benefit of the peasants, in the West Indies. The system referred to in Nyasaland has the warm support of the British Cotton Growing Association. There has been a steady improvement in the quality of the lint, and the licenses issued to traders in certain centres resulted in keen competition in the purchase of the crop, and no difficulty was found in obtaining a local sale for all the cotton produced.

As regards tobacco, which appears to be becoming the chief cultivation on the larger estates, it is said that the area under this crop for the year under review was 10,199 acres as compared with 7,411 in the previous year, and the export of cured tabacco for the year first referred to amounted to 3,763,014 lb., which was valued locally at approximately £94,167, showing an increase in the exports of this crop to the value of £37,569 or 1,500,469 lb. in weight; and the tobacco now being harvested covers an area of 9,534 acres. In spite of unfavourable weather during the past year, it will be seen that the export of tobacco from Nyasaland is steadily increasing; but at the same time, it must not be considered that a large crop is not always a profitable crop, for the crop at present under consideration was not valued as highly as the smaller crop harvested in 1911-12. In London, there appears to be a rapid sale for the highest quality leaf at satisfactory prices, but it is maintained that the future success of tobacco growing in Nyasaland will depend upon finding quick markets for medium grades, which undoubtedly form the major portion of the crop.

It seems that the good prospects which lie before the cultivation of tea in Nyasaland depend upon the interesting development, noticeable during the last few years, that the more educated natives are beginning themselves to consume this beverage. It may not be in the far distant future before the local demand for tea will equal the supply, to the greater profit of the grower, since it pays better to sell tea at the local price of 1*s.* to 1*s.*6*d.* per lb. than export it to London to be sold at from 5*d.* to 9*d.* per lb.

Some progress is reported in regard to rubber, and there is quite a fair quantity of cultivated and uncultivated rubber exported from the Protectorate, amounting in value, during the year under review, to £6,237 and £3,360 respectively. The area has increased during this period, but the exports show a decrease in value. The year under review is distinguished by the circumstance that it is the first in which the exports of cultivated rubber have exceeded those of the wild kind.

The cultivation of coffee is dying out. Little but regret can be expressed at this, for, provided satisfactory prices remain firm, this crop is undoubtedly the most profitable one in the Protectorate. However, prices have fluctuated and planters have been discouraged. The area under cultivation is now 1,976 acres, showing a reduction of 624 acres compared with the area recorded in the previous year. The gradual disappearance of the old and once important Chillie and Capsicum industries has been caused by similar factors of uncertainty, but it is pointed out in the report that the markets for these products are now getting firmer and the question is raised as to whether it may not be advisable for the larger land owners to take up again these original cultivations more extensively.

The last section in the Director's report deals with Nyasaland as a cattle-raising country. In view of the increased demand for meat, the large areas of suitable pasture land and the healthy conditions as regards disease maintained with the assistance of the veterinary staff of the Department of Agriculture, there is every prospect of important developments in cattle raising. Government herds, scattered throughout the various districts, are now selected and centralized under proper management at the Government Farm near Zomba, where careful experiments will be carried out in the breeding, milking and transport qualities of the cattle and the possibility of profitable crossing with imported breeds.

It is not proposed to review in this article the supplementary reports to that of the Director, compiled by the various Officers on the staff of the Department. These are principally of local interest or, at least, of special interest, only to those immediately concerned in the various lines of work with which they deal. Special reference, however, may be made to the report of the Veterinary Officer, and to that of the Agriculturist, which contains an interesting section dealing with plant diseases.

COTTON.

RIVERS' TYPE OF SEA ISLAND COTTON.

When the Rivers' type of Sea Island cotton seed was first introduced into the West Indies some discussion took place concerning the extent to which this seed was covered with fuzz. An article on the subject appeared in the *Agricultural News*, Vol. IV, p. 106, in which was reported an analysis of a typical sample of Rivers' seed as imported, based on the proportion of fuzz on the seeds in the sample. The conclusions arrived at were stated in the following paragraph of the article thus: 'That in the selection of Rivers' seed care has been taken to select for the character of the lint; that small variations in the character of the seed have received less attention, hence the seed is to a certain extent variable in character; that the characters of the seed are not fixed, so that extreme types, such as fuzzy seeds, on the one hand, and absolutely clean seeds, on the other, both tend to produce average seed of the Rivers' type, i.e., having a small amount of fuzz; and, finally, that the character of the lint is fixed and does not vary with the variations in the character of the seed.'

It was thought that some interest might attach to an examination of the cottons now grown in various West Indian islands, most of which have had their origin in Rivers' seed. Accordingly samples have been examined and the results are recorded in the following table, and the results of the examination of the original Rivers' seed are included for comparison.

The samples from Montserrat include Rivers', Stirling and Heaton from the plots grown on a large commercial scale. The Rivers' sample came from a field planted from seed derived in 1908-9 from a plant selected at the Montserrat Botanic Station from which commercial lots of seed have been obtained in this instance without further regular selections. The sample of Stirling seed came from a field planted with Stirling seed derived from Stirling seed obtained from Barbados in 1912 and cultivated commercially in Montserrat for two seasons. The Heaton seed had its origin in a single plant, not of Rivers' type, selected in the Montserrat Botanic Station in 1908-9 and grown commonly from that period.

The Montserrat samples, St. Kitts 7·1 and 7·5 and St. Vincent 2·5 are derived from single plants grown from seed originally sent from St. Kitts and St. Vincent respectively: they do not represent commercial cultivations.

The samples from St. Kitts, St. Vincent and Barbados represent what are believed to be ordinary commercial samples taken without special selection or special precautions.

It has hitherto been held that there exists a somewhat close correlation between smooth black seed and inferior lint, and also between this type of seed and a cotton plant of straggling, tall habit bearing pale or nearly white blossoms, and pains have been taken in most West Indian colonies to pick out the smooth black seed from seed used for planting. It is not surprising, therefore, to find that smooth black seed occurs less frequently in the samples now examined (1914) than in the seed originally imported (1904).

In some instances the smooth black seed has been entirely eliminated and in others reduced to a very low percentage.

It is curious to observe that the samples from St. Vincent —a colony which produces a quality of cotton renowned for its excellence—show the largest amounts of smooth black seed, though even here the amount is less than in the original Rivers'.

In addition to the removal of smooth black seed from seed used for planting, it is customary to rogue out from the fields any plants recognized as bearing lint of impure type, and also plants not comparing generally to type: two methods of selection on a commercial scale are thus in operation and both must exert their influence on the character and quality of the succeeding cotton crops.

The presumption now arises that there may be at least two kinds of smooth black seed, one of which is correlated with inferior lint and associated with the tall plants with pale blossoms, and which has been largely eliminated by the methods of seed selection and rogueing adopted, and the other which is not correlated with inferior lint. If this is the case, the smooth black seeds now met with will not produce the poor types of

COMPOSITION OF SAMPLES OF 1,000 SEEDS.

	Original Rivers' seed as imported.	Montserrat.						St. Kitts.		St. Vincent.			Barbados Co-operative Cotton Factory.
		Rivers 7.	Stirling.	Heaton 9.	St. Kitts 7·1	St. Kitts 7·5	St. Vincent 2·5	Sample from ginnery A.	Sample from ginnery B.	Estate Samples. A.	B.	C.	
Grade I. Quite free from fuzz	50	10	6	4	0	0	0	0	6	32	30	32	8
Grade II. Nearly free from fuzz	606	68	334	40	56	5	0	94	70	400	526	502	262
Grade III. Slight amount of fuzz	232	598	314	338	498	252	80	664	536	458	382	436	690
Grade IV. Partially covered with fuzz	76	288	260	572	414	692	900	204	336	88	38	22	36
Grade V. Completely covered with fuzz	22	16	26	16	16	33	18	14	46	2	4	0	0
Abortive seeds	14	20	60	30	16	18	2	24	6	20	20	8	4
	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000

plants or the inferior lint formerly met with as the product of smooth black seed.

It will be of interest if observers will record the points coming under their notice that have a bearing on the question.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date September 8, 1914, with reference to the sales of West Indian Sea Island cotton:—

Since our last report the sales of West Indian Sea Island have only amounted to 8 bales, good quality St. Kitts at 16*d*.

While the present unsettled state of affairs continues, we see no prospect of making progress unless at throw-away prices.

Messrs. Henry W. Frost & Co., report that in the Southern States no new crop has been received, and with no stock on hand the market has not opened.

BRITISH COTTON GROWING ASSOCIATION.

The one hundred and twenty-seventh meeting of the Council of the British Cotton Growing Association was held at the Offices, 15, Cross Street, Manchester, on Tuesday the 1st instant. In the absence of the President (The Rt. Hon. the Earl of Derby, G.C.V.O.), Mr. J. Arthur Hutton occupied the Chair.

Reference was made to the loss sustained by the Association through the death of Mr. A. H. Gill, M.P., who has been a most valuable member of the Council since the Association was formed, and it was mentioned that a letter of condolence had been sent to Mr. Gill's family. It was decided that any Member of Association's staff who joined the battalion which is being raised in Manchester, should be guaranteed re-engagement on discharge from Army service, and be given all the other benefits agreed upon by the leading Manchester Firms.

WEST AFRICA.

It was reported that a meeting had been held at the Colonial Office on the 19th of August, when members of the London, Liverpool and Manchester Chambers of Commerce, Chambers of Mines, Shipping, Banking and Cotton Growing Interests were all represented. The question of how West African trade could be carried on during the present crisis had been discussed, and Mr. Hutton had laid stress on the importance of the Government taking over the War Risk Insurance at a nominal premium, that Shipping Companies should not charge excessive freights, and that there should be better facilities for financing. The purchases of cotton in Lagos to date amount to 13,316 bales, as compared with 13,368 for the same period of last year, and 8,853 bales for 1912. The purchases in Northern Nigeria to the end of June were 483 bales, as compared with 1,366 bales for the same period of 1913.

NYASALAND.

It was decided to make advances to planters against cotton which cannot be shipped at the present time owing to the war.

A communication recently received from Mr. C. S. Pickford of Halifax, Nova Scotia, states that with reference to the Toronto Exhibition, the West India Court was again one of the chief attractions, though this was diminished through the unfortunate failure of Trinidad, Dominica and St. Lucia to send exhibits at the last moment.

THE LOCKING UP OF PHOSPHATE FERTILIZERS.

The *Experiment Station Record*, Vol. XXX, No. 8, gives the following abstract of results obtained on this subject, appearing in a Java publication:

Experiments with soluble and insoluble phosphates on various Java soils are reported, the results in general tending to confirm Hilgard's conclusions that if highly ferruginous soils are fertilized with soluble phosphates 'the phosphoric acid is likely to be quickly withdrawn from useful action, so that any excess not promptly taken up by the crop is likely to become inert and useless; . . . that the phosphoric acid tends to combine with the oxids and hydroxids of the trivalent metals, especially with those of iron, the equivalent aluminic compounds showing the same tendency but to a smaller degree, and that this ferric phosphate is for all practical purposes insoluble and inaccessible to the crop.'

The results, however, did not confirm Hilgard's conclusion 'that on ferruginous soils rather difficultly soluble phosphates should be used, such as bone meal and Thomas' slag, which are said to be more slowly if at all acted upon by ferric and aluminic hydrates,' and tend to discredit Van Bylert's conclusion 'that the degree of usefulness of the fertilizer and the relative amount tied up in the soil is materially affected by the phosphate being either in a soluble or in an insoluble state,' since the difference in the results obtained with soluble and insoluble phosphates were insignificant.

Notwithstanding the rapid and extensive fixation of soluble phosphates which took place in certain lateritic soils, it is not, in the author's opinion, to be inferred that moderate application of such phosphates 'cannot produce a beneficent effect on the crop and good economic results.'

The general conclusion is that the fixation of phosphate fertilizers in soils is chiefly due to certain colloidal compounds of the soil.

Manurial Experiments with Cotton in North Carolina. In the Bulletin of the North Carolina Department of Agriculture, No. 195, is contained a report of the results obtained from cotton experiments on the sandy loam soils of the coastal plain of North Carolina during the period 1903-9 inclusive. Although it need not be inferred that the results obtained apply to West Indian Sea Island conditions, it seems worth while to place on record in the *Agricultural News* the salient points brought out in these experiments.

When only two manurial constituents were used, nitrogen combined with potash afforded the largest net return per acre, while a mixture of nitrogen and phosphoric acid gave the smallest profit. It was shown that, on the whole, nitrogen is the predominant or controlling constituent for adding the greatest profit per acre. Lime alone has been used, on an average, with little profit, but lime used in connexion with a complete fertilizer seems to prove quite profitable, and it is suggested that lime should be supplied under these conditions at the rate of 1,000 lb. of slaked lime broadcasted every two or three years.

In conclusion it may be noted that the value of soil analyses was brought out in these experiments, for by the consideration of the composition of the various soils of the State, it was inferred that the results obtained would apply to the sandy and fine sandy loams of the upper coastal plain section of the State. The varieties of cotton plants experimented with were of the American Upland type.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultura News' should be addressed to the Agents, and not to the Department.

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Agricultural News

Vol. XIII. SATURDAY, SEPTEMBER 26, 1914. No. 324.

NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number describes the general work of the seed-control stations on the Continent, and indicates the possible ways in which systems of seed-control might be more generally employed in the Tropics.

Under the heading Sugar Industry, on page 306, will be found an interesting article on the utilization of molasses for alcohol production, and of bagasse as a source of paper making.

On pages 308 and 309 several articles appear in connexion with cotton. Of special interest is that entitled Rivers' Type of Sea Island Cotton.

Insect Notes, on page 312, comprise an article on insects and pain. A note on the transmission of Mal de Caderas is also given.

Under Students' Corner, on page 315, will be found the second instalment of the article explaining the dynamics of a plough.

Fungus Notes, which will be found on page 316, describe the cause and prevention of Sorghum smut.

An article on Sesamum, its cultivation and selection, appears on page 317. This is of interest as a possible new industry in the West Indies.

Trinidad Horticultural Club.

The useful work that is being accomplished by the Horticultural Club in Trinidad is shown in a report of a recent meeting published in the *Port-of-Spain Gazette* for September 4. At this meeting it was announced that successful overtures had been made with the Trinidad Poultry and Pet Stock Association with a view to holding a joint exhibition in October. Mr. Freeman, Vice-President of the Club and Director of Agriculture, suggested that the Government should be approached with the object of holding the show in the Government grounds at St. Clair, where no charges would be made for admission.

Following the conclusion of this business, Mr. J. C. Augustus, Curator of the Experiment Station proceeded to give a practical demonstration in budding and grafting. He dealt principally on grafting by approach and T-budding. The different stages in the operations were shown practically, and information was given in connexion with the proper time of year to conduct these operations. Mangoes are best budded in the rainy season, but it is generally advisable to bud cacao during the drier months of the year. The economic importance of budding was discussed, and it is apparent that the demonstration was highly appreciated by the members and that this form of disseminating knowledge is likely to serve a very useful end.

Radium and Plant Growth.

Reference has been made from time to time to this subject in the *Agricultural News* and the present note will form an interesting continuation of the subject. According to the *Gardener's Chronicle* (August 15, 1914), experiments have just been concluded at the grounds of Messrs. Sutton and Sons, of Reading, which provide interesting information as to the practical influence of radium compounds on plant growth. Naturally the plants experimented on were garden plants of temperate countries, and the results, therefore, from a West Indian aspect are intrinsically important but not necessarily applicable. The effects of the use of radium appeared to be greatest in the seedling rape and red clover plots. In most instances germination was quicker and more even, and more growth was made, but whilst stimulating early growth there is a distinct loss of colour in the foliage and there is also a probable weakness in constitution.

In one series of experiments it seemed that increased yield occurred mostly in root and foliage, hence where radium compounds are applied for fruit or grain producing crops, it would seem that it might be advisable to supplement the radium with phosphates and potash. An interesting fact brought out was that the effect of the expensive radio-active ore differs very little from that of the cheaper residue left after the valuable radium bromide has been extracted. This suitability for agricultural purposes of what is virtually a by-product raises some hope that after further experimentation it may be found practicable to utilize radium on the estate.

'The Thinking Hand'.

This is the suggestive title of a recent book on practical education in elementary schools, by Mr. J. G. Legge, Director of Education of the City of Liverpool. *Nature* (for August 20, 1914), in reviewing the volume states that we are apt to speak of 'seeing' when we mean 'perceiving' and forget that science through many centuries has acquired knowledge by means of hand work. There can be no doubt that the methods which are described in this book have proved to be a valuable means of stimulating the intellectual activity of children. By means of manual exercises in which such diverse materials as wood and metal, cardboard, rope and cane, twine leather and stone are used, the pupils are taught elementary physics, domestic science, and gardening. Naturally a great deal depends upon the teaching—it must be thorough—and the author pleads for considerable liberty in presenting the subjects. The book is characterized by the large number of illustrations it contains, which occupy by far the greater part of the volume. These serve their function admirably and indicate the materials and methods employed more clearly and convincingly than a more extensive letter-press would do.

It is likely that a greater general application of this system of teaching in elementary schools in the West Indies would serve a useful purpose. Apart from the utilitarian aspect—by no means inconsiderable owing to the dependence of the masses on manual labour, domestic or agricultural—there is more likelihood of developing ideas and instilling method in the mind of the average West Indian child through his hands than there is by means of the orthodox slate and blackboard instruction. This principle applies also in the case of secondary schools, especially the lower forms. Successful efforts have already been made in the direction indicated, but if its importance were more fully recognized by the authorities and the examiners, and teachers were selected and trained in this work of manual instruction, it is likely that in the near future greater satisfaction would be felt by the average employer of labour than that which we hear expressed at the present time.

School Gardens in the Leeward Islands.

In his report for the year 1912-13, the Inspector of Schools for the Leeward Islands discusses the state of the gardens attached to some of the primary schools in this Colony. During 1912, there were thirty-three school gardens in operation in the Leeward Islands, but since that time a few have been discontinued. It should be noted that the grants are now paid from local votes instead of from a Federal vote as formerly. This is considered preferable, as each Presidency provides the money required for its own school gardens and no more.

On the whole, the condition of the gardens does not appear to be very satisfactory, principally as the result of the extreme severity of the drought experienced during the year under review in Antigua and elsewhere. In fact, in awarding marks in Antigua the inspection had to be postponed until some months after rain had been received in order to make a fair judgement possible. The Inspector states that in a general way the pupils should be made to use note books more than they do, and should be led to try and find the principal reasons for the causes of failure or any unusual success in the growth of crops that may occur from time to time.

The Study of Soil Fertility.

In the Tropics, in a general way, the study of the plant has received greater attention than that of the soil. In Great Britain the reverse is the case: Fertility has been historically the outstanding feature of agricultural research. In the Tropics, the Botanic Station has been the fundamental institution: in England it has been the chemical laboratory.

Ever since the Rothamsted Experimental Station has been established, it has devoted its attention principally to problems of soil fertility. In the *Journal of the Board of Agriculture* (August 1914), the present Director (Dr. E. J. Russell) points out that soil fertility, though originally believed to depend on the presence of sufficient plant food, is in reality dependent upon at least six factors: (1) the amount of plant food in the soil, (2) the amount of water present, (2) air supply, (4) the temperature, (5) sufficient space for root development, and (6) absence of injurious agents. At the present time attention is concentrated at Rothamsted on the first and last of these. In the former, as well as the mere provision of plant food in the form of suitable manures, essential points for study are the control of waste, the changes which the manure undergoes in the soil, and the proper balancing of manures. This latter point is exceedingly important, for it has been found that the plant, like the animal, needs for its best development a sort of 'balanced ration' so to speak—it can make more use of its nitrogen supply in certain forms and in combination with other kinds of nutrients just as the animal can use its organic nitrogen most advantageously in conjunction with fixed quantities of carbohydrates.

Important experiments now in progress at Rothamsted are the chalking trials. These show that during the first season, two-thirds of the outlay involved in chalking was recovered. This outlay was simply the cost of the labour used in digging the material and applying it. After the lapse of a few years the results indicate so far, that chalking, under Hertfordshire conditions at least, is a paying operation.

Interesting work is also being done with green dressings—a subject which has also received considerable attention in the West Indies, but most interesting of all is the consideration of Pickering's horticultural research on the effect of one growing crop on another, in relation to the mixed cropping of annuals. Oats and barley grown together give the same yield as when cultivated separately, whilst a leguminous crop, as would be expected, increases the yield of the one it is growing with. If, in the case of oats and barley one crop does suppress development in the other, say at the early stages, it must later on stimulate it, the two effects counterbalancing each other.

INSECT NOTES.

INSECTS AND PAIN.

The accompanying article entitled Insects and Pain, by Mr. H. B. Weiss, is taken from the *Canadian Entomologist* for August 1914:—

This article is of interest as a discussion of the extent to which insects experience pain as understood by the human animal, but the author is not able to arrive at a definite conclusion in the matter. It would seem that while insects have well developed nervous systems, the human intelligence has no means of accurately gauging the kind of sensation which is felt by the insect, under conditions which in us would produce pain in various degrees of intensity, shading off to slight irritation, inconvenience or annoyance:—

In various books on entomology one often comes across the statement that insects do not suffer acute sensations of pain as do the higher animals. Different facts are cited to prove this, the most familiar being the case of a butterfly that was pinned alive, escaped and returned to its feeding among flowers with apparently no inconvenience. Kirby and Spence quote the action of a bee eating honey though deprived of its abdomen. Dr. John B. Smith found that if he cut off the abdomen of a fly it would live for twenty-four hours after with practically no digestive system, very little nervous system and most of its heart gone, and when the head was removed it lived for the same length of time. The interesting feature was that no apparent symptom of pain was developed.

It is also said that if a dragonfly be captured, held loosely by the wing and the tip of its abdomen presented to its mouth, it will proceed to eat it at once as far as it can reach.

Referring to the human system, many experiences commonly called painful are only unpleasant or disagreeable. This confusion is due to the fact that painful things are always unpleasant. Painfulness however is quite distinct from unpleasantness. The same stimuli which result in sensations of pressure, warmth and cold may also bring about painfulness if they are long continued or repeated often enough.

There are various theories accounting for pain sensations, the oldest one teaching that there was no specific pain organs but that sensations of pain were brought about by continued or excessive reactions of other end-organs, especially those of pressure. This theory was disproved by the discovery that certain anaesthetics destroyed pain sensations independently of pressure sensations. For instance, if one's tooth is treated with cocaine, no pain is felt upon its removal but one is conscious of the pressure of the dentist's instrument.

Another theory is that pain is produced only by the excitation of distinct end-organs of pain. This theory is based on the discovery of pain spots on the skin. However, the spots which are sensitive to pain and not to pressure have been found to occur only on the elbow joints and membranous coverings of the eye. This lack of spots is explained by assuming that more stimulation is required to excite pain end-organs than pressure end-organs.

A third theory is that pain end-organs are not distinct from pressure end-organs but are exposed pressure organs situated under unusually thin parts of the epidermis and that pain is not due to any activity of these end-organs but to a transformation in the grey matter of the spinal cord of nerve excitations conveyed from these exposed pressure end-organs.

Returning to insects we find that they have well developed nervous systems and that their organs are well supplied with nerve endings. Moreover many insects give signs of discomfort when handled or mutilated. There is no doubt but that they are highly susceptible to pressure stimuli. In fact end organs of touch such as hairs and bristles are distributed over the entire integument.

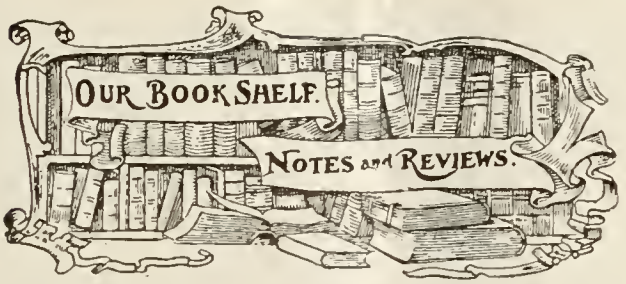
Pain sensations however are hard to distinguish in insects from those of touch. One argues that the mutilated insects heretofore referred to, experienced no pain simply because they exhibited no signs of suffering. What then constitutes a symptom of pain in insects? Who is qualified to judge? Many pain racked persons go about their duties without exhibiting any signs of pain other than changes in facial expression. Of course, extreme mutilation of the human body results in almost immediate death, while in the case of insects death is not immediate. All pain, however, is an exhausting experience and injurious to the organism. With insects final exhaustion is simply deferred.

In the case of the dragonfly eating its own body, it is hard to find a human parallel unless we cite mentally unbalanced persons who inflict serious injuries upon their person. One might argue that they would not do this if it were painful and yet we are positive such actions are painful.

The character of the insect nervous system is unlike our own, and the surface of their bodies is usually rigid and hard and probably not sensitive to pressure and pain in the same way as our own bodies, so that we have no reliable guides as to their sensations of pain. Man judges most things by himself and when this guide fails he is at a loss to explain certain happenings in a satisfactory way. It seems therefore, that the evidence for assuming that insects do not suffer acute sensations of pain is not by any means complete. We simply do not know and have no reliable means at present of finding out.

According to the *Review of Applied Entomology* for June 1914, the Government Veterinary Surgeon in Ceylon reports that serious trouble has been caused in Ceylon by *Stomoxys calcitrans*, which was found to be swarming in one of the towns and a cause of serious irritation to cattle and horses. The eggs, which are usually laid in masses in straw, hatch in from one to three days. The larva completes its growth in about eleven days, and six days later the adult emerges from the puparium. Green in Ceylon has bred *S. calcitrans* from decayed pumpkins and *S. plurinotata* from decayed shoots of the giant bamboo. It will be remembered that *S. calcitrans* occurs in the West Indies and South America and is supposed to be the transmitter, or one of the transmitters of Mal de Caderas.

An important point in connexion with water culture experiments is referred to in the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases* for June 1914. Culture experiments with *Aspergillus niger* in Raulin's solution with and without zinc showed different results according to the nature of the vessel employed. In a solution of hydrochloric acid equivalent in acidity to that of Raulin's solution, the writer found 0·05 milligramme of zinc per 125 c.c. In these experiments Bohemian glass, Jena glass and quartz glass were used, and there was a big variation, as shown by the figures in the solution with zinc and the solution without zinc.



DISEASES OF ANIMALS., By N. S. Mayo, M.S., D.V.S., New York: *The Macmillan Co.*, 1913.

This book was first issued under the title Care of Animals. It is stated in the preface that the name is now changed in order that the contents of the book may be better expressed. The advisability of this alteration is open to question, since the principal aim has been to give concise, practical directions that can be used by those who have to do with the care of animals, and not to present information for the use of those who make the diseases of animals a special study. We think, in fact, that those sections of the work which deal entirely with the care of animals, for example, the breaking in of animals, the transport of animals, and the nursing of animals are likely to prove just as useful, if not more so, in the hands of the agriculturist than the account of infectious diseases like anthrax and Texas fever. However, this is a minor point in forming a judgment of a book which, as a whole, is undoubtedly one of the most useful of its kind that has come under our notice.

The first chapter gives general advice as regards the care of animals, including reference to exercise and protection. The care of animals is then considered in regard to their requirements in the stables and the yards. This chapter includes good sections on quarantine and the importance of bedding. A rather unexpected branch of the subject of animal management is that which comes in Chapter III the care of pets. In the course of this chapter the educational value of pets as a hobby for children is very properly emphasized, and we might with advantage suggest that more attention be given to this matter in the West Indies. The section on the training of dogs is particularly good, though rather more space than is perhaps necessary is accorded to the care of cats.

Chapter IV deals entirely with the judging and handling of the horse. In this the age, points, and style, together with the training and breaking in and the curing of bad habits are dealt with in a concise and practical manner. On account of its great practical importance a whole chapter is devoted to lameness and shoeing.

After describing the general indications of disease in animals, the author proceeds to describe the treatment of sick animals, which really amounts to a most useful description of nursing methods. The ways to give medicine are both described and illustrated, and the means employed in the confining or restraining of animals are equally well told. Figure 36 shows how a horse may be thrown by means of side lines, and figure 37 illustrates the half-hitch method of throwing a bull. The author very justly devotes several pages to the subject of disinfection and antiseptics. It is undoubtedly a fact that there is considerable scope for increased employment of disinfectants and aseptic methods generally in the yard and stable, not only in the United States for which this book has been specially written, but in the West Indies as well.

For the convenience of the stockman and horseman, who are the chief persons written for in this book, the various simple surgical treatments employed in the cure of injuries are briefly described in Chapter VIII. The stockman is told of the first aid treatment of wounds and various other external injuries induced by organic diseases. The chapter includes also a section on castrating, caponizing and spaying.

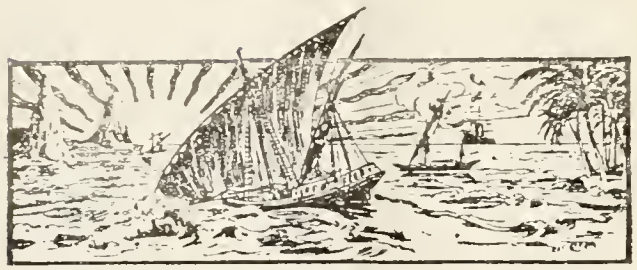
Breeding and veterinary obstetrics receive attention in Chapter IX. The usual information connected with parturition and the attendant diseases are given, and the author does not fail to add a little note at the end on caring for the young and weaning. Diseases and injuries of the bones, limbs and joints are dealt with next, and this is followed by an equally useful chapter on the diseases of the alimentary tract, and of the digestive functions. All the ailments referred to are those with which the experienced farmer is well familiar, but it is certain that his efficiency will be advanced by studying the instructions carefully given by the author of this book. Chapter XII deals with the diseases affecting the respiratory system, such as bronchitis and pneumonia; and those diseases affecting the brain and the nervous system are described in the chapter which follows. These latter ailments, or rather fatal maladies, include lock-jaw and apoplexy. The diseases affecting the skin and the eye are of course important and are outlined briefly in Chapter XIV.

It is often the case that those who have not had the advantage of a training in biology possess limited views as to what parasites are, especially concerning those organisms which are only partially parasitic. By describing diseases, chiefly of the skin, like ring-worm, scab of sheep and cattle, mange of dogs and bots in sheep, horses and cattle, as well as ticks, the author presents to the reader's mind a very clear idea of the formidable enemies which the stock owner has to face in respect of his care for the animals he owns. In the southern States and in the West Indies, great importance attaches to ticks and worms living as parasites in the alimentary canal, and the author might with advantage have devoted a little more space to these matters. The diseases produced by the more or less highly organized parasites just described, are followed by an account of contagious and infectious diseases induced by bacteria. It is hardly necessary to do more than mention this fact, as the explanations given are perfectly orthodox and present no special points of interest.

The last chapter but one is concerned with miscellaneous diseases. Many of these are not caused by specific organisms, though, as a point of interest, it may be mentioned that a few of them like actinomycosis of cattle and ergot poisoning are caused by fungi. This chapter includes an account of several kinds of injury set up in the digestive tract by certain foods. Mouldy corn causes staggers, whilst cotton-seed meal fed in too large a quantity gives rise to a disease of the nervous system.

The book concludes with a collection of recipes and brief advice. This latter section, entitled Brief Advice on the Commoner Diseases, might in a time of emergency serve a very useful purpose, because the information fully to the point is given under the name of each disease arranged in alphabetical order, and at the end of each note the number of the page in the book is given where further information is to be found. Incidentally this section, which is in fact a summary of the whole book, should be useful for revision purposes in the case of agricultural students preparing for examination. There is a good index consisting of ten pages (two columns to a page) of well selected references.

It is by no means always the case that a book written primarily for a temperate country can be recommended to those interested in its subject under tropical conditions. In this particular case there can be no hesitation in doing so.



GLEANINGS.

Der Pflanzer for May 1914 contains an article describing a method of solidifying oils applicable to tropical oils and fats, thereby increasing their value. In an article on tropical forestry, the natural rejuvenation of teak trees is described.

A communication received from the acting Agricultural Superintendent, St. Vincent, shows that the usual routine work is being conducted in the experiment station, but little of general interest appears to be happening as far as the out side work of the department is concerned.

It is stated in *Der Pflanzer* for April 1914 that the yield of Manihot rubber is increased after scraping the bark. In this number the present position of rubber standardization is reviewed. Two important notes include the use of castor oil as a motor lubricant.

It is expected in England, according to the *India Rubber Journal* for August 22, 1914, that there will be a big reduction in rubber plantation supplies for 1914 and 1915. It is believed that the prices, especially for first grade rubber, will range high.

Two interesting Indian reports received recently are (1) that on the Dharwar Agricultural Station, and (2) that on the Surat Agricultural Station, both for the year 1912-13. These publications contain a considerable amount of information on cotton growing and selection.

According to the Grenada *Government Gazette* for August 15, 1914, the exports of cacao and cotton from that island for the seven months ended July 31, 1914, show a reduction on those of the corresponding period in 1913. Fruits and spices, on the other hand, exhibit an increase in value.

In the *Bulletin Agricole du Congo Belge* for June 1914 is a very interesting article on mechanical labour in Katanga. In this article a traction engine is described which combines the useful feature of draft with lifting. This is accomplished by means of a crane carried in front of the engine and worked by the same.

An important Japanese publication to those interested in the agricultural chemistry of rice is the monograph published in the *Journal of the College of Agriculture*, Sapporo, entitled Influence of the Alkali Salts upon the Growth of the Rice Plants. To each section of the paper a concise summary of results is attached.

Der Tropenpflanzer for July 1914 contains several interesting articles dealing with the following subjects: the geographical distribution of the oil palm; the ostrich feather industry; a discussion as to whether the planter should gin his own cotton; a note on Manihot rubber, and a review of rubber and other cultivations in Ceylon, 1913. Attention is given in this issue also to the use of bacterial disease against plagues of grasshoppers.

Bulletin No. 11 of the Department of Agriculture, Ceylon, deals with the import of manures into that colony. It is interesting to observe that most of the nitrate of potash used is imported from India, the import in 1908 being 287 tons of the refuse salt-petre, valued at Rs. 200 per ton. This has increased to 2,082 tons in 1912-13 valued at Rs. 208 per ton. Sulphate of potash has also increased and in 1912-13, 5,082 tons were imported valued at Rs. 145 per ton.

Reference is made in *Nature* for August 13, 1914, to a new text-book on agricultural bacteriology entitled Vorlesungen über landwirtschaftliche Bacteriologie by Dr. F. Löhnis. In this the author adopts the old Zopf classification remarking that no better one has yet been formulated. With this *Nature* is in agreement. The text-book has the usual range adopted under the subject for the study of soils and foodstuffs.

A publication that should prove interesting to West Indian planters is Bulletin No. 44 of the agricultural and chemical series of the Experiment Station of the Hawaiian Sugar Planters' Association. This is entitled The Implements of the Industry, and it gives an illustrated account of the agricultural implements suitable for employment in the Tropics for the special object of reducing manual labour on the estate. This bulletin should be examined by those who live under conditions where labour is expensive or scarce.

The question of the origin of the nitre deposits in Chili is discussed in *Nature* (August 20, 1914). It has been suggested that the beds have been formed by the nitrification of immense deposits of seaweed and guano, but it is more probable that they represent the concentrated fertility of the thousands of square miles of land between the watershed of the Andes and Coast Range, the nitrates formed in these regions being washed out by the periodical mountain floods which occur every seven or eight years, and subsequently recovered by the evaporation of the leachings in the lower levels, where the nitrates are found.

It is stated in *The Board of Trade Journal* for August 20, 1914, that a thirty years' concession has been granted for the exploitation of coco-nut groves in the zone of the Pacific coast of Costa Rica to a company known as Compania de Cocales del Pacifico. The company undertakes to preserve and replant the existing coco-nut palms and to plant coco-nuts in those places where they do not already grow. The company is also to establish within a year a transport service consisting of sailing vessels of at least 15 tons register, fitted with auxiliary petrol motors of 20 h.p. The company as well undertakes to establish a factory in San Jose for the extraction of coco-nut oil.

STUDENTS' CORNER.

DYNAMICS OF A PLOUGH.*

PART II.

The question to be considered is the best position and direction to apply the force to overcome these three several resistances. To do so it is necessary to reduce them to one single resistance, and to fix approximately the position and direction of this. Under the laws of dynamics (force in motion) any number of forces or resistances (components) acting on a solid body and differing in magnitude and direction may be resolved into a single force or resistance, the position, magnitude, and direction of which are fixed by the magnitude and direction of of the several components.

FIG. 7. B= Force acting in echelon, parallel to beam.

In Stephen's Book of Farm Implements, published in 1858, dealing with this subject, the point of resultant resistance—that is, the final resistance arrived at on combining the several resistances in operation—of a plough is called the 'centre of gravity'. As, however, gravity is not the principal cause of the resistance of a plough, I prefer to call the point in question the 'resultant centre of resistance and point of balance'. By this is meant the imaginary point in the body of the plough from which a single force, acting horizontally to the said point and parallel to the land side, will overcome the resistance with a minimum of loss. If the force be applied obliquely to the said point the direction of the plough will not be altered, but the plough will advance in echelon to and parallel with the said force. The word 'echelon' may be better understood by recalling the drawing of a barge in a canal by a horse walking on the bank. This point, then, from the estimate already made of the components of resistance, I place approximately in the plough we are considering at 15 inches to the rear of the point of share 2 inches up from the base line of plough (which is a straight line from the point of share to tread of back wheel) and 3 inches to the right of the land side of the plough, looking from the rear of the plough. To ascertain the precise position is not essential to the argument.

It should here be noted that this imaginary point when a plough is at work is not a fixed point, but is constantly on the move from side to side and up and down, due to the variation in intensity of the three components caused by the varying composition of the land being ploughed; but under ordinary circumstances, it will be fairly steady within an inch or two of the position stated. It is not possible to apply the force required to overcome the resultant resistance at the best theoretical position—namely, in a line horizontal with the said point and parallel with the land side of the plough—owing, firstly, to this line passing through the earth in front of the plough, as shown in figure 4, and, secondly, to the fact that the hame-hooks of a horse are about 4 feet above the surface of the ground.

For obvious reasons, the power can neither be applied on the line AC nor the line AB. It therefore becomes necessary to equip the plough-body with a beam raised high enough to clear both the furrow in front of the share and the ordinary surface growth on the land, and carried back from the share far enough to provide room for the front part of the mould-board to join the share in a regular curve. These considerations fix the length and shape of leg and beam, which together form a straight shanked hook, the horses being attached to the end of the shank, the share and the mould-board being joined to the returned curved end of the said hook. As the force has to be attached to the front end of the beam, and as force acts in a straight line, the power of the horses attached to the front of the beam crosses the gap between the point of the beam and the centre of resistance in a straight line. The leg and the beam must be made strong enough to resist the strain thereby set up in them, tending to straighten out the hook formed by the leg and beam.

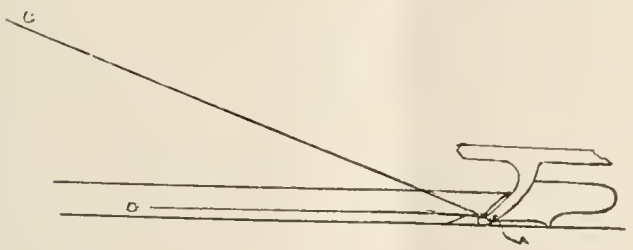


FIG. 8. A. Centre of Resistance and Point of Balance.
B. Best Theoretical Position for Line of Draught.
C. Hame-hook of ordinary Draught Horse (4 feet above surface and 14 feet from A).
AC. Straight line from Hame-hook to centre of Resistance.

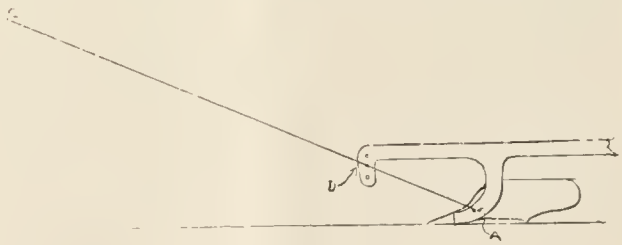


FIG. 9. A. Centre of Resistance.
C. Hame-hook, 4 feet above Surface and 14 feet from A.
AC. Line of Force, and passing through Bridle-pin at D.

The beam must not only be high enough to clear the furrow and strong enough to stand the strain, but must be long enough to bring the line of draught in a straight line from the hame-hooks to the centre of resistance, as shown in Fig. 5.

* The *Journal of Agriculture* of New Zealand for June 20, 1914.

FUNGUS NOTES.

SORGHUM SMUT.

Specimens of imphee attacked by a smut disease were recently received from Montserrat, with an enquiry as to treatment. The smut proved to be due to the well-known *Sphacelotheca* (Ustilago) *sorghi*, (Lk.) Clinton, which is known to occur from time to time on imphee and Guinea corn in the West Indies.

The spores of the fungus are usually sown with the seed, germinate in the soil at the same time, and infect the seedlings at an early stage. The mycelium of the fungus keeps pace with the extension of the plant in the form of thin threads which grow up through the softer tissues, especially the pith. No particular damage to the plant is caused and no sign of the disease is visible until the period of flowering, when the fungus develops rapidly in the anthers and ovaries, and there produces masses of black powdery spores which replace the pollen and the seeds. The outward appearence of the panicles is not much altered until the membrane which at first encloses the spore masses bursts, when they appear as if coated with powdery soot.

The spores are very resistant, and the occurrence of a small quantity of smutted material among the seed corn is capable of producing widespread infection in the following crop. The disease is thus cumulative, and its occurrence even in small proportions should therefore not be considered negligible.

Treatment is rendered easy by the absence of the fungus from the interior of the seed, and owing to the fact that only very young plants can be infected. Any method which secures the sterilisation of the seed without destroying its germinative power is effective.

Two types of treatment are in common use against this and other diseases of a similar nature, depending on the use of (1) chemical fungicides, (2) hot water, for the killing of the spores. The hot water process is a somewhat delicate one, since a temperature of at least 129° F. has to be maintained in order to secure the desired effect, and a temperature above 138°F. is liable to kill the seed. This involves an equipment and a carefulness in handling that are not always at the service of the West Indian planter. The use of chemical fungicides is more likely to meet his case.

The substances most in favour for the purpose are (1) formalin and (2) copper sulphate. Dilute solutions of either substance may be used in two ways. The seed is either steeped in the solution or is sprinkled with it and then thoroughly mixed in order to secure uniformity of action. Commercial formalin is a 40-per cent. solution of formaldehyde gas in water. It is not dangerous to use, but its fumes have a strongly irritant action on the mucous membranes of eyes, nose, and throat, and even weak solutions cause a harshness and peeling of the skin if allowed to remain in contact with it for any considerable time. A solution of proper strength is obtained by mixing 1 pint of formalin with 30 gallons of water. The cost of formalin in Barbados is 3s. per (Imperial) pint. If copper sulphate (bluestone) is used, 1 lb. should be dissolved in 10 gallons of water.

In carrying out the steeping method, the seed is contained in a bag or close basket and immersed in the solution, being lifted up and down a few times to get rid of the enclosed air. The time of soaking is two hours in the case of formalin, three minutes in the case of copper sulphate solution.

In the sprinkling method, if formalin is used, the grain, after it has become thoroughly wet should be left in a covered wooden vessel, or in a heap covered with wet sacking, for several hours, and then spread out to dry. If copper sulphate solution is used, the grain should be dried immediately.

It is advisable to test the germination of the treated seed before sowing, so that allowance may be made for any which has been killed. Formalin is less likely to damage the seed than copper sulphate solution.

In handling the grain after treatment, the greatest care should be taken that it does not come into contact with any article that is likely to be contaminated with smut spores, and that it is not exposed where dust which may contain the spores is likely to settle upon it.

There is another sorghum smut, *Sphacelotheca* (Ustilago) *reiliana*, (Kühn) Cl., which differs from the above in that, instead of the grains being affected separately, the whole head is conglomerated into a smutted mass.

This does not appear to have been recorded from the Lesser Antilles. It is not amenable to the treatment described above, but must be met by obtaining seed from an uninfected source.

DOWN THE ISLANDS.

ITEMS OF LOCAL INTEREST.

GRENADA. The Land Officer's Report for August states that work on the Settlement roads at St. Cyr was continued this month. As regards progress of work on the holdings in general, the allottees on all the Settlements were engaged during the early part of the month in weeding corn and sugar-cane. During the latter part of the month, they were occupied in preparing land for planting cassava and sweet potatoes. Turning to the condition of the crops, the Land Officer reports as follows: 'Maize shows considerable promise, the weather having been very favourable for its growth. Larger areas than last year having been planted the crop should be a big one. As regards sugar-cane, this crop has also benefited by favourable weather and is now very promising. The areas on all Settlements have been extended this year. In connexion with ground provisions, those already planted are doing well. The cassava crop at Westerhall is satisfactory, and fairly large reapings should be made during the coming months. Fair quantities of peas have been reaped, and most of the settlers are being induced to re-plant further crops of this quick food-producing product as soon as one crop is reaped. The root crops, such as yams and tannias, are being gradually put in and are doingwell.'

ST. LUCIA. On the Land Settlement at Réunion several allotments are now occupied and bear crops that are in excellent condition. The Government has offered lots free for the period of one crop for the cultivation of provisions.

Work in the Experiment Stations has included the distribution and transplanting of limes and the planting of wind-belts. Observations relating to the staple crops show that cacao promises well whilst the prospects for sugar are exceedingly good. The second lime crop was coming in at the time of writing.

DOMINICA. During August the lime crop was in full swing, and 3,130 barrels of green limes were shipped. In the Experiment Stations, weeding and cutlassing were in progress, while in the nurseries the beds were being forked, seeds sown, plants potted and lime seedlings transplanted. The plant distribution for the month was as follows: limes, 3,300; budded lemons, 25; budded limes, 12; total, 3,337. The Curator states that, owing to the disturbed conditions now prevailing, it was not possible to forward an exhibit of fresh limes to the Toronto Exhibition as intended. A coming event of interest is the expected receipt at the Lime Experiment Station of three new varieties of grape fruit and five of oranges.

ANTIGUA. In this island the Curator says the cane crop is beginning to feel the effects of the dry weather experienced during the month. The fields of young cotton are fairly healthy, but require rain. Onion seed has recently been received and a large proportion was planted immediately. Crops of maize and sweet potatoes will be established as extensively as possibly as soon as the weather becomes favourable. The experiments on the kiln-drying of corn will be repeated and experiments also in the making of corn meal are to be conducted. A mill for corn meal-making has been erected at the Botanic Station. Society meetings during the month have included a general meeting of the Agricultural and Commercial Society already reported in the *Agricultural News*, and a meeting of the Onion Growers' Association at which was considered a scheme for the extension of their useful activities. In a special communication recently received from the Hon. Secretary of the Agricultural and Commercial Society, it is stated that it has been resolved to postpone the Antigua and Agricultural and Industrial Exhibition which had been arranged to be held in February 1915.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture returned to Barbados on September 23, 1914, by the R.M.S. 'Chandiere' from an official visit to the Northern Islands announced in the *Agricultural News* for September 12.

A NEW INDUSTRY.

THE CULTIVATION AND SELECTION OF SESAMUM.

Sesamum is a seed-producing crop, the cultivation of which is worth attention in the West Indies. Experiments have been made already in Grenada, Antigua, Montserrat and St. Kitts. The commercial possibilities of the cultivation are of course not yet definitely known; in Antigua, the principal factor which interfered with the cultivation of this crop was disease, but the appearance of a paper on the improvement of Sesamum, in the *Philippine Agriculturist and Forester* makes it seem likely that this and any other difficulties pertaining to the plant itself can be got over by selection.

It may prove interesting before referring to the selection work, to give a brief account of the cultivation of the crop. A native most probably of North Africa, Sesamum is a plant which requires a warm climate, and although it can be grown on almost the poorest land in cultivation it does best, like most other crops, on a rich fertile one, preferably light. The methods of planting differ, but in the Philippines it has been found best to plant the seed in rows. When they are about 4 inches high, they may be thinned from 2 to 4 inches apart. This depends, of course, upon the variety and the cultivation. The land must be properly weeded. As regards different varieties, it is stated that these can be easily recognized from one another by their leaves, capsules, and the duration of time from sowing to maturity. Some are early varieties and others are late. One of the most productive varieties tested in the Philippines seems to be No. 1622-F. (White). Further reference will be made to varieties later on.

Several diseases of Sesamum appear on the Philippines. The most common insects are leaf rollers. There are two fungus diseases observed: the damping off fungus, and a leaf spot caused by *Cercospora Sesami*, A. Zimm. The damping off disease generally occurs in rainy wheather, when the plants are crowded. It attacks only the small plants. *C. Sesami* attacks the leaves only, and eventually causes them to fall.

The harvesting of Sesamum is very easy and simple. The stem is cut close to the ground with a sickle, and the cut stems are then piled up and tied into bundles. The smaller the bundles the better will be the drying. Immediately after they are brought to the drying house, they can be spread on a mat. They are dried there till all the capsules are opened and the seeds can be shaken out. As regards market value, the figures given in the paper under consideration do not apply to the West Indies, but it may be noted that it is said 3 litres of the white variety seed sells at 30 to 40 centavos. The black fetches less.

With reference to the use of Sesamum seed, it is stated that two-thirds of the world's production goes to Marseilles for oil extraction largely used for making soap, in perfume, and for burning in lamps. It is also extensively used in certain places, e.g. Egypt, as a substitute for olive oil. As is well known, the residual matter or cake is employed as a cattle food, in which connexion it has been observed to have a great influence upon the butter and fat of dairy cows.

Turning now to the selection experiments, it may be explained that before the harvesting of each variety, selection was first made in the field. During the selection several variations were noted: in the number of the locules, in the branching habits, and especially in regard to susceptibility to leaf spot. Space prevents a discussion here of the tables of observations, and it must suffice if we present the summary of conclusions, based upon these figures, which the author places at the end of his article:—

'(1) The yield of sesamum can be increased by selection in the field, and by growing the selected seeds in separate plots. (2) The sports which appear in 403-F, such as the hairy and the smooth forms, can easily be bred true. (3) With the character of high yielding which is found in certain plants of 403-F can be correlated branchiness, fineness of the hair, and shape of the capsules, in all of which they differ from the common stock. (4) The varieties of 404 and 403-F can be self-fertilized. (5) Sesamum in common cultures in the Philippines needs to be improved by selection, as regards strength of stem, immunity to disease, uniformity of type, resistance to drought, and brevity of crop period; and above all else, as to productiveness.'

MARKET REPORTS.

London.—The West India Committee Circular, September 8, 1914.

Arrowroot—2*d.* to 4¾*d.*
Balata—Sheet, 2 7½; block, 2 2½ per lb.
Beeswax—No quotations.
Cacao—Trinidad, 57/- to 64/- per cwt.; Grenada, 51/- to 58/-; Jamaica, no quotations.
Coffee—Jamaica, no quotations.
Copra—West Indian, £24 per ton.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 16*d.*
Fruit—No quotations.
Fustic—No quotations.
Ginger—Quiet.
Isinglass—No quotations.
Honey—No quotations.
Lime Juice—Raw, no quotations; concentrated, no quotations; Otto of limes (hand-pressed), 10/6.
Logwood—No quotations.
Mace—No quotations.
Nutmegs—No quotations.
Pimento—Quiet.
Rubber—Para, fine hard, 2/9¾; fine soft, 2/4; Castilloa, 1/8.
Rum—Jamaica, 2/2 to 5/-.

New York.—Messrs. Gillespie Bros., & Co., July 24, 1914.

Cacao—Caracas, 11½c. to 12c.; Grenada, 11c. to 11½c.; Trinidad, 11¾c. to 11⅞c.; Jamaica, 10c. to 11c.
Coco-nuts—Jamaica and Trinidad, selects $20·00 to $21·00; culls, no quotations.
Coffee—Jamaica, 9¾c. to 13½c. per lb.
Ginger—7½c. to 10c. per lb.
Goat Skins—Jamaica, 46c.; Antigua and Barbados, 43c. to 46c.; St. Thomas and St. Kitts, 40c. to 43c. per lb.
Grape Fruit—Jamaica, $1·75 to $2·50.
Limes.—$3·75 to $4·50.
Mace—45c. to 53c. per lb.
Nutmegs—110's, 11⅜c.
Oranges—Jamaica, $2·00 to $2·50.
Pimento—3⅞c. per lb.
Sugar—Centrifugals, 96°, 3·26c.; Muscovados, 89°, 2·88c.; Molasses, 89°, 2·61c., all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., September 14, 1914.

Cacao—Venezuelan, no quotations; Trinidad, no quotations.
Coco-nut Oil—80c. per Imperial gallon.
Coffee—Venezuelan, 13c. per lb.
Copra—$5·00 per 100 lb.
Dhal—No quotations.
Onions—$3·25 to $3·50 per 100 lb.
Peas, Split—$7·25 per bag.
Potatoes—English, $2·85 per 100 lb.
Rice—Yellow, $7·00 to $7·50; White, $7·00 per bag.
Sugar—American crushed, no quotations.

Barbados.—Messrs. James A. Lynch & Co., Ltd., September 19, 1914. Messrs. T. S. Garraway & Co., September 7, 1914.

Arrowroot—$4·50 per 100 lb.
Cacao—$13·00 per 100 lb.
Coco-nuts—No quotations.
Hay—$1·50 per 100 lb.
Manures—Nitrate of soda, $65·00; Cacao manure, $48·00 to $50·00; Sulphate of ammonia $78·00 to $85·00 per ton.
Molasses—No quotations.
Onions—$3·50 per 100 lb.
Peas, Split—$6·00 to $6·25 per bag of 210 lb.; Canada, $4·75.
Potatoes—Nova Scotia, $4·25 per 160 lb.
Rice—Ballam, $5·55 per 100 lb.; Patna, no quotations; Rangoon, no quotations.
Sugar—American granulated, $8·00 per 100 lb.

British Guiana. Messrs. Wieting & Richter, September 12, 1914; Messrs. Sandbach, Parker & Co., August 28, 1914.

Articles.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	$7·00 to $8·00 per barrel of 200 lb.	——
Balata—Venezuela block	No quotation	——
Demerara sheet	65c. per lb.	——
Cacao—Native	12½c. per lb.	13c. per lb.
Cassava—	96c. to $1·08	——
Cassava Starch—	——	——
Coco-nuts	$16 to $20 per M.	$23 per M.
Coffee—Creole	——	16c. per lb.
Jamaica and Rio	16c. per lb.	16c. per lb.
Liberian	10c. per lb.	14c. per lb.
Dhal—	$5·50	$5·40 to $5·50 per bag of 168 lb.
Green Dhal	——	——
Eddoes—	$1·44	——
Molasses—Yellow	None	——
Onions—Teneriffe	——	——
Madeira	6c.	7c.
Peas—Split	$6·50 to $7·00 per bag (210 lb.)	$7·50 per bag. (210 lb.)
Marseilles	——	——
Plantains—	16c. to 48c.	——
Potatoes—Nova Scotia	$2·75 to $3·00	$1·40
Lisbon	——	——
Potatoes—Sweet, B'bados	——	——
Rice—Ballam	No quotation	——
Creole	$6·00	$6·00
Tannias—	$2·88	——
Yams—White	——	——
Buck	——	——
Sugar—Dark crystals	$3·00 to $4·25	$3·00
Yellow	$3·50	$3·50
White	——	——
Molasses	——	——
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M.
,, Cordwood	$1·80 to $2·00 per ton	——

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Printed at Office of *Agricultural Reporter*, 4 High Street, Bridgetown, Barbados.

AGRICULTURAL NEWS

Vol. XIII. No. 325.] SATURDAY, OCTOBER 10, 1914. [One penny.

JUST ISSUED.

WEST INDIAN BULLETIN.

Vol. XIV, No. 3.

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AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

OF THE

IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

VOL. XIII. No. 325. BARBADOS, OCTOBER 10, 1914. PRICE 1*d.*

CONTENTS.

The History of Agriculture.

To be unacquainted with the history of ones specialty is to lack that sympathetic interest which a knowledge of the past must invariably arouse. All the wider issues fail to be fully appreciated, and it is impossible to form just estimates of the value and creditable worth of past endeavours owing to ones ignorance of the conditions under which they were conducted. For the young man, as a form of education, the study of the history of his occupation has a broadening influence and frequently acts beneficially in the way of lessening the tendency to under-rate rather than over-rate results and achievements that are now out-of-date. In the business of agriculture as well as in the administration and science of agriculture is this true; in fact the study of history shows that these different spheres of activity are inseparable and in this way also is of great worth.

In forming an estimate of previous work it is essential to become familiar with the environment under which it was conducted. Few people who, in the ordinary course of events merely utilize for their own advantage the results achieved by others realize the difficulties that have in some instances been faced and overcome in bringing to light new facts or in materializing new ideas on a practical basis. The details of the environment under which the work was done remain untold, for on the modern knowledge market results are valued for what they are worth and not by the energy which has been expended in producing them—just as a pound hardly earned can purchase no more than a pound that has been gained with comparative ease. A study of history does the pioneer credit in this respect, and in doing this it arouses sympathy on the one hand or provides encouragement on the other for those similarly engaged at the present time. In other words, the study of history is inspiring.

From another point of view the study is of value in a more materialistic way. It shows the extent to which one event may affect another—a most important aspect for those who are concerned with administration in any capacity. The depression in the sugar industry in the West Indies during the nineties, for example, was largely responsible for the revival of the Sea Island cotton industry which has been the making of several of the islands. Coming nearer the present time, such

as event as the passing of the St. Vincent Agricultural Credit Ordinance, although it was not done with that motive, can now be seen stimulating the formation of credit societies in other places.

Such examinations of the past enable estimates to be formed of the future, and will provide illustrations of the adage that even in agriculture, history repeats itself.

Coming more particularly to the recent history of West Indian industries and scientific efforts, no better idea of the tendencies and difficulties can be got than by perusing the volumes of the quarterly journal of this Department. There have been big changes. Occasionally statements are made to the effect that the average planter tends to be conservative in his ideas. Whether this be true or not the fact remains that we have all been forcibly carried along into new commercial and scientific phases. At the beginning of the last decade there was practically no industrial organization in the West Indies and no co-ordinated research. Here the impression must not be given that the work of one or two isolated investigators is negligable, nor that the enterprise of individual planters at this time may be overlooked. On the contrary, the commendable and valuable nature of such work from the point of view of the historian serves to show up the general need for more of it at that time, and its worth is thereby emphasized.

But from the point of view of the general development of the present industrial fabric, it is interesting to observe that at the beginning of the last decade the pioneer investigators concentrated their attention on individual difficulties and requirements. Naturally problems were definitely circumscribed. There was the new work with varieties of seedling sugar-canes and the investigation of its different diseases: the manurial requirements of various crops were investigated: and attention was more and more drawn to the value of selection and the necessity for introducing new minor crops. Later when the cotton industry was beginning to be established special attention was given to the selection of this plant and to the study of the new diseases it brought. All these matters, however, were almost entirely botanical and chemical, though of course there were important economic aims underlying all this work. But it was not until about 1905 that what may be fittingly termed the economic period began. By now much of the chemical and selection work had resolved itself into routine investigation, brightened, it is true, here and there, by an original investigation carried on perhaps in a few spare hours when the routine work so permitted. But the economic period was one of organization, and was characterized by extremely important developments.

As examples of what has been done, reference may be made to the Government organization of the cotton industries in several islands, to the establishment of the central sugar factory system, to the land settlement organizations including credit systems, and lastly to two such recent co-operative institutions as the Antigua Onion Growers' Association, and the St. Lucia Government Lime Juice Factory. Then the general administration of agricultural matters has vastly improved of recent years, which means that educational facilities are better and that more agricultural literature is circulated. This improved administrative machinery of a very technical kind does not have to rely only upon local scientific research for facts, ideas and material, but can use its knowledge and experience to draw upon other places and employ imported information or material to the best advantage. Such work is as valuable in its way as the investigation of local circumscribed problems, but it is not noticed so much unless regarded historically.

Agricultural education has grown by perceptible stages during the last ten years and is now efficient as far as it goes. In the absence of large sums of money, which education is supposed to require, the West Indies have had to work on the principle, which is a very sound one, that almost anything can be made instructive if regarded intelligently. A typical movement has been to use secondary schools and Botanic Gardens and Experiment Stations as centres of education as well as the small holdings of the peasants where competitions are held. Directed from a central office, courses of instruction are arranged and without any definite educational institution either as regards personel or equipment three or four co-ordinated educational schemes have been evolved for the benefit of the inhabitants of these islands. This work again has grown, and for its proper appreciation requires to be studied historically.

The observations that have been made in the course of this article concerning the West Indies in particular refer principally to official or Government efforts that have been made of recent years. It will be understood that historical studies can be made back along other and longer lines. The

The history of West Indian labour and of the sugar industry from its genesis have been dealt with by several writers. They seem hardly aspects of the subject to be suitably considered here. Our object has been to indicate that the just apportionment of credit for work, true estimates of progress, and a live understanding that one is carrying on what others have set in motion, can be got best by a study of the history of agriculture.

SUGAR INDUSTRY.

THE POSSIBILITIES OF PALM SUGAR PRODUCTION.

Considerable interest was aroused in certain islands in the West Indies as the outcome of the prominence given to the sugar palm as a source of sugar in the *Agricultural News* for August 1, 1914, as well as in the *West India Committee Circular*. Attention to this plant has been given mostly by American investigators in the Philippines and Hawaii and by the Departments of Agriculture in British India. The discussion at the Eighth International Congress of Applied Chemistry included some remarks on the production of sugar and alcohol from the sap of the Nipa palm, and it is intended to reproduce some of these remarks in this article. First of all, however, to avoid confusion, it is intended to give the popular and scientific names of the principal palms which are at present regarded as providing profitable supplies of sugar.

The names of these are as follows: the palmyra palm (*Borassus flabelliformis*) investigated in India; the sugar palm (*Arenga saccharifera*) investigated in the Philippines; the wild date palm (*Phoenix sylvestris*) of Bengal; the Sago palm or Puri palm (*Corypha elata*) of the Philippines; and the Nipa palm (*Nipa fructicans*) of the Philippines. As well as these, there are other species of Arenga that offer possibilities, and even the coco-nut is not to be forgotten as a possible source as a by-product of sugar, or rather of alcohol.

For the moment it is the Nipa palm and the Sago palm to which we wish to call attention as a source of sugar and alcohol. It was stated at the Congress that there was considerable scope in the direction of using this palm which grows wild amongst an industrious native population, and it would appear that the reason why it has not been used as a source of alcohol is the want of investigation and the establishment of some system whereby the native agriculturists could conveniently carry on an industry. In regard to the sago palm, this tree lives for about thirty-five years and during this time stores up a large amount of starch as reserve material in the trunk. If an incision be made in the top of the tree below the bud, a pure juice can be collected which contains as much as 18 per cent. of sucrose. From 300 to 250 ℔ of sugar can be obtained in a season from a single tree. The sucrose thus formed is derived from starch, the latter being found to disappear from the top of the trunk downward. This conversion of starch into sucrose is ascribed to a specific enzyme. With further reference to this palm it may be of interest to quote the *Philippine Agricultural Review* for May 1914, which says: 'the Buri or sago palm will undoubtedly be held in high esteem in the future, when the methods of tapping it are better worked out and a way around the difficulty of its late maturity is found.' Speaking of the Nipa palm the same journal says: 'it is likely to be for some time used more as an alcohol crop.'

The increased price of sugar and the rapidly increasing demand for alcohol makes the subject of sugar palms of special interest in places where there is a large amount of available land not under field cultivation. It is not to be expected that these palms will ever displace the intensive cultivation of sugar-cane and similar crops, but they may be found to form a valuable supplement to the more systematized agricultural industries in the larger tropical colonies.

DEPARTMENT NEWS.

Mr. H. A. Tempany, B.Sc., F.I.C., Superintendent of Agriculture for the Leeward Islands, arrived at Barbados after five months' leave in England, by the R.M.S. 'Danube', on October 5, 1914. Mr. Tempany will proceed to Antigua by the R.M.S. 'Chaudiere' on October 8, after spending the intervening days at the Head Office in Barbados, for the purpose of discussing official matters with the Imperial Commissioner of Agriculture.

Mr. W. Nowell, D.I.C., left Barbados by the S.S. 'Guiana' on October 7, 1914, for the purpose of paying an official visit to Dominica. During his stay, the Mycologist will investigate lime root diseases and, in connexion with these, conduct trials with carbon bisulphide emulsion. Mr. Nowell is expected to return by the Royal Mail Canadian Steamer arriving in Barbados on October 21, 1914.

Information has been received to the effect that the Secretary of State for the Colonies has been pleased to promote Mr. J. C. Moore, Agricultural Superintendent, St. Lucia, to the position of Superintendent of Agriculture, Grenada. Mr. Moore is expected to arrive in Grenada from leave in England on October 26, 1914.

In the article on coco-nut experiments in Ceylon, which appeared in the last issue of the *Agricultural News* (Vol. XIII, p. 292), it will be seen that on plot 2, where sulphate of potash was used, the number of nuts per candy of copra was high, showing that this manure tends to exert an unfavourable effect in this particular respect. A similar influence was observable where nitrate of soda was the dominant manure. The best result as regards the number of nuts per candy of copra was obtained from that plot which was simply ploughed twice annually. Here the number of nuts per unit referred to was remarkably small and therefore satisfactory. In the report under consideration this latter result is commented on as being difficult to explain.

FRUIT AND FRUIT TREES.

THE PREPARATION OF ORANGES FOR MARKET.

A Note and Comment in the *Agricultural News* for March 1, 1913, pointed out the large degree of attention that has been given by agricultural authorities in South Africa to matters connected with the shipment of citrus fruit. The importance of standard boxes was strongly emphasized, and in order to show the value of good packing, it was stated that careful shippers during 1912 were getting 17*s.* 6*d.* per box of oranges, whilst careless ones obtained only 3*s.* 6*d.* to 6*s.* 6*d.* per box. The chances of commercial loss in this direction were it was pointed out, largely reduced by a system of Trade Commissioners in London and a method of Government inspection of fruit at the seaports of the Union.

It now appears that Rhodesia is hastening to devote attention to the same thing. In the *Rhodesia Agricultural Journal* for August 1914, the Citrus Advisor to the British South Africa Company, which is largely responsible for Rhodesian interests, calls attention to the action on the part of the Union of South Africa briefly outlined above, and gives information as to the best methods of preparing oranges for market, confining these remarks not to the fruit of a highly selected kind known as 'kid glove' varieties, but to the general average standard of fruit produced on the ordinary estate.

After discussing the time to gather fruit, the writer proceeds to describe the appliances required. The importance of the careful use of clippers for gathering is indicated, and it is pointed out that the calyx should be allowed to remain on the orange, for it is one of the hall marks of properly handled fruit. No protruding stub, however, must be left, or it will puncture other fruits coming in contact with it. In connexion with picking baskets or bags, it is stated that a wicker basket made flat on one side to fit against the back, and padded inside to prevent the fruit getting bruised is the most satisfactory receptacle. The gathered fruit is put into a grove box next; the fruit must be taken out and put into the groved box by hand and not poured out. No particular pattern of box is necessary, but the boxes should be strong and measure about 13 inches wide by 14 inches deep by 27 to 30 inches long. The pickers should be warned not to fill the grove boxes so full that the fruit lies higher than the top of the sides, so that they can be placed on a waggon one on the other in tiers without injuring the top fruits while carrying them from the grove to the packing house. Also, when filled, they should be moved to the shade of trees while waiting to be loaded.

Because the object of present day fruit growers is to cultivate low-headed wide-spreading trees, the importance of ladders is not as great as it was. In fact every endeavour should be made to employ ladders as little as possible because they tend to cause injury to the trees.

A simple matter which requires, however, careful attention is the curing of oranges. When oranges are first taken from the tree, the cells on the rind are filled with water and expanded to their full extent causing the rind to be brittle and the cells easily broken. In this condition damage during packing would be likely to occur, so to remove the moisture from the rind the fruit is kept in grove boxes, which are stacked in tiers around the packing house and the air permitted to circulate freely round and through them. Eventually the rind becomes more tough and leathery and reduced in thickness; in this condition it will stand pressure without bruising or bursting. The length of time required for curing varies according to the humidity of the climate. One danger attendant on the packing of damp fruit is the likelihood that fungi and bacteria may set to work and cause disease or fermentation.

After curing is finished the fruit is graded. The perfect specimens – those without blemish, extra bright, smooth, thin-skinned and of good shape – may be packed separately, and marked 'choice' or 'fancy,' but it is stated that unless the percentage of perfect specimens is fairly high it is best to leave them with the mass, relying upon the higher price the better appearance will command. The work of grading is followed by the operation of sizing. This is done by passing the fruit through a machine which mechanically places the fruits of the various sizes into separate bins provided for the purpose. By a good sizer is meant one that will size fruit (whether round or oblong) accurately according to its diameter, and which will pass the oranges on freely, not allowing them to stick and choke up any portion of its parts. It must not damage the fruit. It is noted in the article under consideration that although grading and sizing are here regarded as two separate operations they are in actual practice accomplished at one and the same time. That is, the boxes of fruit just as they come in originally from the grove are put into the hopper on the sizer and a man experienced in the work grades them, passing the marketable fruits down the one run-way of the sizer and inferior fruit down the other. Any fruit unfit for any grade whatever is thrown into the box placed near him for the purpose and this fruit is discarded altogether.

It has already been shown that the Government of South Africa have laid down regulations as to the size of the orange boxes, and a necessity for standardization in Rhodesia is pointed out in the article under review. The points of importance to be observed in making the boxes are that the frames should be made accurate and the parts square with each other or the boxes will be crooked and the inside unevenly divided, which will result in the packed box being too tight or to loose. Instructive details are given in connexion with the making of these boxes but space will not permit reproducing the information here. Turning next to the actual packing, it is stated that paper is required which should be thin, strong and contain as little oil as possible to enable it to absorb and throw off moisture rapidly. The paper can be purchased from dealers cut into squares ready for use in standard sizes. To facilitate the removal of oranges from the bins into which they have rolled from the sizer, a moveable stool is provided to enable the packer to reach the fruit easily. Coming to the operation of packing itself, detailed information again is given on this subject. 'If the wraps have a design upon them they are placed in the paper-holder with the design downward. With stool box and paper holder placed in position the packer takes a wrap with the tips of the fingers of the left hand allowing it to spread out over his palm; with the right hand he takes an orange from the bin and puts it, blossom end on, into the paper on the palm of his left hand and with the right gives the ends a twist and places it in position in the box. The first two layers of fruits are placed in the box with the twist of the paper upwards; after they are placed with the twist downwards. This brings the fruit in proper position in case the bottom of the box is opened by mistake in the market.'

The manner of placing the fruit in the box to suit the nine different packs and to fill the box exactly and tightly to the proper level which is from $\frac{1}{2}$-to $\frac{3}{4}$-inch above the edge of the box is indicated in a diagram accompanying the article which shows the arrangement of a layer of oranges of different sizes in crates.

THE QUALITIES IN CACAO DESIRED BY MANUFACTURERS.*

It is by no means easy to make a definite statement which is generally applicable, because the various manufacturers look for different qualities, and cacaos from certain districts are prized for special purposes. There is, further, some danger in describing a desirable appearance, for it is not the appearance that is wanted, but the qualities that are associated with it.

In general, we believe that if the planter only allows ripe pods to be gathered, ferments for a reasonable period, cures with care, and keeps the material dry, the beans will have the right appearance, and that he will be producing the best that the types of tree on his plantation will produce. It is evident from this statement that the value of claying and dancing is called in question.

We understand that *unfermented* cacao finds purchasers, but fermented cacao always obtains the higher price; unfermented beans are more difficult to shell, and they produce an inferior cocoa. Partially fermented beans suffer from the same defects. With over-fermented beans the shell may become so loose as to be fractured in carriage and handling. This opens the way for attack by grubs and moulds. This danger may also be incurred: (1) with over-ripe beans, in which the germ penetrates the shell; (2) by washing, which leaves the shell tender; and (3) by lack of care in curing.

Cacao may be spoilt by not observing conditions of cleanliness during fermentation, or by exposing to bad odours. On curing, these defects may be hidden, only to be revealed again on roasting, when the objectionable 'hammy' or other flavour is developed.

Other objectionable features are the presence of twig-like pieces of dried pulp and placenta, and of small flat beans.

Criollo cacao obtains a higher price than Forastero or Calabacillo, because, while it is the rarest, it is a valuable ingredient of good chocolate. Large beans are preferred because they have a lower percentage of shell than small beans.

Probably the most highly appreciated quality is constancy or reliability of quality. A cacao which varies from bag to bag, or from time to time, will get little appreciation. Under ideal conditions standard qualities would be put on the market—Criollo, Forastero, Calabacillo would be fermented separately, and the beans graded according to size. Such a procedure would only be practicable where the cacao from several plantations was taken to a central fermentary. At the present time we are far from this. Indeed, instead of a careful grading of good qualities, there is in practice a mixing of good and bad. Thus cacao merchants buy cacao which they know to be diseased or unfermented and deliberately mix it with good cacao. Such an action may not seriously affect the price of that particular lot, but it affects detrimentally the reputation of the cacao from that district, and the manufacturer regards that cacao as less desirable.

It is to be regretted that in some places cacao is still taken to the steamer in surf-boats. Well-prepared cacao thus becomes wet with sea-water, and may later be spoilt by mould.

*Abstract of a paper read by H. P. Booth and A. W. Knapp, of Messrs. Cadbury Bros., Ltd., at the Third International Congress of Tropical Agriculture, London, 1914, appearing in the *Journal of the Royal Society of Arts* for August 7, 1914.

MOCHA COFFEE CULTURE.

The *Monthly Bulletin of Agricultural Intelligence and Plant Diseases* for July 1914 contains the following note on the cultivation of Mocha coffee:—

Mocha coffee derives its name from the small ruined town on the South Arabian coast of the Red Sea from which it used to be exported. It is an absolutely unique product with a flavour and aroma quite distinct from the Abyssinian variety; though many writers consider them identical.

The trees belong to three main types: (1) pyramidal with the biggest branches at the base; (2) umbrella-shaped with the lower part of the trunk bare; (3) bush shaped.

In the low regions where rain is abundant, the fruit is larger but of inferior quality; in the hot dry uplands, growth is slower and the grain is smaller and rounder, but of the finest quality.

The annual production of Mocha coffee is about 100,000 bags of 160 lb. each, and the principal importing countries are the United States, which takes 30 per cent.; France which takes 20 per cent.; and Egypt which takes 18 per cent., others being the Red Sea ports (7 per cent.), and Germany (5 per cent.), England (5 per cent.), Spain (3 per cent.), and Austria (3 per cent.). About half the amount is exported from Aden, and half from Hodeidah.

THE CUBAN WALNUT.

This interesting species, known botanically as *Juglans insularis*, Griseb., is a tree which is found commonly along the water courses in the Highlands of western Cuba. In the *Modern Cuban Magazine* for August 1914, Senor J. T. Roig publishes the specific characters of the plant, and points out that it is distinguishable from a closely related Walnut that grows in Trinidad. The trees sometimes attain a height of 100 feet or over and are found in some abundance only on mountains of certain altitudes. The trees are very little known in Cuba outside the regions where they grow, and in view of the fact that these native nuts are reported to be as good and of nearly the same size as those obtained for consumption from North America, it seems desirable to publish information on the subject. Moreover, the timber of this tree is fine-grained and should be in demand for cabinet work. The horticultural value of the tree promises to be important owing to the suitability of the plant as a stock on which to graft imported varieties of walnuts and pecans. The nut in its wild state compares favourably with the imported black walnut; the kernel is much more mild in flavour than that of the American species, and an important botanical feature is the great variation exhibited as regards size and shape of the nut and thickness of the shell, thereby throwing out possibilities for improvement by selection. It is believed that *Juglans insularis* should prove useful as a shade tree for coffee and cacao.

Attached to the article are two plates illustrating the botanical features of the plant: these include the nuts, hulls, leaves, bark and stem, as well as reproductions of the different types of nut in cross-section.

Botanically it is interesting to note that Cuban opinion favours the idea that *Juglans cineria*, Lin., which is a North American species, does not exist in Cuba, and it is asserted that *Juglans cineria*, described by Richard some years ago in Cuba, is synonymous with Griesbach's *J. insularis*.

It will be seen that there are several points of interest attaching to this plant, and it might be desirable to establish specimens in the Botanic Gardens of the West Indian islands. Further information can be obtained from Signor J.T. Roig, Botanist, of the Cuban Agricultural Experiment Station

AGRICULTURAL PROSPECTS IN MONTSERRAT.

On September 19, the Commissioner of Agriculture, at the invitation of the Commissioner of this Presidency, Lt.-Colonel Davidson-Houston, C.M.G., addressed a large and representative meeting held in the Court House in Plymouth, Montserrat, on the agricultural prospects of Montserrat, at which His Honour the Commissioner presided.

In the opening portion of his address Dr. Watts reviewed the past history of the island, as indicated by consideration of the value of the exports: he dealt with these in a series of nine quinquennial periods back to 1869, and showed that during the first three of these periods 1869-73, 1874-8, 1879-83, the total exports had an average value of some £32,909. In 1883 came the sugar crisis from which time the sugar industry of the island dwindled, as is shown by the gradual falling off in the value of exports in the succeeding periods, these being in 1884-8 £24,000, 1889-93 £27,223, 1894-8 £20,020.

The rise in the period 1889-93 was due to a vigorous effort to restore the sugar industry by resuscitating the group of properties known as the Irish estates.

The period 1899-1903 was the most disastrous in the island's recent history: the sugar had dwindled to small proportions and all agricultural work received a crushing blow in the hurricane of 1899. In this period the value of the exports fell to £13,853, being as low as £8,287 in the single year 1900.

Fortunately, at this period, attention was directed in several parts of the West Indies to the possibilities of cotton growing, and nowhere more energetically than in Montserrat; so that the cultivation of Sea Island cotton, which first figures in the exports of 1903 with a value of £1,487, soon became an industry of importance and we find the island's exports improving in value so that in the period 1904-8 they reached an average of £29,348 a year, and in the period 1909-13 they exceeded £40,000.

During this last period, cotton has assumed the position of greatest importance, the average annual value of the exports of cotton and cotton seed being £22,372. The average value of limes and lime products, the items next in importance, being £8,050.

Obviously, then, Montserrat is greatly dependent on its cotton industry, and must view with some concern the interference with this and the consequent low prices that are anticipated as the result of the existing European war. The situation is, therefore, one that must be fairly faced and carefully discussed.

In view of the temporarily diminished consumption of Sea Island cotton it would seem desirable that there should be a temporary reduction in output so as to obviate the accumulation of large stocks at low prices, as they would tend to depress values unduly during a prolonged period.

There will undoubtedly be some reduction in planting next year in those islands that are largely producing sugar, in view of the high prices likely to be obtained for that commodity. There will thus most probably be some reduction in Antigua and in Barbados. The diminished price of cotton will in itself tend to curtail cotton planting in many places; attention will be turned to other crops.

Facing now the position presented to Montserrat, the speaker saw no reason for apprehension. The island has recently had a period of very considerable prosperity, money is now more abundant and more widely diffused in the island than it has been in living memory, while the lands of the island are more generally cultivated, are more opened up and weeded and cleared than they have probably ever been. The opportunities therefore, are extremely favourable for attempting new industries while still continuing the cotton industry on a reasonable scale on the lands known to be well suited to the crop, and on which the cultivation can be carried on most economically.

The question arises— What crops can be considered other than cotton?

The increased price of sugar will no doubt make it worth while to consider the revival for a time of the muscovado sugar industry. There is still a fair area under sugar cultivation, chiefly producing sugar for local use: there are several sugar works and these may be repaired and improved to enable the crops to be taken off. It may be worth considering at this juncture whether small muscovado mills may not be operated by means of oil engines. Dr. Watts understood that this is being tried in at least one instance in Montserrat. A new and substantial set of works has just been erected at Rileys that will serve a fair area. Speaking generally, the district from the windward side of the island from Farm to the leeward side to Gages may be regarded as capable of providing itself with sugar machinery of a not very perfect kind it is true, but of a character that may enable sugar to be grown to advantage during a period of high prices.

Sugar alone will not suffice, and attention must be given to other crops. Speaking broadly, for export purposes there should be crops that will keep and can be stored: one's mind naturally turns to grain crops that have this advantage.

Foremost amongst grain crops stands corn (maize). The people of the island are familiar with its cultivation: it serves as a home-grown food and the excess can be exported. It is anticipated that many food crops, including corn, will sell at increased prices during the next few years: before the disturbance of values caused by war, corn was steadily increasing in price and new sources of supply were being sought. The West Indies are now obtaining less and less corn from the the United States and are getting large supplies from the Argentine.

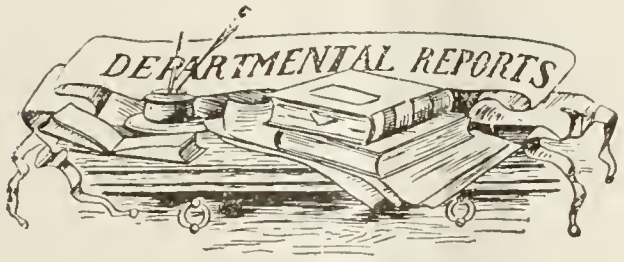
Corn cultivation fits in well with cotton: when the cotton crop is reaped it is easy to prepare the land for corn and to plant considerable areas. Corn is a short period crop so that a return is quickly obtained and the land is available for some other crop. A moderate monetary return thus remunerates the grower for the work of a short period.

If corn is to be grown on any large scale and for export, it will be necessary to consider the question of drying machinery. Fortunately, a certain amount of information is now available as the outcome of the experiments made in Antigua in this direction. It seems possible to obtain for a moderate cost, machines capable of drying 15 to 20 bushels of corn an hour; such machines should be within the capacity of local corn growers or co-operative associations of growers.

Arising out of this may come the question of central drying establishments and granaries.

If corn growing is to be attempted on any considerable scale, increased attention must be given to methods of cultivation, seed selection and manuring: it will be necessary to modify the somewhat haphazard methods now in vogue and to deal with the matter in a more businesslike manner. The Imperial Department of Agriculture intends to publish a pamphlet on corn growing at an early date.

The account of this address will be concluded in the next issue of the *Agricultural News*.



ST. LUCIA: REPORT ON THE AGRICULTURAL DEPARTMENT FOR THE YEAR ENDED MARCH 31, 1914.

Issued in the same form as those previously reviewed in this volume of the *Agricultural News*, the report under consideration begins by describing the work done in the gardens and the observations made on the decorative plants. In connexion with plant importations an interesting event has been the introduction of two species of Juniperus and the receipt from the Trinidad Agricultural Department of several grafted varieties of mangoes. Work in the nurseries has included the raising and distribution of a large number of economic plants. Out of a total of nearly 59,000 plants distributed, nearly 57,000 were lime seedlings. Of these lime plants 1,800 were distributed free to Crown Land purchasers. Owing to the Department's work at Union having been gradually closed down during the year, the special line of work just referred to is now being carried on at Réunion in the Choiseul district.

The establishment of this station was one of the principal events of the year before last, and during the year under review its first season's work is also of special interest. An account has already appeared in a recent number of the *Agricultural News* (see issue for June 20, 1914) on the first year's work at Reunion, and it will only be necessary to refer here to one or two details connected with the routine work. Plots have been established for the raising of lime plants, vanilla, Para rubber, oranges, grape fruit, etc., and as soon as the necessary protection from wind by the planting of wind-breaks has been accomplished, it is likely that success will attend this important line of work at the new experiment station. It should be mentioned here that, appended to the report of the Agricultural Superintendent are the regulations made by the Governor-in-Council in regard to Réunion estate, part of which has been cut up into small holdings and a part reserved for the experimental work above referred to. The appendix contains a valuation of the Land Settlement lots and the report on the working of Réunion estate for the year under review. In concluding these remarks on Réunion estate, it may be noted that this institution has successfully passed through its first year of operations with results that give cause for much gratification.

Turning to the section in the report dealing with insects and fungus pests, it is stated that useful work continues to be done by the encouragement of entomogenous fungi. A special line of activity continued from the previous year has been the cacao root disease experiment. It has been proved that the causative fungus can live as a saprophyte, and can also attack lime trees as well as cacao trees that may be planted in an infected area. During the past year, an interesting experiment has been the application of a fungicide known as 'Fungal', with a view to testing its preventive and curative powers. The results obtained have been disappointing and it appears so far, that the only remedy and preventive treatment for cacao root disease is by means of deep isolation trenches, the application of quicklime to the soil and the burning of diseased wood on the spot.

Progress in the chief industries has been satisfactory. The value of the lime products exported was approximately £3,110 compared with £1,084 and £290, the values for 1912-13 and 1911-12, respectively. The principal industry as far as the total value of the exports go, is sugar. The value of the sugar products exported for the year under review was £67,679 compared with £53,549 for 1911-12. It is possible that in the future the sugar industry in St. Lucia may undergo increased development, but it is unlikely that it will extend as rapidly as the lime cultivation.

In regard to cacao, the position remains about the same, the value of the exports being about £36,888. It is observed that there is considerable neglect on the part of the peasants in regard to this cultivation—a matter which the Department is endeavouring to deal with.

The minor industries of St. Lucia include coco-nuts, honey and Bay oil. It may be noted that the value of the honey exported is considerable, being worth over £500 annually. During the season under review apiarists reported that the honey season of 1913 had been bad, hence the present figures are below the average. It is stated that the local demand for selected seed nuts for coco-nut plantations has been considerable. The future before coco-nut planting in St. Lucia is satisfactory.

Agricultural education in St. Lucia falls under four heads. As in other islands, there are the Reading Courses Examinations of the Imperial Department of Agriculture; as well as this there are the agricultural pupils at the Botanic Station, the agricultural lectures in the secondary school (St. Mary's College) delivered by the Agricultural Superintendent, and agricultural instruction in the primary schools. There are certain special difficulties attaching to agricultural education in St. Lucia but, on the whole, the efforts that are being made appear to be serving a useful purpose. It is satisfactory that improvement is indicated in regard to nature study in the elementary schools. The largest part of the section on agricultural education in the report is devoted to elementary school inspection, which shows that useful work is being done in this direction by the Agricultural Department.

The extension of interest in the lime industry led the Government in 1913 to establish a lime juice factory where peasants and others could sell their produce on a co-operative basis. As already noted in the *Agricultural News*, in determining the profits there is deducted from the amounts realized for the sale of produce the amounts paid for the purchase of limes and lime juice together with the expenses of working the factory and disposing of the produce, and, in addition, a sum equivalent to 10 per cent. of the amount paid for the purchase of limes and lime juice, the remainder being regarded as gross profits to be divided, one-third being paid to the Government and two-thirds to the vendors of fruit and juice, this latter to be distributed to the vendors by way of bonus, in proportion to the amounts paid to them for limes or lime juice. The price paid for limes and lime juice is based on a scale of prices having a relation to the value of concentrated juice and insuring a safe margin of profit to the factory. The seller of fruit realizes his full value when he gets his bonus derived from the share of profits.

The first year's working of the factory has shown that juice concentration, amongst other processes, has given extremely satisfactory results, particularly as regards factory loss of acid. By referring to the report a full account will be found of these matters, including a description of the building and plant.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

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The *Agricultural News*: Price 1*d.* per number, post free 2*d.* Annual subscription payable to Agents, 2*s.* 2*d.* Post free, 4*s.* 4*d.*

Agricultural News

Vol. XIII. SATURDAY, OCTOBER 10, 1914. No. 325.

NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number discusses the value of a study of the history of agriculture, with particular reference to what has taken place during the past fifteen years in the West Indies.

On page 321, an account will be found of the most recent information on palm sugar production. A list is given of the principal palms which are at present regarded as providing profitable supplies of sugar.

A useful account of up-to-date methods of preparing oranges for market will be found on page 322.

On page 324, an account of an address given by the Imperial Commissioner of Agriculture at Montserrat in regard to the agricultural prospects of the near future, is published on page 334.

A review of the report on the Agricultural Department, St. Lucia, for 1913-14, appears on page 325.

Insect Notes, which will be found on page 328, comprise an article on a wood-boring moth which damages certain economic and ornamental plants in the West Indies.

Instructive information concerning co-operative credit in Trinidad will be found on page 332.

The West Indian Bulletin.

The present issue of the *West Indian Bulletin* (Vol. XIV. No. 3) contains six articles of much interest and importance. The first is entitled A Veterinary Survey of the Windward and Leeward Islands. In this, Mr. P. T. Saunders, M.R.C.V.S., late Veterinary Officer to the Imperial Department of Agriculture, reviews in geographical order his professional and official observations made during the last three years through the islands from Grenada to St. Kitts-Nevis inclusive. This contains useful suggestions and comments on such matters as quarantine legislation, the control of tuberculosis, of the meat and milk supply, and the general aspects of veterinary matters in the several islands.

On agricultural education and its adjustment to the needs of the students, Dr. Francis Watts, C.M.G., Imperial Commissioner of Agriculture for the West Indies, writes at considerable length, and beginning with the most elementary grades, sketches the various systems in vogue with particula rreference to the West Indies. In this paper, which was read at the recent International Congress of Tropical Agriculture, Dr. Watts refers at some length to the question of Agricultural Colleges.

In view of its industrial importance, an account of the advantages and disadvantages relating to the budding of cacao is reprinted in this number from the last Annual Report on the Agricultural Department, Dominica, under the charge of Mr. Joseph Jones.

Turning to the next article, in view of the uncertainty that has long existed in regard to the chemical methods employed for the commercial valuation of concentrated lime juice and citrate of lime, a translation of the Report of a Chemical Committee of the Ministry of Agriculture, Rome, is reproduced, and this states that of all methods, Ogston & Moore's (Warrington's) method is to be preferred. Following on this article, are tables of specific gravities and the equivalent pounds of sugar per Imperial gallon of cane-sugar solutions at 30° C., compiled by Mr. William Douglas, F.I.C., F.C.S.

The number ends with the Annual Report on the prevalence of some pests and diseases in the West Indies during 1913, compiled by the Entomologist and Mycologist on the Staff of the Imperial Department. The form of this report is now well known to West Indian readers, and it is to be expected that the present report like previous ones will serve a useful purpose. It shows concisely the degree of occurrence of the different pests and diseases of cultivated crops in the Windward and Leeward Islands during the past year.

Jamaica's Export Trade.

Statements appear in the Supplement to the *Jamaica Gazette* for July 2, 1914, showing the position of Jamaica's export trade for 1913. The interest of the United Kingdom, from the figures given for the last three years, appears to be a rapidly diminishing quantity. In forty years her percentage of acceptance has dwindled down from over 81 per cent.

to just over 17 per cent. There is evidence of an increasing trade with other countries, that is to say, places other than the United Kingdom, the United States and Canada. A big falling off is shown in regard to the shipment of sugar to the United Kingdom, whilst a general decrease has occurred in the case of Jamaica's greatest product—fruit. This was due largely to the unfavourable seasons of recent years, but it is satisfactory to note that there is a corresponding improvement in the output of coco-nuts, dyewoods and tobacco, these being articles which are either neglected in more prosperous times, or which are more or less uninfluenced by seasonal conditions. In the near future an increase of the exports of essential oils is looked for, and there is no doubt that next year there will be large alterations all round, particularly in regard to the export of sugar, fruit, cacao and dyewoods to the United Kingdom.

An interesting table is given in the report under consideration, which affords a bird's-eye view of the relative importance to the island of its staple products, and of its minor products. Fruit comes first, being about 50 per cent. of the value of the total exports, the lowest position is occupied by sugar—2 per cent. During the last three years the shipment of cacao has increased; 3·6 per cent. in 1911, the value of this product in 1913 was 5·2 per cent.

Agriculture in Ceylon.

Interesting information is contained in *Colonial Reports*—Annual (Supplementary) No. 797 for Ceylon in regard to agriculture in that colony during 1912.

In the section dealing with the Department of Agriculture, it is stated that it has been reorganized on a completely new footing, to meet the needs of the planting community and of research work.

A trial of cotton growing in the south of the island has proved successful. The variety experimented with was Allen's long staple American Upland. The coco-nut crops of 1912 were shorter than they should have been, owing to the drought of the two previous years. Cacao, on the other hand, passed through one of its best years. Prices were, on the whole, higher than in previous times.

Dealing with diseases of animals, the report states that rinderpest prevailed in the North-Central and North Western Provinces during April, May, and June. The total number of cases was 9,103, of which 6,096 died, and 717 were shot. There were also 485 cases reported of foot-and-mouth disease. None of these diseases occur in the West Indies.

With regard to the settlement of Crown lands, the report states that during the year 1912 an area of about 96,000 acres was settled. The confidence of the people in the fairness of the settlements offered continues, and the increased facilities for acquiring land from the Crown are appreciated. Except in special cases, the alienation of Crown land in Ceylon is effected by the sale of the freehold at public auction.

Vegetable Growing in Antigua for Canadian Market During Winter Months.

At a recent meeting of the Antigua Agricultural Society, Mr. T. Jackson, Agricultural Superintendent, read an important paper concerning the possibilities of developing a trade in vegetables with Canada during the winter months. It was pointed out that Antigua should be able to compete successfully even with Florida, Cuba and Porto Rico during the winter months because of the risk caused by the occurrence of frosts in Florida, heavier freight charges, and the fact that most of the Cuban and Porto Rico supply is consumed in New York.

The reason why this idea has not been taken up seriously in the past seems to be because of difficulties attendant on packing and shipping. Experience in regard to the cultivation and exportation of onions, however, has already provided information which will enable these deterrent factors to be overcome. As regards the condition in which vegetables from Antigua may be expected to arrive in Canada trial shipments have already shown that even such perishable vegetables as tomatoes and pumpkins have arrived in good condition and have sold at a profitable prices. It is essential of course that only sound vegetables should be exported and that attention be given to packing, and to variation in regard to age and maturity. In fact the chief difficulties seem to lie almost entirely on the part of the producers, but with the same expenditure of energy and skill that has been shown in regard to onions there is little doubt but that more perishable produce could be raised and exported with profit.

In the event of Antigua taking up this industry, Mr. Jackson advised that it might be best to utilize the cane banks of early fields for such crops. This would not necessitate a reduction in the area under cane and would be economical in other ways. As regards source of seed, it was pointed out that selected seed of acclimatized vegetables is generally better than that of imported kinds. It was advised that standard varieties of the following should be grown in small quantities: egg plant, pumpkin, sweet pepper, ochro, squash, water melon, tomatoes, cucumbers and beet root. Potatoes were omitted because these were deserving of a special note, for it has been definitely proved that certain lands in Antigua can produce potatoes ripening from January to April. This crop alone, therefore, is worthy of attention.

The paper concluded with a reference to the possible means of establishing a co-operative institution for packing, etc., and for special investigation in regard to insect and fungus pests.

Mr. Jackson's suggestions received the full support of the members of the society, and it is expected that action is now being taken to put the above ideas to a practical test.

INSECT NOTES.

A WOOD-BORING MOTH.

The following letter from the Agricultural Instructor, Nevis, to the Imperial Commissioner of Agriculture again calls attention to the ravages of this wood-boring moth which is injurious to a wide range of trees and shrubs, and is generally distributed in the Lesser Antilles:-

'I beg to forward specimens of a grub found boring into the stems of orange and tangerine trees. The grub attacks fairly large stems, tunnelling in the hard wood. The stems which are attacked remain green for a fairly long time after the hard wood is practically destroyed, especially if the weather is favourable; but the whole stem eventually dies.

'I am also forwarding a piece of the stem showing the damage done. This was quite green when taken from the tree.'

Examination of the specimens referred to above indicates that the 'grubs' are the caterpillars of the moth *Duomitus punctifer*, Hampson. The piece of stem (? tangerine) mentioned in the letter, appears to show an attack of this insect in an advanced stage with certain minor peculiarities which will be mentioned later.

Duomitus punctifer was described and figured as a new species by Sir Geo. F. Hampson, Bart., B.A., in a paper entitled 'The Moths of the Lesser Antilles', which was published in the *Transactions of the Entomological Society*, London, Part III, September, 1898. This paper gave an account of moths of certain families collected by Mr. H. H. Smith in St. Vincent, Grenada and the Grenadines, with certain records (Dominica and St. Lucia) of insects collected by Mr. W. H. Eliott. In this paper, the distribution of *D. punctifer* is given as Dominica, St. Lucia, St. Vincent and Grenada.

Injuries to trees similar to those now known to be caused by this insect have been observed in the Lesser Antilles for a number of years, but in most cases only the larvae were found and in some only the tunnels caused by them

The first published account of these injuries definitely ascribed to the attacks of *Duomitus punctifer* appears to be that included in the Annual Report of the Barbados Department of Agriculture for 1912-13, where the Assistant Superintendent of Agriculture gives an account of the life history, with descriptions of the larva, pupa and adult, the nature of the attacks and the remedies to be adopted for their control. The plants there recorded as attacked are the white wood (*Tecoma leucoxylon*), soursop (*Anona muricata*), *Ipomoea* spp., and ornamental crotons (*Codiaeum* spp.).

Duomitus punctifer is a moth of the family Cossidae which includes a number of species the larvae of which are borers in the woody stems and branches of trees and shrubs.

The adult of this species is grey in colour, slightly tinged with pink, the body is tapering and spindle-shaped and the wings are rather narrow, giving a general appearance somewhat like that of the hawk moths. The female moth has a wing expanse of about 2½ inches; the male is somewhat smaller. The male is an active flyer and is frequently attracted to light. The female does not fly so readily, at least until after the eggs are laid.

The eggs are laid in or on small twigs. The hatching larvae tunnel through these to the larger branches. The fully grown caterpillars are sometimes as much as 2 inches in length. The colour is a dirty white with a yellow 'cervical' or prothoracic shield; the mouth parts are dark brown.

When the larva is about to pupate it eats its way toward the surface, and leaves a thin film of bark as a cover to the exit from its tunnel; and then, drawing back a short distance into the tunnel, it pupates. The pupa is naked: the abdominal segments are armed with rows of backwardly directed spines and the head bears a stout spine which projects forward. When the moth is about to emerge, the pupa works itself forward by means of the abdominal spines, breaking the thin cover of bark over the exit of the tunnel, by means of the spine on the head, until it (the pupa) stands out from the surface of the bark by nearly half its length. The pupa case then splits open and the moth crawls out. The empty pupa cases may often be seen projecting from the tunnels.

A characteristic feature of the tunnels of this moth is to be found in the partitions which are built across the tunnels at intervals.

The food plants of this insect would appear to be many. As long ago as 1900, a borer in the stem of coffee, was reported as doing considerable damage in Nevis. This insect was not identified, but it was stated to belong to the family Cossidae, and was probably this species. A few years later, camphor trees growing at the Botanic Gardens at St. Kitts were severely injured by the larvae of a Cossid moth, which has since been identified as *Duomitus punctifer*, and since then (1912) this insect has been recorded attacking the Nicaragua shade tree (*Glyricida maculata*) in the same locality.

In Antigua, the soursop has been attacked by a borer which is believed to be the same insect. In Montserrat, it has been found tunnelling in sapodilla trees (*Achras sapota*). In St. Lucia, it has been reported in guava, in St. Vincent, in *Pithecolobium saman*.

In the case of the section of stem of tangerine from Nevis, mentioned at the beginning of these notes, a peculiarity occurs which is worthy of remark. The attack in this stem has been of many years' duration, judging from appearances. Several of the openings of the tunnels have entirely healed over by the growth of a callus, while others give the impression that the caterpillar ate right through the bark not leaving the usual thin protective layer of bark over the mouth of the tunnel. It is likely, however, that the insect followed its characteristic custom, and that the unusual appearance is due to the fact that the strong growth of callus under the bark forced off the remnants of the thin covering over the tunnel, giving the impression that the larvae had eaten it away.

It has been observed that often, if not always, the tunnels of *Duomitus punctifer* in the smaller branches of the whitewood are infested by a mealy-bug which sometimes occurs in large numbers.

The remedies are the usual ones for wood boring larvae. Badly infested trees or portions of trees should be cut and burned. In other cases, the larva may be killed by probing with a strong wire, or they may sometimes be removed by means of a wire hooked at the end. Carbon bisulphide injected into the tunnels is also a satisfactory means of killing the larva. The partitions across the tunnels should first be broken by probing with a wire, and after the carbon bisulphide has been injected, the tunnels should be stopped by means of wet clay, wax or soap. Carbon bisulphide is a volatile and inflammable liquid, and no fire or light should be brought near it.

In all cases where severe injury to trees and shrubs has been reported, the attacks appear to have been continued over a long time. A little observation should enable the presence of this insect to be discovered before the injury has become so severe, and it should be possible to check the attack in its earlier stages.

VETERINARY NOTES.

RECENT VIEWS ON BOVINE TUBERCULOSIS.

It was promised in the last issue but one of the *Agricultural News* that an article on the papers prepared for the recent International Veterinary Congress, London, would be published in this issue. The following summaries have been taken from different papers dealing with the important subject of tuberculosis. At the end of a Report on the Tuberculosis Bureau of the Royal Agricultural Board, Stockholm, Mr. Gustav Regnér writes:—

It has been my desire in the foregoing to point out the necessity of noticing, and, as far as possible, making use of the favourable factor in the struggle against tuberculosis. This factor is indisputably to be found in the fact that there are numerous herds which are free from tuberculosis.

It must not be expected, however, that farmers will take the initiative by themselves in this respect. *The defensive side of the tuberculosis struggle also requires support and guidance from higher quarters*, this so much the more as the herds here in question often belong to the less intelligent and, financially less favoured farmers.

In my opinion the Government must therefore render assistance in this part, as otherwise in the struggle against tuberculosis, by letting the farmers have tuberculin-tests free of charge and by veterinary surgeons giving them all necessary advice and information.

On account of what I have said, and on condition that a resolution on the tuberculosis question be submitted to the Congress for adoption, I therefore submit that same may contain the following thesis:

Those herds which are naturally non-tuberculous must be searched out and in every manner protected from infection. At least the expens in connexion with this searching should be defrayed by the Government.

As regards the relation of the types of tubercle bacilli, Professor Eber, Director of the Veterinary Institute of the University of Leipzig, came to the following conclusions:—

Pure cultures derived directly from human or bovine sources possess certain biological characters which, in the majority of cases permit of a distinction into a human and a bovine type.

The occurrence in nature of transitional forms between the said types (atypical strains), and the possibility of changing the human type by passage through animals in such a way that, with the means at present at our disposal, it cannot be distinguished from the bovine type, indicate that the characters mentioned depend upon adaptation to the host for the time being, and that under certain conditions they can again be altered by a change of host. The two types of mammalian tubercle bacilli described by Kossel, Weber and Heuse, the human type and the bovine type, are not in reality types or subspecies with constant characters, but rather varieties of one and the same bacillus with relative variable characters.

Meat inspection in regard to transmission is an extremely important branch of the subject of tuberculosis. On the general principles governing the examination and inspection of the organs and meat of tuberculous animals, Dr. Nieberle, of Hamburg, holds the following views:—

(1) The most important problem in meat inspection is the certain recognition and the proper removal of tuberculous organs and their associated parts.

An organ is to be considered tuberculous when its lymphatic glands are tuberculous.

(2) In cases of localized and regressive generalized tuberculosis, and in cases of extensive disease of the intermuscular glands, the meat may be exposed for sale in the raw condition after the removal of the diseased portions. Where the disease is very extensive a declaration to that effect must be given.

(3) A whole carcase is to be considered unfit for food when there is (a) tuberculosis with marked emaciation; (b) acute miliary tuberculosis or evidence of a recent generalization.

In the case of (b) the sterilized fat may be sold for human consumption under declaration.

(4) In cases in which the suspicion arises that the meat may be dangerous (the presence of lesions in the organs, with recent widespread caseous miliary tuberculosis of the lymphatic glands, or of the so-called softened tuberculous lesions) the inspector must examine the carcase thoroughly for the existence of evidence of a recent infection by way of the blood stream.

(5) In the examination of every case of tuberculosis the inspector must examine and cut into all the glands or organs at the seat of primary infection. In all cases in which the localized nature of the disease is not beyond doubt all the intermuscular glands must be examined.

FATTENING PIGS IN CASSAVA.

Although it is unlikely that under present conditions profit will accrue from the employment of this starch as food for pigs in the West Indies and possibly not even in Europe, the following note, taken from the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases* for July 1914, contains results on the subject of sufficient interest and importance to deserve their being placed on record in the *Agricultural News*. The investigations are described by Mons. A. Gouin and P. Andouard from Paris.

The writers, continuing Professor Frateur's experiments in feeding pigs on cassava, made some trials, and found that the method recommended by Professor Frateur might be profitable in Belgium, where cassava is obtainable for twelve or thirteen francs for 100 kg. (*4s. 10d.* to *5s. 3d.* per cwt.), but that it could not be followed in France, where cassava costs 18 francs the 100 kg. (*7s. 3d.* per cwt.).

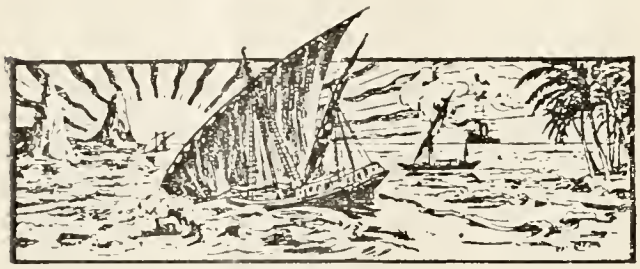
With a view to finding a more economic use for cassava, the writers made some experiments of their own, with the following results:—

1. In the case of pigs fed with milk as well, it only took 3 lb. of cassava to produce a gain in live weight of 1 lb. instead of 4·18 lb. of cassava required at Louvain.

2. By substituting for the milk ration 1·1 lb. of rice gluten and 2½ oz. bone meal, which costs *1d.* and is equivalent to 1 gallon of separated milk, there is required, to produce a gain of 1 lb. live weight, only 2·9 lb. of cassava.

In practice, the profit exceeded 40 per cent.

Professor Frateur fed the cassava to the pigs in slices, cooked and then crushed. The writers fed it raw. It had been previously chopped fine in the colony itself.



GLEANINGS.

During 1913 to 1914, 16,880 lime plants were raised and distributed at the Botanic Station, Montserrat; 3,270 bay plants and 10,628 sweet potato cuttings besides a large number of other planting material were also sent out.

Reference is made in the *India Rubber World* for September 1914 to the opening early this summer of the new Treub laboratory at the Botanic Gardens, Buitenzorg, Java. In this Colony also, a new agricultural school has just been opened, the instruction at which will be of a special character.

The ground nut still continues to be the only article actively cultivated for exportation in the Gambia, and is likely to continue so while in good demand, and until some more easily grown crop for which there is a market is discovered by the local non-strenuous agriculturists. (*Colonial Reports*—Annual, Gambia, No. 805 of 1914.)

In the *Journal of the Royal Society of Arts*, an interesting article appears on the orange industry of Spain. This refers to the bitter marmalade oranges of Seville and to those shipped for direct consumption. The article discusses the preparation of oranges and orange material for shipment, including orange flower water and orange wood. Land adapted to orange cultivation in the Seville districts is valued at from £40 to £100 per acre.

From information received by the Imperial Commissioner of Agriculture from the Canadian Trade Commissioner for the West Indies, there appears to be some possibility that onion growers in the West Indies, particularly the Antigua Onion Growers' Association, may soon extend their market in Canada to include British Columbia. The Association referred to is giving the matter prompt attention.

An interesting note appears in *Nature* for July 2, 1914, on marine biology in the tropics. It states that the action of denitrifying bacteria in tropical seas is considerable, as is also the precipitation of calcium carbonate by marine bacteria. The extraordinary work of *Bacillus calcis* is stated to be responsible for the formation of chalk and oolitic rocks in the shallow seas round the Bahamas.

If tea is kept for a long time in packets for shipment it deteriorates; but if the tea is kept on the estate, the packets can be re-opened and re-fired prior to despatch, thereby ensuring a continuation of a sound condition. This idea is being taken into consideration, according to the *India Rubber Journal*, in Ceylon owing to the limited storage accomodation in Colombo under the disturbed conditions of the present time.

A seemingly good way of denaturing alcohol is by bringing ethyl alcohol, before it has passed through the state of vapour in contact with the vapours arising from the destructive distillation of wood. A distillate is thereby produced which is neither ethyl alcohol nor methyl alcohol. Although containing both substances it is suitable for industrial purposes. The product from this process has been termed 'distol'.

The *Mail and Empire* of Toronto (September 5, 1914) contains a short note on the West Indies exhibit at the recent National Exhibition. It appears to have been one of the most attractive and instructive features of the day. It is extremely desirable that efforts to represent fully the West Indies in future years at this exhibition should be energetically continued, in view of the importance of West Indian trade with Canada.

According to the *Board of Trade Journal* for September 3, 1914, it is reported that the country lying between the Lualaba and the Kasoko River in the Belgian Congo is fertile in palm trees, and the production of oil is considerable. It is marketed in earthern pots of nearly 9lb. for which 6*d*. a pot is paid, which is equivalent to £6 per metric ton. As this raw product sold at £32 per ton in Europe, an opening for exports would seem available, despite heavy transport rates.

A note appears in the *Journal of the New York Botanical Garden* for August 1914 to the effect that His Excellency the Governor of Bermuda visited the Gardens in August and was especially interested in the hardy trees and shrubs that might be grown in Bermuda. The West Indies are in several ways indebted to the New York Garden for valuable exploration and other botanical work in connexion with the West Indies. It is only necessary to mention, for example, Dr. N. L. Britton's visits.

An important note appears in *The Board of Trade Journal* for August 27, 1914, to the effect that it has been found in the Bahamas that an excellent substitute for horse-hair, which might be more extensively employed in the manufacture of cheap upholstery, has been found there in the waste made in cleaning sisal fibre. This waste, which represents from 15 to 25 per cent. of the material concerned, is twisted into rope, then dyed and finally untwisted. The fibre retains the twisted character and is springy.

Interesting results on the influence of electricity upon plant growth are reported from a German source in the *Experiment Station Record*, Vol. XXX, No. 9. It appears that when the charge is too strong there is a decrease in yield, but when the charge is reduced to what may be called an optimum value, there is a corresponding increase amounting to about 12 per cent. In studying the effect of electrical discharges upon transpiration and evaporation, it was found that when the discharge took place from points placed 13 cm. above water surface, evaporation took place much more rapidly than from an untreated surface, ranging from five to ten times greater.

STUDENTS' CORNER.

DYNAMICS OF A PLOUGH.*

Part III.

To permit the line of force being made a straight line to the centre of resistance under all circumstances, the beam at its point is fitted with a long bridle provided with pin holes for lateral adjustment and moveable up and down, so that the point of attachment of the team to the beam is adjustable in practically all directions. If the forces could be applied on the line AB, fig. 8, none of it would be wasted in doing useless work. As, however, it has—for the reason stated—to be applied obliquely, as shown in fig. 9, under the principles of the parallelogram of forces, out of the total power so applied only about 75 per cent. is applied to overcome the resistance and draw the plough horizontally forward, the other 25 per cent. acting to lift the whole plough vertically. In fig. 10 the oblique force is decomposed into two components, one horizontal (AB) and one vertical (AE).

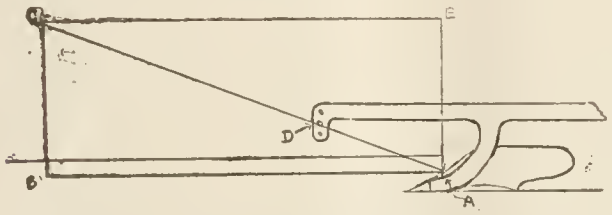


Fig. 10. A. Centre of Resistance.
AC. Line of Draught, the Diagonal.
AE. CB. Parallelogram of Force.
AB. Force acting to draw Plough forward.
AE. Force acting to draw Plough upward.

The magnitude of the total force being represented by the length of the line AC (say 510 lb.) the magnitude of the forces AD and AE is proportional to their length—in this case 14 to 4: the power therefore applied to draw the plough forward is 420 lb., and that to lift it vertically is 120 lb. It will be seen from this that, contrary to the ordinary opinion of ploughmen, the further the horses are away from the plough the less power will be required to draw it: as the parallelogram of force becomes longer it becomes narrower, and less of the total power is wasted in lifting the plough vertically—that is, AE becomes less and AB greater the further the horses are from the plough. It has to be noted that the centre A is also the balance-point, and that theoretically, so long as the force is applied in a straight line to A, no matter what the obliquity of the line may be short of a right angle to the horizontal, the plough will run straight forward on a level keel, the force AE acting vertically to lift the plough by the balance-point, but wasting more and more of the total power as the angle of draught deviates from the horizontal. This, however, only holds true in actual practice within a small range for the vertical position of draught, and a still smaller range for the horizontal position. Should the bridle pin be placed above the straight line from hame-hooks to centre of resistance, as in Fig. 11, as force acts in straight lines and as the direction of the draught is not now in a straight line to the centre of resistance, the plough will lift behind until the bridle-pin is lowered to bring the draught-

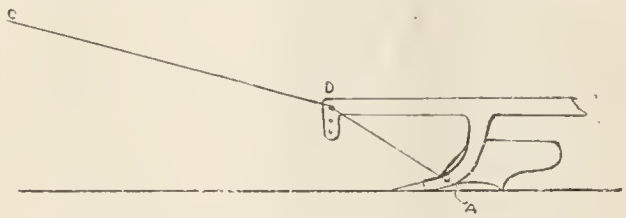


Fig. 11.

line straight. If, on the other hand, the bridle-pin is below the straight line from hame-hook to centre, then for the same reason the plough will be lifted in front. We have so far considered only the effect of different verticle positions of draught, but the same rules apply also to the horizontal position, the balance-point in the plough-body being the balance-point both for the vertical and horizontal planes.

* The *Journal of Agriculture* of New Zealand for June 20, 1914.

New Sources of Oil.—*Dumoria Heckeli*, found on the Ivory Coast by Chevalier, is native of tropical forests. Its seeds yield a semi-solid oil, snow white when fresh, with a pleasant sweet flavour and slightly aromatic, at the rate of 16·5 per cent. of the seeds or 33·25 per cent. of the kernels.

Baillonella toxisperma, Pierre, or *Mimusops Djawa*, Engler, has been recently found in the Mayumbe district of the Belgian Congo. It yields a white aromatic oil at the rate of 56·04 per cent. of the kernels or 40·50 per cent. of the seeds.

Both residual cakes are unfortunately toxic on account of the presence of a glucoside of the saponin group, but they may be employed as manure, for they contain a considerable amount of potash and nitrogen (2 and 3 per cent., respectively) though very little phosphoric acid (*Dumoria Heckeli* 0·75 per cent.).

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date September 19, 1914, with reference to the sales of West Indian Sea Island cotton:—

Since our last report about 40 bales of West Indian Sea Island cotton have been sold. These include 17 bales St. Vincent, 22*d.* to 31*d.*, which were offered before the war; the remainder being St. Kitts' cotton, 15*d.* to 16*d.* for Old Crop, and 16½*d.* for a few bags of New Crop.

The fine trade continues disorganized owing to the war, and we are afraid will continue to remain so, because some of the chief consuming markets are in the region of Lille, where the fighting is now taking place.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending September 12, is as follows:—

Only one bag of the New Crop has been received so far. The stock of 38 bales consists of two planters' crops brought over from last season. It will be a fortnight yet before the receipts are large enough to admit of our judging the quality of the odd bags of the crop. The reports from the plantations are favourable.

CO-OPERATIVE CREDIT.

TRINIDAD AND AGRICULTURAL BANKS.

A brief historical sketch of the efforts that have been made for many years in Trinidad to establish agricultural banks will be found in a paper on Co-operative Credit in the *West Indian Bulletin*, Vol. XIV, No. 1. Up to the present time the difficulties in Trinidad seem to have been sufficiently great to prevent anything definite being accomplished in the way of the establishment of credit societies. Now, however, mainly as the results of two important directions of effort, it seems likely that this important requirement will be satisfied. Judging from the *Proceedings of the Agricultural Society of Trinidad and Tobago* for August 1914, the two lines of effort adopted that may lead to ultimate success in the movement are (1) the discussion of the whole subject by the Government in co-operation with the Agricultural Societies, that is to say, the subject has been approached conjointly from both official and unofficial sources; (2) the distribution, amongst the agricultural societies of copies of the St. Vincent Agricultural Credit Societies Ordinance of August 1913.

Before this Ordinance was published, the Government Committee on agricultural banks appointed in 1912 issued a majority report stating that cheap money was required in the Colony but that no practical scheme could be evolved for the establishment of agricultural banks. Ten reasons were given for making this statement, and these reasons the two minority reports endeavour to prove unsound, arguing principally on the basis of the St. Vincent Ordinance and on the results of experience in India and other countries. The points around which controversy has been waged have been brought up so often from time to time in the past and have led to such inconclusive decisions that it seems desirable to publish the majority committee's points side by side with those of the minority committees:—

1. There is no demand for an agricultural bank by cane-farmers, owing to the system of advances by factories.	1. Such banks being local and membership voluntary they would not be founded in districts where not required and people who do not wish to use them would not join.
2. No bank could be profitably worked at the low rates (6 to 10 per cent.) charged by the sugar factories on advances to cane-farmers. A minimum rate of 20 per cent. is estimated for a bank.	2. Eight per cent. is the maximum interest allowed on transactions in St. Vincent. If in this colony 10 or even 12 per cent. was necessary the results would still be beneficial.
3. Factory owners have intimated their intention to cease making advances if a bank be established.	3. This objection appears founded on the assumption that the banks must charge high rates of interest (20 per cent.).
4. Small properties (cacao, etc.) are in the great majority of cases very heavily mortgaged, and the owners are in addition largely indebted to shopkeepers to whom as much as 40 per cent. is paid in interest, with the result that sooner or later their holdings must be lost.	4. Mortgages would probably not be the ordinary security. Growing crops and personal security of one or two other persons would be more usual. Personal knowledge too plays an important part.
5. Small proprietors do not always meet their obligations, due to carelessness or otherwise.	5. Neglect to meet obligations would deprive a person of membership and power to borrow again, whilst not doing away with his liabilities. The bank would thus have an educational influence and make for improvement in this direction.
6. There is a lack of mutual confidence between proprietors and dealers.	6 & 7. The same considerations as under (5) apply.
7. With jointly owned properties dissensions between the owners cause the security to deteriorate.	
8. That small proprietors would be unable to take shares in a bank.	8. The value of shares would be small. Shares or entrance fees in Raiffeisen banks do not provide the capital, only the reserve fund.
9. That if they did take shares it would only be for the purpose of borrowing money and to borrow more than they invested.	9. A man becomes a shareholder or member for the purpose of borrowing money when required, and naturally more than he has invested or he would not join.
10. That a bank would require several local branches within each a staff, including inspectors. The cost of a staff for an average district is put at £500-£600 per annum.	10. Under the Raiffeisen co-operative system expensively paid local staffs and inspectors are not necessary, and thus this, the most formidable financial difficulty as regards working disappears.

The Agricultural Societies are of opinion that in the majority report of the Government Committee too much emphasis has been laid on the difficulties. And moreover the reports received from the various district agricultural societies made after careful consideration of the actual rules and regulations of the St. Vincent Ordinance, intimate that agricultural credit societies of the Raiffeisen type should be established in the Colony. It is also considered that the necessary legislation should be introduced as soon as possible following generally the lines of the St. Vincent Agricultural Credit Society's Ordinance including the amendments to the rules gazetted on August 21.

Perusal of the paper in the *Proceedings of the Agricultural Society of Trinidad* may give rise to some confusion in the minds of those who are not fully acquainted with the various steps that have been taken in the colony as to which of the numerous committees are responsible for the various points enumerated. Nevertheless it appears evident that the influence of the St. Vincent Ordinance is being felt in Trinidad and that there is every likelihood that the necessary organization for the successful establishment of agricultural banks will be introduced in the near future.

The vascular system of sugar-cane plants suffering from sereh is stopped up with gummy matter which influences the circulation of water in the plant so that healthy stems absorb 1·18 times more water than affected stems. Using a lithium salt as an indicator, the writer showed that the salt had risen to a height of 70 cm. in 3½ hours in a healthy plant, while in a diseased plant it had only reached 30 cm. (*Monthly Bulletin of Agricultural Intelligence and Plant Diseases*, July 1914.)

NEW CROPS.

TRIALS WITH NEW CROPS IN RHODESIA.

The results of certain experiments conducted at the Botanic and Experiment Stations, Salisbury, during 1913 to 1914, are described in the *Rhodesia Agricultural Journal* for August 1914. Amongst this information are notes on several species of bean which possess certain points of interest and are herewith reproduced:

'KANKOMA BEAN. A species of bean introduced from Northern Rhodesia, where it is largely used by the natives for food. The plants made excellent growth and ripened early, producing a prolific crop of long narrow pods well filled with seed.

'LAING'S BEAN (*Mucuna* sp.). A species of velvet bean, differing from the ordinary variety in having a white seed and a pod free from irritating hairs. This latter feature marks it out as an improvement on the ordinary variety. The pod is also bigger and the quantity of leaf growth at least equal to that of velvet bean. The small trial of this season will be extended next season.

'DEDMAN'S BEAN. Another variety of velvet bean which seemingly failed to set seed this season at the Botanic Experiment Station, Salisbury.

'TEPARY BEAN. This much-advertised dry-land bean of the Central American States germinated well and evenly, and made vigorous although short growth, setting seed freely. At maturity it sheds its leaves almost entirely. It was attacked by stem maggot in the same way as cowpeas, and was far from being the heavy yielding crop it is in its country of origin.

'DHAL (*Cajanus indicus*). A variety with variegated seed was tried this season, with very promising results. The growth was distinctly superior to the ordinary Dhal, but the plant seems later in setting seed.

'TANGIER PEA (*Lathyrus tingitanus*). This plant, which has a copious pea-like growth keeps green almost through the winter. Stock however, are not too fond of its somewhat bitter foliage. It flowered for the first time in July.'

Besides these leguminous grain crops above referred to, there is another of the same family described under the name of Tree Lucerne (*Medicago arborea*). This plant, which is distinct from *Cytisus proliferus*, has now been growing at the Botanic Experimental Station for several seasons without, however, any great measure of success. The plants have not attained full size nor have they flowered. They are also very susceptible to the attacks of white ants.

Interesting notes appear on sesamum and yam. The first crop is said to grow well vegetatively, but the yield of seed has been too low to make its cultivation remunerative in Rhodesia. The white-seeded variety is earlier than the pearly seeded, but the yields per acre were only 140 lb. and 224 lb., respectively. As regards yams, it is said that this crop does not give entire satisfaction. The yield per acre is apt to be low as compared with other roots, and the tubers are frequently attacked by insect and other pests, so that their keeping qualities, for which they are renowned, are wanting here. During the year two varieties of spineless prickly pear have been under trial. Neither, however, has proved to be entirely spineless. They seem to show a tendency to revert to the original spiny form. In view of the formidable nature of this plant as a weed in arid countries the Rhodesian Government has forbidden its cultivation.

Turning to that part of the article which describes the results obtained with grasses, it is said that a promising hay grass for late cutting is molasses grass, a Brazilian species whose botanical name is not given. Guinea grass, well known in the West Indies, has given great satisfaction in Rhodesia as a most promising winter grass, rivalling Napier's fodder. Last of all, reference may be made to Mazagua, a sorghum native of West Africa, with which trials have been made in the Leeward Islands. In Rhodesia this plant, which resembles Kaffir corn, has made normal growth during the last two seasons, but has shown no outstanding qualities either in leaf or seed production. It is proposed to give it a trial on sandy soil during the coming season.

LICORICE.

Seeds of this crop have been obtained from the Royal Botanic Gardens, Kew, for experimental cultivation in St. Kitts and other West Indian islands. The following article, therefore, should prove interesting to readers of the *Agricultural News*:—

A very considerable part of the licorice root used in America is from marshy plains in Turkey and Russia.

This root is not cultivated, but grows wild in large quantities, generally in great stretches of open ground where the soil is more or less damp. It is regarded as a serious pest and greatly interferes with cultivation. Much land is abandoned to it, while some is ploughed and sown notwithstanding its presence. It is a perennial herb of the genus Glycyrrhiza of the bean family. The licorice of commerce is obtained by evaporating an infusion of the sliced roots. This solidified substance is used for flavouring confectionary and beer as well as entering into the make-up of most of the brands of tobacco.

The growth above ground of the plant is about 2 feet, while the root is about as deep beneath the soil. The land in Syria from which the root is gathered is leased from the owners, the condition, as far as lands that are cultivated, being that the digging out of the licorice root must cease when the time comes for planting the cereal crops. The result is, as far as these lands are concerned, that the getting out of the roots must be done quickly as soon as the rains, which begin in October generally, have somewhat moistened the ground, as it would be very difficult to do the digging in the long dry summer.

The root is piled in great stacks, and when the digging season is over a watchman takes charge, and the root remains thus stacked through the winter and the following summer, when it becomes quite dry and is ready for transportation to the coast. Great care has to be exercised that that the stacks do not heat or mildew.

The Aleppo district gathers and exports, on an average, an aggregate of 8,000 tons annually of dry licorice root, while Bagdad yields about 6,000 tons, Antioch 4,000 tons, and Damascus 500 tons.

The pulp is pressed, with American ingenuity, into boards which are used in cabinet work, and which are said to make up into novel and handsome articles. (*Tropical Agriculturist*, Vol. XLII, No. 4.)

MARKET REPORTS.

London.—The West India Committee Circular, September 22, 1914.

Arrowroot—2*d.* to 4¾*d.*
Balata—Sheet, 2/4; block, 2/1 per lb.
Beeswax—No quotations.
Cacao—Trinidad, 60/- to 61/- per cwt.; Grenada, 53/6 to 55/-; Jamaica, no quotations.
Coffee—Jamaica, no quotations.
Copra—West Indian, £24 per ton.
Cotton—Fully Fine no quotations; Floridas, no quotations; West Indian Sea Island, 15*d.* to 31*d.*
Fruit—No quotations.
Fustic—No quotations.
Ginger—Quiet.
Isinglass—No quotations.
Honey—No quotations.
Lime Juice—Raw, 2/3 to 2/6 per gallon; concentrated, no quotations; Otto of limes (hand-pressed), 10/6.
Logwood—No quotations.
Mace—No quotations.
Nutmegs—No quotations.
Pimento—Quiet.
Rubber—Para, fine hard, 2/8½; fine soft, 2/2; Castilloa, 1/8.
Rum—Jamaica, 2/2 to 5/-.

New York.—Messrs. Gillespie Bros., & Co., July 24, 1914.

Cacao—Caracas, 11½c. to 12c.; Grenada, 11c. to 11½c.; Trinidad, 11¼c. to 11¾c.; Jamaica, 10c. to 11c.
Coco-nuts—Jamaica and Trinidad, selects $20·00 to $21·00; culls, no quotations.
Coffee—Jamaica, 9¾c. to 13½c. per lb.
Ginger—7½c. to 10c. per lb.
Goat Skins—Jamaica, 46c.; Antigua and Barbados, 43c. to 46c.; St. Thomas and St. Kitts, 40c. to 43c. per lb.
Grape Fruit—Jamaica, $1·75 to $2·50.
Limes.—$3·75 to $4·50.
Mace—45c. to 53c. per lb.
Nutmegs—110's, 11¼c.
Oranges—Jamaica, $2·00 to $2·50.
Pimento—3⅞c. per lb.
Sugar—Centrifugals, 96°, 3·26c.; Muscovados, 89°, 2·88c.; Molasses, 89°, 2·61c., all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., September 28, 1914.

Cacao—Venezuelan, no quotations; Trinidad, no quotations.
Coco-nut Oil—80c. per Imperial gallon.
Coffee—Venezuelan, 13c. per lb.
Copra—$4·00 per 100 lb.
Dhal—No quotations.
Onions—$3·25 to $3·50 per 100 lb.
Peas, Split—$7·25 per bag.
Potatoes—English, $1·75 to $2·00 per 100 lb.
Rice—Yellow, $7·00 to $7·50; White, $6·50 per bag.
Sugar—American crushed, no quotations.

Barbados.—Messrs. James A. Lynch & Co., Ltd., September 19, 1914, Messrs. T. S. Garraway & Co., September 7, 1914.

Arrowroot—$4·50 per 100 lb.
Cacao—$13·00 per 100 lb.
Coco-nuts—No quotations.
Hay—$1·50 per 100 lb.
Manures—Nitrate of soda, $65·00; Cacao manure, $48·00 to $50·00; Sulphate of ammonia $78·00 to $85·00 per ton.
Molasses—No quotations.
Onions—$3·50 per 100 lb.
Peas, Split—$6·00 to $6·25 per bag of 210 lb.; Canada, $4·75.
Potatoes—Nova Scotia, $4·25 per 160 lb.
Rice—Ballam, $5·55 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
Sugar—American granulated, $8·00 per 100 lb.

British Guiana. Messrs. Wieting & Richter, September 26, 1914; Messrs. Sandbach, Parker & Co., September 25, 1914.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sand-Bach, Parker & Co.
Arrowroot—St. Vincent	$7·00 to $8·00 per barrel of 200 lb.	——
Balata—Venezuela block	No quotation	——
Demerara sheet	65c. per lb.	——
Cacao—Native	12½c. per lb.	13c. per lb.
Cassava—	96c. to $1·08	——
Cassava Starch—	——	——
Coco-nuts—	$16 to $20 per M.	$23 per M.
Coffee—Creole	——	16c. per lb.
Jamaica and Rio	16c. per lb.	16c. per lb.
Liberian	10c. per lb.	14c. per lb.
Dhal—	$5·50	$4·80 to $5·00 per bag of 168 lb.
Green Dhal	——	——
Eddoes—	$1·44	——
Molasses—Yellow	None	——
Onions—Teneriffe	——	——
Madeira	4¾c.	5c.
Peas—Split	$6·50 to $7·00 per bag (210 lb.)	$7·50 per bag. (210 lb.)
Marseilles	——	——
Plantains—	16c. to 48c.	——
Potatoes—Nova Scotia	$2·25 to $2·50	$2·25 to $2·50
Lisbon	——	——
Potatoes—Sweet, B'bados	——	——
Rice—Ballam	No quotation	——
Creole	$6·00	$6·00
Tannias—	$2·88	——
Yams—White	——	——
Buck	——	——
Sugar—Dark crystals	$3·50 to $4·25	$3·50
Yellow	$4·00 to $4·10	$4·00
White	——	——
Molasses	——	——
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M.
,, Cordwood	$1·80 to $2·00 per ton	——

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Printed at Office of *Agricultural Reporter*, 4 High Street, Bridgetown, Barbados

AGRICULTURAL NEWS

Vol. XIII. No. 326.] SATURDAY, OCTOBER 24, 1914. [One penny.

JUST ISSUED.

WEST INDIAN BULLETIN.

Vol. XIV, No. 3.

CONTENTS.

AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

OF THE

IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

VOL. XIII. No. 326. BARBADOS, OCTOBER 24, 1914. PRICE 1d.

CONTENTS.

West Indian Food Production.

NEARLY fifteen years ago, in the first volume of the *West Indian Bulletin*, a paper appeared on the subject of food supplies of some of the West Indian islands. This paper dealt with the possibilities of substituting locally grown produce for imported food, and referred, in a general manner, to several matters of much economic interest. At the present juncture, when the question of food supplies is one of special importance, it will be instructive to consider some of the points raised in this paper, and to try to extend the information so as to bring the present treatment of the subject up to date. Before proceeding to do this, however, it may be advisable to point out that at the time the paper was written (1900) many of the West Indian islands were in a serious state of depression both as regards capital and labour. To-day, in a sense, and to a certain extent, the position is also critical. It is, however, not so much a question of financial depression as it was then; it is rather the existence of a menace that there might in the near future be a temporary shortage in the supply of food. If this occurred, it would naturally mean an increase in prices. Assuming this happened, the burden would fall upon the poorer classes unless there was a corresponding increase in wages, or at least an increase in the possibility of continuous employment. Without entering further into a point of controversy, it will be apparent that the conditions to-day and fifteen or twenty years ago are critical, and that this circumstance lends particular interest to the subject under consideration. It is not to be inferred, however, that the subject is unworthy of consideration under normal circumstances: even under ordinary conditions the supply of food in these islands is of extreme importance, and it is as an ordinary economic problem that it is proposed to consider the matter in this article. The significance of the views at the present juncture will be self-apparent.

Food supplies in any country fall into two great divisions: those which are imported, and those which are grown locally. For purely agricultural colonies, and especially for colonies dependent on transport by sea, the quantities of imported foods consumed in these islands are very large. The most important articles of diet obtained from abroad are flour, corn (maize) and salted fish: as far as the labouring classes are concerned,

flour is the least important of the three. Rice, which is a staple article of diet is also imported, but as it now largely comes from British Guiana, it may in a sense may be regarded as locally grown. In the paper under consideration, this point is raised—Is it economically sound to confine the colonies' energies to the production of a staple like sugar or cacao for export, and to import large proportions of the necessary foods out of the money so obtained? Assuming that the external supply of food is available at reasonable prices, that the exported produce of the island can be sold at profitable rates, and that the whole energies of the people and the whole resources of the island are engaged, it is economically sound. If these conditions are not adequately fulfilled, it behoves those concerned to consider an increased production of foodstuffs locally. At the present time the possibility of these contingencies having to be seriously considered in certain islands is not to be overlooked.

It is evident that there are considerable risks underlying the present sources of food supply, and if it were not for the demand for labour by capitalists, and the desire on the part of the labourer to work for money rather than produce directly for his own maintenance, there would be greater attention given to food production. The economics of industry in the West Indies are more complicated than is generally recognized by those unacquainted with the general conditions: the desire for luxuries is strong, and the average West Indian is imbued with exogenous ideas of a so-called civilization, which are in many respects unsuited to the geography of his surroundings.

The production of locally grown foodstuffs is best brought about by the establishment of land settlements, for it may be taken for granted that capitalists will always produce staple articles for export. Under a land settlement scheme the co-operative sale of produce can be introduced, and in this way the grower obtains money for his work, whilst at the same time he confers stability on the food supply of his island. An extension of this idea is the growing of foodstuffs for export, after having satisfied the local demand. This may be encouraged on the ground that the amount of exports will vary according to local requirements, which will be met first. Attention has already been given to these matters in the West Indies, and where the action taken has been well organized, success has generally followed. It has to be borne in mind that the West Indies endeavour to grow, and quite rightly, what cannot be easily cultivated in other parts of the world. Staple foodstuffs can be grown anywhere, but not products like Sea Island cotton, limes, cacao, and arrowroot. On the other hand, it should be remembered that the West Indies can grow foodstuffs during six months of the year when growth is practically quiescent in northern latitudes, and this is well worth consideration as an encouraging point in favour of a larger area under such crops as corn (maize) and sweet potatoes.

In the article in the *West Indian Bulletin* attention is called to the possibilities before the manufacture of meals from the various starch-producing plants. Sweet potatoes and yams may readily be converted into meal just as corn and cassava can. This raises a fundamental point: the keeping qualities of West Indian foodstuffs. As a general rule local foodstuffs do not keep well, and this has undoubtedly been a deterrent factor in their cultivation. But efforts have recently been made to store locally grown corn in the West Indies, and with success. The production of meals would also be a way out of the difficulty, though naturally, the wisest course in the care of especially perishable produce would be the exportation of the surplus amount to other islands, or to the northern markets during winter.

Another disadvantage to an entirely local supply of food lies in their chemical composition. As a rule they contain a very low percentage of protein (nitrogenous matter) and fat. Starch and sugar provides energy for work but not the right nutrients for the renewal of muscle. Hence a great point in favour of the consumption of salted fish is that it supplies large quantities of nitrogen. The richest vegetable foods the planter grows are beans and peas. These are rich in nitrogen, and considerable quantities are cultivated in the different islands, though the amount is limited in some places because of the liability of these leguminous crops to insect attack: but at the present time the cultivation of these crops is receiving increased and serious consideration. Nitrogen, in the West Indies, can be got from pork, and pig production is to be encouraged for this reason, and also for the reason that suitable food can be raised locally on which to feed these animals. Salted pork is imported to a not inconsiderable extent, apparently for the dietetic object of providing fat. Of recent years this requirement has been greatly supplied by cotton seed oil which is largely used by the peasants in the preparation of food.

SUGAR INDUSTRY.

THE MESSCHAERT GROOVED MILL ROLLER.

In the issue of the *Louisiana Planter* for September 12, 1914, an account is given of an invention termed the Messchaert grooved mill roller, for which it is claimed that it is capable of effecting appreciable improvement in the work of cane mills.

Essentially the device in question consists of a series of equidistant circumferential grooves cut on the feed-roll of the mill, each groove being $1\frac{3}{4}$ inches deep and $\frac{3}{4}$-inch wide. The distance between the grooves is not stated, but the information is given that in the case of the mill to which the device was first applied, fifteen grooves in all were cut on the roller. The dimensions of the mill roll in question are not specified, but for a 72-inch roller, the distance between the grooves works out on this basis at 4·425 inches. Analytical data are given which show the improvement effected in the milling properties of a cane mill by the introduction of the device in question, the information indicating that the best results are obtained when the feed roll of every mill in a train is grooved in the way indicated.

The inventor explains the efficacy of his device in the following manner: 'When there are no juice grooves the juice has to run up hill to get out and thus forms a little pool on top of the feed-roll. . . . . Where the feed-roll is provided with juice grooves no pool forms . . . . . all the juice flows down the front and back of the roll.'

It is claimed by the inventor that none of the bagasse enters the grooves on account of its natural resiliency. Some difficulty was however experienced owing to the increased amount of 'fine trash' which dropped into the juice pan through the grooves; by this term is probably understood the material usually known as cush cush in West Indian sugar factories, consisting of cane trash and very fine megasse sodden with juice.

It is stated that this difficulty has been overcome by the employment of a scraper, devised by Mr. James Ogg of the Hawaiian Agricultural Company, fitted to the bottom of the roller. This consists of a series of spikes projecting from the turn plate which fit into the grooves and thus remove the objectionable material.

The devices in question appear to possess merit, and the detailed reports thereon of mill engineers which are shortly to be forthcoming from every mill in the territory of Hawaii will be awaited with interest.

SOLIDIFIED MOLASSES.

The *Louisiana Planter* for September 12, 1914, contains an article by Dr. H. C. Prinsen Geerligs on the subject of solidified molasses.

The subject-matter of the article in question deals with the old problem of the profitable employment of exhausted molasses, having a purity of about 30, and appends details of the process which has come into vogue in Java during the past ten years, whereby exhausted molasses is concentrated to absolute dryness, and is turned into square blocks and packed in bamboo baskets. This process overcomes the difficulties previously attendant on the shipment of molasses, involving as it did the employment of expensive packages and the handling of a product which owing to its liability to frothing frequently gave rise to trouble and loss.

Dr. Geerligs states that in its best form the product is black or dark green in colour; never red or reddish brown; it should be brittle and in appearance vitreous. It should not be gummy or leathery in texture, and should be free from minute air holes. The dry substance in the finished product can attain a percentage as high as 99·8.

Apparently the quality of the resulting product depends in large part on the character of the molasses employed; it would seem that the less the glucose of the juice has been decomposed in the course of manufacture the better the product will be. On this account, any marked alkalinity of of hot juice or syrup is undesirable in a factory aiming at producing solidified molasses, and for the same reason the prolonged maintenance of syrups and massecuites at a high temperature is to be avoided.

The process of manufacture as described is relatively simple, and consists in first steaming the final molasses so as to effect the removal of suspended impurities and subsequently concentrating the liquid in a vacuum pan. In boiling, a low and even temperature must be maintained together with a high vacuum. The finished product at the temperature of the vacuum pan is a thick, very viscous fluid, which solidifies on cooling to a glassy mass.

In Java the manufacture of the product has attained to considerable proportions during the past few years: the exports for 1911 to 1913 are summarized below:—

1911	59,221 tons
1912	76,718 ,,
1913	66,809 ,,

No data are given for the prices realized by the commodity. The bulk of the exports are shipped to Southern India where it is used as a raw material in spirit manufacture and also in preparing tobacco.

In Java, owing to the prevalence of Mahomedanism, very little alcohol is consumed while custom regulations render difficult the export of rum to foreign countries. Under these conditions it would seem that the introduction if this method of dealing with exhausted molasses has proved of marked value; it remains to be seen however, how far the increasing introduction of industrial alcohol as a source of fuel is likely to modify the present position.

From an article in the *Canada-West India Magazine* for September 1914, we glean that Canada's war tariff makes considerable changes in the sugar duties. For raw sugar answering the 96° test, the duties were raised from $40\frac{3}{4}$c. to $\$1{\cdot}03\frac{3}{4}$ per 100 lb. for preferentials. A pleasing point to the West Indies is that the preference on their sugars is more than doubled, an increase from $16\frac{3}{4}$c. to $33\frac{3}{4}$c. on raws. This is $6\frac{1}{4}$c. more than the 20 per cent. called for under the Reciprocity Agreement.

The Jesuits have long been famous for their educational methods. One of these is quoted with approval in *A Path to Freedom in the School*, a book reviewed in *Nature*, August 27, 1914, viz. to put those students who understand to explain to those who do not. An improvement even on this is suggested: arranging, that is to say, that the boys teach each other, irrespective of supposed ability. It is claimed that excellent results in certain subjects, such as history and French, have been obtained in this way.

FRUIT AND FRUIT TREES.

THE MANURING OF BANANAS.

On this important subject, the *Queensland Agricultural Journal* for August 1914, has an article from the pen of Mr. J. C. Brünnich, F.I.C., Chemist to the Department of Agriculture, Queensland. The writer points out that in most publications on banana culture, very little space is given to the question of manures, and that very few experiments in this line have been reported. In the *Agricultural News* of August 1914, there was a note on some experiments made in manuring bananas also in Queensland.

When one considers that until recent years the culture of the banana in all banana-growing countries was of the most reckless nature large areas of land under bananas being simply cropped for years and years, until owing to complete soil exhaustion the crop became unprofitable—the want of any reliable information as to the value of manuring, or as to the most suitable manure, is not surprising. The fact that in Queensland the yearly crop of 4,500,000 bunches in 1898 had dropped to a little more than 1,000,000 in the last few years, led the Department of Agriculture there to investigate the matter, and to institute a series of experiments under the direction of Mr. Brünnich, the results of which he gives in the paper referred to above.

In the first place he thinks that the manurial experiments carried out show beyond doubt that exhausted banana lands, provided the soil be in good physical condition and contains a fair amount of humus, may be made by cultivation and the application of heavy dressings of artificial fertilizers, to produce crops equal to those from virgin lands.

After stating that from all the evidence obtainable, there can be no doubt but that bananas require a well-drained, loamy soil, containing a fair amount of humus, and good quantities of potash, lime and phosphoric acid in a readily available form, he notes some evidence as to fertilizers in other places.

In Teneriffe the banana culture has made great progress, due to irrigation. The land is also heavily manured with stable compost and guano.

Potash manures especially have given good results in India.

Experiments in Panama have proved the great benefits of liming soil in the cultivation of bananas. This is also proved by the experiments in Queensland.

Phosphoric acid is of great value, but more particularly potash must be supplied in liberal amounts. A number of experiments carried out in Fiji and in Queensland by J. M. Hattrick fully bear this out, and he states: 'that for every 1*s.* spent on potash, the planter received 6*s.* in return.'

A good deal of humus is returned to the soil by the stalks of the plant when the fruit has been reaped. The plan of cutting the stalk into pieces is better than leaving it to rot whole. The growing of green crops of leguminous plants is also strongly to be recommended, so long as the cover crop is not allowed to grow too near to the banana stools, and so rob them of necessary moisture.

Semler's statement 'that no other cultivated plant exhausts the soil to such an extent as bananas,' is borne out by the comparison of soils from virgin land and exhausted banana land. The analyses show that the total amount of potash present is reduced by nearly one-half, and the amount of available potash remaining is less than one-tenth of that found originally. Now, by an investigation of the actual food requirements of the banana plant, it has been ascertained that a fair crop of bananas removes from the ground per acre 123 lb. of potash, 12½ lb. of phosphoric acid, and 43·7 lb. of nitrogen, whereas the stalks left on the ground contain 150 lb. of potash, 6 lb. of phosphoric acid, and 41·4 lb. of nitrogen. Evidently, therefore, 273 lb. of potash, or about 5 cwt. of sulphate of potash, per acre, must be available to the banana plant in a readily available form to produce its next crop in a few months.

After some preliminary experiments the standard fertilizer was fixed per acre at 160 lb. of potash (applied as 320 lb. potassium sulphate), 80 lb. of phosphoric acid (applied as 470 lb. superphosphate), and 40 lb. of nitrogen (applied as 290 lb. dried blood, or 290 lb. nitrate of lime, or 200 lb. ammonium sulphate). This was applied twice a year to normal crops, and in double quantities to crops on exhausted lands. Of course a similar plot was left without manure. The land was first ploughed shallow, and all weeds removed. One month before planting it was ploughed deeply down to a depth of 18 to 24 inches. Cavendish bananas were used, planted 12 feet apart, giving 302 stools to the acre. The first lot of manure was applied in the plant hole, well mixed with the soil, and subsequent applications were made as top dressings, and slightly hoed under. It might be well, however, in old banana plantations, to apply a part of the fertilizer in holes made with a crow-bar to a depth of 18 to 24 inches round the stool, at a distance of from 3 to 5 feet, and the rest as a top dresssing.

The cost of this heavy application of artificial fertilizers is very great, but the results justify it, at least in Queensland. The average yield for three years of plots treated with the standard fertilizer was 3,035 dozens of bananas per acre, at a value of, say, £38, the fertilizer costing annually about £12 10*s.* In the experiments with double the amount of fertilizer, the average was 4,330 dozen, at a value of £54, and at a cost of £25.

Near this experimental block of land, similar manurial experiments were carried out by the head teacher of the State School, with even more striking results as to the value of the standard fertilizer. His unmanured land gave a crop worth £28 11*s.* 9*d.* per acre; that treated with the standard fertilizer yielded £67 2*s.* 3*d.* at a cost of £12 6*s.* 6*d.* while that treated with the double dose yielded £55 15*s.* 2*d.* at double the cost. It may be mentioned that this experiment is referred to in the chapter of fertilizers, in 'The Banana', by W. Fawcett, B.Sc., who also refers appreciatively to the work of the author, whose article is under review.

In conclusion it is stated that the soil after such treatment is improved both in its physical and chemical condition. The application of these principles may well lead to the profitable replanting of banana lands, abandoned as exhausted

THE CULTIVATION OF GROUND NUTS.

As a staple crop for exportation, the ground nut (*Arachis hypogæa*) has made great advance in the last four years in Rhodesia, and very interesting information as regards this crop is contained in an article in the *Rhodesia Agricultural Journal* for August 1914.

The writer, Mr. H. Godfrey Mundy, F.L.S., points out that the advance in the popularity of this crop among Rhodesian planters is due, to a great extent, to the introduction by the Department of Agriculture of superior varieties. In the West Indies, in those islands where the soil seems suited to the plant, as in St. Kitts and Montserrat, the Imperial Department of Agriculture has also been experimenting with superior varieties imported

The chief market for ground nuts is Marseilles. The demand is increasing, as is shown by the fact that in ten years the imports there had more than doubled. In the year 1902 there were imported into Marseilles 171,788 metric tons of ground nuts, while in 1912 the imports had grown to 359,296 tons. Nor has the value shown any tendency to decrease, the quotations in May 1913 being from £11 to £12 10*s.* per short ton for unshelled nuts, and from £14 to £15 per ton for shelled nuts. It may be noted that a saving is effected in bags as well as in freight charges by exporting the nuts shelled.

As the ground nut belongs to the order Leguminosae it has in common with other leguminous plants the power of absorbing free nitrogen from the air and of storing it in the roots. Experience in Rhodesia has proved that the ground nut carries a greater number of bacterial root nodules than any other leguminous crop grown in that country, and therefore, as a rotation crop, its value is very great. Mr. Mundy says that it even tends to enrich the land on which it is grown, and that on the light loam and sandy soils, for which it is especially suited, if grown in rotation with other crops to which manure has been applied every third year, a crop of ground nuts will maintain if not increase the fertility.

There are two well-marked types of varieties of the ground nut, the one with vines more or less erect, termed bunch or bush varieties; the other with more or less prostrate stems, termed 'runner'. In the bunch varieties the nuts are produced in dense clusters around the main stem, whereas the running varieties may bear clusters all over the length of the vines. It will be seen, therefore, that the harvesting of the former is less troublesome that that of the latter. The bunch varieties seem also to yield a larger amount of forage than do the 'runners', on account of the superior height which the plants attain.

As to the cultivation of the ground nut, the soil most suited to it is a light loam or sand; the presence of lime does not seem to be essential. Heavy water-logged or clayey soils are to be avoided, because it is necessary that the flower-stalk should be able to push the immature ovary, which develops into the nut, beneath the surface of the soil, and this it often cannot do on soils of this kind.

Sandy soils are easy to work, and beyond ploughing—7 to 9 inches deep being ample—and working it to a good tilth, no special preparation is required. It must be emphasized—(1) that the ground must be thoroughly cleaned and free from weeds; and (2) that the surface soil must be well worked and kept loose, in order to allow the flower stalks to enter the soil.

Seed selection in this crop, as in all others, is important. Large, well-filled pods should be chosen for the purpose of sowing, and these should be thoroughly dry and free from mould.

In the West Indies, as far as experiments in St. Kitts and Montserrat have shown, the best time of planting is about May, the crop being then mature in about September or October. In Rhodesia, Mr. Mundy says that the best results have been obtained by planting in November or December, the crop not being ready for reaping then until six or seven months. He recommends that shelled seed be used for planting, not unbroken pods, because any lack of moisture in the soil at the time of planting leads to irregular growth on account of the shells not softening and decomposing easily. The distance of planting depends upon the variety grown. For running kinds the rows may be 3 feet apart, the plants being from 15 to 20 inches distant in the rows; while for the bunch varieties, rows 30 inches apart, and plants from 12 to 18 inches seems sufficient. Two seeds are usually placed in each hole, about $1\frac{1}{2}$ to 2 inches deep. This would require from 35 lb. to 50 lb. of unshelled nuts to the acre, according to the spacing of the ground. The question of planting in ridges or on the flat seems to be a very debatable one.

With regard to subsequent cultivation the objects are: first, to keep down weeds especially in the earlier stages of the crop: secondly, to maintain the surface soil in a loose and open condition. Cultivation must cease as soon as it is seen that the flowers are being knocked off or the young pods uprooted.

The harvesting of the crop is usually done by hand, which is a troublesome and possibly expensive process. In any large area under cultivation, one of the mechanical harvesters used in the Southern States of America may be recommended. An illustrated account of one of these is given in the article under consideration. In countries where dry weather can confidently be expected after reaping, no great precautions need be taken to keep the heaps of nuts, when extracted from the soil, dry. It is advisable, however, to plant upright poles at intervals through the field, and at the base of these to place a layer of brushwood. After a few days the bunches of nuts are collected and piled on the brushwood platform around these poles, where they can remain, and be threshed at leisure, if there is no danger from ants or rats.

Threshing usually consists in hand-picking the nuts from the vines, but it has been reported in Rhodesia that good results have been obtained, and much time saved, by bunching the haulms in the hand and striking them across a horizontal pole. After threshing, the nuts can either be bagged at once, or shelled first. If quite dry when bagged, they will keep sound for months. Care must be taken to avoid bagging unripe nuts, or any not perfectly dry, if heating, which deteriorates the value, is to be prevented.

According to the Rhodesian report, the returns of the most prolific variety grown there in 1913, at the Botanic Station, Salisbury, gave an average for three years of 1,511 lb. per acre. According to the report of the Botanic Station, in Montserrat, the average yield of the most prolific variety grown there for four years was 1,570 lb. per acre. Planters would, of course, have to consider whether such returns are remunerative at current prices.

Besides the demand for ground nuts in the Marseilles market for the purpose of oil extraction, there is a demand for them in Great Britain, with reference to which the following remarks from a market report of about three years ago are given in the article under review:—

'There is no difficulty in selling ground nuts in this country provided they are shipped in quantities of not less than 50 tons. There is no market for *unshelled* nuts, and it is of the utmost importance that the nuts reach this country in a thoroughly sound condition. The current market price is about £13 10*s.* per English ton (approximately 12*s.* per 100 lb.). As a rule ground nuts are packed in bags of about one and a quarter hundredweights. It is important to notice that unshelled nuts are absolutely useless here.'

According to a communication received from the Board of Agriculture and Fisheries, it appears that the Agricultural Consultative Committee desire to impress upon farmers the great importance, in the national interest, that the acreage under wheat during the coming year should be largely increased. In reply to questions asked in the House of Commons, the Government declined to hold out any financial inducement to farmers to increase their acreage of cereals.

AGRICULTURAL PROSPECTS IN MONTSERRAT.

The following constitutes the concluding portion of Dr. Watts's address in Montserrat, referred to in the last issue of the *Agricultural News*. The first part of the address ended with a consideration of the prospects before an extension of corn-growing: this, the second part, begins with a discussion on the subject of bean and pea crops.

There are several bean and pea crops that appear to offer advantages at this period when, in addition to local uses, there are likely to be openings for these grains at good prices in markets outside the colony.

Pigeon peas (*Cajanus indicus*) first call for consideration. They are largely grown in this island, but rather for purposes of green dressings than for grain. There is good reason for thinking that they may be grown profitably for their grain, which would find a market in other parts of the West Indies, as in Trinidad and British Guiana, or they might be exported to England where these peas should sell at prices comparable with ordinary field peas.

Pigeon peas can be advantageously planted after cotton: they grow well, require little attention when once established, and cover the ground so as to eradicate weeds. After the peas are reaped, the bushes may be buried, or, prior to burying, they may be fed over by stock. After this treatment the land is left in excellent condition for succeeding crops.

These peas, therefore, lend themselves extremely well to the existing condition of things, and their extended cultivation on some of the fields now in cotton is a matter for careful consideration.

Several other kinds of bean and peas are worth considering as field crops at this time. Amongst them what is known locally as White bean (*Phaseolus lunatus*) a bean widely grown under a variety of names all the world over—calls for attention. It has the advantage that it is free from insect attacks owing to its leaves containing a poisonous principle. The vines, therefore, cannot be fed to stock. This bean might, with advantage, be planted to follow corn so that the vines may run upon the old corn stocks after the corn has been reaped. The beans, if produced in large quantity, would find a market in England and elsewhere abroad.

There are several varieties of what are known in America as cowpeas that are known in the West Indian islands by various names and some known in Montserrat as black eye peas that should prove very useful. They come quickly into bearing and may be cultivated when a short period crop is indicated.

Bengal beans should find a sale in the English market as food for stock. Some enquiry has already been made for these beans which have been valued at from £6 10*s*. to £7 per ton (about 3*s* 6*d*. to 4*s* per bushel) in London; but possibly higher prices may be obtained. There is some objection to the black seed-coat in that it gives rise to a discoloured meal: attempts are therefore being made to find a bean of this class having a light-coloured seed-coat.

It may be remarked that many beans possess more or less poisonous qualities; careful investigations have, therefore, to be made before attempting to place a new bean on the market.

If peas and beans are to be grown on a large scale it will be necessary to employ machinery for threshing them from the pods. Enquiries are being made for suitable machines for this purpose.

Amongst crops that may advantageously be grown are such well-known ones as sweet potatoes, yams, eddoes, tannias, and well-known vegetables of this kind. The characters and properties of these are so well known that it is unnecessary to enlarge upon them now. Cassava is a crop that may be grown to advantage in some districts. It has this merit, that it can be converted into starch, meal and cakes, which can all be stored and will provide a valuable addition to the food supply. Some demand is arising for dried cassava roots, and active steps are being taken to ascertain whether it is possible to build up a profitable trade in this direction.

The foregoing crops may be regarded as general in their nature, that is, they may be grown practically by all who are interested in land, whether in the form of large estates or small holdings. There are some crops which are more limited in their capabilities but which may well have attention from careful cultivators.

Onions may be referred to in this connexion. They have been successfully grown in Montserrat for several years and the trade in them is capable of being considerably developed. If this is to be done it will be necessary to exercise greater care in the manner of curing, grading and packing, and onion growers in Montserrat would do well to follow the steps taken by the Antigua Onion Growers' Association.

Pine-apples can be successfully grown in Montserrat, and now that there is regular fortnightly communication with Canada by the New Royal Mail line of steamers, there is good reason for thinking that a profitable trade with the Dominion might be developed in pine-apples. If anything is to be done in this direction it is essential that the greatest care should be taken in selecting, grading and packing the fruit, for it is absolutely necessary that this produce should be sent in uniform condition and in uniform packages. There is good scope here for co-operative working, and it is desirable that something should be done in this direction. There is no doubt that here the Local Agricultural Departments can render useful assistance.

As a minor industry, reference may be made to the successful cultivation of Bay trees for the production of Bay oil of standard purity and quality: work in this connexion is being steadily pushed forward.

The exportation of stock has always occupied a fairly prominent place in the activities of Montserrat. If this work were taken in hand in a more systematic manner, there is no doubt it could be largely and profitably extended. Throughout the world there is an outcry concerning the shortage of beef and prices are advancing steadily: this shortage affects the supply and the price at places within our reach such as St. Lucia, Trinidad and Bermuda. It is understood that His Honour the Commissioner has already taken steps to ascertain whether beef can be profitably supplied to Bermuda, and that the experiment so made promises favourably.

There is an opening in Montserrat for cattle raising, but if any success is to be attained more care must be taken in the selection of animals for breeding. Various attemps have been made departmentally to improve the breeds of cattle, but it would seem as though the better animals resulting from these efforts had been shipped or disposed of rather than kept for breeding. If any trade is to be done along this line, it is essential that only good animals properly raised and fed for beef purposes should be offered for sale.

In conclusion the speaker again stated his impression that the time is a favourable one for the development in Montserrat of agricultural enterprises as yet little exploited; that both the people and the land are in better condition for undertaking these developments than they have ever been,

and that it may ultimately turn out that the temporarily diminished market for cotton will be in the long run advantageous to Montserrat, in that it will lead the people to seek to develop and appreciate new agricultural resources. He hoped that this brief review of agricultural prospects and possibilities might prove of service to those who have these problems to face.

At a time like this when it is necessary to think of new enterprises, the value of the Local Agricultural Department with its Experiment Station becomes increasingly apparent. Planters of all classes have the opportunity of freely consulting Mr. Robson, the Curator, who has much available information ready to hand, and who is in a position to supplement his own knowledge by enquiries at Headquarters, which again can glean information from widely extended sources.

At this time, too, it should prove of great service to planters to be able to see at the Botanic and Experiment Stations many of the crops actually growing that are now under discussion, and also to see the various experiments in their cultivation. Unfortunately, in Montserrat, as in many other places, planters neglect to visit these Stations as regularly and as frequently as they should do.

It would prove advantageous and stimulating alike to the planters and to the Curator if the former were to make a resolution to pay a visit of enquiry to the Station at least once a month. They would thus realize that there exists much information already available, that much of the work they contemplate undertaking has already been done, and that facts are ready stored up for their use and guidance; that in addition to this the stations are provided with plants and seeds ready for starting new developments or can procure these to advantage in a short time; and, in a word, that the experience of the Station may prove a guide to their efforts and an aid in overcoming their difficulties.

THE ANTIGUA ONION GROWERS' ASSOCIATION.

A report of the sub-Committee of this Association, which appears in the Antigua *Sun* of September 25, 1914, states that the business of the Association, which is but recently organized, has been so successful that the Committee suggest that it ought to be largely extended in order that it may cope with the whole crop of onions grown in the island. This is estimated at about 200,000 lb.

The proposals are :

(1) That onions will be purchased at not less than 1c. per lb. cash from growers to whom crates will be supplied by the Association for delivery at the Association's premises. There the onions will be graded, cured, and packed, and then exported and marked by the Association. After deducting working expenses, and a commission of 3 per cent., the surplus profit will be distributed *pro rata* among contributing growers at the end of the season.

(2) That all members of the Association shall agree to sell their onions to the Association on the above terms, and shall not ship onions except through the Association; an agreement is to be signed by all members to this effect, with a penalty clause.

For the purpose of central premises the Government of Antigua have kindly placed at the disposal of the Association the old cotton factory buildings, rent free, for three years.

Sufficient funds at the start will have to be provided for fitting up the premises, for the purchase of the onions, for the provision of necessary stores, such as crates, and for initial expenses. After going into the requisite details under these heads, the Committee came to the conclusion that the amount of capital required for this purpose will be £371 5*s.* 4*d.*, which it is proposed to raise, either by subscription among the members, or by a loan, bearing, they suggest, interest at the rate of 6 per cent. per annum.

The advantages of this co-operative scheme are obvious: (1) the planter will always receive without delay a price giving him a reasonable margin of profit without the responsibility and worry attaching to shipment and marketing; (2) the centralization of the packing will ensure a better standardization of the onions, and therefore a better reputation; (3) the organization dealing with the whole crop of onions will enable orders to be filled with certainty, and therefore, with greater advantage.

WEST INDIAN COTTON.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending September 26, is as follows:—

The receipts of the new crop have been only 13 bales, so far, which have not been sampled or offered for sale; consequently the market has not opened. It will be a fortnight before the receipts will be large enough to admit of the Factors putting out any cotton for sale. The stock, therefore, is limited to two Planters' crops brought over from last season, and are nominally held at 28*c.* and 30*c.*

During the fortnight ended October 1, 3 bales of British West Indian cotton were imported into the United Kingdom. Since last report about 100 bales of West Indian Sea Island cotton have been sold at 12*d.* The market is depressed. (*The West India Committee Circular*, October 6, 1914.)

WEST INDIAN COTTON IN SIERRA LEONE.

It was reported last year that the returns from the West Indian cotton experiments in Sierra Leone were very promising. This year, according to the Annual Report of the Agricultural Department, Sierra Leone, for the year 1913, the plants have not grown as well principally owing, it is believed, to the attacks of the red rust fungus. Samples of seed had been procured from those plants which have survived and will be sown next year. By this means it is hoped that it will be possible to obtain an acclimatized type of West Indian cotton.

In Appendix I to the report under consideration, the Imperial Institute's report on last year's Sea Island cotton is published. The lint is described as clean, soft, fine, lustrous, and of pale cream colour with some yellow or brown stains. The yield of lint on ginning was 30·8 per cent. The yield of lint per 100 seeds was 3·96 grammes. The seeds were of medium size and either without fuzz or with very little white or greenish fuzz of medium length. The strength was irregular, but, on the whole fair, though a considerable proportion of weak, immatured fibre was present. The length of the fibres was rather irregular, varying from 1·4 to 2·1 inches, mostly from 1·7 to 1·9 inches. The sample was valued from 16*d.* to 17*d.* per lb. ginned, with fine and extra fine Sea Island cotton at 16*d.* and 19*d.* per lb. respectively. The cotton was remarked upon as being of excellent quality, and it was believed that it would have been even more valuable if less weak undeveloped fibres had been present.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

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The *Agricultural News*: Price 1*d*. per number, post free 2*d*. Annual subscription payable to Agents, 2*s*. 2*d*. Post free, 4*s*. 4*d*.

Agricultural News

Vol. XIII. SATURDAY, OCTOBER 24, 1914. No. 326.

NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number deals with the subject of West Indian food production, and indicates some of the ways in which the locally grown supply may be economically augmented.

One page 337, under the heading Sugar Industry, will be found two interesting articles on a new grooved mill roller, and on the question of solidified molasses, respectively.

Under the heading Fruit and Fruit Trees, on pages 338 and 339, appears a resumé of the latest information on the manuring of bananas and a useful account of the way ground nuts are cultivated on a large scale in Rhodesia.

The concluding portion of Dr. Watts's address on the agricultural prospects in Montserrat appears on page 340.

Insect Notes, which will be found on page 344, deals with a new pest of cotton which attacks the young leaves of this plant.

Under the caption Departmental Reports, the report on the Botanic Station, Montserrat, is reviewed to show the progress that has been made as regards experiments and the production of produce during 1913-14.

Indigo.

There is some possibility that the prices of indigo may range high in the near future on account of the restricted output of the synthetic product. During the last ten years the production of the latter by Germany has enormously increased, with the result that the growth of the indigo crop has ceased to be profitable except the very best varieties on a large scale in Bihar and Java. It may be noted, however, that the year of maximum depression of the natural indigo market (1905) was followed by high prices owing to the reduction in area the previous year.

Extensive experiments conducted in Bihar some years ago showed that natural indigo, in the dyeing process, gave a better bloom and depth of colour to the cloth than the synthetic product did, and, moreover the plant product is said not to possess the undesirable odour that accompanies the aniline dye. So that the dyer's prejudice being favourable, it is only a slightly higher price which is required to stimulate wider cultivation.

Indigo, it will be remembered, has been used and is used at the present time as a green dressing. It is a drought-resisting crop, but does not thrive under shade as local experiments in Grenada have clearly demonstrated. It will, however, tolerate a damp heavy soil provided it gets the necessary sunshine.

Those who are interested in this crop will possibly be aware that the substance indigo does not exist in the plant as such. In the plant a glucoside called 'indican' is produced, which is afterwards artificially turned into indigotin by a fermentation process. Research work has been done in connexion with this with a view to determining the 'indigotin value' of the plant, and the amount of indigotin in indigo of which the former is the essential chemical principle. Conclusive results have been obtained which have assisted in the chemical selection of good varieties.

In 1907, the Imperial Institute published in its Bulletin that a new plant from Sierra Leone called *Morinda citrifolia* contained a substance identical in composition with indican. The roots of this plant are used by the native dyers in West Africa, and the tissue is dealt with in much the same way to produce the pigment, as is employed in India by the native cultivators of *Indigofera* spp., the true indigo-producing plants.

It may be added that at one time indigo was extensively cultivated in several of the West Indian islands. It may yet prove to be a profitable cultivation for some of these colonies.

Sisal Hemp and Henequen.

In the *Agricultural News* of April 25 last, there was an article on the cultivation of Sisal hemp in the West Indies. In connexion with this subject, a very instructive letter appears in the *Journal of the Jamaica Agricultural Society* for August 1914, from Mr. H. H. Cousins, the Director of Agriculture in Jamaica, on the growing of Sisal hemp and Henequen.

After mentioning the various attempts to establish

these plants, he points out that some failures were owing, doubtless, to the fact that attention had not been paid to the different kinds of soil required by the two different species.

The natural soil of the Sisal hemp (*Agave rigida, var. sisalana*) is that of a limestone formation; and Mr. Cousins says that it has been demonstrated that if cultivated on such a soil this species will grow for several years without poling. It must be remembered that this premature poling is what the planter of Sisal hemp has to combat. He also says that cutting the leaves at three years, instead of four years has been proved to render the plants less liable to premature poling.

As regards Henequen (*Agave rigida* var., *fourcroides*), Mr. Cousins shows, by citing several instances of plantations visited by him in Jamaica, where it is being grown experimentally, that this species can be successfully cultivated on dry alluvial soils which are very deficient in limestone.

Seeing that there is a growing demand for the fibre obtained from both these plants, it will probably be to the advantage of the smaller West Indian islands, if experiments, which are about to be made with these plants, prove successful. There is a great deal of uncultivated land of limestone formation in the drier islands, which might profitably be put under Sisal hemp; and also in the same islands much land, deficient in limestrove, which at present bears only scrub that might well be planted in Henequen.

The Coco-nut and the Avocado Pear.

In the *Bulletin Agricole du Congo Belge* for March 1914, there are two very interesting and instructive articles, one on the cultivation of the coco-nut palm, and another on the avocado pear.

Mons. P. Drowsil, the Director of Agriculture, made notes on the cultivation of the coco-nut palm in various tropical districts of Africa and Asia, which he embodies in the article under consideration. For the best results, he considers that the palms need a fairly light, well-drained soil. On such a soil they will flourish, from sea-level up to about 700 feet, if the water-supply, either from rainfall or natural drainage is sufficient. It is interesting to note that the writer confirms the observations made by Mr. Jackson in Antigua, as to the want of correspondence between the size of the nut picked from the tree and the weight of copra obtainable from it. This he seems to attribute to varietal characteristics, and in this connexion he mentions several well-known types. Among the methods of starting the growth of a coco-nut, that practised in Java, of placing the nuts in a horizontal position on a lattice of bamboo, shaded by coco-nut branches, until the first leaf appears, is noteworthy. The writer makes many recommendations and suggestions as to the cultivation of the trees and the preparation of copra.

The article on the avocado pear, by Mons. L. Pynaert, is quite an exhaustive one. Points of interest are: the description of a large number of varieties from various parts of the Tropics, among which is a seedless one: the attempts which are being made to improve the fruit by seed selection: and the clear directions given for budding superior varieties on possibly inferior seedlings. After some remarks on the diseases of the avocado, the article concludes with some advice as to developing the market in temperate countries for this tropical fruit. With cold storage, and proper selection, grading and packing, he thinks there is a possible future in store for the remunerative exportation of the avocado from the Tropics.

Modern Views on Heredity.

The subject of heredity formed the subject to Professor Bateson's inaugural address at the meeting of the British Association at Melbourne. The *Gardeners' Chronicle* emphasizes the Professor's statement of the difficult problem facing the modern student of heredity, and the advances in knowledge made by means of the Mendelian method of analysis. The starting point of modern investigations is the conception that an organism is formed by means of 'pieces of living material' derived from the present organisms. Thus the characters of the individual are determined by those of the germ cells by the fusion of which the individual is produced. But as the germ cells produced by an individual are not necessarily all alike, variations occur in the resulting organisms.

The problem therefore may be stated thus:—If a population consists of members which are not alike, but differentiated, how will their characteristics be distributed among their offspring? The object of the Mendelian student is to discover this proportion of the distribution of these characteristics, how variations between two kinds of the same thing—fowls for instance, or cotton plants, to use a West Indian example—are distributed among their offspring.

Much work has to be done along Mendelian and similar lines before any more real light is thrown on the great problem of the origin of species. For although the Darwinian hypothesis of the survival of the fittest expresses a general truth applicable to the average individual, it hardly explains the survival of the factors of germ cells, on which factors the characteristics of the individual depend.

A great deal of what is called variation is only the new combination of factors, and although there is evidence that factors may be lost, and so their characters disappear, there is but little evidence at present of the origination of new factors.

Most of the new varieties of cultivated plants are the result of deliberate crossing. Remembering their number, it becomes no easier to conceive of such enormous deviations from type coming to pass in the wild state. As the evidence stands at present, all that can be safely said in support of the doctrine of evolution is that variation occurs as a definite event often producing, however, a discontinuous result; and that the succession of varieties comes to pass by the establishment of groups of individuals owing their origin to such isolated events.

INSECT NOTES.

A NEW COTTON PEST.

An unusual occurrence has taken place at St. Kitts during the present cotton-growing season, which seems to indicate that a new and unexpected pest of young cotton plants has appeared.

The circumstances of this occurrence are briefly stated herewith.

On two estates in St. Kitts much trouble was experienced in getting cotton established in certain fields, the young plants being eaten off as soon as they appeared above ground. On one estate about 30 acres had suffered from these attacks; one field of 14 acres was planted several times, and completely destroyed each time; and eventually another crop was planted instead of cotton. On another estate a patch of about 2 acres in a large field was planted and eaten down six times.

The characteristic feature of these attacks is to be found in the fact that the cotyledons or seed leaves are eaten. Any plant which gets through the seed leaf stage and develops its first foliage leaf seems to escape further attack.

The cause of this injury has been difficult to locate, but after repeated searches the Agricultural Superintendent has established the fact that the damage is done by cockroaches.

At the time of the Mycologists's visit to St. Kitts in July these affected cotton fields were visited by that officer with Mr. Shepherd, when they found a few crickets, grasshoppers and cockroaches, but no beetle-grubs or cut worms were found which might have caused the injury.

Mr. Shepherd afterwards applied a poison bait of cornmeal and Paris green to a portion of this field planted with cotton for this purpose. Four days later the plants were just coming up, and they were unharmed; but there were large numbers of dead cockroaches lying on the ground in the vicinity of the rows where the poison had been applied.

Since that time the Agricultural Superintendent has conducted experiments with similar cockroaches collected in the fields where the cotton has been attacked; and these insects in captivity have destroyed the young cotton in a manner exactly similar to that in which the young plants were destroyed in the field.

The cockroach concerned in these attacks on cotton has been identified as the Australian cockroach (*Periplaneta australasiae*). This is the common household cockroach in the West Indies. The insects so far observed in the field have all, or nearly all, been the young or immature stages of this species.

This attack on cotton by cockroaches is very unexpected, for although several species of these insects are known to occur in these islands they have not before been suspected of being serious pests of field crops. Their association with the injury under consideration lends a new interest to them, and it is hoped that whenever cockroaches are observed in the fields by planters and others, they will be collected and forwarded to the Agricultural Officer in each island, with a statement of the conditions under which they occur, and remarks as to the kind and extent of injury which they are supposed to cause.

TRI-TRI IN ST. LUCIA.

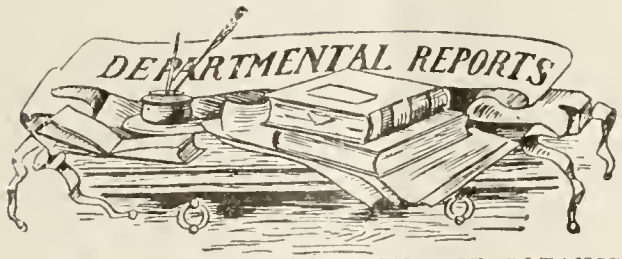
An interesting note on the habits of these little fish appeared in the *West Indian Bulletin*, Vol. XIV, No. 1, based on the observations made by Mr. W. N. Sands in regard to St. Vincent. It will be remembered by those who read this article that the tri-tri is able to ascend an almost perpendicular surface provided it is covered with a film of moisture. In this way the fish are enabled to migrate up the rapids so typical of West Indian streams.

The economic side of the habits of these fish is brought out in a letter recently received from Mr. A. Brooks, Acting Agricultural Superintendent, St. Lucia. In this it is recorded that the tri-tri have invaded the hydraulic ram at the Réunion Experiment Station to such an extent that the water service was temporarily put out of action. It seems that the fish travelled about ½ mile up the Choiseul River, then along a stone canal and climbed a perpendicular stone wall 15 feet high over which the waste water flowed from the ram. They continued on through a small hole in the wall and entered the house containing the ram. They then passed through the double valves, the ram which was working at full pressure all the time, and entered the air chamber and were then forced up the delivery pipe to a height of a little over 200 feet. Arriving there they gave a great deal of trouble by blocking the hose nozzle.

A few days later the ram stopped and it was found to be entirely choked with tri-tri, and the chamber of the air cock on the plateau 200 feet above, when opened, were found to be full of these fish, still living in a condition of considerable activity.

To prevent any further invasion of this kind a wire screen has been placed in a suitable position to render the recurrence of such an event impossible.

Telegony. A very interesting article on the subject of telegony (the supposed influence of impregnation upon subsequent conceptions) appears in the *Journal of Heredity* for September 1914. In this article, as in the previous one noted in the *Agricultural News*, it is shown that there is no direct influence. The circumstance has to be borne in mind, however, that a female which produces a second offspring is no longer the female that produced the first offspring; in other words, the conditions of environment of the second foetus are different from those of the first. But the essential fact is that the female has no means of 'warehousing' in any way the characters belonging to the first male. It is known of course, by way of example, that during the development of the foetus the functions of the mother's pancreas cease to operate, the two organisms being entirely dependent upon the pancreas of the foetus. This indicates a complete intermixture of blood, but investigations have shown that the blood of the mother returns to its normal composition immediately after birth. Similarly the functions of the pancreas become normal again as shown by the composition of the blood as regards its sugar content. From these considerations it will be obvious that what is generally considered telegony has nothing to do with heredity, and should not be introduced into discussions on points which concern the transmission of characters.



MONTSERRAT: REPORT ON THE BOTANIC AND EXPERIMENT STATION, 1913-14.

In this report under the heading of the work done in the gardens and the observations made on plants several points of interest appear. It is mentioned that the twelve peach trees, planted in 1912, have made fair growth, and were in flower in the early part of 1914. Work in the nurseries has increased in importance owing to the greater attention given in the island to the cultivation of the Bay tree, 3,270 plants of this tree having been distributed during the year. In addition there have been 16,880 lime plants, 211 papaws, and 500 cacao plants sent out, besides many others of interest and value. Two species of fodder grass, namely, Rhodes grass (*Chloris gayana*), and Sudan grass (a variety of *Sorghum halepense*) have been introduced for observation.

The section of the report dealing with cotton experiments shows that much interesting work is being done with regard to cotton selection, the examination of the characters of each variety being carried out with great care. Generally speaking, the usefulness of this cotton selection has been fully demonstrated and the work will be continued, so that further data may be accumulated. As to manurial experiments on cotton, it has been decided to discontinue them on present lines. Work also with cotton hybrids, having proved of very doubtful value, will for the future be greatly reduced. Having given a trial to Sakellarides cotton for three years, the Curator does not recommend its general cultivation in Montserrat. An Ordinance passed by the Legislative Council and approved by His Excellency the Governor in May 1914, which aims at the suppression of insect pests by enforcing the destruction of old cotton plants by the last day in February in each year is noticed.

Coming to the section on lime trees, we note that they are much troubled in Montserrat by scale insects, especially the purple scale (*Lepidosaphes beckii*). It is also suspected that the grub of the 'hard back' (*Exophthalmus esuriens*) is responsible for considerable damage to the roots of the trees. Various insecticide washes have been experimented with to control the purple scale, but apparently ineffectually. In February 1914, however, during a visit to the island of Mr. H. A. Ballou, M.Sc., the Entomologist of the Imperial Department, spraying experiments were conducted under his supervision, a new insecticide being particularly tested. This is 'Scalo', a modification of Mr. Cousins's 'Paranaph' a mixture of whale-oil soap, kerosene and naphthalene, devised by Mr. J. C. Moore, Agricultural Superintendent at St. Lucia. It is too early to state what the ultimate result of these applications will be.

The experimental work on Bay trees is very valuable, owing to the interest that is being developed in their cultivation. The trees, which are planted 9 feet by 6 feet, are not allowed to exceed 6 or 7 feet in height, in order to facilitate the gathering of the leaves. Only a few shoots are removed from any one tree at a time and nothing in the nature of stripping the tree is resorted to. It is estimated that one man working with a pair of ordinary garden secateurs, with two women to strip the leaves from the cut shoots, ought to collect 300 lb. of leaves a day, where trees are grown in bush form, and when there is a considerable number of trees. Experiments with a view to ascertaining whether there is a difference in quantity and quality of yield at various periods of the year have shown that the middle months of the year give the best results, owing, probably, to the absence of immature leaves on the plants at that season.

As the sweet potato is the chief food crop in Montserrat, attention has been given to the question of varieties in the work of the Experiment Station for the last six years. A list is given of the twenty heaviest cropping varieties experimented with, together with the average yield. This ranges from 15,950 lb. to 9,984 lb. Some of these are recommended for trial on account of their large yields, and some others on account of their clean attractive appearance and good cooking qualities. Experiments are also carried out to decide as to which are early and which late maturing varieties. Half of the row of each variety under trial was reaped at five months from planting and half at six months. Some of them show no gain in weight by remaining in the ground for more than five months, while others show a considerable increase. An interesting experiment as to the relative value of cuttings raised from potato tubers and cuttings taken from the ground is hardly exhaustive, but seems to point to the conclusion that cuttings raised from the tubers tend to increased yield. The section ends with a table of figures, which seem to show that the best yield is obtained by planting in the later months of the year.

Trials with newer varieties of ground nuts were carried out with fairly satisfactory results, although the season had been unfavourable. It is noted that, as a rotation crop on cotton lands, the ground nut is worth a trial.

In the section on work connected with the control of insect and fungoid pests, it is interesting to note that during a visit paid to Montserrat in June 1913, Mr. H. A. Tempany, B.Sc., the Superintendent of Agriculture for the Leeward Islands, discovered that the cotton stainer was parasitized by a small Arachnid, which fastens itself under the wings of the insect. It has not however been decided whether it is very destructive to its host.

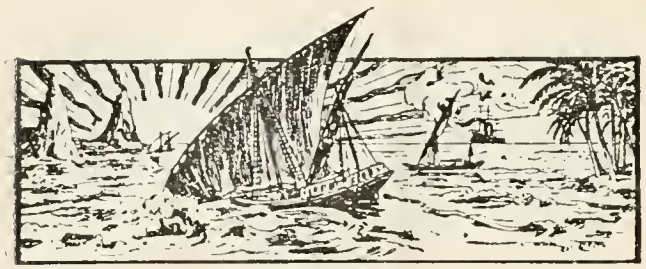
Slugs (*Veronica occidentalis*) have been responsible for a good deal of damage to the potato crops in some parts of Montserrat. Persistent collection and destruction of them is recommended as the best method of combating their attacks.

In addition to being possibly the source of some damage to lime trees, the grub of *Exophthalmus esuriens* seems to be responsible for injury to Bay trees also.

A disease of the bolls appeared rather prevalent in the cotton fields during this season. Specimens of diseased bolls have been submitted to the Mycologist of the Department for examination.

The growth of the cotton industry in Montserrat during the last ten years is shown by figures given. In 1904 there were 600 acres under cotton cultivation, in 1914 there are 2,200. In 1904, 70,723 lb. of lint was the quantity shipped, in 1914 it was 293,627 lb. On the contrary, the lime industry, in which Monsterrat was the poineer West Indian island, has considerably fallen off. Attempts have been made, however, in recent years to plant new areas in this crop.

Among minor industries, the cultivation of the papaw, for the preparation of papain, seems to be well maintained; and the planting of Bay trees is very much on the increase. The interest in the cultivation of pine-apples has been somewhat revived; His Excellency the Governor of the Leeward Islands in July 1913 gave a lecture to a representative body of planters on the advantages of the cultivation of this crop, describing the methods of growing and packing the fruit. The variety grown in Montserrat, though of excellent flavour, is however rather small in size.



GLEANINGS.

A note in the *Journal of Agriculture* of New Zealand shows that the saccharine content of ripe grapes is from 18 to 24 per cent. Of temperate fruits nearly all are far below this value, ranging in the case of plums from 2·1 per cent. to green cherries, 10·8 per cent.

Circular No. 2 of the Uganda Protectorate Department of Agriculture, on the subject of cotton cultivation, says that the Department is constantly at work on the improvement of the staple, and issues to cultivators the best seed available. The whole seed supply is under the control of the Department of Agriculture, and only seed issued by or approved by the Department may be sown.

In connexion with the forthcoming examinations conducted by the Imperial Department of Agriculture, the following candidates have notified their intention of sitting: H. Auguste (Dominica - Final), F. Simmons (St. Vincent —Intermediate), Arnold Gallway and Alfred Macdonald (Antigua—Intermediate). The examinations will take place in November 1914.

Information is reviewed in the *Journal of the Royal Society of Arts* for September 11, 1914, to show that the mole in regard to agriculture is a beneficial feeder. An investigation conducted at the University College of North Wales showed the contents of the stomachs of a large number of moles to contain 'leather jackets', centipedes, 'wireworms' and similar animal organisms injurious to agriculture.

In an article on cowpeas published in the *Agricultural Gazette* of New South Wales (August 1914), it is stated that in manurial trials at the Hawkesbury Agricultural College, phosphoric acid proved to be undoubtedly the most important manurial ingredient for this crop. Sulphate of potash, though it increased the yields, was too expensive; while nitrogenous manures, especially nitrate of soda and sulphate of ammonia, were decidedly detrimental.

The *Geographical Journal* for September 1914 contains an interesting review of the coal resources of the world. There is no fear of a coal famine. It seems that the United States has the largest known supply; China and Canada are also very rich, whilst the valuable resources of Germany is a fact of great political importance which is said to be inadequately realized in Great Britain, whose coal reserves (in England and Wales) are estimated at 189,533 million tons.

A successful way of destroying rats, noted in the *Tropical Agriculturist* for April 1914, is the following: After having ascertained which rat holes are inhabited by stopping up the mouths with earth, half a teaspoonful of carbon bisulphide is poured into each of these holes and, after waiting a few seconds to allow the liquid to evaporate, the mixture of vapour and air is ignited. The resulting explosion, though slight, is sufficient to fill the hole with poisonous gases that kill all the rats almost instantly.

The *Louisiana Planter* for August 1, 1914, states that Calcutta agents have been inducing distillers in India to use solidified molasses in place of the home-made product. It is to be shipped from Java, and the preliminary experiments are stated to have been satisfactory. The molasses is brought in oblong blocks each weighing about 185 lb. and these are crated. During the hottest weather there is, of course, some loss, but at that it is much less than when brought in vats or barrels. The freight charge is also smaller.

A note on the commercial conditions in Brazil, published in *The Board of Trade Journal* for August 27, 1914, refers to the financial difficulties which have occurred recently as a result of want of economy in the expenditure of Government money. Brazil depends for her foreign obligations upon her exports which are principally rubber and coffee. The fall in the price of rubber, and the recent interruption of international credit systems, have therefore seriously interfered with the Brazillian financial position for the time being.

A letter received from the British Cotton Growing Association, dated September 17, 1914, states that the demand for citric acid in England is very active at the present time and to some extent exceeds the supply. The British Cotton Growing Association is willing to look after any consignments sent to them for sale. As regards West Indian Sea Island cotton, the same letter states that this product is so essentially an article by itself that there would appear to be no need for any apprehensions that it will be unsaleable.

The cessation of German exports of chemicals opens up considerable scope for British chemical manufacturers. Naturally the question of potash is all important, and an interesting article in *Nature* for September 17, 1914, refers to the kelp of the West Highlands and points out that it seems feasible to suggest that this industry should be taken up again, as it furnishes not only potassium salts but also iodine. The same article refers to the increased demand for citric acid, which will no doubt be of interest to lime growers in the West Indies.

A note on potash manures in the *Journal of the Board of Agriculture* of England for September 1914, draws attention to the need for seeking new sources of this manure. It is suggested that farmers for the present should employ all unskilled labour in collecting all readily available vegetable refuse with a view to drying and burning it and storing the ashes for early spring use. The ashes must be stored in a dry place, for the carbonate of potash present in ashes is very soluble and will quickly wash out if exposed to rain. The great value of sea-weed is referred to.

STUDENTS' CORNER.

DYNAMICS OF A PLOUGH.

Part IV.

In preceding numbers extracts from the article under review* have been given in extenso. In this number an abstract of the concluding paragraphs is presented.

Two horses yoked abreast, i.e. two equal parallel forces give a resultant equal to a single force acting midway between them of equal magnitude to their sum; in other words, the two horses abreast have the same result as one big horse twice their power, yoked midway. (See fig. 12.)

To draw the plough straight forward, the force must take a straight line from a point midway between the hame-hooks of the single large horse. The bridle-pin must be on this imaginary straight line.

If instead of two horses abreast, four horses are yoked, two in front of two, a new vertical resultant has to be formed as seen in fig. 13.

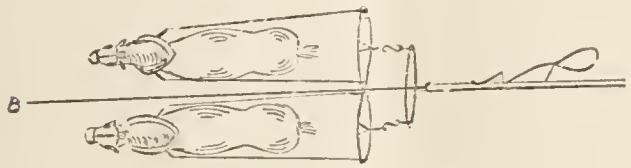


Fig. 12.

This resultant gives a combination half-way between the front and back horses. The bridle-pin must be lowered about 2 inches from the proper position for two horses. In the case of three horses abreast the resultant is shifted to the middle of the middle horse at his hame-hooks. The bridle-pin must be shifted 6 inches or 7 inches on the bridle. As to the horizontal position of the bridle-pin, four horses, two in front of two, have the same effect as two horses abreast, and six horses, three in front of three, the same effect as three horses abreast.

Fig. 13.

Such are the theoretical principles governing the application of power to draw ploughs, and they hold good under all circumstances. It must be remembered that the position of the resultant centre of resistance varies under different circumstances. Practical ploughmanship consists largely in knowing what to do to adjust the resultant force of the team. The following are a few hints of what to do under ordinary difficulties.

Not enough dip. See to the share: if it is worn bevelled on the underside and is of steel, get it sharpened by a blacksmith; but if it is of cast iron, grind it bevelled on the upper surface or put on a new one. Cast shares are made by all makers with different amounts of dip, and can be got by ordering when required with more or less dip. If the share is in good order and more dip is still wanted, raise the bridle and shift the coulter—if this be circular—farther back. This is very necessary if the ground is hard on the surface, as a circular coulter, more especially when blunt, then becomes a wheel to hold the plough up out of the ground. Circular coulter-blades should always be ground sharp when worn blunt, but this is seldom done. In very hard or stony land, straight-bar coulters should be used instead of circulars.

Too much dip. Lower the bridle and shift the coulter. If it is circular forward, put on a share with less dip.

Too much land. Shift the bridle-pin to the left, set the coulter to run off land, and shorten the couplings of the land horses.

Not enough land. Shift the bridle-pin to the right and set the coulter to point more to the left. If it is a circular coulter and worn off land, get it ground, bevelling on the right-hand side to a sharp edge, and put in the shank with the flat side to the left. Set the land-wheel to point to the left by packing it behind the square-holed washer—a short piece of fencing wire will do. Bend the steering-rod just behind the knuckle-joint, to make the wheel run pointing more to the left. See that the share is not worn bevelled on the underside. A share so worn, reduces the land by making the plough run lighter on the wheels. The wheels are all set to run slightly to the left, and if the pressure upon them is reduced, they lose their grip on the surface, and hence also their guiding effect. Widen the land horse's couplings and keep them farther to the left.

In conclusion a share should be 2 inches or 3 inches narrower than the furrow which is to be ploughed. It is a mistake to use a share too wide. The idea that the draught of a plough is proportionate to its weight, is also a mistake. The draught of every plough will vary with the width and depth of the furrow, and the condition and quality of the land. Whilst a light plough is easier to handle for a man, it makes hardly any difference to the horses, within reasonable limits.

* The *Journal of Agriculture* of New Zealand for June 1914.

Stomata and Leaf Movement.—It has been recorded in a recent issue of the *West Indian Bulletin* that the number of stomata, per unit of area, varies in a constant manner in different varieties of sugar-cane, and that these variations are correlated with certain variations of leaf structure. In connexion with this subject of the location of stomata on growing seedlings of other Gramineæ, the *Gardeners' Chronicle* for September 12, 1914, records some observations of interest. In wheat and oats, the stomata occur in the greatest number at the apex of the cotyledon, which is the part that moves most readily to stimulation from light, while at the base there is an absence of stomata. In seedlings of Panicum and Paspalum, the stomata are evenly distributed over the whole surface, and in these the whole cotyledon is equally influenced by light through its length. It would seem, therefore, that there is a connexion between the distribution of stomata, and the perception of light in seedlings; and perhaps in more mature leaves.

FUNGUS NOTES.

WILT DISEASE OF LEGUMINOUS PLANTS.

A recent occurrence in Montserrat on *Tephrosia candida* of wilt disease, of the kind which has had very serious effects on leguminous plants in many parts of the world, renders it advisable, in view of the expected increase in the cultivation of leguminous food crops, to summarize the available information respecting the disease.

The Montserrat specimens exhibit the usual signs of attack by Fusarium wilt disease; the vessels are filling up with colourless hyphae, the wood is turning brown in places, and spores of Fusarium type are being produced. The specimens examined are not in an advanced stage so far as their general appearance goes. The wood is mostly sound, the tissues external to the cambium are softened but not disintegrated, yet the roots bear on the outside very numerous almost mature perithecia of *Neocosmospora vasinfecta*, Erw. Sm.

This is the fungus which for many years has been regarded as the perfect stage of the widely distributed Fusarium wilts of cotton, okra, melon, and amongst others a wide range of leguminous plants, including cowpea, pigeon pea, chick pea, indigo and Crotalaria. It has been found in association with such diseases in North America, Africa and Asia. So far as is known to the writer it has not previously been identified from the West Indies.

The history of the investigation of the disease is somewhat complicated. E. F. Smith published in 1899 the results of prolonged studies of wilt diseases of cotton, cowpea, and melon. He found that all were due to closely similar parasites, which gave rise to the same type of disease in their respective hosts, and produced morphologically indistinguishable Fusarium and Cephalosporium forms of conidial fructification. On each host were also found the perithecia of an Ascomycete, whose spores gave rise in pure cultures to conidial stages like those found on the diseased plants. Attempts to produce the disease on its various hosts by inoculation from pure cultures derived from the ascospores were unsuccessful, and though it could readily be produced by inoculations from cultures derived from the conidia found on the plants, such cultures could not be induced to form perithecia. While it was admitted that the chain of evidence was incomplete, the presumption of the continuity of the disease-producing fungi with the Ascomycete was so strong, that they were regarded as identical; and the name *Neocosmospora vasinfecta*, based on the perithecial form, was given to the whole assemblage; the forms on the cowpea and melon, owing to the failure of cross inoculations, being distinguished as varieties under the names *tracheiphila* and *nivea*.

A. Zimmerman found the perithecia of Neocosmospora in German East Africa on cotton in 1904. E. F. Butler in 1910 published the results of his investigations of Fusarium wilt diseases on cotton, pigeon pea, gram (chick pea), and indigo in India. He found the perithecia of Neocosmospora occurring on the diseased roots in the same way as Smith had described, but in a long series of experiments he failed to secure infection by inoculations with cultures derived from the ascospores, or to obtain perithecia in cultures of proved parasitic nature derived from the diseased tissues. In the following year B. B. Higgins in North Carolina also reached the conclusion that the parasite on cowpea was distinct from the perithecia-forming fungus. H. W. Wollenweber has confirmed these results, and has pointed out that in cultures, certain differences occur between the conidial stages of Neocosmospora and the parasitic forms. The opinion is now generally held by mycologists that *Neocosmospora vasinfecta* is a harmless saprophyte, whose conidial stages, though closely resembling those of the fungi which produce the wilt diseases in question, are in reality quite distinct from them. At the same time the constancy of the association is a curious feature, unless Neocosmospora exists as a saprophyte much more commonly than it is at present known to do. For the present the parasitic forms obtained have been returned to their old position in the genus Fusarium. Much work has been and is being done in the exact comparison by means of cultures of the members of this large and perplexing assemblage of forms; and considerable progress has been made in this direction. The fact is emerging that the wilt disease parasites found on various hosts are separate forms or species, and are not interchangeable. Such knowledge is very important in its practical bearing on rotation of crops, since it enables a choice to be made of a crop not susceptible to the wilt disease of the one preceding it.

The deep-seated nature of the disease obviously renders any external treatment of affected plants hopeless, and the use of sprays for prevention is of no avail, since all experience goes to show that infection takes place to a very large extent through the soil, which retains infective material in some form for a period which must be measured in years. In view of the latter fact it is obviously very important in the case of small outbreaks or sporadic cases to dig up and burn the affected plants, while manure which is open to the suspicion of containing infected material should not be used for crops of the same allied kinds.

Since the classical example of a disease-resisting variety occurred in connexion with wilt disease of cotton, this avenue of escape is hopeful in the case of similar disease of other plants, and it has in fact been followed with success. Thus varieties of cowpea and melon have been developed which will thrive under conditions of soil infection which absolutely prohibit the growth of the ordinary sorts.

So far as the West Indies are concerned, Fusarium wilts, with the exception of the Panama disease of bananas, do not appear to have attracted much attention, and may therefore be presumed to be uncommon or absent from other crops of any importance. It is an interesting fact that the Rivers' strain of cotton, from which practically all the Sea Island grown in the West Indies is descended, was selected as resistant to wilt disease, and has either maintained its resistance or has not been exposed to infection here, the latter being an improbable alternative. A case of severe damage to a crop of pigeon peas is recorded as occurring in Trinidad about 1900. A fungus was found on that occasion which was regarded as an immature Nectria.

DOWN THE ISLANDS.

ITEMS OF LOCAL INTEREST.

ST. VINCENT. The Agricultural Superintendent (Mr. W. N. Sands) returned to the colony from six months' leave of absence in England by the Royal Mail during October. In this island, cotton growers though viewing with apprehension the position as regards cotton are for the present confining attention to the crop soon to be reaped. During this time they will have an opportunity of considering to what extent, if any, reduction in area should be

made when planting begins next June. The same attitude is adopted in the other cotton growing islands.

ST. LUCIA. Mr. J. C. Moore, formerly Agricultural Superintendent, visited this island on his return from England previous to proceeding to Grenada to take up his new post as Superintendent of Agriculture of that Colony. A report from the British Cotton Growing Association states that a shipment of St. Lucia lime juice has recently sold at the high price of £52 10*s.* per pipe. From all reports it seems that the prospects before lime juice are exceedingly good. In this connexion it may be added that the future before cotton is not as gloomy as was thought in some quarters soon after the outbreak of war.

The monthly report of the Assistant Agricultural Superintendent for September states that there are over seventy families working free grants of land adjoining the Experiment Station at Réunion, and their gardens are becoming well stocked. A similar effort was made at Union but only seven people took land, and only one of these has commenced to work it. During September, the cacao crop was promising and the second crop of limes that was then coming in promised to be a good one. The sugar crop is reported to be very promising except in the district where the drought has been severe. An extension of the area under sugar has been made wherever possible, owing to the active state of the market. During the month, 4 casks of concentrated lime juice were shipped from the Government Lime Juice Factory. This completed the first crop of the present season and totalled 6381/2 gallons or 15 casks.

DOMINICA. The Curator, Mr. Joseph Jones, reports that the lime crop is coming in slowly and is likely to continue up to January or later. The latest cable quotations for concentrated lime juice were £43 to £45 per pipe. Local prices are as follows: green limes 8*s.* per barrel; ripe limes 7*s.* 6*d.* per barrel; raw lime juice 1*s.* 2¼*d.* to 1*s.* 4*d.* per gallon. In Dominica some trouble has been caused of late by fungus diseases of the roots of limes and of cacao. As reported in the last issue of the *Agricultural News*, the Mycologist to the Imperial Department of Agriculture is at present in Dominica investigating these outbreaks. Mr. F. R. Shepherd, acting Superintendent of Agriculture for the Leeward Islands, visited Dominica for a few days during September. An interesting and important development has been the installation of steam concentration plants on three lime estates in Dominica. On four properties there are already citrate plants.

MONTSERRAT. There is little news to report from this island with the exception that the cotton growers continue to contemplate the present economic position philosophically. During September, an address on the agricultural prospects of Montserrat was delivered by the Imperial Commissioner of Agriculture at the request of His Honour the Commissioner of the Presidency. This address is published in the present and last issue of the *Agricultural News*. There is some likelihood that the area under Indian corn will extend in this and other islands within the next six months. In this connexion it may be mentioned that a pamphlet on Indian corn is now being published by the Imperial Department. This institution will also have issued by the time this is read a valuable pamphlet on cotton growing, a companion to the well-known pamphlet on lime cultivation which met with such a favourable reception in the West Indies, and in other parts of the world.

ANTIGUA. As reported in the last issue of the *Agricultural News*, Mr. H. A. Tempany, Superintendent of Agriculture, returned from leave in England. By the mail leaving Barbados on September 30, Mr. V. M. Weil, B.Sc., Assistant Government Chemist, left for home, having completed his term of engagement under the Government of the Leeward Islands.

ST. KITTS. It is reported that the low rainfall during September has adversely affected the cane crop in the Basseterre valley district. In the northern parts rain is also much needed but several showers have fallen during the latter part of the month. The earlier planted cotton is nearly all picked; the returns have been fair but the younger bolls have dried up from drought. The later planted cotton is green and gives promise of better yields. The possibility of a second picking from the earlier cotton should be good if the rains come in soon.

NEVIS. The report of the Agricultural Instructor for the quarter ended September 30, 1914, states that an experimental plot has been planted with seeds of superfine cotton obtained from St. Kitts, to which island the original seed was sent by Mr. E. L. Oliver. Cotton cultivation as a whole, and in fact most of the crops of the island have suffered a good deal during the quarter from the dry weather experienced. Certain pests like the cotton worm have given trouble, but remedies have been applied in good time. A large number of plants received were distributed during the quarter, including 4,500 sweet potato cuttings and 1,068 lb. of selected cotton seed. Thirteen pounds of white, and 7½ lb. of red Bermuda onion seed were imported by the Agricultural Department and supplied to growers at cost price. Considerable amount of attention has been given to planting of provision crops.

VIRGIN ISLANDS. It is interesting to note in a recent report that the harvesting of the lime crop is being conducted satisfactorily. During August, 300 barrels of limes were purchased at the Station. One estate has started the crushing of limes and the concentration of lime juice on its own account, showing a tendency for the industry to advance. At Parraquita Bay estate, 20 acres of land have been cleared for coco-nut cultivation. The weather during August in the Virgin Islands was ideal for the cotton crop.

DRUGS AND SPICES IN THE LONDON MARKET.

The outbreak of the European war has caused not only a dislocation of business, but in the first few weeks almost a stagnation, especially in the drug market in which Germany has hitherto held a very large part, more particularly in synthetic productions. One of the results of the war will be, no doubt, transference of these manufactures to English proprietors, but with these as well as with raw products, it will be some time before the markets assume anything like a normal condition; but, quoting from a recent article in the *Lancet*, 'the effect of the war is not felt solely in the sphere of manufactured drugs. In Belgium, Germany and France are produced many of the most important of the vegetable drugs, and new crops of some of them were awaiting harvest when the call to arms removed labourers from the fields. Aconite, arnica, camomile, belladonna, digitalis, colchicum, gentian, valerian, lavender, conium and other vegetable drugs are grown in the parts of Europe which are in, or near the zone of hostilities, and consequently there is bound to be a scarcity in the supply of all of them.' It may be that some of the deficiencies may in the future be supplied by our West Indian possessions. As the drug auctions in Mincing Lane have been held at irregular intervals during September, quantities, and prices asked and paid have been very erratic.

MARKET REPORTS.

London.—The West India Committee Circular, October 6, 1914.

Arrowroot—2⅝*d.*
Balata—Sheet, 2/2; block, 1/8½ per lb.
Beeswax—No quotations.
Cacao—Trinidad, 56/- to 60/- per cwt.; Grenada, 54/-; Jamaica, no quotations.
Coffee—Jamaica, no quotations.
Copra—West Indian, £24 per ton.
Cotton—Fully Fine no quotations; Floridas, no quotations; West Indian Sea Island, 12*d.*
Fruit—No quotations.
Fustic—No quotations.
Ginger—Quiet.
Isinglass—No quotations.
Honey—No quotations.
Lime Juice—Raw, no quotations; concentrated, no quotations; Otto of limes (hand-pressed), no quotations.
Logwood—No quotations.
Mace—No quotations.
Nutmegs—No quotations.
Pimento—Quiet.
Rubber—Para, fine hard, 2/10; fine soft, 2/4½; Castilloa, 1/8.
Rum—Jamaica, no quotations.

New York.—Messrs. Gillespie Bros., & Co., July 24, 1914.

Cacao—Caracas, 11½c. to 12c.; Grenada, 11c. to 11½c.; Trinidad, 11¼c. to 11⅜c.; Jamaica, 10c. to 11c.
Coco-nuts—Jamaica and Trinidad, selects $20·00 to $21·00; culls, no quotations.
Coffee—Jamaica, 9¾c. to 13½c. per lb.
Ginger—7½c. to 10c. per lb.
Goat Skins—Jamaica, 46c.; Antigua and Barbados, 43c. to 46c.; St. Thomas and St. Kitts, 40c. to 43c. per lb.
Grape Fruit—Jamaica, $1·75 to $2·50.
Limes.—$3·75 to $4·50.
Mace—45c. to 55c. per lb.
Nutmegs—110's, 11¾c.
Oranges—Jamaica, $2·00 to $2·50.
Pimento—3⅞c. per lb.
Sugar—Centrifugals, 96°, 3·26c.; Muscovados, 89°, 2·88c.; Molasses, 89°, 2·61c., all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., October 12, 1914.

Cacao—Venezuelan, no quotations; Trinidad, no quotations.
Coco-nut Oil—74c. per Imperial gallon.
Coffee—Venezuelan, 13c. per lb.
Copra—$3·60 per 100 lb.
Dhal—No quotations.
Onions—$2·80 per 100 lb.
Peas, Split—$8·00 per bag.
Potatoes—English, $1·25 to $1·50 per 100 lb.
Rice—Yellow, $6·00; White, $5·40 per bag.
Sugar—American crushed, no quotations.

Barbados.—Messrs. James A. Lynch & Co., Ltd., October 17, 1914, Messrs. T. S. Garraway & Co., October 19, 1914.

Arrowroot—$4·00 to $4·25 per 100 lb.
Cacao—$11·00 to $12·00 per 100 lb.
Coco-nuts—$17·00.
Hay—$1·50 to $1·70 per 100 lb.
Manures—Nitrate of soda, no quotations; Cacao manure, $48·00 to $50·00; Sulphate of ammonia $78·00 to $85·00 per ton.
Molasses—No quotations.
Onions—$6·00 per 100 lb.
Peas, Split—$6·00 to $6·25 per bag of 210 lb.; Canada, $4·50 to $4·90.
Potatoes—Nova Scotia, $3·50 per 160 lb.
Rice—Ballam, $6·30 to $6·40 per 100 lb.; Patna, no quotations; Rangoon, no quotations.
Sugar—American granulated, $6·50 per 100 lb.

British Guiana. Messrs. Wieting & Richter, October 10, 1914; Messrs. Sandbach, Parker & Co., October 9, 1914.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot St. Vincent	$7·00 to $8·00 per barrel of 200 lb.	——
Balata—Venezuela block	No quotation	——
Demerara sheet	65c. per lb.	——
Cacao—Native	12½c. per lb.	13c. per lb.
Cassava—	96c. to $1·08	——
Cassava Starch—	——	——
Coco-nuts—	$16 to $20 per M.	$23 per M.
Coffee—Creole	——	16c. per lb.
Jamaica and Rio	16c. per lb.	16c. per lb.
Liberian	11c. per lb.	13c. per lb.
Dhal—	$4·50 to $4·75	$4·80 to $5·00 per bag of 168 lb.
Green Dhal	——	——
Eddoes—	$1·44	——
Molasses—Yellow	None	——
Onions—Teneriffe	——	——
Madeira	3½c.	3⅝ to 5c.
Peas—Split	$6·00 to $9·00 per bag (210 lb.)	$9·50 per bag. (210 lb.)
Marseilles	——	——
Plantains—	16c. to 48c.	——
Potatoes—Nova Scotia	$2·25 to $2·50	$2·25 to $2·50
Lisbon	——	——
Potatoes—Sweet, B'bados	——	——
Rice—Ballam	No quotation	——
Creole	$5·50	$5·50
Tannias—	$2·88	——
Yams—White	——	——
Buck	——	——
Sugar—Dark crystals	$3·50 to $4·00	$3·50
Yellow	$4·00 to $4·10	$4·00
White	——	——
Molasses	——	——
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M.
,, Cordwood	$1·80 to $2·00 per ton	——

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Printed at Office of *Agricultural Reporter*, 4 High Street, Bridgetown, Barbados

AGRICULTURAL NEWS

Vol. XIII. No. 327.] SATURDAY, NOVEMBER 7, 1914. [One penny.

JUST ISSUED.

WEST INDIAN BULLETIN.

Vol. XIV, No. 3.

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AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

OF THE

IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

VOL. XIII. No. 327. BARBADOS, NOVEMBER 7, 1914. PRICE 1*d.*

CONTENTS.

Agricultural Development.

THE development of new enterprises and the extension of old ones in the West Indian colonies, may often be stimulated by experimental facilities of a commercial kind in contradistinction to the work commonly carried on at experiment stations and in chemical and biological laboratories. For instance, it is clearly not sufficient to be able merely to produce a given crop for consumption abroad, it is necessary as well to be able to export it satisfactorily. This latter consideration applies more especially in the case of perishable produce like fruit and vegetables, and it is instructive to remember that there are facilities at the present time for investigation in the direction suggested. In the production of fruit for the northern markets it would be interesting, and probably useful, to make trial shipments in cold storage and in cool storage of different varieties and at different times of the year. The experiments might include series where the fruit is kept at different temperature and under different conditions of humidity. Such investigations should lead to a better understanding of the changes that take place in the fruit. With the encouragement given by preferential treatment of British West Indian products in Canada, and the facilities offered by the newly established Canada-West Indian service of the Royal Mail Steam Packet Company it seems desirable that systematic efforts should be made to take advantage of the opportunities offered, in order, by means of experimental shipments of suitable products, to ascertain in what directions extension of trade may be looked for.

These experiments are not likely in the first instance to prove entirely remunerative, but they will furnish valuable information for guidance as to the direction in which progress may be made, and at the same time it is probable that they will indicate the most economical and effective methods of obtaining the information desired, and of disseminating it for general use. Even unsuccessful ventures thus carried out have considerable value, in that they obviate the necessity of repeated losses on the part of isolated individuals in their efforts to acquire the information sought. On the other hand successful ventures can be rapidly followed up, and in a more extensive manner, than if the information had been privately obtained.

It will serve a useful purpose if agricultural officers, and those concerned with the development of

co-operative efforts, will endeavour to make use, for purposes of investigation, of the facilities now existing. These facilities are considerably extended by the presence on the staff of the Company referred to in Canada of an agent in charge of commercial enquiries.

Another case where commercial facilities can be used for investigation is in the numerous co-operative factories that have of recent years come into existence. We have in the West Indies the central sugar factories, one at least of which, at the outset, received some measure of Government assistance and encouragement.

From the published accounts of some of these factories much useful information has come to light, whereby precision is given to the local sugar industry. It is now fairly well known in some districts what is the average quality and sugar content of the cane grown in each season, how much cane is required to make a ton of sugar, and how much cane, on the average, is raised on an acre of land. A glance through the discussions on sugar manufacture taking place ten or twenty years ago will show how vague were the ideas on these subjects, and a little consideration will show what a gain must result as regards future discussions from the precision of ideas thus acquired.

Examples of other co-operative concerns which are also aiding progress are the lime juice and cotton factories. The St. Lucia Government lime juice factory has already been the means of establishing useful data in connexion with concentration and other matters related to the preparation of lime products for the market, though the principal aim of the institution is to provide a local factory and market for the small growers, who cannot afford to erect crushing plants for themselves, or to ship the fruit in marketable quantities. These side lines ought to be taken into consideration in judging the benefit of commercial concerns to the general public. Naturally enough, if a private factory discovers, even empirically, economical methods of working, it is not instinctively prompted by the scientific spirit to spread its news abroad. If that were so, in extreme cases, there would be no need for patent offices. But, in a general way, in these colonies the all-round development of the island is of sufficient importance to the individual for those who can, to put forward enlightened views and information on the local industries.

Cotton factories, especially the Government concerns, have done a very considerable amount of good work in the directions indicated in this article. They were instrumental in the first instance in demonstrating the manner in which the machinery required was to be erected and manipulated: they also demonstrated the lines on which the business of buying and selling should be conducted: and, in close connexion with the British Cotton Growing Association, they found the manner in which West Indian cotton was to be placed on the market, and what qualities are necessary for maintaining a successful industry. As a result of all this a knowledge of the cotton business, including the working of ginneries and of dealing in cotton, is now diffused even to some of the very small islands in the West Indian community.

Another effort of this kind to which attention may be directed is the recently formed Onion Growers' Association of Antigua. This association by undertaking to handle, pack, ship, and sell a very large proportion of the onion crop of the island has already demonstrated many useful lessons, and has succeeded in securing for the produce of Antigua a degree of recognition for uniformity and excellence in quality, which is proving of very great service to the industry. It is in contemplation to extend this work by undertaking to deal on similar lines with other vegetable products and fruits. The success of this association will prove useful in a pioneering sense, as indicating the manner in which similar associations may be formed in other colonies.

Reference may also be made to the consolidating effect and stability given to the arrowroot industry of St. Vincent by the formation of the Arrowroot Growers' Association of that Colony. This association has succeeded in fixing the price of arrowroot within reasonable limits both upwards and downwards, and by judicious advertising has made some move in the direction of extending the use of this commodity.

Impetus is being given at the moment to proposals to extend in these islands the cultivation of corn and of various kinds of peas and beans: these developments afford opportunities for co-operative experiments both in the employment of machinery, such as corn driers, and the appliances used in shelling, cleaning, and storing grain and pulse. Investigations and experiments of the kind under consideration are also necessary in this connexion in the direction of finding new markets for these products, and for extending their sale and use. No doubt much work along these lines will devolve upon the several agricultural departments throughout the West Indies. Some of them have begun in a preliminary way the work suggested in the preceding paragraphs, as will be seen by referring to back numbers of this journal and to the Departmental

Annual Reports, but the time has come when the work should be taken up on a larger and more intensive scale with the support of the actual producers, who should evince a definite desire to improve the conditions of their colonies, by showing how to make the utmost of such facilities as they possess.

SUGAR INDUSTRY.

PRODUCTION OF SUGAR IN INDIA.

In connexion with the supply of sugar during the next few years, and in view of the importance of the question from a West Indian standpoint, the following notice of the position of the Sugar Industry in India, taken from *The Board of Trade Journal*, October 1, 1914, will be of interest:—

The production of white sugar in India has been a matter of serious study both by the Government of India and the Local Governments, and as a result of the meeting of the Board of Agriculture held at Pusa in 1911, progress has been made on the following lines:—

A sugar engineer has been appointed, and has been attached to the Agricultural Department in the United Provinces. He has set up a 100-ton factory at Pilibhit, which has had a satisfactory year's working, and he has given technical advice regarding the erection of two central factories for the Gorakhpur district; he has also advised on several projects for the starting of similar schemes in other districts of the United Provinces. Farms have been opened at Nawabganj and Shahjehanpur in the United Provinces, and one in the Tirhoot Division of Bihar, for the introduction, survey, and testing of new canes. In Burma a sugar-cane experiment station has been opened in the area commanded by the Môn canal. In the Kamrup district of Assam important work has been done in locating and surveying several blocks of 10,000 acres suitable for sugar-cane, and on a portion of this area a preliminary experiment is being undertaken by the Local Government in the growth of cane with the aid of steam tackle, with the object of encouraging enterprise on a large scale. A block of 4,632 acres of land in the Central Provinces has been leased to a Cawnpore gentleman with a view to the formation of a company, and a cane-breeding station for the production of new canes has been started at Coimbatore. The first year's work resulted in over 2,000 new seedling canes being selected.

In Bihar eight central factories have in recent years been erected, with a crushing capacity of some 24,000 tons of cane a day. The erection of two or more factories is in contemplation. At Bubnowly, in the Gorakhpur district of the United Provinces, on the borders of Bihar, a central factory has been set up with a capacity of from 400 to 600 tons. The production of sugar in Bihar is paying, and an extension of the industry is likely, conditions in this tract being favourable to the development of the central factory system. The sugar-cane crop of India in 1913 gave a yield of nearly 2,600,000 tons, to which the production of palm sugar, estimated at 480,000 tons should be added; the cane sugar crop comprises about a quarter of the world's cane crop of 9,500,000 tons

CANE SUGAR'S OPPORTUNITY.

One effect of the present war, which must greatly affect the West Indies, is the partial paralysis of the beet sugar industry on the Continent of Europe. According to the *International Sugar Journal*, September 1914, it is a forgone conclusion that this year's beet campaign in Europe will be very restricted. In Belgium there can be none. The part of France, where the beet sugar industry chiefly flourishes, is the theatre of war; so that France will hardly have any sugar available for export. In Germany and Austria, though most of this year's crop may not be destroyed by an invading army, yet considering the huge drain their army drafts must make upon available labour, it is likely that they too will only be able to fill their home markets; and even if there be a surplus it would be difficult to place it on the world's markets without great risk of capture. It may be noted, however, that Dr. Prinsen Geerligs, in the *Louisiana Planter* (September 26) writes from Holland to the effect that Germany may have a large surplus which, if not exported, is likely to deteriorate owing to the difficulties of storage due to the scarcity of bags consequent on army requirements, and the prohibition of the importation into Germany of jute.

Considering that the abovementioned countries, according to the *International Sugar Journal*, accounted for 1,366,947 tons of the total of 2,136,190 tons sugar imported into the United Kingdom in 1913, it is evident that the other beet-sugar exporting countries of Europe can hardly make up the deficiency. Whether Holland will dispose of her surplus to Germany is still a matter of conjecture, while very little of Italian sugar comes to England even if there is much to come. Russia alone is left, and her output, even supposing that the war conditions allow of the full harvesting and manufacture of her beet crop, cannot go very far in filling up the deficiency, apart from the difficulties of being able to ship her produce from the Black Sea. It is clear then that the United Kingdom will have to depend during the war on the world's supply of cane sugar. That the Government is aware of this fact is shown by the steps they have taken. They have purchased 100,000 tons of Mauritius white sugar; they have arranged that British Guiana shall supply them between now and Christmas with 60,000 tons; and it is stated that they have also purchased 250,000 tons of Java and 60,000 tons of Jamaica sugar. Further, a Royal Commission on Sugar Supplies has been appointed, whose task is to find out the best means of keeping up the stock of sugar during the war.

Now this paralysis of the beet sugar industry on the Continent must evidently prove the best opportunity of strengthening the position of cane sugar in the markets of the world that has occurred for many a year. Even if the continental producers are able to resume their output in 1915, it will be no easy task for all of them to regain the British market. And the more protracted their enforced inability, the harder will be the task. It is therefore probable that a new arrangement of the sources of sugar supply will follow the war. The nature of this re-arrangement will depend largely on those who make the most of this opportunity. Another factor in the re-arrangement of sources of sugar supply acting for the benefit of the cane-growing tropical colonies, may be 'Imperial Co-operation'. The gifts of cane sugar to the Imperial Government by several of the West Indian colonies and by Mauritius may help to foster this sentiment to their lasting benefit.

FRUIT AND FRUIT TREES.

THE VANILLA INDUSTRY IN THE SEYCHELLES.

The crop of vanilla for 1913 was even lower than that for last year and the lowest on record since 1895. It amounted to 11,261 lb. of a declared value of Rs. 85,697 or about 10*s.* 3½*d.* per lb. The prices are good after having been as low as 4*s.* 3*d.* per lb. a few years ago, and these high prices have induced planters to resume vanilla culture which had nearly been abandoned during the years of drought between 1904 and 1911.

Under the influence of a good rainfall from November 1911 until now (March 1914) vanilla vines are showing very good growth, especially in those localities where manuring with alternate layers of lime and earth following heavy mulching with dry weeds is adopted.

Many complaints were made in times of drought about insects attacking vanilla vines, roots or pods, causing the death of the plants. At present no such complaints are heard, and vines of excellent growth are seen everywhere flowering and fruiting abundantly, in spite of the myriads of ants which crawl upon the vines at the time of flowering in search of juice excretions where a few scale insects happen to congregate. These are sheltered by the ants from their natural enemies by structures very often made of the 'sooty mould' found in the neighbourhood on the vanilla props attacked by scale bugs. It was long thought that the ants were causing the destruction of vanilla flower buds, but planters now realize that the ants are not injurious, having seen vines infested with ants flowering luxuriantly under the influence of good weather conditions, and producing in some cases as many as seventeen bunches of pods on the same vine.

The vanilla vines planted in many localities since 1911 (November) have not yet come into bearing. The weather during the year under review (1913) having been propitious, better crops are anticipated in the near future. However, vanilla, which was introduced into Seychelles about fifty years ago, has been planted all over the colony, but the vines no longer grow as well as formerly on soils which have been devoted to the same plant for such a long time. The question of manuring has been taken up by a few prominent planters with marked success, and a new and complete set of experiments is being arranged at the Botanic Station in order to help planters in the selection of the cheapest and most efficient manures.

It is also contemplated to carry out a set of field trials on $\frac{1}{20}$-acre plot on an estate near Government House newly acquired in order to determine the best shade trees for vanilla, the best props for growing the vines, the best time for pruning, the best physical and bacteriological conditions of the soil, and the best method of irrigation and of selecting vines to be used as cuttings. (*Annual Report on Agriculture and Crown Lands*, Seychelles, 1913.)

COPRA IN CEYLON.

Those interested in coco-nut cultivation will doubtless read with interest the following remarks on the actual cost of making copra in Ceylon, taken from *Tropical Life*, June 1914.

It costs in Ceylon on a well-managed estate 128*s.* a ton to produce copra, of which expense half is incurred in manuring the palms. During 1913 copra realized an average price in Ceylon of £25 12*s.* a ton. The profits seem good. Another fact of interest is stated in the same article. After a good year of rain 4,396 nuts are sufficient to make a ton of copra, while a less rainy year can increase the number required by 15 per cent.

In the issue of the same journal for September 1914 there is a striking account of the spoilage of copra on a large scale in the hold of a stranded steamer on the coast of Luzon. It was found that bacterial action was taking place throughout the mass of copra, resulting in the production of a large amount of hydrogen sulphide. The corrosive action of the free acidity produced is shown by an illustration of its effects on the bronze propeller shaft of one of the ship's launches. It is probable that many instances of the deterioration of copra in transport are repetitions of the above conditions on a small scale. The rate of bacterial action depends upon the care used in preparing the copra, and the degree of moisture present. With carefully dried copra the deterioration due to bacterial energy will be much reduced, though it can hardly be avoided completely until more satisfactory sterilizing methods of preparation are generally employed.

MANURIAL EXPERIMENTS WITH COCO-NUTS IN NEVIS.

On the principal coco-nut estate in Nevis the trees continue to thrive, and are bearing well. During the quarter ended September 30, 1914, 16,000 nuts were shipped, and a large number is being germinated to be planted on a neighbouring estate. Some idea of the importance which is attached to the prospects before coco-nut cultivation in Nevis can be got from the fact that a series of manurial experiments are being carried out on the property first referred to, under the supervision of the local Department of Agriculture. Those interested in coco-nuts will no doubt be glad to be in receipt of information concerning the plan that is being adopted, and will await with interest the results that will be obtained in due course.

There are eight experimental plots, each ½-acre in area, and there are twenty-eight trees in each plot. The series is as follows:—

Plot 1 is the control plot.

Plot 2 received as manure 8 estate baskets of pen manure per tree.

Plot 3 received as manure 8 lb. of tankage per tree.

Plot 4 received as manure 8 lb. of basic slag and 4 lb. of sulphate of potash per tree.

Plot 5 received as manure 4 lb. of sulphate of ammonia per tree.

Plot 6 received as manure 4 lb. of sulphate of ammonia, 8 lb. basic slag and 1 lb. of sulphate of potash per tree.

Plot 7 received as manure 8 lb. basic slag per tree.

Plot 8 recieved as manure 8 lb. of cotton-seed meal per tree.

The manures were applied on July 30, and the nuts on the trees in each plot were counted and the numbers recorded.

The experimental plots are visited once a month by the Agricultural Instructor for the purpose of counting and recording the dry nuts which fall from the trees.

In connexion with these experiments reference may be made to manurial trials with coco-nuts conducted in Ceylon, an account of which was published in the *Agricultural News* for September 12, 1914.

THE JABOTICABA.

It is generally known that almost all the fruits cultivated in the West Indies are exotics, having been introduced since the colonization of these islands from some other parts of the Tropics. In later years the introduction of hitherto uncultivated fruit trees has been carried on in the Botanic Gardens in different islands, noticeably in Dominica, where the much esteemed durian (*Durio zibethinus*) and mangosteen (*Garcinia mangostana*) from India have successfully fruited, and where the litchi (*Nephelium litchi*) from southern China is now growing. Other tropical fruits, highly appreciated in their native habitats, may perhaps be naturalized in the West Indies, the produce of some of them even becoming a profitable export in the future. One of these is the jaboticaba, pronounced zha-bu-ti-cá-ba, (*Myrcaria cauliflora*) of Brazil. Mr. Wilson Popenoe, of the United States Department of Agriculture, describes this interesting fruit tree in an article in the *Journal of Heredity*, from which the following remarks are gleaned. Apparently, both from the illustrations accompanying the article, and from the description, the tree, which attains a height of 35 feet, is most ornamental, not only from its symmetrical head of dense foliage, but also from its habit of producing its deep purple grape-like fruit upon the trunk of the tree from the ground up, and all along its branches. When heavily laden, the tree is a curious and beautiful sight. This habit of producing fruit on old wood is not uncommon among other tropic trees, as for instance the cacao and the calabash. The flowers are very like those of the guava, both being of the same order (Myrtaceae). The fruit resembles the grape, not only in colour, but also in consistency and taste, especially in the superior varieties; the skin, however, is considerably tougher, containing a large amount of tannin. The tree produces under favourable conditions several crops a year, even when there is scarcity of rain. It seems to prefer a deep rich soil, although it is said to succeed in almost any soil, at elevations from sea-level up to 3,000 feet or more. When planted, room for a spread of at least 30 feet should be allowed to each tree. In Brazil it is exclusively propagated by seed, but as Mr. Popenoe points out, to perpetuate choice varieties some form of grafting should prove successful. The fruit is greatly esteemed by the Brazilians, and is all consumed in the local markets, fetching 50c. per kilog. (about 1s. per lb.) in Rio Janeiro. An excellent jelly is also made from it. The fruit is sent to the market from the interior packed in a most primitive way, usually in the ordinary kerosene-tin box, known so well in the West Indies, without any packing material whatever, the result being that a great proportion of the fruit is crushed or bruised. If smaller packages were used, and some care taken in the packing, the jaboticaba might be shipped to considerable distances, the toughness of its skin and its keeping qualities giving it the advantage probably over a fruit like grapes, which, as is well known, can be transported safely. This tree might succeed in the West Indies, or at least in some of them; and although its growth is slow, six or eight years being required for it to come into bearing, yet if the older colonists had allowed such a consideration to have weight, the present generation would have been badly off for fruit trees.

Increased Wheat Production in the Dominions.—One of the matters brought into prominence by the present war is the question of an adequate supply of cereals. As was noticed in the last number of the *Agricultural News*, the Board of Agriculture and Fisheries has been impressing on farmers in Great Britain the duty of increasing the acreage under wheat; and practically the same advice has been given to the farmers of the Dominions of Canada and New Zealand, by their respective Ministers of Agriculture.

The Agricultural Gazette of Canada, September 1914, prints a message to the farmers of Canada, signed by the Minister of Agriculture, the Hon. Martin Burrell, some sentences of which are here quoted:—

'Britain needs more than men, she must have food,—food this year and food next year.'

'Canadian farmers, who by extra effort enlarge their wheat and other crop acreages, will be doing the best thing possible to strengthen the Empire in its day of trial.'

In *The Journal of Agriculture*, August 20, 1914, published by direction of the Right Hon. W. F. Massey, P.C., the Prime Minister and Minister of Agriculture of New Zealand, he makes an appeal to the farmers of the Dominion to make arrangements to grow as much cereal produce as possible, so that New Zealand may be able to do her share towards providing against the probable world-wide shortage of breadstuffs. The following is the concluding sentence of the appeal:—

'I ask the patriotic farmers—and that means all the farmers of the Dominion who have suitable land—to at once put the necessary operations in hand, with a view to growing as much as possible of wheat and oats, thus giving to the Empire what may prove to be extremely valuable assistance.'

Alleged New Varieties of Coffee.—Coffee cultivation to any large extent has almost ceased in the smaller West Indian islands. A hundred years ago however it was largely and profitably grown in Dominica, especially in the Soufrière district. Lately a communication has been received by the Commissioner of Agriculture, from the British Vice-Consul in Guadeloupe making enquiries as to a particularly vigorous variety of *Coffea arabica*, suitable for cultivation on exposed hillsides, which was stated in a book on Trinidad by M. deVerteuil, to grow in that district, and to be known as 'Soufrière coffee'. The Curator of the Botanic Station in Dominica has failed to identify any such variety. He suggests that the vigorous specimens, noted by M. de Verteuil growing in the situation described, were probably plants growing in rich pockets of soil upheld by rocks, while the enfeebled plants around them were on soil liable to be washed away by heavy rain. Enquiries were also made by the same gentleman as to a variety of coffee said to be cultivated in Brazil under the name 'Carnillon'. On referring this question to the Director of the Botanic Gardens, Rio de Janeiro (Dr. Willis), he has replied that no such named variety is known by his office to be grown in Brazil.

The result of a dynamite experiment conducted in Kuala Lumpur, as reported in the *Agricultural Bulletin of the Federated Malay States*, June 1914, will be of interest. Three rows of rubber, running the length of the field were selected, one row being treated with dynamite while the other two acted as controls. In the dynamite plot the average increase of girth, after a period of seven months, amounted to 2·56 inches, while in Control No. 1, the increase was 1·81 inches and in No. 2, 1·62 inches. It is not stated definitely that the excess in girth increase over the control plots was absolutely due to the effect of dynamite, but as the area in which the experiment was conducted shows more or less uniform growth throughout, it would appear that the explosives had good effect. Whether this treatment is profitable will depend on how long the beneficial effect lasts.

COTTON.

WEST INDIAN COTTON.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending October 3, is as follows:—

The receipts of new crop cotton have been only 31 bales so far, which have not been sampled or offered for sale, therefore the market has not yet opened.

It will probably be a fortnight before the receipts are large enough to induce the Factors to put out any cotton for sale.

During the fortnight ended October 15, 33 bales of British West Indian cotton were imported into the United Kingdom. Since last report a fair to good business has been done. Quotations generally are reduced ½*d.* per lb. (*West India Committee Circular*, October 20, 1914.)

COTTON PROSPECTS IN ENGLAND.

The Commissioner of Agriculture has received the following letter from Mr. J. Arthur Hutton, Chairman of the British Cotton Growing Association. This letter is of interest at the present time, as being a record of the disposal of the stock in the English market, and as affording good advice for cotton planters in the West Indies in regard to the crop now being harvested:—

Since I wrote you last, trade has gone distinctly worse, and the continental demand, either for cotton, yarn or cloth, has practically ceased.

We have naturally felt a good deal of anxiety about the stock of West Indian cotton. We had about 1,500 bales in stock when the war broke out, and our total sales in August and September only amounted to 121 bales. It looked as if we were going to have to hold cotton for a long time, and we therefore felt, in the interests of the planters, that we must try and clear the stock before the new crop began to come in.

I am more than pleased to be able to tell you that we have cleared out practically the whole of the stock. The prices are, I am afraid, very low, but we have done the best we could, and no one can do more than that.

In order to effect a sale, we had to agree to accept a six months' bill, and the interest on this will come to about £400. We do not propose to debit the planters with this amount; but will bear the loss ourselves, in order to help them in their loss. If we had insisted on cash payment in the present state of finances, we should still be holding this cotton, and might have to hold it for another year or two, for no one can tell how long the war may last.

I gather from your last leiter that there is likely to be a considerable substitution of sugar for cotton next year, and if this is the case I should strongly urge holding the new crop, just coming along, for good prices. I am not altogether sorry to hear of a possible reduction in acreage, as it wil strengthen our hands in holding up the new crop, but I hope the planters wont go so far as to lose touch with cotton, for there is bound to be a re-action and we shall again see high prices, especially for the better qualities.

As regards prospects for 1915-16 crop, as the planting time does not come on until about next May, we had better write you again nearer the time, as the situation may have entirely changed by then.

MUTATION IN EGYPTIAN COTTON.

The origin of the Egyptian type of cotton is obscure. According to one theory, it is a product of hybridization between a brown-linted tree cotton and American Sea Island, both of these types having been cultivated in Egypt nearly a century ago. Whether or not this be true, there can be no question that the varieties now grown are of mixed ancestry, a condition which some investigators regard as favourable to mutation.

Numerous varieties have appeared from time to time in Egypt. The Ashmuni variety, now grown only in Upper Egypt, originated about 1850. This variety gave rise in 1887 to the Mit Afifi, and from the latter the Abassi, Yannovitch, Nubari, Sakellarides, and Assil varieties have successively been developed.

As grown in Arizona from imported seed, most of the Egyptian varieties are readily distinguishable by the habit of the plants, and by the characters of the leaves, involucres and bolls, as well as of the fibre.

So far as the scanty evidence goes, each of these varieties originated with a mutant, i.e., an individual plant which showed an abrupt and definite change in the characters expressed. This conclusion is supported by the more complete data at hand regarding the history of the varieties which have been developed in Arizona.

The plant-breeding work in Arizona was begun twelve years ago with imported seed of the Mit Afifi variety. Persistent selection of the best plants caused some improvement in earliness and productiveness in the quality of the fibre, but the progress was not very substantial prior to 1908, in which year two types very different from the Mit Afifi were recognized and isolated. One of these was the Yuma variety, now commercially grown in Arizona. This form has continued to express its distinctive characters with a high degree of uniformity, notwithstanding the fact that the parent individual and its immediate progeny were not protected against cross-pollination.

Two additional varieties, described in this paper under he names 'Pima' and 'Gila' have lately been developed in Arizona. The Pima variety appeared as a single plant of marked individuality in a field of Yuma cotton at Sacaton, Arizona, in 1910. Its characters have been expressed in its progeny with great uniformity during the three subsequent generations. This variety is easily distinguished from the parent Yuma variety by its relative limblessness, and by the correlated retention of the lowest fruiting branches and bolls; by the more uniformly developed leaves; by the shorter, relatively wider, and nearly separate involucral bracts; by the plumper and more abruptly and sharply pointed bolls, and by the longer fibre.

The Gila variety is derived from a single plant discovered by Mr. E. W. Hudson in a field of the acclimatized Mit Afifi stock grown at Sacaton, Arizona, in 1908. In its external characters this type resembles the parent Mit Afifi variety much more than the Yuma, but differs from the Mit Afifi in its earlier ripening, smaller vegetative branches, greater productiveness, and longer fibre. Individuality of the parent plant, together with the uniformity shown by its progeny during the subsequent generations, indicates that the Gila variety, like the Yuma and the Pima is of mutational origin.

Egyptian cotton exhibits, although in a minor degree,

the tendency to develop new varieties by mutation which characterizes *Oenothera Lamarckiana*. There is a further parallel in the fact that in both cases very similar, if not identical, new characters come into expression at different times and in different places. An example of this phenomena in Egyptian cotton is afforded by the Nubari and Yuma varieties.

If the tendency to produce mutants is a result of remote or complex hybridization, the mutability of Egyptian cotton might be accounted for upon either of the following grounds: (1) the supposed hybrid origin of the type as a whole, or (2) later crossing with other types of cotton.

Ever since mutation became recognized as a factor in the breeding of Egyptian cotton, the following methods have been followed in Arizona: (1) recognition and isolation of desirable mutants; (2) selection and comparison, on the progeny-row basis, of those individuals among their progeny which express most fully the desirable characters of the new type; (3) elimination from the seed-increase fields, preferably before blossoming begins, of the aberrant and otherwise undesirable individuals. (*Journal of Agricultural Research* for July 1914.)

ABSORBENT EARTHS.

In connexion with the article that appears on this page under the heading Boiler Covering, the following note on the origin and composition of, and commercial demand for, siliceous earths may prove of interest. The information has been obtained from two sources: (1) a paper by A. J. Jukes-Browne and Prof. J. B. Harrison on the geology of Barbados (*Quarterly Journal of the Geological Society*, Vol. XLVIII. Part 2, 190, p. 170); and (2) Diatomaceous Earths (Kieselguhr) and Their Utilization (*Bulletin of the Imperial Institute*, Vol. III. 1905, p. 88).

Siliceous earths, known in various places under the names Infusorial, Radiolarian and Diatomaceous (Kieselguhr) earths are widely distributed throughout the world, though the most important deposits, commercially, are those that occur in Germany. In Barbados, according to reference (1) noted above, there are 'some beds consisting of 77 per cent. of organic silica with only 0·35 per cent. of calcareous matter. These are the well-known infusorial or radiolarian earths, composed almost entirely of siliceous organisms—radiolaria, diatoms and sponge-spicules, the broken débris of these remains forming a matrix in which more perfect specimens are scattered. Associated with these beds are layers of felspathic and pumiceous sand or dust, and some of them are rendered gritty by the intermixture of such material. Other beds are so fine, soft, and slightly consolidated, that specimens of them are as light in the hand as lumps of pumice. Their exposed portions are generally white, though below the surface they are often yellowish drab, pink, or streaked with these colours.'

The economic applications of 'infusorial' earth as an absorbent, e.g. in the manufacture of dynamite and polishing material, and as a non-conductor of heat, are well known. A way of applying the Barbados material locally is shown in the accompanying article. Apart from this, the present European situation might render its exportation profitable if it were found to possess properties superior to those earths of a similar nature in Scotland and in the Dominions. According to the Imperial Institute, the chief difficulty in shipping infusorial earth is the large bulk it occupies in proportion to its weight. Kieselguhr has been imported from Germany and Norway at prices varying from £3 to £4 per ton.

BOILER COVERING.

A useful non-conducting covering for boilers and steam-pipes can be made from Barbados infusorial earth, the use of which is calculated to result in considerable economy in steam and fuel. This infusorial earth can be purchased in quantity in Barbados through the usual commercial channels at a cost of about $8·40 per ton.

In order to use infusorial earth for this purpose a sufficient quantity is allowed to soak in water for several hours, preferably over night; the excess of water is poured off, leaving a mixture of infusorial earth and water of a consistency convenient for working. To this a mixture of shredded coco-nut fibre and shredded felt is added in sufficient quantity to hold the mass together in a sort of plaster, and the whole is well worked to mix it intimately.

The boiler or steam pipe to be coated is prepared by being well scraped to remove rust and dirt, and is then painted over with a coating of red oxide of iron paint and allowed to dry.

If a number of strands of barbed iron wire are wrapped round the boiler or pipe they afford an excellent hold for the coating, and enable it to adhere better.

The boiler or pipe being thus prepared, it is washed over with a mixture of infusorial earth and water, of about the consistency of thin cream, and the covering mixture is then applied in thin layers uniformly over the surface, successive layers being put on until the coating is 1½ to 2 inches thick. Each layer should be allowed to dry partially before the next is applied.

In the case of a flanged pipe, it is generally found best to cover the pipe up to the level of the flanges, which should, however, not be completely covered, otherwise it is difficult to find them should it become necessary to effect repairs. After the last layer of coating has been applied, the whole surface is washed over with a mixture of infusorial earth and water, similar to that mentioned above. This serves to fill any holes or crevices, and gives the exterior a smooth, neat appearance.

If desired, a lagging can be placed over the coating. This lagging or final covering may be either fine galvanized wire gauze, canvas, or good sacking.

It has sometimes been remarked that when a coating of this kind has been removed, the iron surface that has been covered has a rusted appearance, and fears have been expressed that the surface has been corroded. Experience has shown that if clean materials free from salt are used, no corrosion takes place from this form of covering.

At a meeting of the Board of Agriculture of British Guiana, held in Georgetown, Demerara, on October 16, 1914, Professor Harrison informed the Board that the Veterinary Committee had reported a very severe outbreak of swine fever on the East Coast. The Board had taken what steps they could to restrict this pest, and from all they could learn they had been fairly successful. The Professor, accompanied by Mr. A. Seton Milne, Government Veterinary Surgeon, proposed to visit the district in the following week to ascertain whether the disease has been stamped out or not. Professor Harrison also reported that the Colony is now free from the disease of mal de caderas, the animals affected having either died or been slaughtered. (The *Daily Argosy*, Demerara, October 27, 1914.)

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

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Agricultural News

Vol. XIII. SATURDAY, NOVEMBER 7, 1914. No. 327.

NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number consists of a discussion of agricultural development possible to the West Indian colonies, if existing facilities, which are indicated, are sufficiently appreciated and made use of.

Notes on the sugar industry, on page 353, include an account of recent development in sugar production in India, and an article entitled Cane Sugar's Opportunity, which discusses the effect of the war in Europe on the beet and cane sugar industries.

Insect Notes, on page 358, present an account of the uses of naphthalene as an insecticide, showing the ways in which it may be employed, and mentioning the safety and cleanliness of this substance.

The vanilla industry in the Seychelles forms the subject of an interesting article under Fruit and Fruit Trees, on page 354, and an account of a new fruit tree in Brazil, the Jaboticaba, is given under the same heading.

Fungus Notes, on page 364, present an account of the black root disease of limes, which has been the subject of special investigation by the Mycologist during his recent visit to Dominica, and which appears to be of serious importance to lime growers in certain districts of that island.

Publications of the Imperial Department of Agriculture.

Two numbers of the Pamphlet Series of the Department's publications are noted below. One of these, No. 75, has recently been issued and distributed, the other, No. 74 is now ready.

Pamphlet No. 74 is entitled *Cotton Cultivation in the West Indies*. This is a pamphlet of nearly 120 pages. In its scope and mechanical preparation it follows closely the pamphlet on Lime Cultivation, which appeared as No. 72 of the series.

This cotton pamphlet presents a complete account of the history of cotton cultivation in the West Indies, including its revival and development during the past thirteen or fourteen years.

The chapter on botanical notes presents interesting information as to the origin of the species or variety of cotton now known as Sea Island, and includes also discussions of such subjects as habit, duration, development of the fibre, transpiration and growth, and heat poisoning.

In the following chapters on cultivation, picking and grading, examination of seed-cotton and lint, and seed selection, a general survey is given of all the processes connected with the production of the crop, and its preparation for market, as well as of those lines of work which are necessary to maintain a particular strain at its best. This portion is well illustrated from photographs taken by Mr. W. N. Sands, Agricultural Superintendent, St. Vincent.

The succeeding chapters are those on the insect pests and the fungus diseases of the cotton plant: these also are abundantly illustrated. The pamphlet closes with an appendix containing useful information tabulated for easy reference.

The pamphlet has been prepared by Mr. W. Nowell, D.I.C., Mycologist on the staff of this Department, and may be obtained from the agents for the publications of this Department, price 9*d*., post free 11*d*.

Pamphlet No. 75 which has recently been issued deals with the sugar-cane pests of the Leeward Islands. The older and better known pests of sugar-cane are briefly mentioned: the newer and less known forms being treated at greater length. Among the latter, the grey weevil (*Exophthalmus esuriens*) is prominent. This insect, though long and well known as a common insect, has only recently been recognized in its true light as a serious pest. Unfortunately this weevil is known to many as a hard back, which results in confusing this injurious species with the harmless (*Ligyrus tumulosus*) and the brown hard backs, which though pests, attack plants in a somewhat different manner.

Exophthalmus esuriens has been abundant during 1914 in St. Kitts, Antigua, and Montserrat, the adults being seen in great numbers amongst the foliage of cotton growing near canes and lime trees. The grubs are root borers of sugar-cane; they attack roots of lime and other trees, and sometimes probably also cotton roots. This insect is closely related to the Barbados root borer of sugar-cane, *Diaprepes abbreviatus*, as shown by its similarity of structure and habit.

The brown hard backs are also important new pests. That of St. Kitts, *Lachnosterna patruelis*, is a small insect, which occurs abundantly in the soil of cane fields. The actual damage by these insects is not yet known, but from the numbers in which they occur and the fact that the grubs are root feeders, it is believed that it is considerable.

The brown hard back of Antigua, *Lachnosterna* sp., is similar in colour to that of St. Kitts, but is larger. It is known to be a serious pest of Indian corn and several other crops, and to damage sugar-cane to some extent, probably more than planters realize. Its fondness for Indian corn, and the ease with which grubs can be collected from the soil at the roots of corn plants, lead to the suggestion to use this crop as a trap for the insect: and directions are given for carrying out the suggestion.

The pamphlet, which is fully illustrated, is by Mr. H. A. Ballou, M.Sc., Entomologist on the Staff of this Department. Price 6*d*., post free 7½*d*.

Irrigation in Italy.

The benefit of irrigation to agriculture in countries of irregular rainfall, such as are many of the West Indian islands, is obvious; but the initial expense of irrigation works is in many instances a hindrance to their being undertaken. The main points in an abstract of a paper by Professor Luigi Luiggi, D.Sc., M.I.C.E., read before the Engineering Section of the British Association in Australia, which is given in the *Journal of the Royal Society of Arts* (October 2, 1914) may be of interest.

The Professor points out that all travellers are struck by the beautiful orchards and vegetable gardens of Italy, especially those of the fertile valley of the Po. But, he says, these could not exist without irrigation, because the land during the five to seven months of the hot season remains generally without a drop of rain, while during the winter months many regions would be flooded by torrential rains.

Owing, however, to the work of the hydraulic engineer, and the industry of the agriculturist, the plains of Lombardy which would naturally lie waste and barren, are transformed into most fertile meadows and orchards, by regulating the natural water-courses, impounding surplus water in reservoirs, and then distributing it over the land at the proper time.

When only small quantities are required, as for orange groves or gardens, the water is generally raised from subsoil wells, either by rotary pumps moved by animals, or more modern and efficient centrifugal pumps worked by oil or electric motors. The cost of this in Lombardy is from 4½*d*. to 11*d*. per 1,000 gallons. Yet the benefits are such that this high expenditure is justified, a good orange grove giving a revenue of from £36 to £54 per acre.

For irrigation on a large scale, recourse is had to storing up the rainfall, the average of which, in Italy, varies from 36 inches in the North to 15 inches in the South, in reservoirs. These vary in size from the modest cistern of a few hundred cubic metres in capacity to large artificial lakes formed in some valley of the Alps or Apennines by dams.

The water from all these artifical reservoirs is generally used first for motive power, and afterwards distributed by means of canals, at the price of about ¼*d*. to ½*d*. per 1,000 gallons.

The State considers it a duty to assist all these undertakings, for the reason that irrigation either renders land—of little value and almost sterile—capable of remunerative cultivation, or increases the value of land already cultivated. In either case the land becomes capable of sustaining an increased population. The large emigration of its agricultural labourers is not beneficial to Italy, any more than it can be to any country. So, to afford more possibility of work at home to that class, the State encourages irrigation by granting subsidies to such undertakings, at least during the first ten to thirty years of their working, all the works so subsidized becoming State property after ninety-nine years.

The conclusion is that irrigation is very beneficial to the farmer, when he can get water at the rate of 11*s* to 17*s*. per acre per year, but that, without a State subsidy for the first thirty years, it would not pay the administration. The State, however, reaps the great benefit of the increased welfare of its citizens, and their consequent greater ability to contribute to the revenue. Without irrigation Italy could not feed two-thirds of her present population: with extended irrigation she hopes to feed in thirty years time a population of fifty or sixty millions.

Camphor.

The camphor market, according to the *Bulletin of the Federated Malay States* (June 1914), is largely controlled by the Japanese output, the only serious rival being the synthetic article manufactured in the United States and in Germany. The price of Japanese camphor for some time has been from 135*s*. to 142*s*. 6*d*. per cwt. It is said that the manufacturers of the synthetic camphor in the United States have been able to turn out this product with fair profit on the basis of the prices obtained for the Japanese, while in Germany it is stated that synthetic camphor has been put on the market at a cost of production of 80*s*. per cwt. The continued success of this synthetic product depends, however, on the cost of the raw material, turpentine, which shows a tendency to rise, unless some other raw material can be found. Planting new camphor trees, to compensate for the loss of those cut down, is being carried out on a large scale in the Japanese islands, but the return does not seem to be financially a great success. Experiments are being made in the distillation of the leaves of the camphor tree, not only in Japan, but also in German East Africa, Ceylon and California, with a prospect of moderate returns. In case of a very high rise in the price of turpentine, the manufacturers of synthetic camphor might perhaps find a raw material in the resin of some West Indian trees of the Order Teribinthaceae, such as various species of Bursera and Amyris.

INSECT NOTES.

NAPHTHALENE AS AN INSECTICIDE.

Naphthalene is one of the by-products obtained in the distillation of coal tar. It has been long known as an insect repellant, and some of its uses are very familiar to nearly everyone. It may be of interest, however, to bring together a brief account of several different ways in which it may be employed.

The best known use for naphthalene is for the protection of stored clothing, books, insect collections, and museum specimens. Clothing such as woollen garments, feathers, and furs are protected from moths and beetles by being packed in tight boxes, or securely wrapped in parcels covered with paper, cotton, or linen cloth. Moth balls, naphthalene flakes or crystals, freely used in such boxes or parcels, give good protection, the insects being repelled by the smell of the naphthalene.

Books which are kept in closed bookcases may be protected to a large extent by scattering flaked naphthalene freely on the shelves, behind the books, and on and between the books themselves.

Insect collections should be kept in tight boxes; naphthalene flakes in the bottom of the boxes, or moth balls on pins in the corners of each box, will keep out insects and mites which are destructive to stored insects. Moth balls can be fixed on pins quite easily. An ordinary pin heated in the flame of a lamp or candle can be forced through the moth ball by means of pliers or forceps, and when it cools the naphthalene will set firmly round it.

As a remedy to be used against cockroaches, naphthalene is not so well known. In the *Agricultural News* for September 27, 1913 (Vol. XII, p. 314) a note appeared giving an account of good results obtained from the use of a mixture of equal quantities of naphthalene (finely powdered) and boracic acid. This mixture was plentifully sprinkled in places frequented by cockroaches. The insects were greatly reduced in numbers after the second application, which was made after an interval of two weeks.

The use of naphthalene for freeing a house from an infestation of fleas was noted in the *Agricultural News* for May 9, 1914 (Vol. XIII, p. 154). In this case a new house was seriously infested before being inhabited. Naphthalene to a depth of 2 or 3 inches was put on the floors of one or two rooms, and after twenty-four hours was swept up and put into the other rooms and passages of the house, until all were so treated. The fleas were all killed out.

Naphthalene is also very useful as a dry bath for dogs and cats infested with fleas. The insecticide in a very finely powdered condition, or in the form of flakes, is rubbed into the coats of the dogs or cats, and the fleas are rapidly driven out by it. They fall to the ground in a stupefied condition; if the operation is carried on over a sheet of cloth or strong paper, and the naphthalene is freely used, the fleas are killed by continued contact with it, and it can be taken up and used over and over again.

The naphthalene has no disagreeable or deleterious effect on the animals, and does not leave any disagreeable smell in their coats after the application. Dogs treated with naphthalene in this way remain much freer from fleas than when the control of these insects depends on ordinary washing and "picking".

Naphthalene has recently been used with success in the prevention of insect attack on stored grain. In India (see *Agricultural Journal of India* for January 1914) an interesting series of experiments was published, which showed that this substance gave a thorough protection to stored maize over a period of thirteen months. The grain was placed in cylindrical bins, about 6 feet deep by 3 feet in diameter, each bin holding about 40 bushels. The charge used was 1 lb. per bin, divided into four lots of ¼ lb. each. These were enclosed in bags made of cloth with open texture, and were placed at equal distances from the bottom to the top. The bins were tight, and were tightly covered. At the conclusion of the trials it was found that about one-half of the naphthalene still remained in the bags.

The results were very satisfactory, and indicate that naphthalene used in this way provides effective protection for stored grain.

Naphthalene is very useful in the preparation of emulsions of oil in soap solutions, in making spray mixtures for the control of scale insects.

The peculiar property possessed by this material of bringing about an easy and perfect combination of oil and soap solutions was discovered by Mr. H. H. Cousins some years ago when connected with the Eastern Agricultural College at Wye, England. Mr. Cousins prepared a mixture to which he gave the name Paranaph, which was composed of soft soap, naphthalene and kerosene oil. This was successfully used against insect pests on plants; and later, in Jamaica, Mr. Cousins applied it also to the destruction of ticks on cattle, fleas on dogs, and other similar purposes.

Mr. H. Maxwell-Lefroy prepared a mixture of whale-oil soap and Barbados crude oil (*West Indian Bulletin*, Vol. III, p. 319), applying Mr. Cousins's principle of using naphthalene to bring about the combination of the oil and soap. More recently, Mr. J. C. Moore of St. Lucia has applied the same methods to the preparation called Scalo, which is a mixture of whale oil soap, kerosene and naphthalene. (See *Agricultural News*, Vol. XIII, p. 282.)

Naphthalene is sold in Barbados at retail, at the rate of 1*s.* per lb., and in quantity at 7½*d.* per lb. In England and the United States the price is of course lower, but even at the rate of 7½*d.* per lb., it is a very cheap material to use for the several purposes mentioned above. It possesses advantages over certain other substances for which it might be used as a substitute, since it is easy to handle, clean, and not dangerous either from being poisonous or highly inflammable or explosive in character.

Onion Growing in the Virgin Islands.—A copy has been received of a circular entitled The Onion Industry in the Virgin Islands, which has recently been issued from the Experiment Station, Tortola. This leaflet has reference to the present conditions of onion growing in the Presidency, where seedlings are raised on a considerable scale by the Agricultural Department, and sold to the peasantry. The local market for the onions so produced is either Tortola, or St. Thomas, the neighbouring Danish colony. The circular states that most of the onions consumed in the Virgin Islands are imported. This would seem unnecessary in view of the suitability of Tortola for onion growing, and the efforts made by the Agricultural Department to encourage this cultivation.

The circular under consideration provides practical information concerning soil requirements, cultivation, transplanting, subsequent treatment of plants, and advice on onion growing in relation to local conditions. The circular would appear to be deficient in respect of information on the sowing of seeds, and the packing and marketing of onions. It may nevertheless be considered likely to assist and encourage those cultivators who are intent upon taking up what promises to be a very profitable industry.

EXPERIMENTS WITH GREEN MANURING IN INDIA.

The importance of green dressing is acknowledged by every planter. Experiments therefore in green manuring, carried out most carefully under tropical conditions in India, should be of interest to the readers of the *Agricultural News*. The following is an abstract of Bulletin No. 40, issued by the Imperial Department in India, on Green Manuring Experiment, 1912-13, carried out at the Agricultural Research Institute, Pusa, under the supervision of Mr. C. M. Hutchinson, Imperial Agricultural Bacteriologist, and Mr. S. Milligan, Imperial Agriculturist.

It is pointed out in the first place, that the decomposition of plant tissue in soil is carried out by a number of various organisms, and that it would probably be wrong to assume that all soils contain equally the necessary organisms for this process. The rapidity of decay also depends largely upon an adequate supply of moisture for the needs of these saprophytic organisms. Hence the decomposition of younger plants is more rapid than that of maturer ones under the same conditions of rainfall. So that any shortage of rainfall after burying a green leguminous crop would naturally tend to diminish considerably its value. But apart from an adequate water-supply, the complete decomposition and nitrification of the green manure will depend on the proper aeration of the soil. In the experiment at Pusa, sann hemp buried in soil in which the water content was kept up to 20 per cent., but without stirring the soil, failed to decompose after twelve weeks, whereas 16 per cent. of water was sufficient to produce complete disintegration when the soil was stirred up once a week.

As the full benefit of green manure does, however, depend more upon the presence of moisture in the soil than upon any other factor, the experimenters at Pusa suggest a preliminary treatment of the green crop before burying it, so as to diminish possibly the degree of uncertainty resulting from entire dependence on weather conditions. The general method suggested is that the green manure crop should be cut, steeped in water, and allowed to ferment in heaps, after which it should be put into the land. It is promised that the best method of doing this, and the relative cost and value of such a procedure as compared with the ordinary practice will form a future subject of investigation.

In conclusion, a warning is given as to superabundance of moisture in the soil after burying in a green crop. When too heavy a rainfall has produced waterlogging of a soil containing buried green manure, and there is insufficient drainage to remove such waterlogging with sufficient rapidity, an accumulation of toxins may take place sufficient to do serious harm to the following crop. Hence the necessity for proper tilth and efficient drainage.

Manganese as a Fertilizer.—A circular has been received from a local merchant, containing an account of a new manure called 'Increaso'. This manure, according to its characteristics as described, would appear to be a substance containing manganese sulphate. The communication states that large increases have been obtained from the employment of 'Increaso' of, say, about 76 lb. per acre. For example, in the case of rice, an increase of 34 per cent. of grain and 30 per cent. of straw was obtained. As regards the nature of the action of this new fertilizer, it is explained that it is probably indirect, constituting an anti-toxic agent which destroys the poisons said to be secreted by the plant in the soil. The price of this manure is $70 per ton

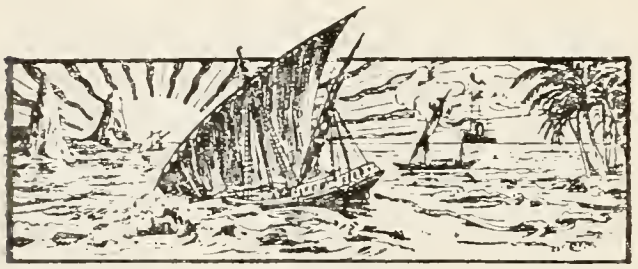
Reference to information on manganese as a fertilizer, filed at this Office, shows that manganese is likely to be of some value as a manurial agent. A useful review of the subject is contained in Circular No. 75 of the Bureau of Soils, United States Department of Agriculture. This refers to increases that have been obtained, apparently in Europe, with a large variety of crops. In considering the nature of the effect of manganese it is said that it is due most probably to its oxidizing activity, and its influence on the oxidizing power of plants, micro-organisms, and soil. Manganese sulphate seems to be the best form to use, though the dioxide has also given satisfactory results in certain places. In regard to the sulphate, another reference says that the value of this salt rests with the sulphate, and not with the manganese, this latter part of the salt being regarded as actually injurious. Again, other information from Hawaii, after referring to the great fertility of the manganese soils in that territory, maintains that the benefit is due to the improved physical condition of the soil which manganese has the power to bring about.

In conclusion it would certainly seem that manganese fertilizers may be regarded as useful catalytic agents, by which is meant agents which are able to assist in producing beneficial effects without themselves undergoing any change or playing any direct part in nutrition. It must be remembered, however, that the general value of manganese has not yet been established, and in certain places, for example in the Tropics, it may have different effects to those produced, say, in England. At all events the considerations brought forward in this note call attention to the need for more extensive experimentation. It would seem decidedly worth while to arrange experiments with a substance like 'Increaso' in certain of the West Indian islands.

Humus in California Soils.—Humus, which is produced by the decay of vegetable and animal matters of all kinds in the soil under certain conditions of warmth and moisture, is considered one of the most valuable ingredients of fertile soils, both because of its physical effect, and because of its nitrogen content, which is made available to plants by the action of bacteria, and also because the mineral elements potash and phosphoric acid held by it are of value as fertilizers.

In a paper entitled Humus and Humus-Nitrogen in California State Columns, by R. H. Loughridge, published by the University of California Press, August 25, 1914, there is an interesting statement of the condition of the soils of that State owing to the presence to a great depth of humus. The writer says that the humus of those soils is very generally derived from plant roots, instead of from accumulations of vegetable material at various depths as the soil was being built up. He notices also that the black colour of a soil does not always denote a high humus content, the colour being sometimes attributable to the presence of black substances derived from the disintegration of rocks. The investigations of Professor Lipman show that nitrifying bacteria are present and active in California soils to depths of 6 feet, and ammonifying bacteria to a depth of 12 feet, thus rendering the nitrogen of the humus available to plants to those depths.

The fertility and value of the land in California therefore are not only based upon the nature of the surface soil and subsoil, but chiefly upon the freedom with which plant roots are able to penetrate to many feet, and secure moisture and the abundant food supply that exists at great depths in all California soils.



GLEANINGS.

Farmer's Bulletin, No. 87, May 1914, of the Department of Agriculture, New South Wales, consists of a series of large and clear illustrations of the teeth of the horse in several stages, showing the indications of age obtainable therefrom.

From *The Sun* of Antigua, October 8, 1914, we notice that, at a meeting of the Antigua Agricultural and Commercial Society on October 2, it was unanimously resolved that the sum of 20 guineas be given from the funds of the Society to the War Relief Fund.

Mr. J. E. T. Hartley, of Magdalene College, Cambridge, who visited the West Indies in 1914 for instruction in tropical agriculture under the auspices of the Imperial Department of Agriculture for the West Indies, has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, Assistant Superintendent of Agriculture in Nigeria.

The working of one of the large central factories in Cuba, as shown by a report recently received by the Commissioner of Agriculture, presents interesting facts. During 150 days of grinding 236,239 tons of cane have been ground, with an average of 78·5 tons per hour. The juice extracted amounted to 78·30 per cent. of the cane, and the sucrose obtained in the juice was 92·46 per cent. of the total sucrose in the cane. The output of sugar for the period mentioned amounted to a total of 174,524 bags, of which 173,324 bags were first sugar.

The figures relating to the working of another factory in Cuba are even more striking. The report for one day's working shows that 5,438 tons of cane were ground on that day; the mills are in three sets or 'tandems', the average number of tons of cane ground per tandem per hour being 79·5. The extraction of juice amounted to 92·2 per cent. on the weight of the cane. The figures given are for the fiftieth day of working, the total weight of cane crushed during that period being 215,763 tons, and the average daily output of sugar about 460 tons.

From the *Veterinary Record*, September 12, 1914, we glean that local anæsthesia is coming more into use in veterinary practice every year. There are now probably few veterinary surgeons who do not employ it. But the ideal local anæsthetic has yet to be found from a veterinary standpoint. The writer of the article referred to considers that urea and quinine, a local anæsthetic of comparatively recent introduction, is probably the safest. It has, however, the disadvantage of slowness of action; but on the other hand, its effects are very prolonged, which is of great practical advantage.

In the *Proceedings of the Agricultural Society of Trinidad and Tobago*, September 1914, there is a list of Trinidad snakes which is very useful for reference. The writer is acquainted with several other species which have not yet been determined.

A second edition of an illustrated handbook of Tropical Gardening and Planting, by H. F. McMillan, F.L.S., F.R.H.S., has just been issued. From the synopsis of its contents it seems most useful for reference. The first section is on general cultural operations, manures, garden tools, and laying out gardens. The second describes and gives directions for the culture of tropical and sub-tropical fruit and vegetables. Section 3 is devoted to the description of flowering and ornamental trees and plants suitable for cultivation in the Tropics. The fourth section consists of descriptions of various economic products of the Tropics, with concluding chapters on insect pests and other diseases of plants.

The employment of a thin film of oil on the surface of pools or tanks of water for the purpose of killing mosquito larvae in such receptacles, is very prevalent in the Tropics. The *Colonial Journal* for October 1914, states that the Government Veterinary Surgeon at Noumea, in New Caledonia, asserts that cod liver oil is more efficacious than even kerosene or petrol. It also keeps off the adult insects for a longer period, in consequence of its slower evaporation. He finds, too, that cod liver oil has a specific effect on all flies, mosquitoes, and ticks. A horse smeared with it is relieved in a few minutes of all the flies; and the ticks, so hard to get rid of from the skin of a dog, are quickly killed by it. The only drawback to the common use of this oil in the ways referred to would seem to be the expense.

Considering that only 2½ per cent. of the world's supply of motor fuel is produced in the British Empire, it would make a large difference in many ways if alcohol could be used. The immediate question is whether alcohol can advantageously be used in internal combustion engines in the place of petrol or other mineral motor spirits. The *Colonial Journal*, October 1914, states that the Imperial Motor Transport Committee have appointed a sub-committee to investigate this question. It is considered that from three to five years will be required for the investigation. Manufacturers do not try to produce a suitable alcohol engine because they do not know whether alcohol would be available. It would of course be necessary to provide a cheap denaturant, which would be satisfactory from an excise point of view without effecting the power, and there is reason to believe that this can be done.

When war broke out, sugars then being sold at from 1⅛*d.* to 2⅛d. per lb. went up at once to 5*d.* and 6*d.* per lb., but when the Government fixed retail prices refiners reduced quotations; it should, however, be taken into account in considering prices, that just before the war the best price fell to the lowest on record (5*s.* 3*d.*). The following August prices show the extent of the rise: Crystallized: Demerara, good to fine, 31*s.* to 33*s.*; Trinidad, low middling to good, 29*s.* to 30*s.*; Jamaica, middling to good, 30*s.* Much uncertainty was felt in the market about cacao; on the one hand much more will come to London, and so tend to bring down price; on the other hand there is the general price of foodstuffs. Prices in August were fairly steady but there was no market so far in West African cacao. (*The Colonial Journal*, October 1914.)

STUDENTS' CORNER.

SEASONAL NOTES.

At this time of the year there is not much to be done on sugar estates with regard to the crop on the ground. The canes have attained such growth as to make further cultivation either unnecessary or impossible. Arrows are beginning to appear, a sign that full growth has been attained. Observations, however, of value may be made, with greater ease at this time than earlier or later, on the morphology of different cane varieties. As regards the flowering or arrowing of the cane, it is of interest to mark and note which varieties of cane arrow freely; which varieties arrow early, and which later. Now also may be advantageously noted the habit of growth of each variety, whether upright or trailing. The difference in colour, manner of growth, and appearance of the leaves in each variety is well worth noting; also, as the canes mature, the question as to whether they drop the trash easily or not. Again, the average number of canes in each stool can be observed. This is evidently practically useful, as it may give a useful factor for the calculation of yield. This question, as all planters know, is important. To be able to estimate the probable crop of the estate with tolerable accuracy is very helpful in planning the work and expense of the coming year.

On cane estates at this season the chief work is the preparation of the land for planting the crop to be reaped in 1916. Note carefully any experiments that may be tried in this direction. For instance, the question whether planting on the flat is more suitable in your locality than trenching and holing; whether there is any advantage in using bits of mature cane as plants rather than 'tops'. No intelligent observation is without its value.

While on the subject of growing crops, an interesting question suggests itself for observation, viz. the possibility of the increase of local supplies of foodstuffs. For instance, can maize be profitably grown? Is it worth while growing it as a staple crop, or only as a catch crop? Such questions can really only be answered by careful observation and notes by the planter student. Or again, with regard to such a crop as sweet potatoes, what soils can they be grown most profitably in, and what is the effect of the crop on the soil? Of course, the student can obtain an answer in general terms to these questions from books, but his own observation of the particular fields he has to deal with, will be of much greater educational value.

Probably no crop in the West Indies is so liable to attacks from a host of foes as cotton. Continual observation as to these is invaluable. Noticing a pest at an early stage, and taking steps to combat and destroy it, often make a vast difference in the results of the crop. New enemies often show themselves, which the observant planter can detect, and so defeat. An instance of this is mentioned in the last number of the *Agricultural News*. The common house cockroach had begun to turn its attention to the destruction of young cotton seedlings in St. Kitts. Careful observation of the plants, and quick attention were sufficient to check its ravages.

At this time of the year heavy rains are usually experienced in most of the smaller islands. Note with regard to drainage the direction of the flow of surplus water; oftentimes the drainage of a field is defective because the artificial lines of the drainage have been attempted to be drawn in a direction not in accordance with those of the natural fall of the land. Again, when water lies long, after heavy rain, in spots, or when the land becomes heavy and puddled, it is an indication that the drains there want attention.

The Imperial Institute. A Circular despatch from the Secretary of State for the Colonies received at this Office deals with the sphere of activity of the Imperial Institute. In the past a considerable amount of investigation work has been undertaken by this institution for private individuals. Now, however, as the institute is occupied with scientific, technical, and commercial researches required by the technical departments of the Governments of those parts of His Majesty's Dominions which contribute to its funds, it is impossible to undertake investigations on any considerable scale for private individuals and firms without adding to the technical staff, and therefore to the general expenses of the Institute. In view, however, of the growing demand for this work, the Imperial Institute has been authorized to undertake investigations required by private individuals and firms for an appropriate fee. It will be left to the authorities of the Institute to decide whether these requests for researches can in each case be properly complied with. An important point is that under this system any reports which may be supplied will become the property of those who pay for them, and will not be communicated either by the Imperial Institute or by any Government to other persons, or published without the consent of those concerned. At the present moment the Managing Committee are not prepared to suggest any actual scale of fees which could meet with the variety of cases which are likely to occur. The fee must be arranged between the Institute and the individual. It is believed that the adoption of this plan will increase the usefulness of the Imperial Institute to the manufacturing and industrial communities of all countries of the Empire.

DEPARTMENT NEWS.

Mr. W. R. Dunlop, Scientific Assistant on the Staff of the Imperial Department of Agriculture, proceeded to England on three months' leave of absence, by the R.M.S. 'Orotava' which left Barbados on October 28.

Mr. W. Nowell, D.I.C., Mycologist on the Staff of the Imperial Department of Agriculture, returned to Barbados on October 26, by the S.S. 'Korona', after an official visit to Dominica for the purpose of studying certain root diseases of limes, and of making other investigations.

Mr. W. N. Sands, Agricultural Superintendent, St. Vincent, was a passenger by the R.M.S. 'Trent' arriving at Barbados on November 2, returning from leave in England, en route to St. Vincent.

Mr. F. Birkinshaw, Assistant Agricultural Superintendent, St. Vincent, was a passenger by the R.M.S. 'Orotava', which sailed from Barbados on October 28 Mr. Birkinshaw is proceeding to Mauritius to take up the position of Agricultural Instructor in the newly formed Department of Agriculture in that island.

FUNGUS NOTES.

BLACK ROOT DISEASE OF LIMES.

The Mycologist to the Imperial Department of Agriculture has recently returned from a visit to Dominica, undertaken for the purpose of ascertaining the distribution of root diseases of lime trees, and of making a trial of possible remedies. The following general account of the observations made is published for the information of planters, in anticipation of detailed reports to follow.

There are several more or less well-defined root diseases attacking lime trees in different parts of the island, but the only one which was found to be of really serious importance is the black root disease, caused by the fungus *Rosellinia bunodes*.

This disease was investigated by Mr. F. W. South, late Mycologist to the Department, in 1911-12, and a description, with suggestions for preventive treatment, was published in the Report on the Agricultural Department, Dominica, for 1912-13.

As affecting lime trees, the disease is only known on estates with fairly recent forest clearings. The effects of a closely similar disease have long been known on cacao, which is usually affected as a sequel to the death of an avocado pear, or breadfruit tree. There is evidence which seems to indicate that the form which usually occurs on cacao is not identical with that which is common on limes.

The losses occurring on lime estates of the character above mentioned are serious, and appear to be quite general. The most discouraging feature of the situation to the planter lies in the fact that the more the soil and situation favour the rapid development of the trees, the more susceptible they are to the disease. There are many flat tracts in the interior of the island where a somewhat shallow soil overlies a continuous sheet of thick hardpan. On such flats the drainage is bad, and the trees in general grow slowly, and bear little fruit. Such trees, however sickly they might look, were not found to have contracted the black root disease. On immediately adjacent slopes, where no hardpan has formed, and the trees thrive much better, the disease is common, as it is on valley slopes, however steep, and on flats with pervious subsoil. The usual idea with regard to fungus diseases, that they attack only unthrifty plants, is directly negatived in this case.

The reason for this anomaly can only be conjectured. Among the more obvious possibilities are (1) that the fungus can only exist in certain conditions of soil—a test of the relative acidity of the soils would be interesting in this connexion; (2) that the forest trees whose roots are susceptible to the disease occur only on good soils; (3) that the roots of slowly growing lime trees are harder, and thus resist the disease. The fact that new roots put out above the wound on the collar often remain healthy, for a time at least, and lead to partial recovery, may prove significant in this connexion; but until such roots have been kept under observation for a longer period, it cannot be said whether they ultimately become affected.

The course of the disease is often easy to trace. The fungus can exist upon woody matter, roots or branches, buried in the soil. Should a lime root come in contact with such infected material, it is liable to become diseased by the threads of the fungus growing into it. Roots as thick as a finger may be thus attacked. The fungus then works along the root, passes from one root to others in contact with it, and eventually reaches and infects the collar of the tree. Around this it gradually spreads, involving other roots as it comes to them, until the tree is completely girdled. The spread of the disease up the stem is strictly limited by the degree of dampness of the bark. Where the stem is open to the air and well ventilated, the bark remains sound almost to the soil-level, and a callus is formed along the edge of the wound, from which roots are sent out in the attempt to replace those which have been killed. If on the other hand the stem is shut in by weeds and low branches, or ventilation is prevented in any other way, the disease may extend for 2 or 3 feet up the stem. As seen under the conditions prevailing during the recent visit, the foliage of the infected trees usually showed no sign of ill health until some time after the girdling of the tree was completed. Vigorous looking trees, with dark green foliage and abundance of fruit, were often found to have the bark of the collar completely infested. Suddenly the leaves of such a tree turn yellow, and soon afterwards fall, leaving the branches bare save for the withered immature fruit. At this stage the tree may linger for a time. The loss of the leaves eases the strain on any small connexions which still exist at the collar or have been established by roots springing from the lower margin of the healthy bark. The latter are usually mere matted tufts, but sometimes a few of them get established, thicken up, and give rise to a rudimentary root system. New shoots then appear on the branches, but they are small and scattered, and though such trees have been met with which have apparently lingered for months, it seems extremely doubtful that they are ever of any use.

As soon as the fungus, in its course along the roots, reaches bark which is exposed above the soil, whether on a projecting knuckle of a root or on the collar, it proceeds to form its spores. The first form of fructification consists of short black stalks, about one twelfth of an inch in length, surmounted by whitish tufts which are heavily powdered with the minute spores. Large surfaces of bark, and occasionally adjoining dead twigs and leaves, are closely covered with these structures. At a somewhat later stage they are mixed with, or replaced by, the second form of fructification, which consists of round black bodies, about one twelfth of an inch in diameter, closely set with irregular projecting scales. These bodies are hollow, and within them are formed large numbers of a second, and probably much more resistent, form of spore. Dead trees, whether standing, or dug up and thrown aside, were often found completely coated for a foot or more at their base with these fructifications. They are also quite common on the dead portions of the bark of still living trees.

There is little doubt that the disease is usually communicated to the lime trees in the first instance from wood left in the soil when the clearing is made, but the examination of a large number of stumps and of much decaying wood gave negative results, and it is possible that the number of such original sources of infection is quite small. By far the greater number of cases now occurring appear to arise from contact with, or infection from, earlier cases of the disease on lime trees. It is true that many isolated cases still occur, but the seriousness of the present situation is largely due to the occurrence of groups of diseased trees in which very commonly a definite sequence can be traced from a more or less central source. Were sporadic cases promptly and vigorously dealt with, the losses would be very greatly reduced. Further, it must be pointed out that the chance of the occurrence of sporadic cases is greatly increased by allowing dying and dead trees to stand; for upon each of these are produced myriads of the spores of the fungus. Whether such spores infect the trees direct, or whether, as is much more probable, they first attack dead material, the result is the same in the end. Dead stumps and rotting wood as such have no power to give rise to

the disease. They may and do exist in tons around a tree without the slightest harm ensuing. Only when they have first themselves become infected do they become dangerous, and such infection must in the first place be due to the spores of the fungus. One diseased lime tree is thus capable of causing a whole clearing to be infested, and the fact that the disease may occur in scattered individuals or discontinuous patches does not necessarily show that more than one original centre of infection existed.

The disease is stated by planters to have become much more serious during the present year; and a period of extremely wet weather is considered to be responsible for the increase. It is however highly probable that it is due in great part to the obviously cumulative nature of the disease, which is further aided in its spread as the growth of the lime roots brings the trees more into contact with each other. The fact must be faced that the disease is capable of making a clean sweep of the trees in the situations which favour its development. Its occurrence is no mere passing incident: it may be compared to a slowly smouldering fire which will spread as long as it has material to feed upon, while the spores, like sparks, scatter and cause fresh outbreaks.

Very careful attention is being paid to possible additional methods of prevention or cure. Certain areas have been surveyed tree by tree, and will be treated with carbon bisulphide emulsion according to the method advocated by M. Bordaz in Martinique. It is difficult to understand how this agent can act successfully, but cases are not at all uncommon of remedies proving successful without apparent reason. Nevertheless planters would be wise to avoid disappointment and loss by not depending on the treatment until its efficacy has been confirmed.

The arrest of the rot, when bark not kept constantly damp is reached, suggests that thorough ventilation of the collar and the main roots near their attachment should considerably delay, if not stop, the progress of the disease. At any rate, since there is no known objection to such a course, and there is possibility of considerable benefit, its effects are being tested. The earth is removed from the collar and the crown of roots by hand, to avoid damage by implements, the lower branches and surrounding vegetation are removed to give the air free access, and the bark is kept clean of spongy moss by the use of lime sulphur wash. There are two weaknesses in this method: (1) it is not possible to put the tree entirely on stilts—the central roots and the under sides of the lateral roots still have a connexion with the collar kept moist by the soil; (2) the roots are so interlaced that the fungus advancing along one root can cross over to the next by lateral branches, and infect the whole root system without having to pass round at the collar.

The detection of diseased trees at an early stage is much facilitated by keeping the collar clear as described. Only by close inspection of this region can such trees be found. As already explained, by the time the affection shows in the leaves, the destruction is usually almost or quite complete. A diseased root when found may be removed with its branches as completely as possible, but this is in practice a very difficult operation, owing to the interlacing of adjacent roots, some of which are usually already infected, or easily become so when they are cut or broken in the necessary digging. Several trees have however been treated in this manner, and the results are being watched.

In this connexion it is important to be able to recognize the disease on the roots. When the bark is lifted the surface of the wood is seen to be marked with dots and with closely adhering short black threads, which may be straight, curved, or angular. The dots, which represent the threads cut across, may be seen on close examination to have white centres. If a cut is made into the wood, it is seen to be completely penetrated by continuations of these threads, which appear as dots, and as short straight black lines running lengthwise and crosswise. If care is taken to distinguish these from the long continuous zig-zag black lines made by another fungus common in dead wood, there is little possibility of mistake. Frequently another form of growth belonging to the black root disease is seen in the shape of a thin white substance spreading in fan-like patches under the bark. The smallest piece of such infested material is capable of infecting living roots by contact.

From the description of the nature of the disease which has now been given it should be clear that the main precautions recommended in the past are absolutely necessary, if the disease is to be dealt with, difficulties arising from the nature of the ground, and the scarcity of labour notwithstanding. They are, first, the prompt destruction by fire of the dead and dying trees, together with as much of the root system as it is possible to remove from the soil; second, the isolation of diseased areas by means of trenches, which may be narrow, but must be deep enough to get below the lateral roots. It is obviously not sufficient to isolate simply the dead or dying trees. By the time they reach that stage there is every probability of the roots of adjacent, apparently healthy trees having already become infected. Either such roots should be laid bare and removed well back into their healthy portions, which gives a chance of saving the trees; or the trench should be carried outside of the suspected trees. If both measures can be carried out, so much the better. The nature of the ground often renders such operations very difficult, but they should be carried out as far as possible. The first precaution, the destruction of the trees by fire, is rendered easy by the inflammable nature of lime wood, and should never be neglected.

No case of the disease on the sour orange has yet been found, although the trees of two orange plantations in forest clearings are on stocks of this nature. Should this apparent immunity be confirmed, the experiments at present being carried out with limes budded on such stocks may be of great importance.

In conclusion, it must be said that there is no desire to create alarm with respect to this disease. Its dangerous nature has been emphasized only in order to impress upon planters the absolute necessity for taking elementary precautions against its spread. It is believed that it is by reason of the lack of these, and for that reason only, that any serious degree of loss is being experienced.

Summary.

1. The black root disease is due to a specific fungus, which can exist on wood buried in the soil, but is not by any means general on such material.

2. The fungus spreads by contact from this infected material to the roots of healthy lime trees, and from one root to another.

3. The rate of the spread of the fungus along the roots is not known, but probably a very considerable time is taken before the advanced stage is reached at which a tree shows signs of sickness.

4. On reaching the light the fungus produces spores, which are carried to a distance, and are capable of producing fresh infections.

5. Such spores are produced on diseased spots long before the tree dies, and also after it is dead.

6. It has not been proved that any curative treatment is practicable.

7. Preventive measures consist in the destruction by fire of all diseased material, and the prevention by trenching of the spread of the disease underground.

MARKET REPORTS.

London.—The West India Committee Circular, October 20, 1914.

Arrowroot—No quotations.
Balata—Sheet, 2/1; block, 1/8½ per lb.
Beeswax—No quotations.
Cacao—Trinidad, 56/- to 63/- per cwt.; Grenada, 51/ to 55/-; Jamaica, no quotations.
Coffee—Jamaica, no quotations.
Copra—West Indian, £23 per ton.
Cotton—Fully Fine no quotations; Floridas, no quotations; West Indian Sea Island, 11½*d*.
Fruit—No quotations.
Fustic—No quotations.
Ginger—Quiet.
Isinglass—No quotations.
Honey—No quotations.
Lime Juice—Raw, no quotations; concentrated, no quotations; Otto of limes (hand-pressed), no quotations.
Logwood—No quotations.
Mace—1/4 to 2/1.
Nutmegs—3¾*d*. to 5*d*.
Pimento—Quiet.
Rubber—Para, fine hard, 2/10; fine soft, 2/3; Castilloa, 1/8.
Rum—Jamaica, no quotations.

New York.—Messrs. Gillespie Bros., & Co., July 24, 1914.

Cacao—Caracas, 11½c. to 12c.; Grenada, 11c. to 11½c.; Trinidad, 11¼c. to 11¾c.; Jamaica, 10c. to 11c.
Coco-nuts—Jamaica and Trinidad, selects $20·00 to $21·00; culls, no quotations.
Coffee—Jamaica, 9¾c. to 13½c. per lb.
Ginger—7½c. to 10c. per lb.
Goat Skins—Jamaica, 46c.; Antigua and Barbados, 43c. to 46c.; St. Thomas and St. Kitts, 40c. to 43c. per lb.
Grape Fruit—Jamaica, $1·75 to $2·50.
Limes—$3·75 to $4·50.
Mace—45c. to 53c. per lb.
Nutmegs—110's, 11¾c.
Oranges—Jamaica, $2·00 to $2·50.
Pimento—3⅞c. per lb.
Sugar—Centrifugals, 96°, 3·26c.; Muscovados, 89°, 2·88c.; Molasses, 89°, 2·61c., all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., October 26, 1914.

Cacao—Venezuelan, no quotations; Trinidad, no quotations.
Coco-nut Oil—66c. per Imperial gallon.
Coffee—Venezuelan, 12c. per lb.
Copra—$3·50 per 100 lb.
Dhal—$5·00 per bag.
Onions—$1·80 per 100 lb.
Peas, Split—$8·00 per bag.
Potatoes—English $1·00 to $1·20 per 100 lb.
Rice—Yellow, $6·00; White $5·00 per bag.
Sugar—American crushed, no quotations.

Barbados.—Messrs. James A. Lynch & Co., Ltd., October 31, 1914, Messrs. T. S. Garraway & Co., November 2, 1914.

Arrowroot—$4·00 to $4·25 per 100 lb.
Cacao—$9·00 to $10·00 per 100 lb.
Coco-nuts—$17·00.
Hay—$1·50 to $1·70 per 100 lb.
Manures—Nitrate of soda, no quotations; Cacao manure, $48·00 to $50·00; Sulphate of ammonia $78·00 to $85·00 per ton.
Molasses—No quotations.
Onions—3·00 to $6·00 per 100 lb.
Peas, Split—No quotations; Canada, $3·75 to $5·00.
Potatoes—Nova Scotia, $1·91 to $2·50 per 160 lb.
Rice—Ballam, $6·10 to $6·20 per 100 lb.; Patna, no quotations; Rangoon, no quotations.
Sugar—American granulated, $6·50 per 100 lb.

British Guiana. Messrs. Wieting & Richter, October 24, 1914; Messrs. Sandbach, Parker & Co., October 23, 1914.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	$7·00 to $8·00 per barrel of 200 lb.	$10·00
Balata—Venezuela block	No quotation	——
Demerara sheet	65c. per lb.	——
Cacao—Native	12c. per lb.	13c. per lb.
Cassava	96c. to $1·08	——
Cassava Starch—	——	——
Coco-nuts—	$16 to $20 per M.	$23 per M.
Coffee—Creole	——	16c. per lb.
Jamaica and Rio	16c. per lb.	16c. per lb.
Liberian	11c. per lb.	12½c. per lb.
Dhal—	$4·50 to $4·75	$4·80 to $5·00 per bag of 168 lb.
Green Dhal	——	——
Eddoes—	$1·44	——
Molasses—Yellow	None	——
Onions—Teneriffe	——	——
Madeira	3½c.	3½ to 4c.
Peas—Split	$6·00 per bag (210 lb.)	$9·50 per bag. (210 lb.)
Marseilles	——	—
Plantains—	16c. to 48c.	——
Potatoes—Nova Scotia	$2·00 to $2·25	$2·50
Lisbon	——	——
Potatoes—Sweet, B'bados	——	——
Rice—Ballam	No quotation	——
Creole	$5·50	$5·50
Tannias—	$2·88	——
Yams—White	——	——
Buck	——	——
Sugar—Dark crystals	$3·50 to $4·00	$3·50
Yellow	$4·00 to $4·10	$4·00
White	——	——
Molasses	——	——
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
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,, Cordwood	$1·80 to $2·00 per ton	——

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Printed at Office of *Agricultural Reporter*, 4 High Street, Bridgetown, Barbados.

AGRICULTURAL NEWS

Vol. XIII. No. 328.] SATURDAY, NOVEMBER 21, 1914. [One penny.

JUST ISSUED.

WEST INDIAN BULLETIN.

Vol. XIV, No. 3.

CONTENTS.

AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

OF THE

IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

VOL. XIII. No. 328. BARBADOS, NOVEMBER 21, 1914. PRICE 1*d*.

CONTENTS.

Improvement of Soils.

PART I.

MR. A. D. HALL, as President of the Agricultural Section of the Australian meeting of the British Association, took an interesting theme for his Presidential address, when he discussed the winning of new land for agriculture—the bringing into cultivation of land that has hitherto been left to run to waste, because it was regarded as unprofitable to farm.

He shows that even amongst densely populated European areas, even within 50 miles of London itself, there are large blocks of uncultivated land which may be considered within the scope of the subject of his address, while continental Europe contains waste tracts of great size.

The causes which render land unprofitable to cultivation may be summarized as rainfall, either excessive or deficient, or not well distributed: the texture of the soil which produces infertility, being either too coarse and sandy, or too close and clayey: and finally the absence of a sufficient supply of lime. Mr. Hall discusses in some detail the bearing of these factors on the problem in view.

It may prove of interest to refer to some of the points dealt with, and in some cases to consider their bearing on West Indian agriculture and conditions.

In the West Indies two phases of winning new land for agriculture are in progress simultaneously. In certain islands, notably in Dominica and St. Lucia, efforts are directed towards the clearing of forests, and bringing under cultivation fertile lands as yet untilled—a phase not within the compass of the address in question. In other islands, notably in Jamaica, and in Antigua, efforts are being made to bring under cultivation land which has hitherto been left to run to waste, because it was regarded as unprofitable to farm. Another class of land that often has to be won back to cultivation, is land that once was under cultivation, but which from defective methods of farming has been depleted of its fertility, and is now lying idle, or is the subject of attempts to bring it back to cultivation. The cause of infertility in this case is frequently due to the loss of humus, a loss to which tropical soils carelessly handled, are peculiarly liable. There are not wanting examples of this class in the West Indies.

In dealing with the question of producing remuner-

ative crops under conditions of deficient rainfall, reference is made by Mr. Hall to what is now known as dry farming, and it is explained that this consists in nothing more than the application of the principles of husbandry worked out by English farmers, which principles were first expounded by Tull, an English farmer of the seventeenth century. It is pointed out that there is, however, a new feature introduced into dry farming by the settlers in arid districts in North America and Australia, namely the use of a year of bare fallow, in which to accumulate a supply of water for the crop of the next year or two. This is the basis of work in districts that may be described as arid.

Much of the work carried on in the drier islands of the West Indies is based on the principles underlying so-called dry farming, and it is the carrying out of these principles, as the outcome of the empirical acquirement of a sound knowledge of conditions governing local circumstances, that produces what is recognized as the good, practical, and successful planter. The object of modern effort, in relation to agricultural education in its broadest sense, is to bring these principles to recognition, and by their further study to deduce from them yet wider and wider generalizations.

It is interesting to note, as evidence of the fact that the principles of dry farming are extensively used in parts of the West Indies, that the value of mulching with trash and vegetable matter, a practice not referred to in Mr. Hall's address, is well recognized; it finds, possibly, its best and most systematic application in arable agriculture in the sugar-cane fields of Barbados, but it also finds application in orchard cultivations in many parts of the West Indies, though, perhaps, under circumstances hardly connected with dry farming.

As the outcome of various considerations, Mr. Hall puts forward very suggestive ideas concerning the actual quantity of water required by the plant and the crop, leading to the idea that good work remains to be done in the production of varieties of crop plants specially capable of producing large quantities of stored material, such as starch or sugar, with the use of relatively small amounts of water; and in this connexion he draws attention to several points requiring investigation, some of which might be well enquired into in tropical countries, if means were found to equip investigators.

Attention is drawn to the relationship between the quantity of water transpired by the crop, and that lost to the soil by evaporation, and it is explained that under the climatic conditions of Rothamsted in England one half of the annual rainfall finds its way back into the atmosphere by evaporation from the soil, and that the amount evaporated is substantially the same from deep and from shallow soils, being determined by the surface only. Various problems awaiting investigation are pointed out, some of which might be capable of solution by West Indian investigators.

If loss of water from the soil surface is so important a matter under the conditions of a temperate climate, it may be suggested that it is of much greater importance under tropical and sub-tropical conditions, and, indeed, that it has a large bearing on agricultural methods in dry districts in these regions.

In this connexion Mr. Hall raises the question how far evaporation from the bare soil can be checked by suitable screens or hedges that will break the sweep of the wind across the land.

The persistent sweep of the trade winds over the country makes the effect of wind very obvious; wind-breaks therefore have been a matter of serious consideration in many parts of the West Indies, and the extension of their use is constantly advocated. In this connexion, however, it would seem that the benefit of mitigating this action of the wind upon the plants has had chief consideration, wind-breaks having principally been used in connexion with orchard crops like cacao and limes; the action of the wind upon the soil itself, as affecting the evaporation from the surface, has had little consideration. It would now appear desirable to ascertain whether wind-breaks may be usefully applied more extensively than at present in connexion with arable cultivation, as a means of reducing evaporation from soil surfaces.

As a method of winning for profitable cultivation land suffering from deficient rainfall, reference is naturally made to irrigation; but at the outset the note is struck that the history of irrigation-farming is full of disappointments, due to the rise of salts from the subsoil, and the subsequent sterility of the land. But it is pointed out that the conditions are now fully understood, and there is no longer any excuse for the disasters that have overtaken the pioneers of irrigation in almost every country. It is explained that under almost all circumstances there is a danger of salts accumulating in the surface soil, and that this can only be obviated by periodic washings out; and also, that there is ever-present danger of raising the water-table, so that the subsoil becomes water-logged, and no longer permits the free growth of plant roots. It is now well recognized that drainage is an essential accompaniment of irrigation, and that most irrigation troubles have arisen from want of proper appreciation of this.

The other factor influencing fertility is the presence of an adequate amount of carbonate of lime in the soil. Mr. Hall has devoted special attention to the investigation of this feature, and attaches great importance to it: indeed, he says that of all the soil factors making for fertility, he would put lime first: upon its presence depend both the processes which produce available plant food in quantity adequate for crop-production at a high level, and those which naturally regenerate and maintain the resources of the soil: it is, moreover, the factor which is most easily under the control of the agriculturist.

This pronouncement is of particular interest to West Indian planters, for over very large parts of the West Indies the soils are remarkably deficient in lime. It would appear too, that here is matter for future investigation locally: for some of the eminently fertile soils, such as occur for instance in St. Kitts, contain but very little carbonate of lime:, the amount being so small in some instances as to lead to the conjecture that, under the conditions obtaining there, it may be that crops take at least part of their nitrogen in the form of ammonia, rather than nitrate.

SUGAR INDUSTRY.

BENEFITS OF USING TOPS FOR PLANTING.

From time to time the point arises as to whether it is better to use tops for planting canes, or to use maturer parts of the cane. W. G. Taggart, in the *Louisiana Planter*, October 17, 1914, unhesitatingly gives his verdict for the tops, even in Louisiana, in spite of the fact that the reaping season, on account of the winter, is necessarily at a period of the year some time removed from the planting season. Of course, in most of the West Indian islands, the practice of planting from tops is almost universal, the reaping and planting seasons almost overlapping each other. Mr. Taggart suggests that tops, 'windrowed', might contain, even after the lapse of some weeks, a fair amount of healthy material for plants. He says that he is going to make the experiment. He proves, in tables given in his article, that the planting of tops must be real economy in two ways. First : the man who sells his cane by weight gains by only reserving his tops for planting, because, even if by tops is meant the upper third of the cane, they are less in weight, when compared with equal lengths of the lower two-thirds, in the proportion, roughly, of 10 to 15, in the case of D. 95, a cane well known in the West Indies. Secondly, the man who grinds his own cane makes a profit by only reserving tops for planting, because the lower two-thirds of the cane contain, in samples of the same variety, nearly 30 per cent. more sucrose than the upper third.

As regards the question of the superiority in sugar content of the cane raised from the maturer joints over that raised from the tops, Dr. Stubbs in his book (*Cultivation of the Sugar-Cane*) thinks that there is none. This result was fairly well confirmed by experiments conducted in Antigua some years ago, under the direction of the Imperial Department of Agriculture.

PAPER FROM MEGASS.

There is in the *Louisiana Planter* for September 1914, a short account by James H. Dod on making paper from bagasse, called almost universally in the West Indies, 'megass'. It is said that the Preston Central of the United Fruit Company, Limited, in Cuba, is now working regularly a factory for the making of paper from megass. The product is of excellent quality, and of good strength, in the form of rolls of wrapping paper of various colours. This achievement has been the result of many experiments, involving a very large expenditure on the part of the projectors. Mr. Tennant Lee who has attained success in this at last, is in charge of the work, which has been in operation since April. According to Mr. Lee's calculations the factory can produce about 1 ton of paper per day: and 1 ton of megass can yield about 50 per cent. of its weight in paper.

THE OUTLOOK OF THE CONTINENTAL SUGAR INDUSTRY.

The outlook of the continental sugar industry at present is black. So thinks Dr. Geerligs in his letter from Amsterdam to the *Louisiana Planter* of October 24, 1914. It was pointed out in the last issue of the *Agricultural News* that the sugar crop of Belgium and France must be reduced enormously because of the theatre of the present war: and that on account of the drain of the war on men and transport, the output of Germany and Austria could hardly reach the normal amount. These considerations are again put forward by Dr. Geerligs in the letter referred to above. He does not think, however, that Great Britain has anything to fear in the matter of sugar supply. She receives sugar cargoes from all parts of the world, and after the arrival of the supply at present on its way, there ought to be sufficient in stock to last till June 1915.

The German Government will allow an exportation of German sugar to the same amount as that which has been exported in 1913-14: but the great question is, who will buy it, and how to get it shipped. The only neutral powers in Europe that do not grow sufficient sugar for themselves are Norway and Switzerland, hardly able to take between them the surplus stock of Germany, calculated at about 1,100,000 tons. Exportation over sea, either to the United States or to the countries of South America, will certainly, under present conditions, be stopped by Great Britain.

There was evidently an idea in the mind of German sugar manufacturers that they might be able to ship their sugar clandestinely via Holland, but in a letter to the *Louisiana Planter* of October 17, 1914, Dr. Geerligs has shown that the Dutch Government have taken steps to prevent this in their own interest, so as to avoid the interference of Great Britain with the Dutch sugar trade.

The Dutch coming beet sugar crop is estimated at 275,000 tons. It is allowed that 60 per cent. of this may be exported, 18 per cent. as raw sugar, and 42 per cent. as refined. When the manufacturer ships his sugar to the bonded warehouses he receives export certificates from the Government to the extent of 60 per cent. of each shipping, in the relation of raw and refined mentioned above. When he sells his sugar to the refiner he passes on also his export certificates, so that the refiner can export the same if he chooses. In this way there is kept enough sugar in Holland, the refineries are kept at work, and the raw sugar manufacturers have a share in the sugar exportation. As the Government certificates will only cover the estimated total exportation of Dutch origin, there is no fear of unlimited exportation of smuggled German sugar.

FRUIT AND FRUIT TREES.

PEAS AND BEANS.

The question of increased food supply is one of importance to the whole Empire at the present time, and not least to the West Indies. The Commissioner of Agriculture, in his address to the planters of Montserrat, reported in the *Agricultural News* of October 24, 1914, brought this point to their notice. One of the important food crops which has received but little attention in the West Indies hitherto, as Dr. Watts pointed out, is that of peas and beans. And yet this crop is well worth trial, and this for several reasons. Take, for instance, the 'cowpea' (*Vigna unguiculata*), as it is called in the United States, and its congener, known in the West Indies as 'black-eye pea' (*Vigna catjang*). These are already grown in these islands, but only as an article of diet for local consumption, or as green dressings for the fields. There does not, however, seem to be any reason to prevent the cultivation of them on a larger scale for export. If the cowpea, which matures very quickly, were grown widely as a catch crop, the land would be enriched, owing to the well-known beneficial results of a leguminous crop. According to reports lately to hand of the market prices in England for such beans, there would seem to be a sufficient margin of profit accruing, if the quantity grown were worth while shipping and placing on the market. Some kind of mechanical sheller would be necessary for dealing with beans or peas in large quantities. Suitable machines are obtainable; they are not very expensive, or beyond the reach of an association of growers, who might agree to experiment in this direction. In fact such machines are already in use in the West Indies. Again care would have to be taken in the drying of the beans, and in the protection of them from insect pests. But here the experience of growers in other countries would direct West Indian growers as to the best methods, and the Departments of Agriculture may be relied upon to give their help.

It may here be mentioned that in the *Bulletin of the Imperial Institute*, No. 3, 1914, it is stated that a sample of cowpeas from Hong Kong was valued in England, where there was a small market for them, at £8 per ton in 1911.

An article in the same publication deals with an effort being made by the Department of Agriculture in Burma to improve the quality of the beans grown there. Amongst them is *Phaseolus lunatus*, a bean also grown in the West Indies, most commonly under the name of 'white bean'. A superior variety from Madagascar—worth £24 per ton in England, while the local variety was only valued at £6 per ton—was selected for trial, and 2 tons of seed have been distributed for experimental cultivation in the Province by the Department. Apart from the possible value of beans as an export, they are very largely used in Burma, as in fact they are throughout the East, as a very nutritious form of diet.

The great difference in the market value between the local variety and the one chosen for introduction is indicative of the good results obtainable by wise selection. This bean may well repay further experimentation with as a crop in the West Indies. It is practically unattacked by insects, owing to the hydrocyanic principle contained in its foliage.

In Bulletin No. 102, of the Bureau of Plant Industry, of the United States Department of Agriculture, there is an interesting article on the history of the cowpea, and its introduction into America, by W. F. Wight. The writer proves that this species (*Vigna unguiculata*) and its near relation, the black-eye pea (*Vigna catjang*), were originally natives of Persia and the neighbouring region, and that they apparently reached the southern countries of Europe on the borders of the Mediterranean somewhere about the beginning of Christian era, but were not cultivated in central Europe till about the sixteenth century. From the evidence collected by Wight, it would seem that from Europe the cowpea was introduced into Jamaica somewhere between 1672 and 1687. Thence it appears to have been taken to one or more of the southern colonies of America between the latter date and 1737, and its cultivation seems to have become fairly common as far north as Virginia by 1795. It is therefore noticeable that the parent stock of the many varieties of cowpea now cultivated in the United States was derived from the West Indies, where, as was stated at the beginning of this article, they are still commonly grown, but in small quantity. Should the cultivation of beans be attempted in these islands on a more extensive scale, it might be well to consider whether plants raised from locally grown seed would not be more productive, and more immune to insect attack, than those raised from seed imported from the United States. The locally grown varieties would have the advantage of a couple of centuries of acclimatization, and may usefully serve as the starting point for West Indian work in selection. In this connexion it may be noted that during a series of experiments made with the cowpea in the Experiment Station in Antigua from 1907 to 1912, chiefly with a view to ascertain its value as a crop for green manure, it was found to be very susceptible to attacks of insect pests, which largely minimized its value in that respect. On the other hand, the local varieties grown by small cultivators do not seem, as far as has been noticed, to be specially troubled in that way.

The nomenclature attached to the cowpea and the black-eye needs a good deal of straightening out. The first is known throughout the United States nowadays as cowpea, with various varietal sub-names. The writer above quoted says that practically all the varieties belong to the species *Vigna unguiculata*, although *Vigna catjang* is not unknown. A striking difference in the two species is that in the former, to which the name cowpea should be restricted, the pods, long before they reach maturity, hang, apex down, on the plant; they are also without marked constrictions; whereas, in the latter, to which the name black-eye might be confined the pods continue to grow almost erect, the apex pointing upwards from the plant, and they are noticeably constricted between the seeds, even at an early stage of growth.

In the West Indies the difficulty in regard to name is accentuated by the fact that the same pea is known in different islands by different names. The name cowpea was practically unknown, or certainly not in general use, until the importation in more recent years of seed from the United States. Even now many persons in the West Indies will probably be surprised to learn that the cowpea is the same thing as what they have long known as 'black-eye pea', increase pea', or 'rounceval'—corrupted even to 'round-so-full.

This last name, 'rounceval', is commonly used in Jamaica for the cowpea, and it is interesting to note that it has survived apparently from its first introduction there; for Sloane, in his *Natural History of Jamaica*, describes, in the year 1687, what is evidently the cowpea, as similar to the English 'rounceval' pea. In an old herbal of a few years later, 'rounceval' is mentioned as a variety of pea grown in England then. The derivation is from the name of the quasi-legendary glorious battle of Charlemagne and his

paladins in the pass of Roncesvalles—a name therefore which would easily lend itself to any striking new variety, especially one of great size. So it was transferred by the colonists from the pea known in England to the bean cultivated by them in Jamaica. This name is also in use for this bean in Barbados. Sloane also describes what appears to be the *catjang* under the name 'calevances'. This name seems to have died out of the West Indies, although 'calevances' are mentioned in customs' lists of these islands as articles liable to duty. On the whole, it seems a pity that one name should not be attached to the same thing throughout the West Indies, so as to avoid confusion. If the name cowpea, as unfamiliar, should not be acceptable, it might be suggested that 'rounceval', which has the *cachet* of antiquity, be adopted for *Vigna unguiculata*, and that the name 'black-eye' be restricted to *Vigna catjang*, its less vigorous and less productive congener.

DOWN THE ISLANDS.

ITEMS OF LOCAL INTEREST.

ST. LUCIA. Strong winds and heavy showers have been experienced, causing an improvement in the growth of the sugar-cane fields. The second crop of limes is coming on fast, and the extension of this industry continues, no less than 11,550 lime plants having been sent out from Réunion alone. The local price for peasants' cacao continues low.

DOMINICA. There are complaints of the lime crop being rather below average; prices fell heavily during the month down to £28 per pipe f.o.b. for concentrated lime juice. The investigation of the root disease of limes, made by the Mycologist during his visit to the island in October, has been described by him in the last number of the *Agricultural News*. There is only a moderate crop of cacao. In the Botanic Station wherever diseased trees are noticed they are being removed, and supplies put in where necessary. The Agricultural Department is authorized to make fortnightly shipments of fruits from the Botanic Gardens to the Netley Hospital for the use of the wounded soldiers.

MONTSERRAT. The Curator reports the completion of the planting of the pine-apple plot of ¼-acre containing 1,000 plants. The reaping of the experimental ground nut plots has been completed, and a good deal of information accumulated for future use. Three bags of the ground nuts have been shipped experimentally to Canada. A new grass (*Chloris Gayana*), which is being experimented with, is found to be easily raised from locally produced seed. The cultivation of pigeon peas seems to be attracting some attention. Sixteen thousand plants of the Bay tree have been distributed from the Station up to date; ½-acre of these trees have been planted on Government land. The moth of a grub attacking sweet potato stems has been sent to the Entomologist of this Department for identification. Onion growers are disposed to follow Dr. Watts's advice to use crates for shipping. A further trial shipment has been made to Canada of pine-apples.

ANTIGUA. From the Experiment Station of this island we have the complaint of prolonged drought. Though the work of plant distribution is continued, the lack of rain has retarded it. Both the cane and cotton crops are suffering from the effect of prolonged dry weather. In most places the soil is too dry for the transplanting of onion seedlings. Up to the end of October Mr. Jackson reports that there has only fallen 29·34 inches of rain for the year. The effect of this small rainfall is felt in all parts of the island, but especially so in the northern districts. The Onion Growers' Association promises to be prepared for curing the coming onion crop. In the *Antigua Sun* (October 28, 1914) it is stated that at a meeting of the above association it was unanimously decided that the money required for the preliminary working expenses of the society this year should be obtained from a firm of merchants. It was also agreed that members may be allowed to sell onions locally, but not to ship them except through the association.

ST. KITTS. The Agricultural Superintendent says that the weather has been very dry up to the latter part of October; since then, however, 3 inches of rain have fallen. The canes, especially in the Basseterre district, have been so affected by the drought that, even if the rains keep up, the crop must be below the average. The rains will benefit the later cotton. Some promising fields are to be seen. Leaf-blister mite is attacking the old cotton, and unless it is kept in check by hand picking, there will be no second bearing. Termites, similar to those which have attacked the canes on Pond estate, have been found also in some cane fields at Buckleys near the sea coast. At a meeting of the Agricultural and Commercial Society held on October 13, it was decided, on account of the war and the drought, not to hold an agricultural show in 1915.

NEVIS. There is not much to report from this island. The growing cane crop has suffered much from drought. The cotton crop is nearly reaped, but the new growth is affected by leaf-blister mite to some extent. Attention will have to be paid to prevent the spread of this pest.

VIRGIN ISLANDS. In these islands there is also the report of prolonged drought. Fields of young cotton seem to have been affected throughout the Presidency by want of rain. The cotton fields of Virgin Gorda, however, promise fair results. In spite of the dry weather the amount of limes purchased at the Station shows an increase on any previous year. The opening of the cotton factory for purchase of cotton from growers will, it is hoped, soon take place.

SISAL PLANTING IN EAST AFRICA.

It seems that British East Africa will soon be in a position to supply a good deal of fibre to the world's markets. In a recent number of the *Agricultural News* attention was directed to late experiments in planting sisal in Jamaica. From an article in the *Journal of the Royal Society of Arts*, for August 14, 1914, it would appear that the planting of sisal (*Agave sisalana*) in certain upland districts of British East Africa in rich volcanic soil, which was begun in 1907, is now an assured success. Planting is steadily progressing, and a large increase of production may be looked for, as the conditions of soil, climate, and labour are favourable, enabling the planters to produce sisal fibre at a low cost. On the coast-line, on coral limestone soil, the industry is also being extended, though the yield of fibre per acre there seems to be rather less than on the upland plantations. The article referred to considers that the industry must soon become most important in East Africa. The suitable climate, the fertile soil, the cheap labour, and the low price of land combine to allow of the output of first-class fibre at a low enough cost to ensure a good profit at the average selling price of the last ten years (£33 per ton). As the planters of sisal in East Africa appear also to be using the best decorticating machinery, and baling presses for the preparation of their product, their future success would seem to be assured.

COTTON.

WEST INDIAN COTTON.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending October 24, is as follows:—

The receipts for the week were 67 bales, making the total to date of new crop cotton 228 bales, against 722 bales last year. The Factors have sampled the cotton and are disposed to sell, provided they can do so on a basis of Fully Fine 23c., Extra Fine 26c. The quality of the crop is better than last year, and with orders in hand we can secure very satisfactory quality, and possibly at some concession from the above prices. For this crop, estimates range around 7,000 bales.

PROPOSED VISIT OF COTTON EXPERT TO THE WEST INDIES.

The following letter, which has been received by the Commissioner of Agriculture from Mr. H. A. Dixon, the Managing Director of the Fine Cotton Spinners' and Doublers' Association, Ltd., is reproduced herewith for general information:—

The greatest part of the crop of Sea Island cotton grown in the British West Indies is consumed in our mills.

It has for some time been our desire to put ourselves into closer touch with those who are concerned with the scientific breeding of cottons, and also with those who actually grow them, and it happens that the opportunity has occurred at the present time of our securing the services of a gentleman who is exceptionally equipped for making a visit on our behalf to the islands where the cotton in question is grown. This gentleman is Mr. J. L. Fonda, who for many years has lived in one of the principal centres of Sea Island cotton growing in Florida, U.S.A., and whose business it has been to buy cotton there for us. Mr. Fonda has also had occasion to give a good deal of attention to the best systems of improving the cotton both in quantity and quality.

In visiting the West Indies Mr. Fonda's instructions are to furnish us with all the information he can collect as to the prospects of Sea Island cotton growing. We have also asked him to make particular enquiries as to any matters in which it might be possible for us to co-operate with the Government and with the planters in order to make the industry more satisfactory both to them and to ourselves.

Mr. Fonda sails from America early in November, and will keep you advised of the probable date of his visit to you.

We beg to solicit your kindly co-operation to make his visit as mutually beneficial as possible.

We had made our arrangement with Mr. Fonda before the outbreak of the present war, but we do not see any reason why the war should interfere with it or cause the delay of a year in making it.

INDIAN CORN.

AS TO CORN.

The following article entitled As To Corn, is taken from *Modern Farming* for September 25 last. The advice given therein is applicable to West Indian conditions to such an extent that it is reproduced, as being of interest and value to readers of the *Agricultural News*:

In 1913 Louisiana produced 41,800,000 bushels of corn, an average of 22 bushels per acre. The average for that year is the highest of any State south of the Ohio River, with the exception of Texas, and not counting Missouri, which usually makes about 30 bushels per acre.

The States in the corn belt produce from 35 to 40 bushels per acre and more on many acres. The query presents itself therefore, why is not Louisiana's yield higher? The following reasons, which apply with slight modification to the other Southern States, are given as some of the most logical ones:—

First: Three one-crop systems—cotton, cane and rice.

The boll weevil and the tariff have made it necessary to think of other crops, however, so henceforth the one-crop systems do not enter into our agriculture as formerly. Let us get away from the single-crop idea as soon as possible.

Second: Corn has usually been planted on land that has been cropped for several consecutive years in cotton, cane or rice.

Third: Seed bed for corn has not been sufficiently well prepared because of lack of time from the other crops.

Fourth: Turning ploughs have been used for cultivating, making shallow work impossible.

Fifth: Cultivation has not been frequent enough.

Sixth: The seed planted has not been selected, but too frequently shovelled out of the crib at time of planting.

Seventh: Too much seed has been imported from the Northern States.

Eighth: Not sufficient attention has been given to the use of fertilizers.

Good seed is probably more than one-half the cause of making high yields, because upon it depends the per cent. of stand obtained, and on that depends the amount of corn per acre.

By good seed is meant that which possesses first-class germinating qualities, the characters desired for propagation, and selected from high yielding strains. It even stands for acclimatization and soil adaptation.

It is regrettable, but true, that in Louisiana (and probably similar conditions so far still prevail in most of the other Southern States) there are but very few places where good seed corn can be obtained. The reason is that we are only beginning to breed corn, as we do live stock. This condition needs to be remedied, for good seed corn, that is, properly bred, ought to be for sale on some farm in every community.

Not having the corn-breeding industry yet developed in many communities, the next best thing is for each farmer to save his own seed corn, which all can do, even though all will not be able to do ear-to-row breeding. Seed ought to be field selected, and there is nothing that will pay as well; hence begin this season to get your seed corn from the field, and in this way help to raise more corn.

The following points are well to remember when doing this work:

Select the corn only when the crop is thoroughly mature

Select the corn from strong and healthy stalks; not from near barren and weak stalks.

Select the corn which has shank only sufficiently long to permit the ear to hang down. Long shanks and good ears do not go together.

Select the corn that has ears completely covered with shuck. The shuck should present a square appearance at the end, which usually means a well-shaped ear.

Every farmer who realizes that his corn yields are not what they should be must make plans to do this work at once, if he aims to improve his 1915 corn crop. Corn improvement, even though achieved only to a small extent at the start, is a long step in the right direction, for it inculcates the habit of striving for bigger and bigger yields. Corn means too much to the farmer of the South, especially now that cotton is not to be relied on as it has been in the past, for any to feel otherwise than that it deserves to command most careful and painstaking attention.

LAND SETTLEMENT IN SOUTH AFRICA.

One of the principal results of the Royal Commission of 1897 was the establishment, in some of the West Indian islands, of a Government scheme of land settlement. In connexion with this it is of interest to note that a Commission was appointed in July 1912, by the Governor-General of the Union of South Africa, to inquire into the provision of small holdings for miners and industrial workers on the Rand. The Report of the Commission, dated October 1, 1913, deals with the following matters:—

(1) The necessity for providing land in that district for establishing small holdings, and for the settlement thereon of persons engaged in mining or industrial occupations;

(2) The extent of land available for effective occupation;

(3) Legislation, if any, required for carrying out any scheme proposed.

The following statement of the Commission with regard to the first matter seems of general interest, where similar problems are presented:—

The Commission in presenting the results of their enquiry find it necessary to draw a distinction between two kinds of settlement on small holdings.

(1) The settlement on small holdings of persons who will continue to be engaged on the mines or in industry;

(2) The settlement on small holdings of persons who have retired from employment on the mines or in industry, who wish to devote themselves to farming and make their living out of it.

Holdings of the first type are referred to in the Report as 'Garden Holdings', and those of the second type as 'Farm Holdings', both types being included under the term 'Small Holdings'. The important distinction is, that while the Farm Holding is one on which a man can make a living by agriculture, the Garden Holding is not. The latter is intended to provide the industrial worker with a home, and with a plot of ground on which he can occupy his time and resources in poultry keeping or some other rural employment. The Commission recommend that a Garden Holding should be not less than 1 acre and not more than 5 acres in extent, and a Farm Holding not less than 25 or more than 500 acres. A holding of 500 acres would be, relatively, a small holding in South Africa. The three mining districts of the Rand are divided into 208 farms with an average acreage per farm of 2,696 morgen, equal to 5,729 acres, a morgen being $2\frac{1}{8}$ acres.

Garden Holdings would have the more direct effect on social conditions on the Rand, but the Commission anticipate that the creation of Farm Holdings would have an important though less immediate effect on such conditions.

The Commission are of opinion that the settlement of the workers on small holdings would result in the improvement of conditions in the following respects:—

(a) By improving housing conditions;

(b) By making the population more settled;

(c) By encouraging habits of saving;

(d) By providing an opportunity for men who, for one reason or another, wish to retire from industrial occupations and take up a country life;

(e) By providing new openings for the rising generation;

(f) By creating a link between the Rand community and the rural population of the surrounding districts;

(g) By reducing the cost of living.

Points (a) and (b) advanced in the above, seem of especial force.

With regard to legislation, several islands in the West Indies have passed Acts in accordance with the findings of the Royal Commission to facilitate land settlement, and such Acts have apparently worked well where there has been need of them. In the Rand, the legislation recommended by the Commission is the introduction of a system of progressive taxation of land values.

Palm Kernels.—In the *Bulletin of the Imperial Institute*, Vol. XII, No. 3, July-September 1914, there is an interesting article on the trade in palm kernels, of which the following is an abstract:—

The two chief products of the West African oil palm (*Elais guineensis*) are palm oil and palm kernels. The former is obtained from the pericarp, or outer pulpy layer of the date-like fruit, the latter are secured by shelling the nuts when the pericarp is removed.

Until recently the trade in palm kernels has been left entirely to Germany, as is shown by the fact that of the total export of these from the British West African possessions in 1912, valued at £3,802,492, the amount shipped to Germany was valued at £3,606,943. The article draws the attention of British merchants and manufacturers to the advisability of securing a proportion of this trade.

Palm kernels are used in Germany as a source of oil and feeding cake. The oil obtained from them is of a white or pale yellow colour, and possesses a pleasant taste. It is used for the same purposes as coco-nut oil, viz: the manufacture of soap and candles, and the preparation of various edible fats. These products are manufactured on a large scale in Germany, and exported largely to Great Britain. The meal which is left after the extraction of the oil from the kernels is of value as a cattle food, the whole of which is practically consumed in Germany itself.

Should British oil-seed crushers undertake to secure this product and to work it, they would probably find no difficulty in disposing of the oil to soap makers and makers of edible oil products, but the English farmer might not be induced so readily to take up the feeding-cake, though of proved value on the continent. Yet there is room for an extension of the production of feeding-cakes in the United Kingdom, the imports of such cakes from abroad in 1913 having been valued at £2,539,892.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

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The *Agricultural News*: Price 1*d*. per number, post free 2*d*. Annual subscription payable to Agents, 2*s*. 2*d*. Post free, 4*s*. 4*d*.

Agricultural News

Vol. XIII. SATURDAY, NOVEMBER 21, 1914. No. 328.

NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number contains the first part of a discussion on the improvement of soils, which is based upon the address of Professor A. D. Hall at the Australian meeting of the British Association.

Among the articles on the sugar industry, one entitled The Outlook of the Continental Sugar Industry presents the opinion of Dr. Prinsen Geerligs with regard to the outlook for the coming year.

The article on peas and beans, which appears on page 370, is of interest at the present time when attention is being given to new food crops.

Insect Notes in this number, on page 376, include an interesting account of the habits of ants, and advice to planters to experiment with a view to learning the effect of different insecticides on the foliage of different kinds of plants.

Fungus Notes will be found on page 380. They include articles on spraying ground nuts for leaf rust, and the damping off of seedlings. The former shows the beneficial result of spraying, and the latter describes how to control the damping off fungus in seed beds and seed boxes.

Publications of the Imperial Department of Agriculture.

The latest number (76) of the Department's Pamphlet Series is now almost ready for distribution. It is entitled Indian Corn. This small publication is intended to bring together the known facts as to corn cultivation in the West Indies, and to make suggestions which it is hoped will help planters and others to increase the value of the Indian corn crops.

Useful suggestions are made with regard to tillage and manuring, whilst the need for the proper curing and storing of the crop, and especially the seed corn, and the remedies to be employed to guard against insect attacks are given due consideration.

The question of curing, storing, and protecting the grain from moulds and insects is discussed, and useful information given on these subjects.

The chapter on seed selection outlines simple methods which may be adopted by anyone who wishes to improve his strain of corn. The account of artificial drying makes reference to the successful operation of the Hess kiln drier in Antigua for curing the grain for storage.

This pamphlet has been prepared by Mr. H. A. Ballou, M.S. Price, 4*d*.; post free 5*d*.

The Refining of Saltpetre.

During the last two years attempts have been made by the Agricultural Chemists attached to the Imperial Department of Agriculture in India, to improve the methods of refining saltpetre. The crude material is an efflorescence on the soil of certain districts, and consists of a mixture of potassium nitrate, sodium chloride, and mud. The present unscientific refining process consists simply in the solution of the nitrate in hot water, separation of the mud by sedimentation, and crystallization of the nitrate from the cleaned liquor as it cools.

Soil Bacteria.

The Report, for 1913, of the Director of the Agricultural Experiment Station of Wisconsin, in a discussion of the influence of soil bacteria on plant growth, points out that these micro-organisms are even yet but imperfectly understood, and that among them are injurious as well as beneficial forms. It appears from the experiments carried out at that Station that if the relation between various crops, the different kinds of soil bacteria, and the different types of soils could be established, new light would be thrown on the complex processes concerned in crop rotation. The example given is of oats and corn, but this might read for our purpose, cotton and sugar-cane, or corn and cotton. It is as follows: if on a given soil corn favours the development of bacteria whose growth in turn stimulates oats, then oats can follow corn in the rotation. On the other hand, if corn retards the growth of bacteria favourable to oats, or favours other bacteria which are detrimental to oats, then oats should not follow corn as a crop rotation.

Explosives and the Blow-Lamp in the Garden.

Whether the spade and the rake will ever become only valuable antiques may reasonably be doubted, but experiments are being made by daring horticulturists to extend the list of garden implements so as to render cultural operations less laborious, and more lasting in effect. In a paper in the *Journal of the Royal Horticultural Society* (August 1914), Dr. H. E. Durham discusses in a pleasant way the use of explosives and the blow-lamp in the garden. By using small (1½ to 2 oz.) charges of cheddite at a depth of 3¼ to 3½ feet and 2 to 2½ yards apart, he came to the conclusion that, compared with the work done by the spade or fork in digging and breaking up the soil, quite ten times as much energy was put into the soil in this way. Although his experiments have not been conducted long enough, he says, to warrant any definite generalization, yet he considers that in all cases a beneficial effect was produced by the explosive treatment. He also believes that the use of explosives gives a means of subsoiling old bodies of herbaceous plants without removing the plants.

As regards the plumber's blow-lamp as a gardening tool, Dr. Durham thinks that its range of usefulness is such that others might like to try it. Pests of the insect world can in some cases be destroyed by it, especially ants' nests. But the chief use to which it may be put is the eradication of weeds in a rapid and effectual manner. They should be attacked while quite small, for then the very slight scorching from the quick passage of the flame over them is enough to destroy them. Even when the weeds in a bed have reached the seeding stage, the lamp may usefully be employed to destroy the seeds, and to prevent a new and probably more prolific crop of the weeds. Another useful function of the blow-lamp is the cleaning off of the unsightly green algal growth which so often disfigures walks and drives, especially in damp weather. Dr. Durham says that a drive so treated by him was rendered free from such growth from October to February, the dampest months in England.

There are therefore, at least, four ways in which a blow-lamp can be put to use in the garden: first, to destroy young weeds; second, to prevent weeds from seeding; third, to tidy up quickly a green walk or weedy path; fourth, to destroy some insect pests.

Should anyone care to experiment in the garden with a blow-lamp, the following description of what it is may be of some assistance:—

The plumber's blow-lamp is a lamp with a blast attachment. It may burn kerosene (paraffin) or gasolene (petrol). The burner is arranged so that a jet of the vapour of the kerosene or gasolene is directed into a tubular chimney, usually horizontal. The position and the intensity of the flame is regulated by air pressure, which is produced by a small piston pump incorporated in the body of the lamp.

The United States Department of Agriculture.

An article which appeared in *Science*, for October 2 last, gives an illuminating account of the amount of money appropriated for the several Bureaus and Divisions of the United States Department of Agriculture, in support of their usual and routine work, and for new developments. The total amount carried by the Act providing for the fiscal year ending January 30, 1915, is $19,865,832, which is an increase of $1,878,887, or more than 11 per cent. over the amount granted for the previous fiscal year. This increase is distributed throughout the several sections of the Department, in certain instances specified sums being definitely allocated to special lines of work.

Some of the largest increases are made in connexion with the demonstration and extension activities, in which work great interest has been manifested. For instance, the sum of $400,000 is definitely allocated to farmers' co-operative demonstration work outside the cotton belt, and $673,240 for similar demonstrations in the areas threatened by the boll weevil; while for the campaign against the cattle tick, funds to the amount of $400,000 are provided, of which $50,000 may be used for demonstration work in areas freed of ticks.

It is impossible in the brief space available for this extract to mention the lines of work projected, and the amounts of money made available for the carrying out of them. A perusal of the article under consideration however records the magnitude of the work of that great Department, and the value of the results attained by the scientific officers attached to it is attested by the amounts of the appropriation, and especially by the increase over the sums provided in the preceding year. These facts also emphasize the recognition on the part of the Government, and the people as a whole, of the importance of agriculture as a fundamental pursuit embracing all branches of science, and of the necessity for fostering its development.

When it is stated that in addition to the amounts already referred to as being provided for the agricultural work in the coming year, large appropriations will be available for agricultural education in the land-grant colleges, for rural education work, demonstration work in agriculture among the Indians, and the payment of the government quota towards the support of the International Institute of Agriculture, the wide extent to which federal assistance to agriculture is being carried out becomes apparent, and the aggregate expenditure from the federal funds appears increasingly impressive.

It is stated, however, that the entire agricultural appropriation is still inconsiderable as compared with the total federal appropriation, the magnitude of the agricultural interests of the country, or even of the annual losses to farm products sustained through insect pests and plant diseases.

Moreover, the conviction is deepening that these appropriations are largely in the nature of a permanent investment for the benefit of the nation as a whole

INSECT NOTES.

ANTS.

In the Annual Report on Agriculture and Crown Lands of the Colony of Seychelles for the year 1913, under the heading Insect Notes, there appear some interesting observations on the life-history of a black ant found in those islands, and the probable correlation of the spread of scale insect pests with the increase in numbers of the ant.

It may be remembered that in Insect Notes in the *Agricultural News*, September 12, 1914, attention was directed to the acrobat ant, a species of Cremastogaster, which has lately become abundant in Barbados, and the connexion between this ant and some scale insects was noted. The habits of the ant (*Technomyrmex albipes*) under consideration in the Seychelles seem to have much in common with the acrobat ant.

In the report above mentioned it is stated as proved, that this ant is indigenous to the Seychelles, but has only multiplied so as to become a troublesome pest in the last eight or ten years. This is attributed to the development of scale insects, which after the droughts of 1904 and 1905 multiplied to such an extent as to cause the destruction of most of the citrus, hibiscus, and Liberian coffee plants in the colony. The favourite food of the ant seems to be the excretion of the scale insects, so it is reasonable to infer that more abundant food supply led to the multiplication of the ants.

The greatest harm done by this special ant would appear to be the increase which it causes in the propagation of scale insects by sheltering them, and protecting them from their natural enemies. A mutual benefit society is thus formed between the ants and the scale insects. The ants protect the scale insects by building a sort of shelter for them on the plants they infest, the shelter being constructed of particles of soil or light vegetable débris; and the scale insects by their excretions supply the ants with food. It has even been suggested that the ants actually transport the eggs or larvae of the scale insects from one place to another to form fresh colonies; this, however, has not been proved. No other great harm is placed on record against this ant, though, as they infest houses in swarms, crawling over everything, even the food on the tables, they are a decided nuisance. This ant may, however, be responsible in the future for other forms of injury, such as the destruction of useful kinds of ants, or the dissemination of disease germs.

The places most often selected by these ants for forming a colony, which they do with great rapidity, are the sheathing leaves of the coco-nut, banana, and sugar-cane. From these may be collected specimens in all stages of growth and metamorphosis, by detaching quickly the leaves infested by them, and shaking the sheaths over a killing bottle. The workers are, as is usual with ants, somewhat smaller than the males and females, the females being the largest. The sexual forms are winged, but after the mating flight the females drop their wings, and are carefully tended by the workers.

The ants are chiefly kept under control by the natural agency of heavy rains. During a prolonged shower the water runs down into the sheaths of the leaves selected by the ants as breeding places, and floods out and drowns swarms of mature ants, as well as eggs.

As is mentioned above, some West Indian ants seem to have much in common with this species from the Seychelles. Any observations made on ants in these islands and on their habits, especially as regards any association of them with scale insects, would not only be interesting, but might be of value in the future, if any species became a danger in any way to the agriculturist. Planters and others are requested to send to the agricultural officers in each island any observations which they may make, in order that they may be be recorded.

Pests of Peas and Beans.—The following, taken from *The Review of Applied Entomology*, is a review of a paper by A. S. Kartzov, on the cultivation of peas and French beans, in *Progressive Fruit Growing and Market-Gardening*, St. Petersburg, 1914:—

In this booklet the author deals with some of the pests of peas, beans, and salads. Peas are subjected principally to attack by various Bruchidae, amongst which *Bruchus pisorum, L.* (pisi) is specially mentioned. The females oviposit on the ovaries, and the larvae live inside, and feed on the seeds, the adults remaining in the seeds through the winter. As remedies the author suggests the heating of the infested seeds to a temperature of 122° F. for not more than two minutes; the use of carbon bisulphide; late sowing of peas, so that the beetles should have left them before sowing; trap crops, sown from ten to fourteen days previously, on which the beetles will oviposit, the plants being afterwards used as food for domestic animals; heating the seeds in winter to a temperature of 68°F., which will cause the beetles to come out of them; moistening the seeds with lime-water a few days before sowing, and the watering of the beds with the same water mixed with soot. Kidney and French beans are attacked by *Tetranychus telarius*, L., and *Aphis radicans*; spraying with 1 per cent. solution of saltpetre in water at a moderate temperature is recommeded against the former, whilst a 1 per cent. solution of tobacco extract is useful against the latter.

Various salad plants are attacked by insects, amongst which the author mentions, *Barathra* (Mamestra) *brassicae*, *Euroa* (Agrotis) *segetum*, *Agriotes lineatus* and *Melolontha melolontha*.

THE EFFECT OF INSECTICIDES ON CERTAIN PLANTS.

In view of the likelihood that the cultivation of certain minor crops may be taken up, if the depression in the cotton market continues, it would seem advisable for experiment station workers and planters generally, to make trial of certain insecticides, in order to learn what effect these exert on the foliage and general health of plants, so that when pests occur they may be dealt with promptly.

The leguminous plants, peas, beans, etc., are quickly affected by certain insecticides. Paris green and London purple injure the leaves of these plants, but it may be found that dry powdered arsenate of lead, used without the admixture of lime, is suitable for this purpose.

Similarly, little is known about the control in the West Indies of the pests of pumpkin, cucumber, and squash, beets and turnips, and Indian corn, and as certainly some, and perhaps all these will be of more importance in the future than in the past, it would be well to know what remedies to apply in case of an attack of pests.

In this connexion it should be remembered that there are two principal groups of insects to be considered: those with biting mouth-parts, and those which puncture the tissues and suck the juices of the plant.

The first of these is represented by caterpillars, and the second by aphids, cotton stainers, and plant bugs. The arsenical and other stomach poisons are available for the destruction of biting insects, while kerosene emulsion, and similar washes are suitable for use against sucking insects. Black Leaf 40, a tobacco extract preparation, is principally a contact poison, but it would probably possess some value as a stomach poison also, and it might be tried experimentally against both biting and sucking insects, since it is likely that it would be less injurious to certain plants than other insecticides.

In certain instances it will be found advisable to use contact sprays instead of the usual stomach poisons for the control of biting insects; especially when these are sufficiently soft-bodied to be susceptible to the action of such insecticides. The following instance is an example of this. A row of very promising garden beets was badly attacked by the caterpillars of a small moth. A stomach poison was tried without success, because each caterpillar was protected between two leaves fastened together by silken threads, or by a portion of leaf folded over or rolled up and tied in place by silk threads. The arsenate of lead did not come within reach of the caterpillar. A mixture of soap, kerosene, and naphthalene was tried with good results; the soapy spray probably penetrated into the hiding places of the caterpillars; at any rate, these beets made much better recovery than those which had been dusted with dry arsenate of lead.

The article entitled Scalo, on page 282 of the current volume of the *Agricultural News*, gives an account of the preparation of this kind of mixture.

VIRGIN ISLANDS: REPORT ON THE EXPERIMENT STATION, TORTOLA, 1913-14.

Under the heading in this Report of Work Done in the Nurseries and in Distribution of Plants, the increased attention given by the local planters to probably remunerative minor industries is very noticeable. Orders for no less than 4,500 coco-nut plants and 1,500 coffee plants were received at the Station: while the supply of 68,500 onion plants was insufficient to meet the demand. The number of lime plants distributed (3,210) was also greater than in the previous year.

A large portion of the Report consists of the description of plot experiments with various crops. Beginning with the lime plot, it is noted that the very dry weather experienced during the year has had a retarding influence on the growth of the trees. With regard to cacao, the poor results seem to point to the conclusion that it is not likely to be suited to the climatic conditions of the Virgin Islands; on the other hand, it is hoped that Liberian coffee may prove remunerative, if only to supply the local market.

Dealing with the orchard plot, the opinion is expressed that citrus fruit is little suited to the Virgin Islands, but that mangoes, especially of the finer kinds, could profitably be grown for export to the neighbouring island of St. Thomas. The suitability of the soil and climate for growing pine-apples also is apparently proved.

The experimental plot of coco-nuts is serving a useful purpose in demonstrating the best way of planting these trees, with a view to encouraging planters to take up this industry.

The sugar-cane plots afford an opportunity to cane growers of obtaining plants of well tested varieties.

As cotton is the chief industry in the Virgin Islands, the plots devoted to various experiments with this crop are, of course, of primary importance. It seems fairly well proved that it is of great importance in those islands to plant cotton early, not later, in fact, than the end of June.

Great attention has also been given to experiments with plants that supply so much of the food of the people of those islands—cassava, sweet potatoes, yams, and tannias. The tabulated results must be of value in demonstrating the best varieties to be grown.

It is hoped to develop an onion industry, which may not only supply the local market, but may also prove profitable in export to the neighbouring island of St. Thomas.

The experiments with the starch-producing tubers of arrowroot and tous-les-mois seem to show that they might profitably be grown for local use.

Other industries of which the work on the Station appears to show the benefit, are the cultivation of the papaw for the purpose of obtaining papain, and the cultivation of the Bay tree. In Montserrat the papaw industry is a growing one, and the climate and soil conditions of the Virgin Islands are well adapted to the cultivation of this plant. With regard to the Bay tree, the Virgin Islands would seem to be exceptionally favourably situated, because there is a market for the leaves so near at hand in St. Thomas.

There is a considerable portion of the report dealing with the work done in cotton selection, with tables of results appended. This careful work cannot fail to be of use in the future.

A table of exports shows that cotton still holds the first place, though followed very closely by cattle. It is gratifying to note that the value of lime juice exported has much increased, and that the value of fresh fruit and vegetables exported is more than double that of last year.

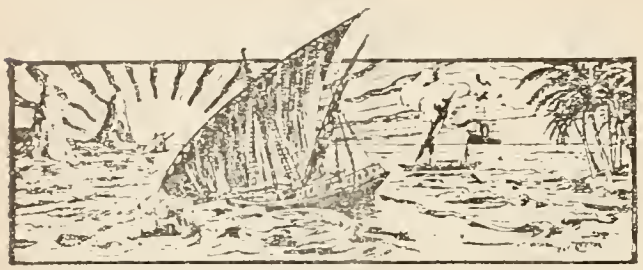
In dealing with the cotton industry in the Presidency, the Report regrets that owing to unfavourable weather conditions the crop gave, on the whole, poor results, though a larger area was under this cultivation than that of last year. The Government factory still continues to be of great use to the planters.

The prospects of further advance in the growing of limes are good. There is much land, especially in Tortola, which, with facilities for crushing, would seem to be suitable for lime trees.

DEPARTMENT NEWS.

Mr. J. C. Moore, late Agricultural Superintendent, St. Lucia, arrived in that island on October 22 from England, and proceeded on October 25 to Grenada to take up his appointment as Agricultural Superintendent in that Colony.

Mr. M. A. Lawrence, Foreman of the Botanic Station, St. Lucia, left that Colony on November 8, to take up an appointment as Overseer in the Agricultural Department, Nigeria.



GLEANINGS.

A copy of the Meteorological Records of British East Africa for 1911 has just been received. It seems very complete. The accumulation of such data from all parts of the world will in time render meteorology probably one of the exact sciences.

The coco-nut crop of the Seychelles of 1913 was the highest ever produced in the colony. The total of 26,036,206 nuts is recorded. Local consumption, it was estimated, accounted for 4 million nuts. Nearly 21 million nuts were converted into copra and exported. (*Annual Report of Agriculture and Crown Lands*, Seychelles, 1913.)

From the same report we glean that a small quantity of citrate of lime is made in the colony, but the attacks of scale insects give little hope of developing this industry. The report is in favour of growing Bermuda onions in some of the islands, as it is thought that the conditions of climate and soil lend themselves to the requirements of onion culture. Imported onions are retailed at from 12c. to 20c. per lb.

Also from the same report we take the following interesting note. Experiments have been made in raising hawksbill turtles in captivity. This work has received a blow from which it may not recover. A disease broke out suddenly in two sea-water enclosures, and all the young turtles were found dead in those enclosures at the same date, though separated from each other by a deep sea channel and a distance of over 6 miles.

From the *Louisiana Planter*, October 10, 1914, we glean that the sugar crop of Trinidad for 1914 was 55,488 tons. A noticeable feature of cane culture in that island is the amount of cane produced, and sold to the factories by the small owners, the number of these selling canes to the factories during this crop being 12,703. There does not seem to be such a development of cane growing in small holdings elsewhere, so far as we know.

In view of the advice given by the Imperial Commissioner of Agriculture to the planters of Montserrat on the advisability and probable profit of growing bean crops, which was printed in the *Agricultural News* of October 24, 1914, the following items taken from the *Produce Markets' Review*, September 19, 1914, may be of interest: 'For English marrowfats, high prices are being asked . . . There is considerably more demand for really good Japanese peas. . . . Rangoon beans are firmer, and the possibilities of large supplies in the immediate future are remote. . . . Butter beans are firmer; some dealers seem inclined to buy any cheap parcels offered.'

A note in the *Journal of Heredity*, August 1914, accompanied by an excellent illustration, points out that the condition of bareneckedness in fowls seems to be a dominant factor. A barenecked cock and two hens, of the breed frequently met with in the West Indies, were brought to the States. Three-fourths of the offspring of these, when mated with each other, were barenecked: while when mated with ordinary fowls, one-half of the offspring inherited the bare neck.

The Egyptian *Journal Officiel* of September 22, contains a decree restricting the area of cotton cultivation during the 1915 season. It is explained that this step is taken in view of the present limited demand for cotton and the possible rise in the price of cereals. Cotton cultivation in the basin lands of upper Egypt is entirely prohibited. It is forbidden to devote more than one-quarter or, where the land is unsuitable for growing cereals, one-third, of estates to the cultivation of cotton. (*The Board of Trade Journal*, October 8, 1914.)

A most drastic step in the endeavour to prevent the importation of fruit infected with any form of plant or insect disease has been taken in British Columbia. The *Agricultural Gazette of Canada*, September 1914, says that the provincial fruit inspectors have been empowered to seize all infected fruit, no matter where it is on display, even though it may have been previously passed by the inspectors. The British Columbian Government are evidently bent on minimizing the risk to their large fruit trade, which would arise from the importation of infectious fruit diseases from other countries.

In connexion with the pamphlet on Indian Corn, by Mr. H. A. Ballou, about to be issued by the Department of Agriculture for the West Indies, attention may be drawn to a pamphlet on the same subject entitled Maize Culture, compiled by A. H. E. McDonald, issued by the Department of Agriculture, New South Wales, as *Farmer's Bulletin*, No. 78, June 1914. The illustrations are very good, especially those showing typical ears and grains of leading varieties. Though the conditions of maize growing in New South Wales and in the West Indies are widely different, there is much interesting matter in this bulletin for the perusal of any planter who may be thinking of devoting more attention to the growing of Indian corn.

The application of motor tractors to farm work is progressing rapidly on the sugar plantations of Louisiana. According to Mr. A. B. Blakemore, in the *Louisiana Planter*, October 10, 1914, 'a hundred uses can be found for one wherever power must be applied on the modern farm.' The first requisite for their efficient use is the laying out of the plantation: cross ditches have to be got rid of. The next item to be considered is the kind of machine to be obtained. The writer referred to, lays it down that the correct size and power of the motor required for plantation work should be not over 9,000 lb. in weight, with all tanks filled: of from 20 to 25 available horse power: and of the four cylinder type. As regards its construction, he thinks it ought to be as nearly 'fool-proof' as possible, so as to allow of its being operated by an ordinarily intelligent labourer, of course under more skilled supervision. He says that automobiles have been run for weeks under sealed bonnets without any adjustments, and that there does not seem to be any good reason why a tractor cannot be built of the same reliability. Such a machine, Mr. Blakemore says, will do the work of twenty eight mules at the cost of the upkeep of seven, will never get colic, and, best of all, does not eat when it is not working.

STUDENTS' CORNER.

SEASONAL NOTES.

In the Leeward Islands where sugar-cane is largely grown, there has been unfortunately for the planter a rather severe drought during the latter half of the year. Such times of drought present special opportunities of making valuable observations for future consideration. In the last number of the *Agricultural News* it was suggested that this period of growth was a good one for making observations on varieties of cane with regard to their characteristics. In a paper contributed to Vol. XIII of the *West Indian Bulletin* by Mr. W. R. Dunlop, on stomatal characteristics of varieties of sugar-cane, the writer expresses the opinion that in the future selection of the sugar-cane for drought resistance, more attention should be paid to the habits of the leaves, and their stomatal characteristics. The latter, of course, can only be observed under the microscope, but anyone can observe and note the habits of the leaves referred to by Mr. Dunlop, and in connexion with this, how each habit is correlated with ability to withstand drought, or otherwise. In some varieties of cane the habit of the growing leaves is to curl involutely, to protect the upper surface, while in some few the habit is to curl revolutely, to protect the under surface. But in all cases, when the leaves are cut from the plant, they proceed to curl up involutely before completely drying.

The student will see, by referring to the paper mentioned above, that the question as to the correlation of leaf characteristics and drought-resisting qualities in varieties of sugar-cane, has not yet been thoroughly worked out. Observations carefully made and recorded on these points may be submitted to the officers of the Agricultural Departments. They will be very likely of use in future investigations.

Another point, which a period of drought must bring into prominence, is the supply of fodder for the live stock of an estate. Experiments might well be made in hay-making. Some of the grasses in the West Indies possess the qualities which tend to produce good hay, such as *Andropogon caricosus*, which has so largely taken posession of the pastures in Antigua, and *Andropogon pertusus*, the sour grass of Barbados. If cut at the proper period, and well cured and stacked, a crop of these grasses might prove, as hay, a great resource in times of drought. Some of the wild leguminosae, such as *Clitoria ternatea* known as 'wina' in Antigua, and as 'blue bell' in Barbados, and *Desmodium tortuosum*, known in some of the islands as 'beggar weed', are good fodder in their green state, and might prove worth while growing as a hay crop. They cover the ground quickly, and do good to the soil. On the subject of West Indian grasses and their value, reference may be made to a paper by Dr. Watts in the *West Indian Bulletin*, Vol. I, p. 410, on the care of pastures in Antigua, and another paper, also by Dr. Watts, in the same periodical, Vol. III, p. 353, entitled Additional Notes on West Indian Fodder. Favourable notice is given in this latter paper to another native leguminous plant as a hay producer, *Stylosanthes procumbens*, known as 'clover' in Grenada, 'creeping trefoil' in Barbados, and in Antigua as 'Mother Siegel'.

At this season many fields of Indian corn will be approaching maturity, and the effects of attacks of insects are likely to be evident. The caterpillars of the boll worm and of the corn ear worm will have attacked the leaves and ears, while aphis may be present on the leaves. In Antigua, the grubs of the brown hard back (*Lachnosterna* sp.) are likely to be found at the roots of Indian corn.

Students would do well to examine this crop, and observe the presence of insects, and endeavour to estimate the extent of injury caused by them; also the amount of control exercised over the pests by their natural enemies.

In the case of the aphids, where these occur, the natural enemies, the lady-birds, lacewing flies, etc., should be easily found; the caterpillars are likely to be attacked by internal parasites, and eaten by Jack Spaniards; the hard back grubs are not known to be attacked by parasites; and observations are needed on these points. In this connexion, Pamphlets Nos. 73 and 75 may usefully be consulted.

The insect pests and diseases of sugar-cane are also likely to be more noticeable as the crop reaches maturity. The root borer (*Exophthalmus esuriens*), the hard back grubs, and the root disease should be observed where these occur, and a lookout kept for the appearance of the rind fungus or stem disease.

In the case of limes and of cacao, the root borer grubs are also likely to be present, feeding on the roots. Limes should be watched for any increase of scale insects, and observations made as to the abundance of the parasitic fungi which attack these pests.

Precautionary Measures against the Spread of Plant Diseases. In referring to the discussions on cacao cultivation which took place at the Third International Congress of Tropical Agriculture, *Tropical Life* (September 1914) takes occasion to make some remarks on the subject of legislation against plant diseases and pests. The writer considers that certificates as to the freedom of plants from diseases or pests are only of value when officially issued at the *importing* centre, for he contends that plants or produce may easily contract disease en route. Of course, *exporting* centres known to be infected ought to be placed under quarantine, and exports of plants or seeds prohibited from such centres, until the cause of the quarantine ceases to exist. Some such regulations are already in force, and are likely to be made more stringent. This question then naturally arises—How are planters to make and keep their properties a clean centre of export? It is suggested that definite areas of not more than 300 to 500 acres should have isolating belts, preferably a practically bare strip of land like a road, right round them. Such a precaution would enable the careful planter to control a disease or pest more easily, and it would tend to prevent its spreading far and wide. Even when the most stringent measures had to be applied, such as burning out, they could be more effectually and economically carried out in such limited areas.

The Water Hyacinth (*Eichornia* sp.) is known in the West Indies only as an ornamental water plant. In Florida it is a pest, interfering with the navigation of some of the streams. In the *Journal of the Royal Society of Arts* for August 14, 1914, it is stated that as a result of the spread of this plant in the waters of Cambodia and other parts of Indo-China, there have been investigations made as to its possible uses. Professor Perrot has published the results of his experiments with the water hyacinth as a fibre producer. He finds that fibre is extracted from the stalk, which can be made into serviceable rope and twine, and it is suggested that it may be woven into bags for use in place of the jute bags for rice now imported. It produces a strong flexible cloth which takes dye easily, of about the same quality as jute. Native workmen obtain nearly 10 lb. of fibre from 220 lb. of green stems, as compared with 3·5 to 4 per cent. of fibre from sisal.

FUNGUS NOTES.

THE DAMPING OFF OF SEEDLINGS.

Indications are received from time to time of trouble experienced from the damping off of seedlings of limes, tobacco, onions and other plants.

In the current volume of the *Agricultural News*, pp. 78-9, some information was given as to methods of soil sterilization by means of steam and of formalin; while in the same volume, p. 158, the author's summary was reprinted from a paper by James Johnson, of the University of Wisconsin, in which, as a result of considerable research, the use is recommended (a) of some form of heat sterilization, or (b) of formalin, 1 part in 50, applied on open beds, at the rate of 2 quarts to the square foot of soil, which are then covered for forty-eight hours to keep in the fumes.

The use of sulphuric acid, 1 oz. to 1 gallon or stronger, for a similar purpose, is reported to give good results in dealing with damping off of pine seedlings, according to two papers, by P. Spaulding, and by C. Hartley and T. C. Merrill, in *Phytopathology*, Vol. IV, pp. 73-92. In the latter paper it is pointed out that the method is doubtfully practicable for less resistent plants unless the acid is neutralized with lime before sowing.

What will appeal more to West Indian planters, who do not as a rule have sufficient use for a steam sterilization plant, and who find formalin expensive, is the outline given by Spaulding of a series of outdoor tests of modifications of nursery methods. Each bed in the series was 4 feet by 12 feet in area, and was raised about 3 inches above the paths. The soil was a very rich, sandy loam, which had been used for years as a vegetable garden, and was very uniform throughout the area occupied by the experiments. *Pinus* seeds were used. Equal quantities of water were given except where otherwise stated. Notes of the results were taken one month after germination. A second test gave practically identical results.

Bed.	Treatment.	Result.
1.	Very heavily manured	Over 50 per cent. loss.
2.	Over 6 inches of top soil replaced by dredged sand	Germination slow and poor, no damping off.
3.	Over 6 inches of top soil replaced by sterile clay subsoil	Practically free.
4.	Watered twice as heavily as rest	Total loss.
5.	Kept as dry as possible*	About 25 per cent. of loss.
6.	Constantly shaded	Total loss.
7.	Check	About 50 per cent. loss.
8.	One foot high board sides	About 35 per cent. loss.
9.	Quarter-inch of fine gravel over soil	Practically free.
10.	Watered through tiles 6 inches below surface	Over 75 per cent. loss.
11.	Check	About 35 per cent. loss.

The results illustrate clearly the well-known influence exerted by excessive watering, shade, and the presence of organic matter in the soil, and No. 3 is especially interesting as showing the effects to be obtained from the use of subsoil, sterile by reason of its situation, and presumably less liable to infection when in use, owing to its comparative freedom from organic matter. A test of the effect of artificially sterilized soil used in a similar manner is not included in the series: such effect is likely to be determined by its degree of susceptibility to reinfection, dependent on its organic content. In circumstances where treatment of the whole bed is considered impracticable, it might still be feasible to use sufficient sterilized soil to test the effect of covering the beds to the depth required by the seedlings in their susceptible stages. Where fuel is plentiful, soil for this purpose may be prepared by the old-fashioned system of roasting, either by lighting a fire on the surface of the bed, or by heating the soil on an iron plate or some such receptable over a fire. It is not sufficient merely to warm the soil: it must be thoroughly heated and kept hot for some time. At the same time care must be taken not to let it get so dry as seriously to impair its fertility by charring the contained organic matter.

Number 9 is a modification of the common practice of covering the seed bed with sand, and is well worth trial where the material is obtainable.

* The loss occurred immediately after a series of daily showers.

SPRAYING OF GROUND NUTS FOR LEAF RUST.

Mr. W. Robson, Curator of the Botanic Station, Montserrat, has recently reported the results obtained this year from the spraying of ground nuts with Bordeaux mixture for the control of the prevalent rust fungus, *Uredo arachidis*.

Previous experiments, recorded in the Reports of the Botanic Station, Montserrat, for 1910-11 and 1911-12 were inconclusive.

On the present occasion, a plot of the Gambia variety was equally divided, and one-half was sprayed twice, using a force pump with 80 lb. pressure, and a Mistry Junior nozzle.

At reaping time the pustules of the fungus were abundant as usual on the unsprayed portion, while on the sprayed plants they were difficult to find. The nuts were carefully picked and weighed, and the results obtained are given as follows:—

	As reaped.	Dried nuts.	Per acre.
Sprayed	296 lb.	148 lb.	1,779 lb.
Unsprayed	208 ,,	104 ,,	1,248 ,,

The yield of the sprayed plot was thus 531 lb. or 42 per cent. more than that of the unsprayed plot.

There was no striking difference in the appearance of the two sections at reaping time, i.e. there was not a browning or wilting of the foliage as had been noticed on a previous occasion, but the growth of weeds had been much more vigorous on the unsprayed portion, and the inference is that this was due to the extra vigour of the sprayed plot.

The difference in the time of application of the Bordeaux mixture, as compared with the 1911 experiments, was as follows: in 1911 the plot was planted on May 31, and sprayed on August 16, and again on September 19, i.e. 77 and 111 days after planting; in 1914 the plot was planted on May 5, sprayed for the first time on July 7, and again on July 21, i.e. 63 and 77 days after planting.

That this difference in the time of application has led to the improvement in the results obtained by spraying, obviously needs confirmation; but whatever the reason, Mr. Robson considers that this year the application has had decided results.

The degree of infestation of the plants by this fungus depends largely on conditions of soil and climate. When the conditions are favourable to the host, only the leaves which are approaching senility are infested; in other circumstances the fungus can be so severe as to kill the plants outright. The improvement to be expected from spraying must therefore vary considerably from one place to another, and from year to year.

VETERINARY NOTES.

TREATMENT AND CONTROL OF NEMATODE AND TICK DISEASES.

The following extracts, dealing with Nematodes (round worms) and ticks, are from papers read at the recent International Veterinary Congress. They form an interesting continuation of information published in the *Agricultural News* (September 12) on tuberculosis:

Nematodes are amenable to the use of certain anthelmintics termed vermifuges.

From the pharmacological point of view, it is better to use the drugs in their natural state than the active principles which they contain, for the reasons that they often contain adjuvants, are less likely to cause accidents, and are less expensive.

The choice of vermifuges depends upon the nature of the parasites and more particularly upon their habitat.

(1) The nematodes of the digestive system.

For the treatment of conditions caused by those parasites the drugs selected must be such as are not readily absorbed by the mucous membrane of the alimentary tract. In order to render the parasites accessible to the action of the medicaments, their administration should be preceded by a purgative, the vermifuges being given fasting on the following day. The doses employed should not be too small.

Instead of mixing a purgative with the anthelmintics, it is preferable to administer the anthelmintic first and then a purgative at an interval of some hours.

(a) The nematodes of the small intestine. In the case of animals which have a simple stomach, the nematodes of the stomach and small intestine are fairly easily accessible to vermifuges. In ruminants they often pass into the first stomachs and fail to exert any effect.

For the treatment of Ascarides in the Equidae, antimony tartarate and arsenious acid are preferable. For the Ascarides of the pig, areca nut, and for those of the dog and cat, areca nut and semen-contra.

Ankylostomiasis of the dog is principally treated with thymol or with mixtures containing male fern.

In the treatment of parasitic gastero-enteritis in the sheep, it is as a rule necessary to use a drenching tube which is introduced into the mouth, or better still, into the œsophagus. The animals should be drenched in the standing position, and should be kept as quiet as possible. The most efficacious medicaments appear to be creosote and thymol.

(b) The nematodes of the large intestine. It is difficult to reach parasites in the large intestine with vermifuges administered per os: administration per rectum offers a greater chance of success. Further, intravenous injections of atoxyl may be tried, especially for those forms which become encysted. The Œsophagostomes and Trichocephala of the small animals are best treated by means of thymol clysters, as suggested by Brumpt.

(2) The nematodes of the respiratory tract.

The method of choice in the treatment of the metastrongyloses (verminous bronchitis and pneumonia) is the spraying of anthelmintic liquids (containing creosote or chloroform) into the respiratory tract.

Syngamosis of birds may be treated by carbolized inhalations, or, more particularly, by intratracheal injections of salicylate of soda.

(3) The nematodes of the circulatory system, the closed cavities, the tissues, and the urinary apparatus.

We are practically unable to reach these parasites. An attempt should always be made to treat the conditions by the administration of drugs by the mouth, and by the intravenous injection of anthelmintics, such as atoxyl, collargol, etc.

(4) The nematodes of the eye.

The intraocular nematodes can apparently be killed by the instillation of anthelmintics, and of collargol in particular.

Extraocular nematodes can be expelled by the injection of slightly irritating liquids under the eyelids.

CONTROL OF TICKS.

Ticks can be destroyed by means of dips containing arsenic. The dipping tanks are placed along the line separating the affected from the free districts. The sanitary service keeps watch so that no animal carrying ticks strays into the free area. The infected and healthy areas are separated from each other by an intermediate zone, and this greatly assists the campaign against the ticks. The majority of stockowners possess their own dipping tanks. The dry vegetation is frequently burned during the summer.

Immunization is readily carried out; more than 25,000 breeding animals have been vaccinated by my method against protoplasms. A reliable method of vaccinating against anaplasma remains to be discovered.

The procedure of inoculating the blood of recovered animals and injecting trypanblue at the onset of fever is a dangerous one in areas infected with anaplasmosis.

Great attention should be paid to the acclimatization of breeding animals. Before starting to improve the breed of animals in an infected area, information must be obtained regarding the type of parasites and ticks present, the general conditions of the district, and the quality of the breeding animals it is intended to employ.

Apart from the parasites which they transmit, the ticks possess variable injurious qualities of their own which render them more or less formidable.

EXPERIMENTS WITH SWEET SORGHUM.

From time to time questions have been asked as to the possibility or advisability of cultivating some of the sweet varieties of sorghum in the West Indies as a source of sugar supply.

In the United States it has been found that the better varieties of sorghum give a large yield per acre, are easy of cultivation, and have rather a high sucrose content. Nevertheless, the juice contains quite a large percentage of gummy materials, which, on concentration, prevent crystallization.

The results of experiments made in India are given in Bulletin No. 41, 1914, of the Agricultural Research Institute, Pusa.

The conclusion arrived at is that, as a source of sugar supply sweet sorghum is not worth growing in India. Even in America it is only grown to make syrup, for which there is a demand in that country.

Two reasons are given for this conclusion. First, the high glucose ratio of the juice militates against the production of good crystaline sugar. Second, the yield of sugar per acre is only about one-third of the average yield of sugar-cane.

It is however stated that as a source of fodder, sweet sorghum seems very valuable, being quick in growth, and very nutritious.

It would therefore appear that it would scarcely be advantageous to attempt to cultivate this plant in the West Indies, except for the latter purpose, for which it may be well suited here, especially if it has any drought-resisting power.

MARKET REPORTS.

London.—The West India Committee Circular, October 20, 1914.

Arrowroot—No quotations.
Balata—Sheet, 2/1; block, 1/8½ per lb.
Beeswax—No quotations.
Cacao—Trinidad, 56/- to 63/- per cwt.; Grenada, 51/ to 55/-; Jamaica, no quotations.
Coffee—Jamaica, no quotations.
Copra—West Indian, £23 per ton.
Cotton—Fully Fine no quotations; Floridas, no quotations; West Indian Sea Island, 11½*d*.
Fruit—No quotations.
Fustic—No quotations.
Ginger—Quiet.
Isinglass—No quotations.
Honey—No quotations.
Lime Juice—Raw, no quotations: concentrated, no quotations; Otto of limes (hand-pressed), no quotations.
Logwood—No quotations.
Mace—1/4 to 2/1.
Nutmegs—3¾*d*. to 5*d*.
Pimento—Quiet.
Rubber—Para, fine hard, 2/10; fine soft, 2/3; Castilloa, 1/8.
Rum—Jamaica, no quotations.

New York.—Messrs. Gillespie Bros., & Co., July 24, 1914.

Cacao—Caracas, 11½c. to 12c.; Grenada, 11c. to 11½c.; Trinidad, 11½c. to 11¾c.; Jamaica, 10c. to 11c.
Coco-nuts—Jamaica and Trinidad, selects $20·00 to $21·00; culls, no quotations.
Coffee—Jamaica, 9¾c. to 13½c. per lb.
Ginger—7½c. to 10c. per lb.
Goat Skins—Jamaica, 46c.; Antigua and Barbados, 43c. to 46c.; St. Thomas and St. Kitts, 40c. to 43c. per lb.
Grape Fruit—Jamaica, $1·75 to $2·50.
Limes.—$3·75 to $4·50.
Mace—45c. to 53c. per lb.
Nutmegs—110's, 11¾c.
Oranges—Jamaica, $2·00 to $2·50.
Pimento—3¾c. per lb.
Sugar—Centrifugals, 96°, 3·26c.; Muscovados, 89°, 2·88c.; Molasses, 89°, 2·61c., all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., November 9, 1914.

Cacao—Venezuelan, no quotations; Trinidad, no quotations.
Coco-nut Oil—71c. per Imperial gallon.
Coffee—Venezuelan, 11½c. per lb.
Copra—$3·50 per 100 lb.
Dhal—No quotations.
Onions—$1·80 to $2·00 per 100 lb.
Peas, Split—$8·00 per bag.
Potatoes—English $1·50 to $1·60 per 100 lb.
Rice—Yellow, $6·00; White $5·00 per bag.
Sugar—American crushed, no quotations.

Barbados.—Messrs. James A. Lynch & Co., Ltd., November 14, 1914, Messrs. T. S. Garraway & Co., November 16, 1914.

Arrowroot—$4·00 to $4·25 per 100 lb.
Cacao—$8·00 to $10·00 per 100 lb.
Coco-nuts—$17·00.
Hay—$1·50 to $1·70 per 100 lb.
Manures—Nitrate of soda, no quotations; Cacao manure, $48·00 to $50·00; Sulphate of ammonia $78·00 to $85·00 per ton.
Molasses—No quotations.
Onions—$3·00 per 190 lb.
Peas, Split—No quotations; Canada, $5·50.
Potatoes—Nova Scotia, $2·00 to $2·63 per 160 lb.
Rice—Ballam, $5·80 to $6·10 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
Sugar—American granulated, $6·50 per 100 lb.

British Guiana. Messrs. Wieting & Richter, November 7, 1914; Messrs. Sandbach, Parker & Co., November 6, 1914.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	$7·00 to $8·00 per barrel of 200 lb.	$10·00
Balata—Venezuela block	No quotation	——
Demerara sheet	65c. per lb.	——
Cacao—Native	12c. per lb.	12c. per lb.
Cassava—	96c. to $1·08	——
Cassava Starch—	——	——
Coco-nuts—	$16 to $20 per M.	$23 per M.
Coffee—Creole	——	16c. per lb.
Jamaica and Rio	15c. per lb.	16c. per lb.
Liberian	10c. per lb.	12½c. per lb.
Dhal—	$5·00 to $5·25	$5·00 per bag of 168 lb.
Green Dhal	——	——
Eddoes—	$1·44	——
Molasses—Yellow	None	——
Onions—Teneriffe	——	——
Madeira	3½c.	3½ to 4c.
Peas—Split	$4·50 per bag (210 lb.)	$9·50 per bag. (210 lb.)
Marseilles	——	——
Plantains—	16c. to 48c.	——
Potatoes—Nova Scotia	$2·25 to $2·50	$2·50
Lisbon	——	——
Potatoes—Sweet, B'bados	——	——
Rice—Ballam	No quotation	——
Creole	$5·50	$5·50
Tannias—	$2·88	——
Yams—White	——	——
Buck	——	——
Sugar—Dark crystals	$3·50 to $3·60	$3·50
Yellow	$4·00 to $4·10	$4·00
White	——	——
Molasses	——	——
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M.
Cordwood	$1·80 to $2·00 per ton	——

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Printed at Office of *Agricultural Reporter*, 4 High Street, Bridgetown, Barbados.

AGRICULTURAL NEWS

Vol. XIII. No. 329.] SATURDAY, DECEMBER 5, 1914. [One penny.

AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

OF THE

IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

VOL. XIII. No. 329. BARBADOS, DECEMBER 5, 1914. PRICE 1*d.*

CONTENTS.

Improvement of Soils.

PART II.

A POSSIBLE explanation of the fertility of certain soils, which contain very small quantities of carbonate of lime, may lie in the fact that these soils are of an open texture, and that the amount of carbonate of lime present is sufficient to permit full bacterial activity, while a similar quantity might be insufficient to maintain a flocculent condition in a clay soil, which might then be unfertile on account of defective physical condition due to deficiency of lime.

Reference is made to the fact that the accumulation of fertility in grass-land left to itself, and neither grazed nor mown, is due to the action of the organism known as azotobacter, which fixes free nitrogen from the atmosphere, and that this activity is indirectly determined by the presence of calcium carbonate in the soil, without which azotobacter cannot function.

It is now known that azotobacter is widely distributed in West Indian soils, and it is possible that it plays an important part in maintaining the fertility of cultivated land. Probably the fertility of long-tilled cane fields is partly due to the activity of this organism, which is dependent upon a supply of organic matter such as is met with in cane fields; this is supplied by the trash and tops that find their way into the soil, as well as through the medium of pen manure.

The experiments that have been made in the direction of employing molasses as a manure or fertilizer, doubtless aim at increasing the activity of the azotobacter. In view of the statement made by Mr. Hall that the activity of this organism is determined by the presence of carbonate of lime, one is led to enquire whether, in the West Indian experiments with molasses, the soils experimented upon contained a sufficient amount of carbonate of lime to permit of the full activity of azotobacter under the stimulus of the readily available organic matter of the molasses.

In the absence of a sufficient supply of lime, that is when the soil has become acid, there is a tendency to the formation of peat, because the bacterial changes which normally take place in alkaline conditions are arrested, and are replaced by changes due to microfungi which do not carry the breaking down of organic matter to the destructive stage. It is pointed out that another kind of peat results from water-logging, and that this may form even under alkaline conditions.

Peat of the former kind tends to form upon the surface of non-calcareous sands: examples of these are found in parts of England, but more extensively in Germany and Holland. The methods of winning these peaty moors is described in some detail: it consists in removing some of the peat which may have value for fuel, litter, and other purposes, and in mixing by cultivation the underlying sand with the peat, this operation being followed by liming, and the use of basic phosphate and kainit. In some cases, when the peat was formed on alluvial land where the ground water is alkaline, treatment with lime is not necessary.

Reference is made to the recovery of sandy and gravelly land other than peat moors, of which large areas exist in England. The method employed is essentially one of green dressing coupled with liming, and the use of artificial manures containing phosphate and potash.

In connexion with the winning for cultivation of land deficient in lime, it is sometimes advisable to employ nitrogenous manures, though usually the nitrogen is supplied by the breaking down of the peat under the influence of lime, or by the use of leguminous plants for green dressings. In this connexion the difference between sulphate of ammonia and nitrate of soda is to be borne in mind. Sulphate of ammonia is an acid manure, and its use involves the consumption of a portion of the lime in the soil, and this may take place to an extent that may retard the recovery of the soil under treatment, unless liberal applications of lime are employed. The Rothamsted experiments show that it is capable of inducing the formation of peat on pasture lands by bringing the soil into an acid condition. Nitrate of soda, on the other hand, may be regarded as an alkaline manure, and thus preferable for use in attempts to recover soils very deficient in lime, though it is to be remembered that in the absence of a sufficiency of lime it is capable of producing a sticky, untractable condition in clay soils, as a result of the destruction of the flocculent condition of the clay.

Mr. Hall's concluding remarks are interesting: 'What I should like in conclusion once more to emphasize is, that the reclamation of heath and peat-land of which I have been speaking—reclamation that in the past could only be imperfectly effected at a great and possibly unremunerative expense of human labour—has now become feasible through the application of science—the knowledge of the functions of fertilizers, industrial developments which have given us basic slag and potash salts, the knowledge of the fertility that can be gained by the growth of leguminous plants. From beginning to end the process of reclamation of moor and heath, as we see it in progress in North-western Europe, is stamped as the product of science and investigation.'

Looking back over the processes of land reclamation, it would seem that they all find application in tropical and in West Indian methods of agriculture.

Indeed the suggestion may perhaps be made that, from the intensity of biological activity in and upon the soil in the Tropics, many of the methods of cultivation have to partake of the nature of those reviewed by Mr. Hall as applicable to the work of winning soil for cultivation. The rapid oxidation of vegetable matter has to be met by constant renewals by pen manure and green dressings: much of the area under cultivation in the West Indies is extremely poor in lime, while problems arising from rainfall, both in excess and defect, are matters of everyday consideration. All that Mr. Hall has said has therefore immediate application here: his remarks not only contain suggestions for everyday application, but they point to problems as yet not completely investigated, some of which have direct bearing on West Indian conditions.

SUGAR INDUSTRY.

THE DETERIORATION OF SUGARS ON STORAGE.

In view of the fact that there have been complaints of the deterioration of sugars in the West Indies, the following brief abstract may be of interest to readers of the *Agricultural News*.

The present abstract is of a Bulletin of the Hawaiian Sugar Planters' Association, No. 24, of the Division of Agriculture and Chemistry, under the title which appears above.

The question of the deterioration of sugars on storage is one that has been much studied in both the cane and beet sugar industry. In order to obtain information of the causes of deterioration, the authors of the Bulletin, Messrs. Noel Deer and R. S. Norris, procured sugars of known origin with certain information as to details of manufacture.

These samples of sugar were analyzed on their receipt, and subsequently after intervals of 60 days and 120 days. The results of these analyses showed that in the case of certain sugars the polarization was lower after 120 days of storing, although in some of them there was no falling off in the first 60 days of that time.

There were fourteen samples in this lot: the average moisture—on their receipt—was 1·44 per cent., the highest having a moisture percentage of 2·42 and the lowest 0·80 per cent.

In the case of twenty-seven other samples the polarization did not diminish, but in most cases increased slightly. The average moisture content for this lot of twenty-seven samples was 1·02 per cent., the highest being 2·34 and the lowest 0·41 per cent.

There would appear to be a connexion between the amount of the moisture in the sugars analysed, and the deterioration experienced on storage, but the lowest percentage of moisture in the lot of samples which showed diminished polarization was very much below the average of those which did not show such diminished polarization, while in the other lot in which the degree of polarization was maintained throughout the test, the percentage of moisture was much higher than the average in the lot of samples in which deterioration in this respect occurred.

The average of acidity in the two lots was much the same, showing that this condition was not responsible for the deteriorating changes. A bacteriological examination of the sugars was made to endeavour to determine whether the presence of organisms was associated with the deterioration. Counts of the number of organisms were made on receipt of the samples, and again after intervals of two months and of four months. Several organisms were discovered in these sugars, and while the results of the examinations varied very considerably, yet they led to certain conclusions being arrived at. The authors state as follows: 'Actually we think that the results of these determinations allow us to say: (1) that generally deterioration of sugar can be connected with bacterial activity; (2) that, however, cases occur where sugars deteriorate excessively, and in which the deterioration can not be attributed to bacterial activity . . . . (3) that sugars containing a large number of organisms retain their polarization, provided they contain but little water.'

In the trials of the effects of sterilization on sugars it was found that where sugars known to be infected with large numbers of organisms were sterilized or kept in the presence of formaldehyde, the polarization remained stationary, but that these sugars when not sterilized or treated with formaldehyde showed a very large fall in the polarization.

Other trials were made to determine the amount of water present in sugars at which deterioration began, and it was found that in the presence of the bacteria which are associated with a falling off in polarization, sugars containing more than 1 per cent. moisture will in all probability deteriorate, while in the case of those in which the water is less than 1 per cent., the polarization will probably remain constant.

It is also shown that there is a connexion between the washing of sugars, and deterioration, since washed sugars show a tendency toward diminished polarization. This is ascribed to the dilution of the film of molasses over the grain of sugar, which when concentrated prevents bacterial action, and to the introduction of additional organisms in the water. If sugars are to be washed, only distilled water should be used for the purpose. A considerable amount of other information is given in the bulletin under consideration, but the points which are fundamental in the question of deterioration of sugars on storage have been brought out in the abstract given above.

The following summary is reproduced:—

'(1) In the great majority of cases of deterioration of sugars the fall in polarization can be connected with bacterial activity.

'(2) Sugars may fall in polarization without evidence of this fall being due to bacterial activity.

'(3) For bacterial action to take place a certain amount of moisture must be present; so long as the sugars do not contain more than 1 per cent. of moisture the danger of bacterial action is small.

'(4) Four distinct organisms are of frequent occurrence in Hawaiian sugars, one of which was of very frequent occurrence in sugars which deteriorated; these are now being studied.

'(5) The capacity of sugars for absorbing moisture varies largely, and this is an important factor in determining the keeping qualities of the sugars; some evidence exists that the amount of moisture absorbed is connected with the amount of chlorides in the sugars.

'(6) A sugar when dried will, when exposed to a damp atmosphere, absorb moisture; such a sugar will then be in a condition liable to deterioration. In factories which experience trouble with deterioration of sugars; we suggest the experimental use of an interior paper lining as a means of protecting the sugar from atmospheric changes.'

It may be of interest to West Indian readers of the *Agricultural News* to note that a considerable amount of work in this connexion has been done in the Leeward Islands. This work, referred to in the bulletin abstracted above, appeared in the *Agricultural News*, Vol. IV, p. 98, in a paper by Dr. F. Watts, C.M.G., entitled Observations on Muscovado Sugars, and one in the *West Indian Bulletin*, Vol. VII, p. 226, in a paper entitled Fermentation Changes Occurring in Muscovado Sugar, by Dr. Watts and Mr. H. A. Tempany, B.Sc.

BEET SUGAR IN CALIFORNIA.

Is there any difference in pure sugars? There is none chemically. Perfectly pure sugar from beet root is chemically indistinguishable from the similar product from sugar-cane. On the other hand, we have had housewives, not only in the West Indies, but also in England and America, declaring that there is a very great difference between them in their physical properties. Cane sugar is a better preservative than beet, they say, and is a better sweetener, less cane sugar being needed for household use than beet. Apparently the Californian beet growers intend to try to eradicate this idea from the minds of sugar consumers. According to *Modern Cuba* for October 1914, they have raised a fund to finance this educational campaign, and to advertise their sugar as 'California'. The first gun of their attack seems to be a quotation from the well-known Dr. Wiley, the late Chief of the Bureau of Chemistry of the United States, who stated during his tenure of that position that: 'refined sugar, whether it is made from cane, beets, corn, or any other product, is the same chemically and physically.'

It must be remembered that the beet sugar industry of California is a very large one. In 1913 over 90,000 acres in that State were planted in beets, producing 230,000,000 lb. of refined sugar, employing an estimated capital of over $15,000,000.

Granulators or Sugar Drying Machines, with their current of hot air, are being used to get the sugars made, whether yellow or white, as dry as possible. To make the tropical cane-sugar industry a greater success, sugars must be produced to stand warehousing without injury. To do this the ordinary centrifugal machines do not seem to be entirely effective.

The inventors of the modern sugar drying machines, such as are known as sugar granulators, can easily dry good vacuum pan sugars of any colour, if first well purged in centrifugals, to less than one per cent. of water, rendering them practically safe from deterioration. The use of a current of hot air enables this to be effected without any other cost than that of the apparatus.—*Louisiana Planter*, November 7, 1914.

FRUIT AND FRUIT TREES.

ORANGE GRAFTING.

In discussing the top working of orange trees in the *Queensland Agricultural Journal*, September 1914, Mr. Charles Ross, F.R.H.S., Instructor in Fruit Culture, notes that in almost every orange grove there are individuals, both amongst seedling and grafted trees, that do not come up to expectations. Some are consistently poor croppers; others, though very prolific, bear fruit of indifferent quality; in other cases the form of the tree is undesirable. To bring such trees into good condition in the shortest time he advises two methods of top working. One is by budding into the old stems, and the other by cleft-grafting.

The possessors of orange trees in the West Indies meet with the same kinds of disappointing trees as are noticed in Queensland. The usual plan adopted here to improve the condition of such a tree, is to saw off the head below the first fork, and then to bud a good variety on to the shoots that arise from the decapitated stump. This process is generally successful; but it takes time, as the new shoots require at least a year before they are fit to receive the buds. It might be interesting, and perhaps profitable to West Indian growers of orange trees, to experiment with their unsatisfactory specimens on the lines advocated by Mr. Ross.

He recommends that the top of the tree be cut off over the second or third forks. If budding is the method to be employed, the following abstract from Professor Hume's book, *Citrus Fruits and their Culture*, ought to be followed.

When an attempt is made to insert buds in old stems by the shield method with a T incision, it is usually found that the bark, being thick and brittle, generally breaks off or cracks. To avoid this, make a curved incision in the bark, like either side of a parenthesis, thus—( ). Use angular bud wood, so that when the bud is cut off, it is either to the right or left of the shield, instead of in the centre. The curved incision is then made either to the right or left to suit the position of the bud on the shield. The bark may then be carefully lifted, and the shield inserted and tied, leaving the bud out at the side of the curve.

Cleft-grafting is hardly resorted to at all in the West Indies, yet Mr. Ross has found it to be the best method in Queensland. It might therefore be well worth while making experiments as to its practicability in these islands. An abstract of the instructions with regard to this process, in Professor Hume's book already mentioned, is here given.

Cleft-grafting will be found useful in working large trunks or branches. The stock is cut off at right angles, and the cut surface is made perfectly smooth. It must be split or cleft open either by the knife, or grafting iron and mallet. As the line of cleavage in orange wood is very irregular, it is best to drive the knife or iron in on the side of the stock before splitting it, so as to leave a smooth, straight surface for the scion. The cleft may be held open by inserting a wooden wedge. The scions should be 4 or 5 inches in length, and should have three or four buds. Trim the lower end of the scion in the shape of a wedge 1½ inches, with the outer edge a little wider than the inner. Slip the cut end of the scion down the cleft until the whole cut surface is within the cleft. The thicker edge should be outside so that the cambium edges of stock and scion may be brought more intimately into contact by pressure. If the stock be large, two scions may be inserted, one on either side of the cleft. When the scion has been inserted, it is firmly bound in with strips of waxed cloth, and the upper surface of the stock, as well as the top of the scion, if cut, should be covered over with grafting wax to prevent loss of moisture.

No further attention is required until the first signs of growth are shown by the scion; then the bandage is cut on the side of the stock opposite to it; or, in the case of two scions, in the space between them. The growing scion should be supported by a slat tied on to the stock.

In hot, dry climates, the removal of the sheltering foliage exposes the trunk and branches to the full heat of the sun, which may result in serious injury to the exposed parts. A satisfactory protection can be afforded by a thin coating of white wash, applied with a spray pump.

SWEET OR SOUR ORANGES.

The advantage to exporters of fruit of maintaining a uniform standard in their produce shipped has been often pointed out in the pages of the *Agricultural News*. The Legislature of Florida passed a law on June 13, 1913, with regard to citrus fruits, which will apparently guarantee to the purchasers of Florida products, ripe and sweet oranges and grape-fruit.

The *Monthly Bulletin* of the California State Commission of Horticulture refers to this law with approval, declaring that its general beneficial result to the Florida growers will be apparent to anyone who will compare the prices received for California and Florida oranges during the last Christmas season.

This law provides that from September 1 to November 5 of each year, all oranges or grape-fruit that are green in colour while on the tree, or when detached from the tree previous to the time of inspection, shall be considered immature, and subject to the 'acid test'. During the same yearly period, all oranges or grape-fruit 'showing an average on the trees of one-half yellow colour indicating ripeness,' or showing the same average when detached from the tree not more than forty-eight hours previous to the time of inspection, shall be considered mature, and not subject to the acid test. It also defines as 'adulterated', and subject to the acid test, any fruit which have been 'artificially coloured' by holding in a warm moist atmosphere for a short period after removal from the tree.

The law describes the acid test, and sets the following limits: Oranges whose juice contains more than 1·30 per cent. of acid (citric) shall be considered immature. Grape-fruit whose juice contains more than 1·75 per cent. of acid (citric) shall be considered immature.

Fruit inspectors are directed to take samples and make tests. Any lot of fruit found to be adulterated within the meaning of the law is to be seized and placed in custody, subject to the order of the Commissioner of Agriculture.

The law also provides for the official testing of samples presented by growers for the purpose of ascertaining the condition of their fruit.

The irresponsible shipping of immature fruit has probably been one of the chief causes of the comparative failure in the development of the fruit trade of the West Indies. Apart from any legislative enactment, it would probably be to the great advantage of exporters of fruit to subject their produce to an acid test. The working of the test is simple, and the officials of the Agricultural Departments in the various islands might apply it.

THE INTERNATIONAL CONGRESS OF TROPICAL AGRICULTURE.

At a meeting of the Antigua Agricultural and Commercial Society held on November 13, 1914, an interesting address was delivered by Dr. H. A. Tempany, D.Sc., Superintendent of Agriculture for the Leeward Islands, giving an account of (1) the International Congress of Tropical Agriculture; (2) of the Tropical Products Exhibition, both of which were held in London in June last, and at which Dr. Tempany represented the Colony in an official capacity; and (3) some remarks on the Sea Island cotton industry based on information he obtained in England. An abstract of this address will be of interest to the readers of the *Agricultural News*. There has been much attention paid to both these events throughout the West Indies, and as Dr. Tempany was present as an official, representing, so to speak, the agricultural science of these islands, his remarks carry particular weight.

The first part of Dr. Tempany's address deals with the International Congress of Tropical Agriculture. The meeting held in London in June was the third of such gatherings, and was attended by a larger number of delegates than either of the two former ones. The origin of these Congresses is owing to the International Association of Tropical Agriculture, which was founded in 1905, to study all questions of tropical agriculture.

Delegates were present in June from almost every region of the Tropics, representing practically every nation which owns tropical colonies. The value of such a gathering with the opportunities it afforded to agriculturists from all parts of the Tropics to exchange views, not only in prepared papers, but also in informal discussions, is very great.

The range of subjects dealt with covered a wide field: from technical education, sanitation, and hygiene in the Tropics, to practical discussions as to the best methods of raising tropical crops. More than two hundred papers were put down for consideration, so that the week of its meeting from June 23 to 30 was a well-filled one. Dr. Tempany only notices certain sections of the Congress which dealt with matters of particular interest to the West Indies.

In the section devoted to questions relating to sugar, presided over by Sir Hesketh Bell, the Governor of the Leeward Islands, two of the chief papers were communicated by Dr. C. A. Barber, formerly Superintendent of Agriculture for the Leeward Islands, who is now Sugar-cane Expert to the Imperial Government of India. Dr. Barber dealt with the extensive work that is now being done in India with a view to the improvement of sugar-cane varieties. Many of the parent plants of the seedlings under trial have been raised from cane imported from the experiment stations in the West Indies, the Imperial Department of Agriculture having evolved a satisfactory method of sending sugar-cane cuttings to long distances by parcels post. The importance of this work of cane improvement, which will doubtless have effect in a few years, can be estimated, when it is remembered that something like three million acres of land are annually under sugar-cane in India, while the amount of sugar produced is still insufficient to supply the local demand.

Another paper dealt with the classification of the varieties of the sugar-cane, by attentive study of each variety, so that in time there may be a plainer path towards the breeding of reliable new canes.

In the sections of the congress dealing with cotton there were many papers of interest. There were a series of accounts of the conditions under which cotton is cultivated in various tropical regions, to which Mr. Sands, the Agricultural Superintendent of St. Vincent, contributed a paper on the industry as carried on in that island, and Dr. Tempany one on the cotton industry in the Leeward Islands. An interesting paper by Professor John A. Todd, of the University College, Nottingham, dealt with the cost of labour as affecting the cotton crop, especially in the United States. He pointed out that the possibilities of increasing the production of cotton so as to meet the increasing demand, was limited in different countries by different conditions. In Egypt the water-supply is the limiting factor. In East and West Africa the heavy cost of transport, and in the Soudan the lack of labour, will probably for some years hinder any great extension of cotton cultivation. In the United States at present, the cost of labour, and the actual impossibility of obtaining sufficient labour have reduced the profit on growing cotton to so small an amount that it would scarcely be sufficient to tempt to any great increase of area devoted to cotton growing. Cotton has always been regarded as essentially a crop needing cheap labour. Perhaps the solution of the difficulty will come from the invention of mechanical appliances, such as pickers. If the Sea Island cotton production of North Carolina becomes affected by these causes, which the Professor alleges affect the increased production of the short-staple cotton, the opportunity may be presented to the West Indies, with their still, relatively speaking, cheap labour, to establish themselves as the principal source of supply of the long-staple cotton.

Another paper in this section by Mr. J. W. McConnel, who visited these islands in 1912, was on commerce and science in cotton growing. He pointed out that success in cotton growing can only be obtained by the application of scientific principles. The two questions for consideration by cotton growers are: how can cotton be improved so as to be worth more money, and how can it be made more prolific so as to cost less to produce. As tending to attain these results, Mr. McConnel emphasized the importance of seed selection, and the necessity for uniformity in product. Mr. McConnel in discussing these questions with Dr. Tempany promised definite facilities in testing small samples of cotton, even single bolls from the West Indies, so that, by means of carefully directed breeding experiments, it may be possible to produce types of cotton calculated to meet the requirements of the spinners with greater exactness than can be done at present.

In the section of the Congress dealing with cereals, an interesting paper on the production of maize was communicated by Mr. Joseph Burt Davy. He pointed out that the world's consumption of maize was now about 3,929,000,000 bushels, actually 447,000,000 bushels more than its consumption of wheat, and that maize yields about twice as much per acre compared with wheat, and is therefore the much cheaper crop to produce. Not only is the grain used as food for man and beast, but it is employed as a source of supply for many commercial products, new uses being constantly found for maize products, and the demand rapidly increasing. The great source of supply of maize hitherto has been the United States, but this year (1914) the United States have begun to import maize from Argentina to meet their own requirements. Mr. Burt Davy looks to South Africa as a probable source of supply in the future. Dr. Tempany points out that this paper has a special message for the West Indies. As in South Africa, so here, there is the possibility of great extension in maize growing. At the present time we are importing into these islands via New York maize grown in Argentina, when we could certainly grow a good deal ourselves.

It is intended to give abstracts of the concluding portions of Dr. Tempany's address in following numbers of the *Agricultural News*.

COTTON.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date November 17, 1914, with reference to the sales of West Indian Sea Island cotton:—

There have been no sales of West Indian Sea Island cotton this month. The stock is confined to about 200 bales, which are held off the market for better prices.

We see no prospects of an improvement in prices while the Germans occupy Belgium and the northern parts of France. Meanwhile Carolina Sea Island new crop are offering 13*d.* for Fully Fine, and 14*d.* for Extra Fine.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending November 7, is as follows:—

The receipts for the week were 184 bales making total to date 451 bales. The market remains quiet with Factors still asking 25c. for Extra Fine, and 23c. for Fully Fine, but no sales have been made as yet. There is very little inquiry in the market, and to induce business they would have to be willing to accept lower prices.

Mr. J. Arthur Hutton, Chairman of the British Cotton Growing Association, writes as follows under date November 10:—

Business seems to be slightly improving, but I am sorry to say it is only very slight at present. Still it is something to see things moving again in the right direction.

CAUTO COTTON IN JAMAICA.

Trials of Cauto cotton are being made in Jamaica, where it is hoped that this variety will prove useful for certain soils in very dry districts. The following note from the *Kew Bulletin*, No. 8, 1914, p. 304, was taken from a letter from Mr. W. Harris, Superintendent of Public Gardens and Plantations, Jamaica, under date of July 16, 1914:—

Cauto cotton is an interesting plant, and promises to be a valuable agricultural crop for dry districts. Here, at Hope, it was planted in the middle of August last, and the crop was picked from the middle of February to May 1 this year, the yield being 600 lb. of seed-cotton per acre.

The plants are growing at 8 feet by 8 feet, and had they been planted at 4 feet by 4 feet, for the first year, and then thinned out to 8 feet by 8 feet the yield would have been much heavier. They are now bearing a fine ratoon crop, and it is said that they yield good crops for at least three years.

There are 50 acres of this crop on the limestone in Lower Clarendon, an exceedingly hot and dry district, and they have made excellent growth even better than ours at Hope where the soil is a light, gravelly alluvial.

The yield of lint from some of the Clarendon cotton was 36 per cent., and the 1914 crop has been sold in U.S.A. at 18c. per lb., whilst the ratoon cotton, grown in Cuba and ginned in Jamaica, was markedly superior to the plant staple, and fetched 25c. per lb.

COTTON EXPORTS FROM THE WEST INDIES.

The following table gives the exports of cotton from the West Indies for the quarter ending September 30, 1914:—

Origin.	No. of bales.	Weight, lb.	Estimated value, £.
Antigua	15	3,750	195
Barbados	12	5,635	352
Grenada		nil	
Montserrat	3	1,599	110
St. Kitts	54	27,000	1,688
Nevis	7	1,747	109
Anguilla		nil	
St. Vincent	52	17,445	1,381
Virgin Islands	12	2,711	181
Jamaica		nil	
Total	155	59,887	4,016

Besides the above quantity, there was exported from Grenada 672 lb., and from St. Vincent 13,299 lb. Marie Galante, and from Jamaica 9,303 lb. Cauto cotton, valued respectively, at £19, £1,381, and £291.

The following statement gives the return of Sea Island cotton exported from the various West Indian colonies during the period October 1, 1913, to September 30, 1914:—

Origin.	Weight, lb.	Estimated value, £.
Antigua	160,490	8,401
Barbados	283,031	16,797
Grenada	nil	
Montserrat	293,162	18,090
St. Kitts	372,633	23,289
Nevis	268,520	16,784
Anguilla	94,372	5,899
St. Vincent	373,122	29,564
Virgin Islands	28,035	1,869
Jamaica	31,872	1,778
Total	1,905,237	122,471

Besides the above Sea Island cotton, there was exported from Grenada 358,378 lb., and from St. Vincent 57,747 lb. Marie Galante cotton, of the estimated value of £10,444 and £2,406, respectively. Also from Jamaica 9,303 lb. Cauto cotton, valued at £291.

The cotton crop in Nyasaland was a failure in the highlands, owing to unfavourable climatic conditions; on the other hand, the crop in the lowlands, which is largely grown by natives, was the largest on record. The European planters would be likely to discontinue growing this crop, unless they could obtain something more than 5*d.* per lb. for their cotton delivered in Liverpool.

With regard to West Africa, the purchase of cotton in Lagos up to the end of September was only slightly less than that of the corresponding period of last year. In Northern Nigeria, however, the purchase of cotton up to the end of July was only a little more than a third of that for the same period of 1913. (*West India Committee Circular*, November 17, 1913.)

INDIAN CORN.

SELECTION OF SEED CORN IN THE FIELD.

At the present time, there are, probably, on many estates in the West Indies, fields of Indian corn just coming to maturity, and it is likely that from the plants now standing in these fields the seed for planting during the coming season will be selected.

The matter of selection of seed corn is one which has in the past received from planters far less attention than it deserves, since this operation has a very important bearing on the success of the crop as a whole.

At the present time it would probably be the best plan for the planter to undertake a simple form of seed selection, leaving the technical forms of plant breeding for a time when he has made some improvement in the strain of corn cultivation, and desires to carry it further.

In the first place, emphasis ought to be strongly laid on two points: (a) the first selection ought to be done in the field, and should be made on consideration of field characters of the plant, and (b) the corn should be husked, and further selected on the basis of the characters of the ear and grain.

The field characters include the following, which should be considered in making the first selection: size and growth of the plant, number and size of ears, the husk, the shank, and the position and attitude of the ear on the plant.

Seed ears should be selected from average size plants showing normal growth. Stunted and overgrown plants are alike uncertain as parents, since they do not give a clear indication as to what they may do in normal conditions.

The number and size of the ears on a stalk are important; one large ear may give more corn than two smaller ones, but in general it will probably be found not to be so. Two average ears per plant should give better results than single ears, and this point should be carefully proved. All ears from two-ear stalks should be kept separate, and planters would do well to make trials of planting them separately, so as to ascertain for themselves how the yields compare.

The husk should completely cover the tip of the ear when fully ripe, and the shank should be slender and long enough to allow the ripened ear to bend over, and also to afford a good grip of the hand as a help in breaking it off clean at the butt of the ear when the corn is being harvested.

The ear or ears should not be too high on the plant, as this sometimes results in the latter being blown over as the ripening ears become heavy, and the root system loses some of its strength. The ears should bend over somewhat, so that rain-water may not penetrate into the tip, especially when the husk has been injured by insects, and so cause rotting and premature germination before harvesting. At the same time the ears should not bend over far enough to touch the ground.

The ear and grain characters can only be determined after the corn is husked. A good seed ear should be of average length, with straight rows running from butt to tip. The tip should be well filled out. The number of rows may vary in different ears, but planters would do well to decide as to the number desired, and select for that number, or at least keep very near it.

The proportion of cob to grain is important; a large cob may bear proportionately a large amount of corn, and in such case it is justified; but a large cob in an ear giving a small proportion of corn is an undesirable character.

Similarly with the size, shape, and colour of the kernels on the ear; these will be found to vary in any field of corn, and especially where little careful selection has been practised. If however the planter decides that he will grow a corn with long narrow kernels, or with broad short kernels, he should select his seed with reference to these points year after year. Also the colour of the corn varies in the West Indies. If it is decided to develop a light-coloured corn, light corn should be selected, and if a dark, or red corn as it is called, is the object aimed at, dark seed should be planted.

It will be seen at a glance that the field selection should include much more corn than will be wanted for planting, since the later examination will, in all probability, result in a considerable proportion being rejected.

It must always be remembered that yield and profit are the two points to be considered, and that all selection and cultivation must have these continually in view; but it should at the same time be held in mind that uniformity is one of the principal factors to be considered. Uniformity of plants in size and rate of growth, in the bearing of ears, their position and habit of growth, are important field characters; while in a good market, uniformity in the size, shape, and colour of the kernels has an important bearing on the value of the grain.

Much importance attaches to continuity and adherence to the initial plan in seed selection. The type chosen as the one to be propagated and fixed should be borne in mind at every selection, season after season. If for any reason it is found desirable to change, it must be realized that a new system starts from the time the change is made. From this it will readily be seen that the matter of selection should have most careful thought from the very beginning, in order that the first object aimed at in the selection be good enough to warrant a continued striving for that object year after year.

DOWN THE ISLANDS.

ITEMS OF LOCAL INTEREST.

ST. VINCENT. At a meeting of the Agricultural and Commercial Society, on November 11, His Honour the Administrator addressed the members on the present agricultural situation and future prospects of agriculture in the Colony. As both cotton and arrowroot have been adversely affected by the war, a partial substitution of other crops was suggested. It was recommended that where suitable mills exist for the manufacture of good muscovado sugar, sugar-cane should be planted up to the full capacity of the mills, because for two or three years at least a fair profit might be expected. The extended growth of other crops, such as cassava, maize, ground nuts, peas, beans, and ground provisions was also discussed. From the report of the Agricultural Superintendent it would seem that there is a revival of interest in sugar-cane cultivation, 1,800 cane cuttings having being recently distributed from the Experiment Station. Three cases of anthrax have been notified in St. Vincent—one in August, and two in October.

VIRGIN ISLANDS. The protracted drought at last seems to have broken. Refreshing showers have been recorded in October. The distribution of economic plants from the Experiment Station continues, especially limes, coco-nuts, and onions. During the first half-month of the working of the Cotton Factory, 35 bales of 220 lb. each were received. The area under cultivation in sweet potatoes has been much increased. The attacks of the leaf-blister mite have been more prevalent; diseased plants are being cut out and destroyed, to prevent further infestation.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

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The *Agricultural News*: Price 1*d*. per number, post free 2*d*. Annual subscription payable to Agents, 2*s*. 2*d*. Post free, 4*s*. 4*d*.

Agricultural News

Vol. XIII. SATURDAY, DECEMBER 5, 1914. No. 329.

NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number is the conclusion of the paper on the improvement of soils, which is based upon the address of Professor A. D. Hall at the Australian meeting of the British Association.

On page 384, there is presented an important article on the deterioration of sugars on storage—a question needing attention.

The articles, on page 386 refer to orange grafting, and to recent legislation in Florida as to the shipment of oranges and grape-fruit.

An abstract of the first part of an address by Dr. H. A. Tempany, on the recent International Congress of Tropical Agriculture, held in London, appears on page 387.

Under the heading Indian Corn, on page 389, there is important advice given as to the selection of seed corn in the field.

In Fungus Notes, on page 396, there is an article on hot water treatment for the prevention of cotton anthracnose, and a note on the cob rot of corn.

Insect Notes, on page 392, contain advice as to the extermination of troublesome ants, and notes on the moth borer of sugar-cane in British Guiana.

Notes on Indian Corn.

As a result of the interest which is being manifested in Indian corn as a crop with considerable possibilities for development in these islands, the Pamphlet No. 76, which was mentioned in Notes and Comments in the last issue of the *Agricultural News*, has been prepared and issued by the Department. In continuation of the attempt to bring forward useful information with regard to this crop, it is proposed to present in each number of the *Agricultural News*, as far as is practicable, Indian corn notes, one of which appeared in the last number under the heading As to Corn: the second, in this present number, deals with the Selection of Seed Corn.

Pure Milk Supply.

In his paper entitled A Veterinary Survey of the Windward and Leeward Islands, which appeared in a recent number of the *West Indian Bulletin*, Mr. P. T. Saunders, M.R.C.V.S., indicates in his notes on each island that the milk supply, almost without exception, is in need of improvement.

In many localities in temperate countries where scientific knowledge has had a wider application to matters of food supply and sanitation, much has been done in the way of governmental control of the supply and sale of milk; in the Tropics, however, less progress has been made.

The *Hawaiian Forester and Agriculturist* for October last, presents the report of the Territorial Veterinarian, in which stress is laid on the need for effort towards the production of milk free from tuberculosis.

Effects of Volcanic Action.

From a review of a book by Dr. H. J. Johnston-Lavis on the effects of volcanic action in the production of epidemic diseases in the animal and in the vegetable creation, and in the production of hurricanes and abnormal atmospherical vicisitudes, in *Nature*, October 29, 1914, we glean that the writer has come to the conclusion, after an examination of the whole question, that while there is no direct relation between volcanic phenomena and disease, epidemic disease may be caused or increased during or after volcanic eruptions in the following indirect ways:—

'(1) The irritating and depressing effects of poisonous fumes on the eyes and throat; (2) the disturbance of water-courses, leading to wells and surface supplies being infected from sewage, and the interference of the ventilation of houses by the accumulation of ejected materials; (3) the moral depression from fear, with the hunger resulting from food supplies being cut off.'

It is admitted by all meteorologists that great atmospheric disturbances are occasioned by volcanic outbursts.

Table Rabbit Breeding in England.

The *Journal of the Board of Agriculture*, August 1914, gives an interesting outline of the movement being made in this direction by means of co-operation. It seems that in the autumn of 1911 a club was established by breeders who were interested in the production of table rabbits. This club was called the English Table Rabbit Club, its main object being educational. The collection of names and addresses of the members formed the nucleus of a table rabbit society, and introduced the principle of co-operation for the purpose of improving their stock. At the annual general meeting of the club held in the autumn of 1913, the important decision was made to convert it into a trading society. The British Table Rabbit Association, Limited, now incorporates the older club, its main business being the breeding and sale of table rabbits (both carcasses and breeding stock), and the sale of skins. The association assists breeders by receiving carcasses, and dressing and marketing these in London. It also purchases rabbit skins both from members and the general public at current prices. Though breeders often have a difficulty in obtaining even a penny or two for their skins, it is believed, that by bulking and grading considerable profits can be earned in trading in skins, which profits will benefit the members of the association. There is little doubt that apart from the question of rabbits as meat much may be done in improving the sale of skins.

The fact that for the three years 1911-13 rabbit meat has been imported into Great Britain to the extent of 1,482,169 cwt., representing a value of no less than £2,111,144, indicates that the increased home production of table rabbits is a matter of national importance. No further proof than these figures is required to show than the association meets a real need.

Oil Products of Local Interest.

There are some seeds very common in the West Indies which few people would consider to be possible sources of oil supply. From a paper in the *Trinidad and Tobago Bulletin* (August-October 1914), by Herbert S. Shrewsbury, F.I.C., F.C.S., Acting Government Analyst, it appears that oil of some value may be extracted from mahogany seeds. The oil has a clear, dark, greenish-yellow appearance and an unpleasant, bitter taste. It could be employed for the manufacture of a soft soap, but not for purpose of hard soap production. It is a very slow drying oil, but might be used for paint mixing after extensive trials. A specimen of the oil from Barbados in 1911 was valued at about £26 per ton.

The seeds of *Jatropha Curcas*, known commonly as physic nut, yield a purgative oil of a yellow colour, a faint peculiar odour, and a bland flavour, which is used medicinally in India. Although this product can be used in the soap and candle industries, it is only valued at £14 to £15 per ton. It may be employed as a lubricant, but it is not very suitable on account of its semi-drying properties.

The Jamaica Agricultural Department.

In February last a Commission appointed by the Government of Jamaica enquired into the working of the Department of Agriculture in that island. The report of the Commission has now been published as a supplement to the Jamaica *Official Gazette*.

The report would seem to show that the Commission had taken into account all the circumstances of the case, and to have presented a report, which while criticising some of the defects of the work, at the same time does not fail to express its appreciation of the good work which has been carried out by Mr. H. H. Cousins, the Director of the Department, especially in the management of the Farm, and those lines of development which have commended themselves to him.

The report contains useful suggestions as to the means by which the work of the Department may be made more useful, and recommends the addition to the staff of an Assistant Chemist and an Entomologist. This latter officer has, we understand, recently been appointed.

The Commissioners in closing the report express their appreciation of the assistance and advice given by Dr. Watts, Imperial Commissioner of Agriculture for the West Indies, and give it as their opinion that it would be of benefit if more advantage were taken of such help as the Imperial Department is willing to place at the disposal of the island.

Coco-nut Nurseries.

For a suitable coco-nut nursery a place moderately shaded should be selected. A trench 12 to 18 inches broad, 18 inches deep and 50 feet long should be dug; then start another similar trench next to this; fill the first trench with earth taken from the second trench; repeat this till you have trenched and filled a space of land 50 feet by 50 feet; fill the last trench with the earth taken from the first; cover the plot with dry coco-nut leaves four or five deep, and set it on fire. You have now a nursery capable of starting 400 nuts.

In selecting the seed nuts do not drop them on the ground from the tree, but lower them down with the aid of a rope. Plants of too mature nuts are always sickly. The nuts should be taken from trees that bear well. Round nuts with less husk and more nut are the most suitable.

There are different opinions as regards the position of planting the nut in the nursery. The writer thinks that best results are obtained by placing the nut upright. The nuts should be placed in the trenches 2 feet apart from each other, and three-fourths of the nut should be under the earth. Water the nuts twice a week if there is no rain.

Such a nursery, the writer says, has given him excellent results, the plants at the age of six months being 4 feet high.

Great care should be taken when removing the plants from the nursery. To pull the plant up by the stem does much damage.

The above is an abstract of an article in the *Tropical Agriculturist*, Ceylon, September 1914.

INSECT NOTES.

AN ANT EXTERMINATOR.

The *Monthly Bulletin* of the California State Commission of Horticulture for October last contains an interesting article entitled A Good Ant Exterminator.

The article is chiefly concerned with the extermination of the Argentine ant, but the recommendation may be of value in connexion with the destruction of other ants when their nests are formed in situations that allow of their being treated by the means described.

In previous issues of the *Agricultural News*, the Argentine ant has been dealt with, its habits, and the injury caused by it were explained, and certain remedies which had been found effectual were described. In other issues, remedies suited to the control of other ants have been given.

These remedies have generally consisted of the use of carbon bisulphide for the destruction of the nests, the use of poison baits, in which the poison occurred in such small proportion that the workers which visited the bait, and carried it to the nest would not be killed, so that it might be fed to the larvae, and thus the nest be weakened and destroyed. Another method consisted of the use of bones, cow heels, i.e., the cow hoof, as traps, to be dropped into hot water when large numbers of ants had collected on them, the ants being thus killed, and the bones and cow heels being put back to attract another lot of ants. The author of the article mentioned above, Mr. D. L. Crawford, states that the use of poison baits, the destruction of the foraging workers, and the use of powders or sprays as deterrents, do not exterminate but rather serve to drive away the ants, and he suggests the use of creoline sheep dip at the rate of 1 quart to 5 gallons of water, or 1 part to 20 parts of water, but if the nest is very near the roots of a tree or other plant, 1 part of the creoline to 30 gallons of water should be the strength used in order not to injure the tree.

As a substitute for creoline sheep dip in localities where this cannot be procured, the following emulsion of carbolic acid is suggested: 1 lb. soap is dissolved in 2 pints of hot water, and 1 pint of crude carbolic acid is then added, and the whole is shaken and thoroughly mixed. This is diluted with about 30 parts of water, making about 15 or 16 gallons of material for use. If it is to be used near the roots of a tree, dilute with 50 parts of water. The directions given for the application of these substances are as follows:—

First sprinkle some of the liquid about the entrance of the nest, to kill the ants which happen to be outside at the time; loosen the soil, and with a hoe scrape out an excavation 2 feet all round the entrance hole, and sprinkle the dirt that has been removed with the liquid to kill all the ants in it. Loosen the soil in the bottom of the hole, and pour in about 3 or 4 gallons of the liquid, and with the crow-bar further loosen the bottom of the hole to help its penetration.

MOTH BORERS OF SUGAR-CANE IN BRITISH GUIANA.

The interesting and valuable work which has been carried out on the estates of Messrs. Curtis, Campbell & Co., and Messrs. Booker Bros., McConnell & Co., in British Guiana, has been noticed in these columns from time to time as the reports of the Entomologists entrusted with these investigations have been received. (See *Agricultural News*, Vol. X, p. 154; Vol. XII, pp. 266 and 282; Vol. XIII, p. 234.)

A further report has now been received, in which Mr. J. J. Quelch, B.Sc. (Lond.), gives results in the work on the control of the small moth borers (*Diatraea saccharalis* and *D. canella*) up to September last.

The report gives records and conclusions derived from the work of collecting egg clusters, and liberating and redistributing egg parasites.

The report shows that these operations are highly beneficial, and that on every estate gangs ought to be maintained for the regular and continued collection of egg clusters. The methods adopted for handling the eggs, and liberating the parasites in the field, were described in the *Agricultural News*, Vol. XII, p. 282. The difficulties in the way of the satisfactory carrying out of this work arise from shortage of labour at the times when labour is most needed for this work, and the lack of suitable supervision for such operations on many estates.

The practice of cutting out and destroying dead hearts with borers in them, and the collection and destruction of all refuse in which these borers may be contained, is also advocated, while it is stated that under certain conditions the use of trap lights is beneficial.

The collection of the egg masses is however the principal operation dealt with. It is recommended that this should be commenced at once (within three weeks after the canes have been cut) and continued regularly until the canes are too large and leafy for proper examination. In each field the replants or supplies should be examined for some time after the ratoons have become too large.

The practice of burning the canes is stated to exert a very harmful influence on the number of the parasites, and while fire also destroys the eggs of the moths, the caterpillars in the canes are largely uninjured, and consequently the succeeding generation of moths, resulting from the development of the larvae which escaped destruction by fire, and which are left in the fields in the tops and unsound canes, is much in excess of the parasites, and the borer attack develops unchecked to a large extent.

There would seem to be no doubt that the investigations, recorded in this and previous reports, indicate a line of control work, which when persistently carried out, must result in a reduction of the injury by the small moth borers.

DEPARTMENT NEWS.

During his recent visit to England, Mr. H. A. Tempany, B.Sc., Superintendent of Agriculture for the Leeward Islands, took the opportunity to sit for the examination for the degree of Doctor of Science, at the University of London. Information has since been received that the degree has been conferred upon him. In addition to his examination, Mr. Tempany submitted as theses, papers on some of the research work which he has accomplished in relation to problems connected with scientific agriculture in the West Indies.

Messrs. A. C. Miles and C. Saunders, Senior Curators in the Agricultural Department of the Gold Coast, arrived in Barbados on November 2, on a visit to the West Indies, which was undertaken at the instance of the Secretary of State for the Colonies. These gentlemen are especially interested in cacao; and their itinerary includes visits to Trinidad, Dominica, and Grenada. It is expected that Messrs. Miles and Saunders will leave Grenada on December 7, connecting the following day at Trinidad with the homeward bound Royal Mail Steamer.

THE UTILIZATION OF MANURE WASTE, FOR TROPICAL CROPS.

The above heading to an article in *Tropical Life*, relative to tea plantations in Northern India, suggests some reflections on the same topic as applied to conditions in the West Indies. There can be no question in the mind of any observer of the manner in which the cultivation, especially that of annual crops, is carried on in most of our islands, that there is an enormous wastage of valuable manurial matter. If any remonstrance is made, the usual answer is that it doesn't pay to collect the stuff and apply it to the land: it is better to apply artificial fertilizers in regulated doses. No one at this stage of agricultural progress is likely to belittle the use of artificial fertilizers at the proper times, or in the proper way. The answer above given is fallacious, because artificial fertilizers can never do by themselves, what the use of the waste material referred to can do, i.e., improve the condition of the soil, and render it more and more responsive to the stimulating influence of artificial fertilizers. These are inorganic and so can add no organic material to the soil. Constant cultivation, especially when the crop harvested, is almost in its entirety removed, depletes the soil of the organic matter originally existing in it, with the result of rendering its humus contents less and less. The soils in many of these West Indian islands are particularly subject to loss of humus, not only on account of occasional heavy rainfalls washing away the lighter particles, but also as a result of bacterial action. The result is that many fields, after having been in cultivation for some years, give poorer and poorer yields, in spite sometimes of a considerable amount of artificial fertilizers having been applied to them. This might be remedied, and the land restored to, or maintained in a condition of fertility, by utilizing many sources of organic matter now neglected or wasted.

Sugar-cane is one of the best crops for the Tropics, because of the amount of trash and tops which find their way back to the soil, either directly, or after having been incorporated in the manure by having been placed in the pens for the animals to eat what they want, and to trample down the rest.

In a paper contributed to the *West Indian Bulletin*, Vol. XIV, No. 2, p. 146, Mr. Tempany, Superintendent of Agriculture for the Leeward Islands, clearly shows, from the record of experiments made in those islands, that under tropical conditions the decay of organic matter is rapid, owing to the high degree of bacterial activity existing both in heavy and light soils. This indicates the necessity of maintaining an adequate supply of organic matter by the liberal employment of organic manures, as the Imperial Department of Agriculture has consistently advocated.

Many sources of this organic matter might be utilized, more than is at present done. On estates the usual source of supply of such manure is the cattle-pen. In few of the smaller islands, however, is the amount of manure increased by spreading bush, cut for that purpose, upon the cattle-pen, though regular clearing of the pastures would afford material, and also benefit the pastures. In fact the supply of vegetable matter is practically unlimited. It is good policy to maintain as many animals as possible, cattle especially, on an estate, with a view to increasing the pen manure, not so much of their actual droppings, but of the litter which may be accumulated in a thick layer under them, the excreta of the animals hastening the decay of the uneaten fodder and bush, and bringing the whole mass into a condition suitable for application to the fields as manure.

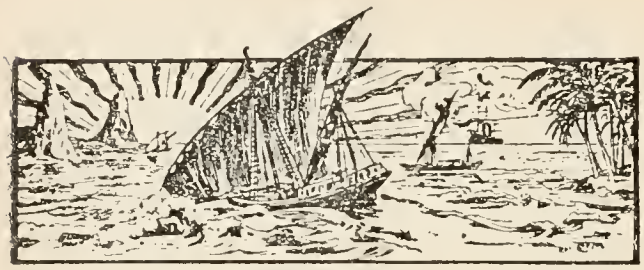
Another source of organic manure neglected in the West Indian islands is sea-weed. After a storm or even a ground swell, there is thrown up on the shores, especially to windward, of these islands, very many tons of sea-weed, chiefly of the Sargasso or gulf-weed. Estates near the sea-coast might well utilize this by partially drying it, and then spreading it as litter on the cattle-pens. The *Botanical Journal*, October 1914, advocates the use of sea-weed as a manure very strongly. It says that, at a rough estimate, the fertilizing material present in a ton of sea-weed would cost from 8s. to 10s. if purchased in the form of a finely divided manure ready for putting on the land. But apart from the fertilizing chemicals contained in sea-weed, its use as a sort of farm-yard manure has this strong point in its favour: that sea-weed is free from weed-seeds, and from the spores of disease-producing fungi. The writer states that sea-weed, when used as a manure need not be allowed to rot first in heaps, but may be put straight on to the land, because it decomposes rapidly, and almost completely into soluble substances.

Potash for fertilizing purposes is likely to become scarce and dear in the near future, as a result of the present war. For soils needing potash, wood or vegetable ashes, as from megass, would possibly afford a supply not to be despised.

In the neighbourhood of towns, even small ones, valuable organic manures, in the shape of the blood and offal of the slaughter house, and the urine and night-soil from public institutions or private houses, which are almost entirely wasted at present, may be obtained for the trouble of collecting them and carting them away.

This utilization of manure waste, while probably worth the attention of the cultivators of large areas, is still more important to peasant proprietors or cultivators of a few acres of land. The wonderful success of the intensive cultivation of small holdings in France and Belgium is largely due to the utilization by those who work them of every possible source of organic manure. The only small West Indian island where there is any similar attempt made, both by the planters and by the cultivators of small holdings, is Barbados. There the result is very striking, both as to the quantity and the quality of the crops produced. Probably on account of the attention paid to the continual supplying of organic matter, the soil seems to have maintained its fertility unimpaired for many years of intensive cultivation.

In Pamphlet No. 47 of the Imperial Department of Agriculture for the West Indies, dealing with manurial experiments with the sugar-cane in the Leeward Islands in 1905 and 1906, Dr. Watts, the present Imperial Commissioner, who was then in charge of the Department in those islands, emphasized the necessity of a liberal use of organic manures. As an appendix to the pamphlet, he published a table of careful analyses, which he himself had prepared, of pen manures and allied manures. This table shows the percentage, as well as the number of pounds per ton, of water, organic matter, ash, phosphoric acid, potash, nitrogen, and ammonia contained in the following manurial substances: pen manure (eleven samples), stable manure, sheep pen manure (three samples), rotted megass and compost from lees' pond, rotted megass, vegetable compost, weeds, leaves, etc., leaves of Agave, sea-weed, lime skins and pulp, bush, etc., cane tops (three samples), cane trash, crushed cotton seed, and cotton-cake meal—in all twenty-nine analyses. Any planter whether of many acres or few, who wants to know just the fertilizing value of the substances mentioned above, may refer to that pamphlet.



GLEANINGS.

Sir Daniel Morris, K.C.M.G., has just edited *A Natural History of Bournemouth and District*. *Nature*, October 29, 1914, says that under the able editorship it is a model of what such a book should be.

The total exports of rubber from Ceylon during the six months, January to June 1914, according to official returns issued by the Ceylon Government, were 15,115,560 lb. (*The Board of Trade Journal*, October 15, 1914.)

An article in the *Tropical Agriculturist* for September 1914, foreeasts many new uses for rubber: (1) wherever leather is used to-day rubber will soon prove a formidable rival; (2) as a competitor of lumber—hardwood flooring, shingles, boat planks; (3) as a rival for steel springs for cars.

In recommending the treatment of land with lime the *Southern Planter*, November 1914, says: 'there are limestone grinding and erushing machines on the market which can be bought at priees ranging from $250 to $700'; and asks, 'Why don't a number of farmers get together and buy one of these machines?'

A letter to the *Tropical Agriculturist*, September 1914, describes 'poppadams' as a thin paper-like biscuit prepared from meal obtained from beans (*Phaseolus* sp.). The same letter says that for making eurry something more than eurry powder is required, namely 'curry leaves' such as moringa, andropogon, and pandanus; without these leaves the true curry flavour eannot be got.

In the year 1900 the world's production of rubber was about 50,000 tons, and the consumption about the same. Last year the world's production of rubber amounted to 117,000 tons, and the consumption to slightly more than that amount. Whatever the temporary effects of the war may be on the rubber industry, it is expected that it will continue to give handsome returns on the large capital invested in it. (*Tropical Life*, October 1914.)

The Director of Agriculture for the Federated Malay States, in his report for 1913, states that the production of rubber that year was 23,719 tons, just over one-half the world's supply. The area newly planted in rubber in 1913 was 34,127 aeres—a larger increase than might have been expected in view of the fall in the price of rubber. This fall was not without good results on the industry. Estates throughout the country have effected considerable economies in their expenditure. (*The Board of Trade Journal*, October 8, 1914.)

At the July meeting of the Board of Agriculture, Trinidad, the Agricultural Society's recommendation to the Government to have mongoose destroyed on Crown Lands adjoining private properties was recommended by the Board, which advised that the Wardens might be supplied with traps, and also authorized to employ trappers in their respective districts. The Board strongly recommended that no premium be paid for mongoose. (*The Bulletin of the Department of Agriculture*, Trinidad and Tobago, August-October, 1914.)

As was noticed in the last issue of the *Agricultural News*, it has been considered expedient to restrict the cultivation of cotton in Egypt. Circular No. 1 issued by the Minister of Agriculture of Egypt recommends cultivators to substitute food crops to meet the enhanced demand for these which must occur. In the list given to indicate what kind of food crops would be best to grow, there are maize, American white or yellow; millet (*Sorghum vulgare*), West Indian Guinea corn; peas; haricot beans: Lima beans; cowpeas or black-eye peas; ground nuts, and onions. (The *Incorporated Chamber of Commerce of Liverpool Monthly Magazine*, October 1914.)

In *The Board of Trade Journal*, October 15, 1914, it is stated, relative to the cultivation of coco-nuts in the Federated Malay States, that there were in 1913, 174,234 acres under coco-nuts—an increase of 16,634 acres as compared with 1912. Of this total only 40,175 acres were returned as from estates of 100 acres and over, so that by far the greater part of the coco-nuts grown in the Federated Malay States is by small holders. Prices for copra and for nuts continued to be very satisfactory. Coffee was grown with some success as an intercrop with coco-nuts, nearly 2,600 acres being returned by estates as under coffee and coco-nuts. The Liberian variety can quite well be grown with coco-nuts.

Creatinin is found in muscles and blood of animals in varying quantities. The following are the results of experiments, concerning the presence of creatinin in several leguminous seeds, reported in the *Journal of the College of Agriculture*, Tohoku Imperial University, Japan, June 1914. In all the legumes examined the presence of creatinin was fully ascertained. The colour tests, the formation of characteristic double salt of creatinin zinc chloride, and lastly the regaining of creatinin from the double salt were applied to determine the presence of creatinin in legumes. The amounts of creatinin in the seeds of kidney bean and soy bean are apparently in much larger quantity than in horse beans and green peas, though its absolute amount seems to be very small.

The Bulletin of the Department of Agriculture, Trinidad and Tobago, August-October 1914, publishes an appeal to the inhabitants of the colony from the Committee appointed by His Excelleney the Governor to deal with the local supply of ground provision. After suggesting possible erops to be grown, the Committee says: 'It should be the aim of everyone to beeome, if possible, a producer instead of merely a consumer. Many people have already realized this, and are acting upon it. The Committee hopes that all who have influence over others will help them to see and act upon it too.' The appeal concludes as follows: 'The essential point now is to eneourage people of all elasses to do a little in their own interests. The net result of many small efforts will be to the great advantage of the community as a whole.'

STUDENTS' CORNER.

THE VALUE OF LEGUMINOUS GREEN DRESSINGS.

In the last number of the *Agricultural News* attention was directed to some leguminous crops as a possible source of hay. The agricultural student might pay attention to this class of plants for several other reasons. The leguminosae afford the very best material for green dressing. But the fact obtrudes itself upon the observer that every legume does not produce identical results in every locality. For instance, the cowpea (*Vigna unguiculata*) seems to be so attacked by caterpillars in Antigua, as to have been abandoned as a green manure crop, although in other islands it has proved to be eminently adapted for this purpose. It is the same case with other crops of this class. One planter will extol the virtues of pigeon peas (*Cajanus indicus*), another tells you that nothing can be better than horse bean (*Canavalia ensiformis*), some one else advocates woolly pyrol (*Phaseolus mungo*), while still another assures you that Barbuda bean (*Phaseolus lunatus*) is the one and only green leguminous dressing. And probably, in a sense, each one is right, because the crop he advocates has been proved, experimentally, best suited for the locality and conditions he has to face. Here then is scope for the student's observations and notes. Carefully observe which leguminous crop succeeds best, and gives the largest green crop in your own neighbourhood. Note any reasons to which you can attribute this comparative success. For instance, one legume may succeed best on a heavy soil, while another is a comparative failure, though giving a fine return on lighter land. Or one may have a much greater drought-resisting capacity than another, and so do better in drier islands.

Another point for noting is the liability of any species to insect attack. Here may be noted what caterpillars attack each species, and whether the use of insecticides could beneficially be resorted to without damage to the plants; whether also the use of insecticides would be economically advantageous. In this connexion, of course, will be noted if any scale insects infest the plants, and the identification of them should be attempted. By such observations as these the student gains real knowledge of his crops, and can give reasons for his operations. He can say that he plants such a legume as a green crop in preference to such another, because of facts which he knows, and not merely because he has been advised to do so by someone else.

While making observations on green manure crops, experiments, even on a small scale, might be made on lines suggested by those carried out at Pusa, in India, as outlined in the *Agricultural News*, November 7, 1914, p. 361, as to whether the value of green manure is not increased by a partial maceration before application.

The student of course knows that one great benefit that the growth of a leguminous crop bestows on the land is the increase of nitrogen in the soil. The roots of each species that comes under the student's observation can be examined for the characteristic nodules. This can be done with a magnifying glass of no very great power, and in many instances with the naked eye. The number of nodules per plant at corresponding periods of growth, might be recorded as a useful index of its value in this respect. The soil conditions materially affect this factor, so such conditions ought to be noted at the same time. It cannot be too strongly put that the habit of observation and reflection on all phenomena, is the way for the student to gain increased knowledge, and that knowledge is real power, in agriculture as in every other walk of life.

Cowpeas and Maize for Fodder.—An experiment conducted in the south coast district of New South Wales with a mixture of cowpeas and maize as a fodder crop, reported in the *Agricultural Gazette* of New South Wales, September 1914, would seem to be instructive to West Indian planters.

For sowing, a mixture of 5 lb. of cowpeas and 20 lb. of yellow dent corn per acre was used. The plots gave excellent results. Cowpeas are excellent drought resisters, and they made in every case splendid growth, climbing to the top of the maize stems, and forming a dense growth at the base. On one of the plots the yield was over 22 tons per acre. The growing of cowpeas with maize for fodder is strongly advised, not only because they grow well together, but also because they greatly enhance the food value of the fodder, whether used green, or made into hay.

Germicides, Disinfectants, Antiseptics, and Deodorants.—'Considerable confusion exists in the popular mind regarding the meaning of the above terms. To many they signify one and the same thing, as a result of which numerous worthless preparations with a disagreeable odour, but otherwise harmless, have been employed in the destruction of disease germs without avail.

'The terms germicide and disinfectant may be used synonymously to designate any agent which has the power of destroying germ life, such as sunshine, heat, carbolic acid, lysol, bleaching powder, corrosive sublimate, and formaldehyde gas. An antiseptic is something which merely prevents the further growth and development of micro-organisms without necessarily killing them; for example, alcohol, boric acid, listerine, hydrogen peroxide, and most of the common disinfectants in dilute solutions. A deodorant may be said to be anything possessing an odour more pronounced and penetrating than the odour which it is intended to modify or cover up. It does not possess, necessarily, either germicidal or antiseptic properties, and depends for its efficiency simply upon producing one odour to mask another. Many of the best germicides are also splendid deodorants, but deodorants are not generally germicides.' (*Modern Farming*, October 5, 1914.)

A Disease of Poultry, which is known as fowl yaws in the West Indies, appears first as an affection of the skin, producing pustules on the comb, wattles, and face of the birds. Unless checked, the disease seriously affects the mucous membranes, and not uncommonly results in death. In Bulletin 240, June 1914, of the Agricultural Experiment Station of the University of Wisconsin, there is a notice of experiments made with a new vaccine treatment of this disease, known as chicken pox, or sore head, in the United States. Vaccines were prepared by grinding diseased tissues, such as the pox scabs and affected membranes, and subjecting them to a temperature of 131° F. for one hour. The injection of this vaccine into healthy, as well as into infected fowls, was found to be very beneficial. When injected in the initial stages of the disease, the vaccine apparently had the effect of rendering the attack milder, and the recovery more rapid. Of four hundred and forty healthy fowls treated by a double vaccination, with an interval of five days, only four subsequently developed the disease; while of seventy-five unvaccinated controls, twenty-six showed marked signs of the pox in the three weeks of observation. The natural susceptibility of birds to infection varies; yet vaccinated birds placed in infected pens escaped the disease, while it was possible to infect some of the controls. Further investigation is looked for.

FUNGUS NOTES.

HOT WATER TREATMENT FOR COTTON ANTHRACNOSE.

In view of its importance, we reproduce in full a preliminary note concerning the treatment of cotton seed with hot water for the destruction of the fungus of anthracnose, contributed to *Science* (Vol. XL, p. 109) by H. W. Barre and W. B. Aull, of Clemson College, South Carolina. Hot water treatment of various kinds of grain for the prevention of smut diseases is now a well established practice.

The note reads as follows: 'During the past three months we have been making a study of the effect of hot water at different temperatures on the anthracnose fungus and cotton seed. The results are very interesting and seem to have an important bearing on the control of the disease. Cotton anthracnose is known to be carried in the seed. The fungus penetrates the seed coats, and the hyphae and spores have been found in the cotyledons on the inside of the seed while the seeds were still in a dormant condition. So far, no treatment has been reported which will kill the fungus without killing the seed. Our hot water treatment studies were made with a view of determining whether or not the fungus could be killed by hot water without injuring the seed. Our results so far are very encouraging, and are considered to be of sufficient importance to warrant publication at this time of this preliminary statement.

'To begin with, we placed cotton seed in water at different temperatures and for different lengths of time, and then germinated them between blotters in the ordinary way in incubators with a view of determining how high a temperature cotton seed would stand without injury. As a result of these tests we find that cotton seed can remain in water at 70° Centigrade for fifteen minutes without injuring the germination. Fifty per cent. of the seed germinated that were allowed to stand in water at 75° Centigrade for fifteen minutes. In a few cases more than 50 per cent. of the seed germinated that had been treated five minutes at 80° Centigrade, but in the majority of cases a very small per cent. of the seed treated for five minutes or longer at 80° germinated.

'The fact that cotton seed, which had been allowed to stand in water at 70° Centigrade for fifteen minutes, germinated as well as the untreated checks, prompted us to germinate a large number of treated seed under sterile conditions, and to examine the seedlings for anthracnose. We used for this purpose the method which has been in use in this laboratory for the past four years for testing seed for disease by germinating them in sterile test tubes. These tests seem to show conclusively that the fungus hyphae and spores in the seed are killed when cotton seed is allowed to remain in water at 70° Centigrade for fifteen minutes, and the germinating power of the seed is not injured. An average of 22 per cent. of the seedlings in the checks from the same lot of seed, and germinated under the same conditions, were diseased. We now have two fields on the college farm planted with seed which were given this treatment, and so far there is no indication of disease in the seedlings, while in the fields planted with the same lot of seed, but not treated, diseased seedlings are abundant. The field tests will, of course, not be complete until the end of the season when the plants are all mature.'

COB ROT OF CORN.

We have received Bulletin 265 of the Ohio Agricultural Experiment Station, which gives the results of an investigation by E. G. Arzberger, of the cob rot of corn.

It appears that in the fall of 1911 there was prevalent over Ohio a disease or affection of corn, which had not previously been observed on so large a scale. The trouble was manifested in a softening and decay of the cob, rendering the grain unmerchantable. The outbreak was so general that great anxiety was felt lest a serious disease of this most important cereal had made its appearance, and in response to the request of leading grain dealers and others, an emergency appropriation was authorized by the Emergency Board, for the study of the outbreak by the Botanical Department of the Experiment Station.

It was found that the fungus concerned in the rot is *Coniosporium Geceri*, Bubak. A large number of living corn plants were examined without any being found that were infected, and artificial inoculations of living plants were quite unsuccessful. It is concluded that the fungus acts only as a saprophyte, existing principally on the tissue of the cob after it reaches maturity, and doing relatively little damage to the kernels. As regards its economic significance it must be classed with the well-known moulds, such as *Aspergillus* and *Penicillium*, as capable of bringing about deterioration of the stored product to an extent which varies with the conditions of ripening and storage.

CARE OF HORSES IN THE TROPICS.

The following notes from a paper by Dr. W. R. L. Best, which appeared in the *Philippine Agricultural Review*, August 1914, on the care of horses in the Philippine Islands, will probably prove of interest to West Indian readers, the conditions of climate and food in the two archipelagoes being somewhat similar.

With regard to breeding horses, the writer emphasizes a fact that is too often forgotten in the West Indies, viz., that to produce colts which will be of good market value, the mares should be of good quality. Breeders may also be reminded that it costs no more to keep a good mare than to keep an inferior animal. Further, unless a good sire is selected, the colts will necessarily be disappointing.

When mares are in foal moderate work is beneficial to them up to within a few days of foaling, provided that care is taken not to overload or overdrive them. In fact, moderate regular work is better for the mare in that condition than allowing her to run at large, when she is exposed to accidents, or than keeping her tied in the stable, when she will probably suffer from lack of exercise.

The earlier the training of a colt begins, the easier is the task; the longer it is postponed, the greater is the chance of a hard struggle in breaking it in. The colt may well be gently taught to lead, to back, to obey simple words of command, from the time it is a couple of weeks old.

As a rule, the horse should not be put to work under two and a half years of age, and then the work should be light, and the working hours short until it is four years old.

If the work of the horse is heavy, the weight of grain in its ration should be increased, and that of the hay or grass diminished; on the other hand, if the work be light, the weight of hay or grass may be increased, and that of the grain decreased. The morning and noon meal should be compara-

tively light, consisting chiefly of grain; the heavy feed of hay or grass should come at night, when the horse has sufficient time to eat and digest it, without having to go to work immediately after eating. A good practice in feeding a working horse is to give him about one-fourth of his daily allowance in the morning about an hour before his going to work. If possible, another fourth of his daily allowance should be given him as a midday meal, and the remaining half as his evening ration. A horse should be allowed two hours at midday to consume and digest his feed.

When a horse comes in from his work he should have a drink of fresh, cool water, care being taken that he does not drink too rapidly, or gorge himself, if very warm. When the sweat has dried off him, a thorough brushing should be given. It is advisable that a horse be watered before being fed, or that an interval of an hour or more should intervene between feeding and watering. The theory is that the water washes the food from the stomach into the intestines before the digestive process in the stomach is complete, thereby producing indigestion.

The giving of food and water to a horse in a heated condition is bad, and may lead to serious results. The introduction of food or cold water into the stomach at such a time leads to a sudden activity in digestion, which often causes colic or other troubles.

Frequent washing a horse removes the natural oil from the skin, and is apt to produce a dry, dusty, and rough coat. This is a common practice in the Philippines, as it is in many of the West Indian islands. It should be discontinued in the interests not only of the appearance of the horse, but also of his health. Good grooming with a stiff brush and a soft body-brush will stimulate the pores of the skin, and keep the coat smooth and glossy. The use of a small amount of kerosene on a cloth, applied to the coat of the horse, is of advantage in this respect. This also serves to prevent irritating settling of flies upon his body.

Any bruises on the horse should be thoroughly washed with a good disinfectant, and the animal not used in any way so as to irritate the galled spots. The application of sugar of lead—20 grains to an ounce of water—will help to heal the wounds, and to harden the skin.

Careful attention ought to be paid to the shoeing of the horse. Many injuries to the knees and fetlocks are to be attributed to carelessness in this matter. Shoes should not be left on too long, as the hoof grows out to such a length as to throw the foot out of its proper axis, and so causes an overloading of certain sinews, resulting often in unsound legs. Horses should not be driven on hard roads without shoes, as their feet are not tough enough to withstand the wear. If the hoof becomes dry, hard, or brittle, a good hoof dressing should be applied once or twice a week.

Castration renders a horse much more valuable for working purposes. It is well to castrate young horses at the age of a year.

WEST INDIAN PRODUCTS.

DRUGS AND SPICES IN THE LONDON MARKET.

Mr. J. R. Jackson, A.L.S., has forwarded the following report on the London drug and spice markets for the month of October.

Though the drug and spice auctions are far from being restored to their normal conditions, either in the regularity of their holdings, the bulk of product brought forward, or the prices realized, there has been, from the beginning of October, a more settled state of things, and a fair amount of business has been effected. Imports have been coming more freely to hand than they did in the early stages of the War. And the same may almost be said with regard to exports, except those of a contraband nature. The prohibition against future trading with Germany has taken a firm hold on the public mind, the result of which will be, amongst other things, the manufacture in England of many of the well-known drugs of a complex character of which Germany has hitherto held the monopoly.

Since the outbreak of the War there has been no drug auction held till the first of October, giving an interval of ten weeks. At the spice auction on the 7th of the month, only small supplies were brought forward of which the following are the details.

GINGER.

This article was represented by 247 bags of limed and wormy Cochin, part of which sold at 15*s.* 6*d.* per cwt. At the end of the month, namely, on the 28th, Cochin and Calicut were represented by 347 bags; of these 109 bags of washed Cochin were disposed of at 23*s.* 6*d.* per cwt. Bright rough Calicut was bought in at 26*s.*, and for 46 barrels of fair to good middling Jamaica, 40*s.* to 45*s.* was refused.

NUTMEGS, MACE AND PIMENTO.

At auction on the 7th of the month, 325 packages of West Indian nutmegs were offered and sold at an advance of one farthing per lb. on previous rates, namely 72's 6*d.* per lb., 85's to 95's 4¾*d.* to 5*d.*, 98's to 108's 4¼*d.* to 4½*d.*, 110's to 120's 4*d.* to 4½*d.*, and 140's to 144's 4¼*d.* Mace was in good supply in the early part of the month. At the auction on the 7th, 81 packages were offered, and 68 sold at advanced rates, good pale fetching 1*s.* 11*d.*, ordinary to fair 1*s.* 6*d.* to 1*s.* 8*d.*, red 1*s.* 5*d.* to 1*s.* 6*d.*, and common 1*s.* 2*d.* to 1*s.* 4*d.* There has been but a very slight demand for pimento during the month, at quite ordinary rates.

SARSAPARILLA.

There has been very little business in this drug, 2*s.* per lb. being asked for grey Jamaica, 1*s.* 8*d.* for Lima Jamaica, and 10*d.* for Mexican.

LIME JUICE, LIME OIL, CITRIC ACID, KOLA, AND CASSIA FISTULA.

At the beginning of the month there was a distinct demand for lime juice, though none was offered at auction; but on the 14th it was announced that the arrivals were coming forward in fair quantities, though a week later these arrivals were found to be held very firmly, good bright Dominica fetching 2*s.* 9*d.* per gallon. At the last sale, however, on the 28th, further arrivals from the West Indies were offered, and resulted in 2*s.* 7*d.* being accepted. In the matter of lime oil, at the beginning of the month 3*s.* 9*d.* per lb. was being paid for West Indian distilled, and 10*s.* 6*d.* for hand pressed. Citric acid has been in fair demand at rates varying from 3*s.* 3*d.* to 3*s.* 4*d.* at the beginning of the month, dropping to 3*s.* to 3*s.* 1*d.* on the 14th, and standing at 3*s.* at the close. Kola nuts have not been greatly in demand, and it is said that there are fair supplies on hand at easy prices, fair sound being offered at 3¾*d.* per lb.; but at the close of the month the arrival of a quantity of fair West Indian brought the price down to 3*d.* At an early date 2 cases of Cassia Fistula pods from St. Lucia, described as 'ordinary lean,' were bought in at 18*s.*

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR, November 17, 1914.

ARROWROOT—No quotations.
BALATA—Sheet, 2/0½; block, 1/9 per lb.
BEESWAX—No quotations.
CACAO—Trinidad, 61/- to 67/- per cwt.; Grenada, 56/ to 61/-; Jamaica, no quotations.
COFFEE—Jamaica, no quotations.
COPRA—West Indian, £24 per ton.
COTTON—Fully Fine no quotations; Floridas, no quotations; West Indian Sea Island, no quotations.
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—Quiet.
ISINGLASS—No quotations.
HONEY—No quotations.
LIME JUICE—Raw, 2/3 to 2/9; concentrated, £30; Otto of limes (hand-pressed), 8/- to 9/-.
LOGWOOD—No quotations.
MACE—9/- to 2/3-.
NUTMEGS—4¼d. to 5¾d.
PIMENTO—Quiet.
RUBBER—Para, fine hard, 2/6¾; fine soft, 2/1½; Castilloa, 1/7.
RUM—Jamaica, no quotations.

New York.—Messrs. GILLESPIE BROS., & Co., July 24, 1914.

CACAO—Caracas, 11½c. to 12c.; Grenada, 11c. to 11½c.; Trinidad, 11½c. to 11¾c.; Jamaica, 10c. to 11c.
COCO-NUTS—Jamaica and Trinidad, selects $20·00 to $21·00; culls, no quotations.
COFFEE—Jamaica, 9¾c. to 13½c. per lb.
GINGER—7½c. to 10c. per lb.
GOAT SKINS—Jamaica, 46c.; Antigua and Barbados, 43c. to 46c.; St. Thomas and St. Kitts, 40c. to 43c. per lb.
GRAPE FRUIT—Jamaica, $1·75 to $2·50.
LIMES.—$3·75 to $4·50.
MACE—45c. to 53c. per lb.
NUTMEGS—110's, 11¾c.
ORANGES—Jamaica, $2·00 to $2·50.
PIMENTO—3¾c. per lb.
SUGAR—Centrifugals, 96°, 3·26c.; Muscovados, 89°, 2·88c.; Molasses, 89°, 2·61c., all duty paid.

Trinidad.—Messrs. GORDON, GRANT & Co., November 23, 1914.

CACAO—Venezuelan, no quotations; Trinidad, no quotations.
COCO-NUT OIL—80c. per Imperial gallon.
COFFEE—Venezuelan, 11½c. per lb.
COPRA—$3·50 per 100 lb.
DHAL—No quotations.
ONIONS—$1·80 to $2·00 per 100 lb.
PEAS, SPLIT—$8·00 per bag.
POTATOES—English $2·00 to $2·30 per 100 lb.
RICE—Yellow, $6·00; White $5·00 to $5·25 per bag.
SUGAR—American crushed, no quotations.

Barbados.—Messrs. JAMES A. LYNCH & Co., Ltd., November 28, 1914, Messrs. T. S. GARRAWAY & Co., November 30, 1914.

ARROWROOT—$4·00 to $4·25 per 100 lb.
CACAO—$8·00 to $9·00 per 100 lb.
COCO-NUTS—$17·00.
HAY—$1·50 to $1·70 per 100 lb.
MANURES—Nitrate of soda, no quotations; Cacao manure, $48·00 to $50·00; Sulphate of ammonia $78·00 to $85·00 per ton.
MOLASSES—No quotations.
ONIONS—$2·50 to $3·50 per 190 lb.
PEAS, SPLIT—No quotations; Canada, $6·00.
POTATOES—Nova Scotia, $2·85 to $3·25 per 160 lb.
RICE—Ballam, $5·75 to $6·05 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
SUGAR—American granulated, $5·50 per 100 lb.

British Guiana. Messrs. WIETING & RICHTER, November 21, 1914; Messrs. SANDBACH, PARKER & Co., November 20, 1914.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	$7·00 to $8·00 per barrel of 200 lb.	$10·00
BALATA—Venezuela block	No quotation	——
Demerara sheet	40c. per lb.	——
CACAO—Native	12c. per lb.	12c. per lb.
CASSAVA—	96c. to $1·08	——
CASSAVA STARCH—	——	——
COCO-NUTS—	$16 to $20 per M.	$23 per M.
COFFEE—Creole	—	16c. per lb.
Jamaica and Rio	14c. per lb.	16c. per lb.
Liberian	10c. per lb.	12½c. per lb.
DHAL—	$5·25	$5·50 per bag of 168 lb.
Green Dhal	——	——
EDDOES—	$1·44	——
MOLASSES—Yellow	None	——
ONIONS—Teneriffe	——	——
Madeira	3½c.	——
PEAS—Split	——	$9·50 per bag. (210 lb.)
Marseilles	——	—
PLANTAINS—	16c. to 60c.	——
POTATOES—Nova Scotia	$2·50 to $2·75	$3·00 to $3·25
Lisbon	——	——
POTATOES—Sweet, B'bados	$1·32	——
RICE—Ballam	No quotation	——
Creole	$5·50 to $5·75	$5·50
TANNIAS—	$1·92	——
YAMS—White	$1·68	——
Buck	$1·96	——
SUGAR—Dark crystals	$3·50 to $3·60	$3·50
Yellow	$4·00 to $4·10	$4·00
White	$5·00 to $5·25	——
Molasses	——	——
TIMBER—GREENHEART	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M.
Cordwood	$1·80 to $2·00 per ton	——

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Printed at Office of *Agricultural Reporter*, 4 High Street, Bridgetown, Barbados.

AGRICULTURAL NEWS

Vol. XIII. No. 330.] SATURDAY, DECEMBER 19, 1914. [One penny.

JUST ISSUED.

WEST INDIAN BULLETIN.

Vol. XIV, No. 3.

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AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

OF THE

IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

VOL. XIII. No. 330. BARBADOS, DECEMBER 30, 1914. PRICE 1*d*.

CONTENTS.

Agricultural Departments and New Developments.

AT the present time when economic conditions are greatly disturbed, much is being written about agricultural prospects in connexion with the changes occurring, or likely to occur, in the production and marketing of staple crops, the increase in development of certain minor crops, and the necessity for particular attention to increased production of food crops. In the West Indies the upset is somewhat in evidence, the markets for at least two crops, cotton and sugar, being particularly affected by the disturbed conditions. The effect on cotton arises from the inability to manufacture the raw material into the finished products, coupled with the lack of demand for them: while the market for cane sugar promises to become more active than seemed likely a short time ago. The depression of the cotton market is partially off-set by a stimulus to sugar production, but the principal cotton centres and the principal sugar areas do not coincide, and consequently the resulting problem becomes more complex. The increase in sugar-cane cultivation will utilize certain lands formerly in cotton, and perhaps will also displace small areas of potatoes, corn and other foods: while, on the other hand, there are considerable areas which for several years have been devoted entirely, or almost entirely, to cotton cultivation, for which profitable crops are desired for cultivation during the next few years. The consideration of the problems thus raised leads to contemplation as to whence the stimulus is to be derived for the inception of trials of new crops, and at the same time it may be asked, what part does official agriculture play in a crisis such as this?

The expression official agriculture may be made to include all the efforts of the Departments of Agriculture through the medium of Botanic Gardens and Experiment Stations, and the instructional work of their officers. In most colonies the work in agriculture each year is recorded in an annual report of Botanic Station or Experiment Station or both. The *Agricultural News* publishes articles dealing with this work and with that carried on in different parts of the world, so that by reference to such recorded information, planters and others may easily put themselves in possession of facts which should be of the utmost value in deciding what course to adopt at a time when trials of new crops are to be made. In this connexion the

functions of the Agricultural Departments and their officers in relation to new aspects of agriculture may be discussed.

Practical agriculturists the world over are known to be conservative. So long as the crops under general cultivation are in demand, new ones are not usually sought after: so long as the existing practices are fairly satisfactory, new methods are not tried.

This is a natural and essential characteristic of planters and farmers generally. There is always some reason for the crops that are grown in any locality, and for the existing methods of cultivation. Sound experimental work continued over a suitable period of years may, and often does, demonstrate reasons for changes, but the practical agriculturist is generally quite correct in waiting till the need arises, or until he has been shown good reason for making substantial alterations either in crop or methods. The experimental work devolves upon agricultural officers who should keep sufficiently in touch with planters and peasants to be able to keep them informed as to the results obtained, and place them in a position to decide as to the practical value of any advice offered to them.

As a part of its work the Experiment Station makes trial of new crops, and year after year records results which may seem to have no very particular application to the needs of the practical agriculturist; but when circumstances arise which necessitate changes, these results prove to be of value. Similarly with new plants which the Botanic Gardens procure from other districts; they appear at first to be merely of very passing interest, but the time may come when they will be found useful. The same remark applies to agricultural practices. At first tried on purely experimental lines and recommended for their theoretical value, they often come to be of general application.

If a few concrete examples are taken to illustrate the points mentioned, we are led to consider recent development in the cultivation of such crops as cotton and Indian corn, beans and ground nuts.

For several years cotton has figured as a crop of major importance in the West Indies, but before its cultivation was taken up on estate lines, trials had been made in Experiment Stations, which indicated the possibilities of cotton as a crop, and also suggested the kind of cotton that should be grown. Since that time, suitable strains of seed have been maintained by seed selection, in which work agricultural officers have taken a prominent part, and indeed in some islands practically the whole of the selection work has devolved upon these officers.

At the present time efforts are being made to stimulate the interest of planters in the possibilities of Indian corn as a crop likely to have special value under the present circumstances. Indian corn was probably grown in the West Indies before the discovery of these islands by Europeans, and has been grown continuously since that time: but in nearly every island it has been cultivated mostly as a minor crop on estates, and by peasant proprietors. It is not yet known just how far corn growing on a large scale can be made profitable, but by suggesting lines of improvement in cultivation, seed selection, and storage of the grain, it is hoped that trials will be made to prove the point, and that a crop will be developed which shall be attractive to estate owners, and at the same time greatly reduce the importations of a product which can be grown locally.

Another example of the part played by official agriculture is to be found in the experimental work of the budding and grafting of tropical plants, which has for many years been carried on in certain Botanic Stations in these islands. Some of this work, as in the case of of mangoes and oranges, is already of recognized importance, while that relating to other plants such as cacao, limes, avocado pears, and others has considerable possibilities.

The budding and grafting of cacao and the budding of limes was, at first, generally considered to be merely a nice bit of technical horticulture, but now it is known that grafted and budded cacao is useful, since a degree of uniformity in the finished product may be obtained by budding and grafting, which is impossible in the crop from seedling trees.

In the case of limes also, the point is well illustrated. Planters believed that budded limes could not be grown profitably because of the cost of procuring and establishing such plants. The work already done has, however, demonstrated one very important point: that the sour orange makes a suitable stock for budding limes upon, and since the appearance of a serious root disease of limes, observations have led to the suggestion that probably limes budded on sour orange stock can be grown on lands where seedling limes are being killed by the disease.

In the matter of estate practice also, advice is often given long before the planters are ready to adopt it. Suggestions as to tillage, mulching, rotation of

crops, green manuring, the adoption of other crops, matters relating to stock and stock feeding, etc., are continually being urged by agricultural officers.

In the past the tendency on many estates has been to keep the smallest number of cattle with which the estate can be worked, while the advice is repeatedly given to increase the number to the greatest that can be maintained, and by a careful system of providing sufficient amounts of suitable coarse fodder, to maintain these animals in the highest state of efficiency.

This means better agriculture, more manure, and an independence of the effect of drought on the question of stock foods, that must result in profit to the estate that carries out the programme successfully.

In agriculture, contrary to the rule obtaining in many other lines, popular demand arises subsequent to the proffering of official instruction and advice. Those who are charged with the advancement of agricultural interests must be content to carry out trials, and to give advice, which do not seem to be wanted at the time by those for whom they are intended. But in time these efforts bear fruit: the trials show the way to the successful adoption of new methods or crops, or they demonstrate their futility, thus saving planters the expense and disappointment of making unprofitable trials.

While much of the work of the agricultural officers relating to new methods or new crops is based on work done and experience gained in other countries, and so has a foundation on the experience of others, requiring only a demonstration as to local applicability, it must be recognized that some of their work is of a pioneering nature, requiring time and accumulated experience to demonstrate whether it may or may not possess valuable features for general application.

Due recognition must be given also to the fact that the individual workers are themselves but human, and that in their work, which is new and of a pioneer kind, their ideas and suggestions in these matters are subject to revision and readjustment from time to time. The fact, however, may be emphasized, that in the more settled questions of agricultural practice, the advice of the body of skilled workers associated with the Botanic and Experiment Stations is likely to be sound and valuable. It merits the consideration that is accorded to it in most progressive colonies, and it has materially advanced the interests of those communities and individuals who have availed themselves of it in connexion with practical affairs.

SUGAR INDUSTRY.

THE QUEENSLAND SUGAR FACTORY SYSTEM.

An interesting letter from Brisbane in the *Louisiana Planter*, November 14, 1914, states that to assist the sugar industry the Government of Queensland has, in the last twenty-one years, invested no less than £635,000 in central factories. Of this, the sum of £322,000 has been repaid, leaving £343,000 still outstanding.

This central factory scheme was designed to develop the cane-growing districts of Queensland, by assisting groups of small owners to erect mills capable of turning out a product suitable to modern requirements. Owing to the large cost of the machinery of a modern sugar mill—£100,000 or more—planters were unable to erect one without Government help. In all, fourteen mills have been erected with Government assistance, while two more are now being built. These last will be of the most modern type, and they will be very powerful, making between 10,000 and 20,000 tons of sugar per year each.

The idea in view with all these mills was that they should gradually pay off to the Government the capital cost, and become the property of the men who mortgaged their properties in order to get the factories. Only four mills now remain in the hands of the Government, the State having been compelled in these cases, through failure in meeting their obligations, to step in as mortgagee and manage the concerns.

In the returns of these government-aided factories, as given in an official report just published, there are great variations. The success of a sugar mill depends on various things, but mainly on a large and continuous supply of cane. To get the best results from the costly and intricate machinery it must be worked as nearly full time as possible. Where this is done the best results are usually shown. The greater the quantity of cane put through, the smaller the proportionate cost of treatment. The more efficient the machinery, the greater the amount of sugar content extracted, and the better the return. The difference in the cost of manufacture in these Queensland factories, per ton of cane, ranges from 2*s* 1*d*. to 7*s*. 7*d*. The difference also in the amount of canes needed to make a ton of sugar is from less than 8 to more than 10 tons. The total amount of cane crushed during the last season was 427,000 tons, producing nearly 48,000 tons of sugar.

The government-aided central factory system has done much for the sugar industry in Queensland, but it has not attained the ideal success hoped for. In the later movements for establishing new mills, efforts have been made to obviate defects, and remedy abuses.

The value of the sugar-cane industry not only to Queensland, but to the whole Commonwealth of Australia, is very great. It seems to afford the best means of populating the immense tropical districts of North Queensland.

THE CULTIVATION OF VANILLA.

In the *Agricultural News*, Vol. XI, p. 148, there appeared an article on the curing of vanilla. Since then from time to time, enquiries have been made of the Imperial Department as to the cultivation of the plant. In view of this, and also because vanilla seems to be a plant suitable for growing in some of these islands, the following notes on its culture may be of interest.

The vanilla of commerce is the cured fruit—known as bean—of a climbing orchid, two species of which are chiefly used in cultivation for the production of this spice—*Vanilla planifolia* and *V. pompona*, both being natives of the tropic regions of Mexico, Central America, and the northern parts of South America. It has been most successfully cultivated as an exotic in the tropic islands of the Seychelles, Réunion, Java, Tahiti, the Fiji Islands, and the West Indies. In Queensland also there are flourishing plantations.

The two species resemble each other closely. The leaves, however, of *Vanilla pompona* are larger than those of *V. planifolia*, while the pods are thicker and more fleshy, but they do not fetch as high a price.

Vanilla requires a tropical climate, hot and moist, with frequent but not excessive rains. It cannot stand drought or strong sea winds.

The soil which is necessary for the successful cultivation of vanilla is a light one with abundance of humus, and good drainage. Stiff clay soils or water-logged ground must be avoided. Mr. A. McFarlane, in an essay on vanilla, published in the *Trinidad Bulletin*, Vol. V, p. 465, recommends as an ideal site for a vanilla plantation the sloping sides of a valley. The natural drainage is an advantage.

In his book *Spices*, Mr. Henry N. Ridley suggests a sloping hillside covered with woods, which of course must be suitably thinned out to allow of sufficient light during the flowering and fruiting seasons. In newly cleared ground, which is not furnished with trees suitable for the support of the vines, support trees must be planted, or the system of cultivation on trellises must be adopted. Whichever plan is followed, the clearing should never be effected by fire. All trees and branches should be cut into pieces, and left to rot on the ground as plant food for the vanilla vines.

Many kinds of trees are used for supports. The best kind is one which will grow from 'cuttings', that is to say posts, from 3 to 8 inches in diameter, and 7 or 8 feet long. It should be a moderate grower which does not give too dense a shade. Mr. McFarlane suggests as good supports, *Bauhinia* sp.; the anatto (*Bixa orellana*); or the candle nut (*Aleurites triloba*). *Jatropha Curcas*, known in the West Indies as physic nut, is also recommended by some authorities for the purpose. According to the author of an article in *L'Agriculture Pratique des Pays Chauds*, 1910, Part II, some trees, if used as supports, become very hurtful to the vanilla which clings to them. He considers that all species of the orders Artocarpeae, such as all figs and breadfruit, and Anacardaceae, such as mangoes and cashews, are poisonous to the vanilla, the former because of their milky sap, which, he says, is injurious to the clinging, and even to the subterranean roots of the vanilla vine; and the latter, because they are usually infested with the black blight, which quickly attacks and weakens the vanilla attached to the trees. He also dislikes for the purpose, *Albizzia Lebbek*, a common tree in the West Indies. Instead of living trees, posts with bars across the top are used in some plantations. McFarlane, in the essay referred to above, dislikes this method, for the reason that when the posts and cross bars rot, as they will do, too much labour is entailed in replacing them, with too much risk too to the supported vine. The trunks of tree ferns have been found in the West Indies to be well adapted for supports, as they are practically indestructible, and at the same time afford excellent attachment for the aerial roots or tendrils of the vanilla. This attachment, in case of the supports having too smooth a surface, can be assisted by wrapping dry banana leaves, or other suitable fibrous material, around the support, securing them with the necessary ties. The supports, of whatever kind, should not be too close; from 8 to 9 feet apart is recommended. In the case of the ground being cleared of trees and exposed to the full light of the sun, banana plants have been beneficially employed as shade for the young vanilla, until the trees on which it is intended that it should climb have attained sufficient growth to provide the necessary shade. If the site selected be exposed to strong winds, it is recommended that a hedge of some quick growing shrub, such as the red hibiscus, be grown as a wind screen. Important points to keep in mind are that the vanilla requires (1) partial but not too heavy shade, and (2) protection from injury by strong breezes, because vanilla is naturally a forest plant.

Vanilla is practically always propagated by cuttings. Where only a limited amount of vines is to be had, they may be cut into pieces of about 1 foot in length, and for such short cuttings it is preferable to plant them first in a nursery bed composed of decayed leaves and leaf mould. By keeping this well watered and shaded, the young plants will have made good roots in a couple of months, and may then be removed to the plantation. Much longer cuttings, however, are generally used, if obtainable, from 4 to 12 feet even in length. McFarlane says that such long cuttings will begin to bear a few beans in about eighteen months after planting. In any case the method of planting is the same. About a foot from the post a slanting hole is made a couple of inches in depth. Into this the end of the cutting is inserted, and the soil pressed tightly around it. The vine is then laid flat on the ground from the hole to the post, and the rest of it tied up on to the post. The part on the ground should be a length of at least two or three joints. This should be thickly covered with dead and rotten leaves, and one or two stones laid atop to keep the vine and its covering in place. Though the cutting will send out roots from the cut end, the strongest roots will be produced at the joints. The best time to plant is in rainy weather. The plants must be kept well watered until growth starts.

The vanilla is essentially a surface feeder, the roots spreading between the humus and the underlying soil. On this account it is unnecessary to dig or plough the ground. But it is very essential that the plants be kept supplied with a sufficient amount of decaying vegetable matter. Artificial manures should not be used, nor animal manure, except in small quantities, well rotted, and mixed with leaf mould.

As regards weeding, McFarlane is opposed to it. He believes that it is better to have the ground of the plantation well covered with weeds of various kinds. These act as a mulch for the surface feeding roots of the vanilla, and the deeper rooted varieties bring up food from the deeper layers of the soil, which the vanilla roots cannot reach, converting it into food, in the shape of fallen leaves, etc., thus constantly manuring the plant. Among plants which he thinks are specially beneficial as surface protectors are species of Tradescantia, common in the West Indies. The French writer above referred to recommends the same thing, but he considers that two species of Oxalis, one of which (*O. corniculata*) is also common in some of these islands, are the most useful plants for the purpose. Of course, if there are climbers among the weeds, which will strangle the plants, or strong growing

shrubs, which shut out the light from the young plants, it will be necessary to clear these out. In its wild state vanilla does not grow on bare soil, and it is more natural to leave the ground covered with a carpet of herbaceous weeds.

After planting the cuttings, all the care that the plantation requires, until the vines begin to flower, is to keep the growing supports pruned, and in case any of the vines grow too high, to turn them down. This turning down of the vines is most important, and must not be neglected. As soon as a vine has reached the length of 10 or 12 feet, it should be loosened from the tree for about the top half of its length, and hung over a convenient branch. It is on these hanging branches that the flowers are produced; and as long as the vine can continue to climb it will not bloom. Hence the necessity of turning down. The end of the vine should not hang lower than a foot from the ground. It must be pinched off when it reaches that length. In detaching the upper part of the vine from the tree it is best to cut the tendrils carefully close to the vine rather than attempt to loosen them from the tree, thus saving time, and possibly the vine, which is more brittle than the tendrils.

A certain amount of pruning is necessary. It is beneficial to remove the branches which have fruited, cutting them off close to the top of the post. The plant will replace them by others, which will be of full length by next flowering season. A small step ladder is useful for the operations of turning down and pruning.

McFarlane suggests that on a vanilla plantation both species of vanilla should be cultivated, as they flower at different times, and so the estate can be kept working for most of the year.

DOWN THE ISLANDS.

ITEMS OF LOCAL INTEREST.

ST. VINCENT. A meeting of the Agricultural and Commercial Society, to discuss the agricultural situation, was held on November 11, at which His Honour the Administrator presided. The Agricultural Superintendent held meetings of small owners during the month at several country villages. Six hundred cuttings of sweet potato were distributed from the Experiment Station, and 240 lime plants from the nursery in the island of Bequia.

ST. LUCIA. The Land Settlement at Réunion is progressing, twenty-two lots having been already sold. The land at the Experiment Station, let in small lots free to families in the village for the duration of the war, has been planted throughout with food crops, which are in excellent condition, and are well taken care of. The second lime crop promises to be a good one; 8,600 lime plants have been sent out from the station during the month. The sugar crop is beginning to be reaped in many localities. The Assistant Director of Agriculture and the Superintendent of the Industrial School, British Guiana, are expected to pay a visit to St. Lucia early in 1915, for the purpose of examining into the working and management of the Government Lime Juice Factory, in view of similar projects in British Guiana.

DOMINICA. The Annual Examination of the Imperial Department of Agriculture for estate overseers was held on November 23. Among the plants distributed from the Experiment Station there were 1,850 lime plants and fifty Para rubber. Some improvement will soon be made in the Botanic Gardens by the erection of a new iron fence near the south gate.

MONTSERRAT. A further experimental shipment of twelve dozen pine-apples was made to Canada on November 5—4 crates of ripe pines in cool storage, and 4 crates in hold space. An experiment has been started with sweet potatoes to test the value of cuttings from tubers, compared with those from vines. One quarter acre of onions has been planted at Harris's Station.

ANTIGUA. An improvement has been made in the Botanic Garden by filling up and grassing over the unsightly rubbish yard on the western lawn. In the distribution of plants there were included 823 coco-nuts, 633 eucalyptus, 231 bay trees, 52,600 onion plants, and 3,000 sweet potato cuttings. Though the cane crop seems to be improving, more rain is required. Further trials in making corn meal are in progress.

ST. KITTS. The fine rainfall in November has considerably improved the sugar-cane crop. It will however be late in maturing. Owing to the backward condition of the ratoons, the question of good plants for the next crop is a serious one. On muscovado estates plants are being obtained from the canes left over from last crop, but on the estates in the factory system dependence has to be put on plants from second ratoons, and here the need of cane nurseries makes itself felt. The greater part of the cotton crop has been reaped, and on the estates the land is being prepared for planting cane. Where cotton is a permanent crop the new growth is coming on well. A meeting of the Agricultural and Commercial Society was held in November, at which Dr. Tempany read a paper dealing with the agricultural situation. This is referred to in another column. From the Experiment Station 1,750 sweet potato and 2,000 casava cuttings have been distributed.

NEVIS. The cane crop, on the whole, looks very promising throughout the island. The cotton crop is reaped, the average return having been about 130 lb. of lint per acre. It is to be regretted that fields of old cotton, planted early in 1913, are still standing in certain parts of the island. The provision crops, especially sweet potatoes, are doing well. There have been distributed from the Botanic Station 1,000 sweet potato cuttings, 2,750 onion plants, and 8 lb. of Guinea corn for seed. Dr. Tempany read a paper to a meeting of planters on November 26 on the same subject that he had dealt with in St. Kitts.

Red Guinea Corn.—A variety of sorghum from East Africa, where it is called Dhurra, is known in Jamaica as red Guinea corn. The *Journal of the Jamaica Agricultural Society*, August 1914, contains an article in which the drought-resisting capacity of this variety is greatly praised. The writer of the article says that in the Liguanea Plains this year, during a time of severe drought, when maize did not grow 6 inches high, and even sweet potatoes were dried up, a crop of Dhurra came to maturity in a little over three months, and formed fine heads with large grains. There are dry parts of Jamaica where crops of maize were planted this year, which failed entirely through drought, whereas red Guinea corn would almost certainly have produced a good crop within five months.

The large red grains of this variety are not hard, and are easily ground or pounded into a flour which makes excellent porridge and cakes. There are other virtues in this sorghum: if by accident an animal eats down a part of the field, it will spring up again: it needs no replanting for a second crop; and further, when the first heads are cut off, three or four smaller heads grow on the same stem lower down, and at the same time ratoons spring from the roots so that every month throughout the year, and longer, crops of grain may be picked.

COTTON.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date November 30, 1914, with reference to the sales of West Indian Sea Island cotton:—

The only business in Sea Island cotton since our last report has been 15 bales stained at 7½*d.*

Carolina Islands are worth 12½*d.* for Fully Fine, and 13½*d.* for Extra Fine, but we do not anticipate much demand until the Germans are out of France and Belgium, as large quantities of Sea Island cotton and yarn are used there.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending November 21, is as follows:—

The movement of the crop to market is unprecedentedly small, the receipts to date being only 901 bales, against 2,497 bales last year. Although this is partly due to the small planters' unwillingness to accept prices now current, however, it does not fully account for it, therefore the Factors are beginning to realize that the acreage was very much reduced, and crop estimates now range around 6,000 bales.

The quality of the Planters' crops seems very good, but the odd bags do not show the improvement hoped for, and the present outlook is that the supply of Fully Fine and Extra Fine will be small.

There has been some demand during the week, resulting in the above sales on a basis of Fine 18c., Fully Fine 21c. to 22c., Extra Fine 23c. The market closed quiet, with very limited offerings.

We quote, viz:—

Extra Fine	23c.	=	13½*d.*	c.i.f. and 5 per cent.
Fully Fine	21c.	=	12½*d.*	„ „ „ „
Fine	18c.	=	11*d.*	„ „ „ „

Freights have advanced 1c. per ℔. and are difficult to secure.

A later report dated November 28 gives the following information:—

The movement of this crop continues very slow, the receipts for the week being only 214 bales, and to date 1,197 bales, against 2,957 bales last year. Although crop estimates are reduced to 6,000 or 7,000 bales, much the larger portion is still on the plantations, and will probably be marketed more freely during December, furnishing a larger offering stock to buy from.

The demand continues on a basis of our quotations, the larger portion of the sales consisting of Fine and Fully Fine on account of the northern mills. The limited supply of Extra Fine to be selected from the odd bags is also in demand.

We quote, viz:

Extra Fine	23c.	=	13½*d.*,	c.i.f. & 5 per cent.
Fully Fine	20c. to 21c.	= 12*d.* to 12½*d.*,	„	„ „ „
Fine	18c.	= 11*d.*	„	„ „ „
Fine off in colour	17c.	= 10½*d.*	„	„ „ „

CONSIDERATIONS AFFECTING THE COTTON INDUSTRY IN THE WEST INDIES.

As was promised in the last number of the *Agricultural News*, an abstract of the concluding portion of Dr. H. A. Tempany's address to the Agricultural and Commercial Society of Antigua is here given. During Dr. Tempany's visit to England, he spent some days in Manchester and Liverpool so as to observe the conditions attending the consumption of Sea Island cotton. The following is an abstract of his remarks on this subject.

West Indian cotton has attained at the present time a perfectly well-recognized position in the market for Sea Island cotton, and is looked on as a regular source of supply of some of the highest grades of cotton now handled. The position which the West Indian grades occupy in the cotton market may be understood from the following. Fine staple cottons comprise such growths as the Egyptian Sakel variety, which has largely displaced the coarser growth of Sea Island from Georgia and Florida; it usually sells at about 1*s.* per ℔., with ordinary West Indian fetching about 18*d.* The grades above this particular quality are the finest cottons from the Sea Islands of Carolina, and the West Indies. There is this important distinction: that whereas the demand for cotton of the Sakel type is very large, that for the classes finer than this is limited. Therefore, if West Indian cotton is to maintain its position, the very greatest care must be paid to the quality of the seed supply. West Indian planters must try to understand clearly the requirement of the spinner. The class of cotton at present supplied by the West Indies meets fairly well the highly specialized requirements of the spinners of the finer classes of yarn. These islands are peculiarly adapted for the production of this type of cotton. If, however, owing to carelessness in seed selection, the character of the staple falls off, West Indian cotton will be classed with the lower grades, and not only will a reduction in prices take place, but the reputation which these islands now have, of being reliable sources of supply for the finer type, will become impaired. During the last few years there has been an improvement in quality doubtless to be attributed in some measure to the attention which has been bestowed on the question of cotton selection throughout these islands by the officers of the Agricultural Departments.

The market for the finest type of cotton in England is limited, and practically entirely in the hands of one group of consumers. Nevertheless, each season the whole of the West Indian cotton has been consumed. At present, however, there does not seem to be room for any great expansion of area devoted to this crop. Dr. Tempany was much impressed by the care that is taken in the selling of West Indian cotton by Mr. Charles Wolstenholme, the broker of the British Cotton Growing Association, and thinks that it is largely owing to the time and trouble that he has expended on the work, that West Indian cottons have attained their present position.

Considering that West Indian Sea Island cotton is such a highly specialized article, it would be probably the best course for the growers in all these islands to combine together to form an Association, which would be able to some extent to regulate the supply. At the present time the crop is flung haphazard on the market for the spinners to take or leave, as they like. If the supply could be regulated in an intelligent manner, many of the very real grievances of growers here would be removed.

Unfortunately, there is no doubt that the fine cotton

trade is bound to be largely at a standstill until the end of the war. Under these circumstances the wisest course for the West Indian islands appears to be to curtail their production at the present, and to turn their attention to other crops. Not that cotton cultivation should cease; for it is hoped that when the war is over a great revival in fine spinning will take place, and it is essential that a sufficient area should be kept under cultivation to maintain our seed supply in such a high state of efficiency that we may be able to resume cotton cultivation under the best conditions.

As to other crops; in many islands planters will turn their attention to sugar-cane, and no doubt some extension in the area under cane cultivation will take place. The cultivation also of food crops, not only for local consumption, but also for export, contains important possibilities which may prove more than a useful stop gap, even developing into industries of some importance.

INDIAN CORN.

CARE OF SEED CORN.

The Indian corn plant is remarkable for its productiveness and for the virility of its seed. In a normal season, every kernel of grain on ears that have properly matured, and have then been properly cared for and stored, will germinate. In seed selection, then, it is not a question of finding seed with good germinating power, but rather of taking seed possessing that power, and retaining it in full until it is wanted for the production of a new crop.

This part of the work is most important. The corn grower must select his seed for yield, since yield is the all-important thing in a corn crop. At the same time he selects for certain definite features which taken together conduce to the yield, to uniformity of grain, and to suitability to the local conditions under which the succeeding crops are to be grown.

Having selected the seed in the field (see last issue of *Agricultural News*) the corn grower should have it dried thoroughly and rapidly, and, from then on, should keep it dry.

The curing and storing of seed corn is quite a different matter from curing and storing corn as grain intended for feeding. Corn intended for planting is best preserved on the ear, or unshelled; corn for grain is generally shelled as soon as dry enough, because of the saving in space in storing shelled corn, which has only one-half as much bulk as the same amount of grain on the ear, i.e. 2 bushels of ears will give 1 bushel of shelled corn. When corn is intended for feeding purposes its germinating power is of no importance, but it is most necessary to maintain this in its fullest vigour in the case of seed corn.

In the United States, seed corn ears are stored in racks or shelves; the racks hold one ear in each section, and the shelves are made to take a layer of ears laid side by side.

In the West Indies, seed corn is often dried in the husk on the roofs of buildings or hanging in the branches of trees. This practice may be all right, but it would seem that the changes in the atmosphere from dry to moist and from moist to dry would result in the loss of germination. It would be interesting to test the germination of such seed corn as to the percentage of kernels that will grow. Seed corn ought always to have a percentage germination of well over 90.

After the corn is selected in the field, and dried, the ears should be carefully examined, and the best of them chosen for planting. If the corn has been properly selected with regard to field characters, the largest of these selected ears which show the required characters of ear and grain should be the first to be chosen, always with the idea of large yield in mind.

The seed is best preserved on the ear, the small and irregular shaped kernels on the tip and butt being shelled off and discarded before planting. For planting purposes the corn should be carefully shelled by hand.

In the West Indies, there should be no difficulty in drying the seed corn properly in the sun and wind. For this purpose the ears might be spread in thin layers, preferably in a single layer, and they should not be allowed to get wet. It would probably be found satisfactory also to hang the corn in traces in a building in which air circulated freely. To make the traces, the husk should be turned back from the ear, but not broken off, and then braided up in such a way that neat traces or strings of forty to fifty ears are made; each ear would then be exposed to the air. The matter of storing seed corn should be made the subject of experimental trials in order to demonstrate the best method for each locality. The value of any method of storing should be determined by germination tests.

Mr. C. P. Hartley, Physiologist in charge of Corn Investigations, United States Bureau of Plant Pathology, is the author of Circular No. 95 of that Bureau, entitled The Seed Corn Situation. According to this circular, the situation in 1912 with regard to seed corn for planting in many corn-growing sections of the United States was a serious one. Farmers had neglected to select seed in good time, with the result that late rains and early frosts so injured the ripening corn at the end of 1911, that many were without seed for planting in the spring of 1912. The farmers blamed the bad season for the deplorable situation in which they found themselves, but Mr. Hartley blamed the farmers, for, in spite of repeated warnings, they had not selected and saved their seed corn as early as they might have done.

Mr. Hartley says 'Twelve years' experience in selecting seed of hundreds of varieties of corn, and testing its germination, teaches that seed that matures well and is well preserved will germinate well. And what is of much more importance, it will yield well if the variety is a good yielding, acclimated variety.'

In another place the same author has the following to say about corn 'running out', and about the need for importing new varieties :—

'A mistaken idea prevails regarding the "running out" of corn because it has been grown too long in a locality. A strain of corn may run out, but the cause is with the farmer, and is not because the corn has been grown too long in the same locality. The longer a corn is grown in the same locality the better adapted it becomes to the conditions of that locality, provided seed is saved each normal season from the best producing individuals.'

West Indian planters would do well to bear these remarks in mind. Newly introduced seed is not wanted at the present time in order to develop a profitable corn industry. Our native West Indian corn planted in the localities where it has been grown year after year is the best seed to start with in the first improvement of the local strains of corn. Careful seed selection, and the proper storing and curing of the selected seed will result in increased yields, and a better product generally, while the work which is involved in this kind of improvement will in a few years result in a sufficient knowledge of the corn plant, and the improvement which can be effected by selection of seed, to enable the planter and experiment station worker to decide whether further improvement will be likely to result from an introduction of new strains of seed, and technical plant breeding.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

Local Agents: Advocate Co., Ltd., Broad St., Bridgetown. *London Agents*: Messrs. Dulau & Co., 37, Soho Square, W.: West India Committee, Seething Lane, E.C. The complete list of Agents will be found on page 3 of the cover.

The *Agricultural News*: Price 1*d*. per number, post free 2*d*. Annual subscription payable to Agents, 2*s*. 2*d*. Post free, 4*s*. 4*d*.

Agricultural News

VOL. XIII. SATURDAY, DECEMBER 19, 1914. No. 330.

NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number treats of Agricultural Departments; their work in the past, and their possible development in the future.

On page 401 there is an account of the working of the Government sugar factory system in Queensland.

The cultivation of vanilla, on page 402, will probably be of interest in some of these islands at the present time.

Under the head of Indian Corn, on page 405, there is an article on the care of seed corn,—an important question.

Insect Notes, on page 408, contains a summary of the entomological information given in this journal during the year 1914.

Fungus Notes, on page 412, also contains a summary of the information given during the year on that subject.

The longer article in the Veterinary Notes, on page 413, treats of epizootic lymphangitis: the shorter one gives hints for the treatment of fistula in horses.

Publications of the Imperial Department of Agriculture.

Number 77 of the Department Pamphlet Series has just been issued. It contains two papers by Mr. P. T. Saunders, M.R.C.V.S., late Veterinary Officer on the Staff of this Department.

The first of these papers on Epizootic Lymphangitis, appears in the present number of the *Agricultural News*, under the heading Veterinary Notes. A more technical paper on the same subject was contributed by Mr. Saunders to the *West Indian Bulletin*, Vol. XIV, No. 3, p. 167.

The second paper is on a disease known as Husk or Hoose, which is caused in certain animals by the presence of nematode worms in the bronchial passages.

The information given in this pamphlet as to the causes, diagnosis, and treatment of these diseases, should be of value to planters and all owners of stock, especially in places where the diseases are prevalent. Price 2*d*.: post free 2½*d*.

Personal Notes.

Mr. P. T. Saunders, M.R.C.V.S., late Veterinary Officer on the Staff of the Imperial Department of Agriculture, has enlisted, and has received a Commission as Lieutenant in the Royal Army Veterinary Corps. It is understood that Lieutenant Saunders is at the front.

Information has been received from St. Lucia of the death, on November 30, of Mr. C. R. Kennaway, at his residence La Perle estate, in the Soufrière district. Considering the increased attention that is being paid to the cultivation of limes in St. Lucia, it may be noted that Mr. Kennaway was one of the pioneers in this direction.

He was always ready to assist in every way the Agricultural Department. In co-operation with the Imperial Department of Agriculture he had started an agricultural credit society in the Soufriere district, which is likely to be of benefit to a group of small holders there.

Information has also been received that Mr. Condell, the Inspector of Schools in St. Lucia, has been promoted to the combined post of Colonial Secretary, Police Magistrate, and Coroner of the Falkland Islands.

During the time that Mr. Condell held the office of Inspector of Schools he co-operated with the Department of Agriculture in the establishment of a system of instruction in agricultural matters in the schools of the island, by encouraging the masters of elementary schools to cultivate school plots, and by supporting the Agricultural Superintendent in holding periodical examinations in the rudiments of agriculture throughout the island.

The death of the late Dr. William Saunders, C.M.G., in Canada on September 13, causes the loss to the world of a notable man of science. He worked hard and successfully in the field of Canadian agricultural investigation, and was fortunate enough to live to see the fruits of his labour, in the improvement

of agriculture throughout the Dominion. As head of the Experimental Farms he conducted many experiments in hybridizing fruit and cereals, to the great benefit of the growers of these crops in Canada. With regard to his work on wheat, a very appreciative article in *Science*, November 13, 1914 says that it has proved of paramount importance and value to Canada: that the production of the Marquis wheat has demonstrated the value of research work in agriculture: and that its value to Canada is scarcely to be calculated in thousands of dollars.

Owing to his scientific crossing of apples, using as the female parent the very small Siberian crab apple, Dr. Saunders has made the production of fairly good apples a reality in regions where the winter temperature falls as low as 60 below Zero, Fahrenheit.

Besides his work in this direction Dr. Saunders was an eminent entomologist, one of his books, entitled *Insects Injurious to Fruit*, being widely used as a text-book in agricultural colleges in the United States and Canada. Dr. Saunders's reputation was world-wide, so that he received many honours from learned societies and universities. He was created a Companion of the Most Distinguished Order of Saint Michael and Saint George by His Majesty King Edward VII, in recognition of his services in the improvement of the agriculture of the Dominion of Canada.

The Mauritius Department of Agriculture.

The Department of Agriculture of Mauritius was formed in 1913, absorbing into its organization the Station Agronomique and the Statistical Bureau of the Chamber of Agriculture, which formerly existed in that colony.

Mr. F. A. Stockdale, M.A., F.L.S., sometime Mycologist on the staff of the Imperial Department of Agriculture, and later, Government Botanist and Assistant Director of the Board of Agriculture, British Guiana, is the Director of the new department, which has its headquarters at Reduit.

The staff of the Department, which includes M. d'Emmerez de Charmoy, has lately been increased by the addition of two officers from the West Indies, Mr. G. G. Auchinleck, B.Sc., who has been appointed Assistant Director and Chemist, and Mr. F. Birkinshaw, who goes as Agricultural Instructor.

Mauritius is principally a sugar-producing colony. The area of the island is 720 square miles, while the export of sugar amounted, in 1912, to 206,677,000 kilos. (about 206,677 English tons) having an estimated value of Rs. 28,900,000 (about £1,926,666), which was about 95 per cent. of the total exports.

The sugar-cane is attacked by two chief pests, the rhinoceros beetle (*Oryctes tarandus*), and the brown hard back (*Phytalus smithi*), the latter of which is a recent introduction, probably from Barbados. For several years the ravages of this pest have seriously affected the sugar crop, and one of the principal problems before the new department is the control of this and other pests.

Dutch Sugar Standards.

The Commissioner of Agriculture has learned that the new annual issue of colour standards for raw sugars has been received by the Customs Departments at Ottawa and Montreal.

It is stated that there is a serious difference between the new standards and those which have been in use for the past six years, amounting to about one and three quarters degrees. In the new standard No. 16 approximates to the former Dutch Standard No. 14, and is stated to be darker than those used by the New York customs authorities.

This matter has been brought to the attention of the Canadian Government, but so far no steps appear to have been taken to bring the standard into unison with those formerly issued.

It will be important to planters and others exporting to Canadian markets to note these facts, and to endeavour to obtain accurate information, accompanied by specimens, illustrating the standard now in use.

Rabbits.

In a note appearing in the last number of the *Agricultural News* attention was drawn to the increased interest shown in England in the rearing of rabbits for the table. More might be accomplished in the West Indies also in this direction. Rabbits give more food per year, and wholesome food too, than any other animal used for human consumption. They can be raised very economically, as in these islands their food costs next to nothing. The *Journal of the Jamaica Agricultural Society*, September 1914, gives some valuable advice about the keeping of rabbits.

One great fault noticeable in rabbit pens is that the amount of green food which rabbits can consume is not considered. Very many rabbits are only half fed. They should literally have a pile of green food provided them. This, with the valueless potato 'pickings' and a handful of corn now and then, is good enough for them. They eat all sorts of common weeds, and any kind of grass.

Another great fault is lack of cleanliness. Plenty of bedding, and this cleaned out regularly, is necessary. A wonderful lot of manure, excellent for garden use, can be accumulated from a rabbit pen.

Another fault is not keeping the sexes separate, and the consequent deterioration of the stock by perpetual inbreeding. The young does should be separated from the young bucks at not later than three months after birth: and the breeding stock should never be left running together.

If these hints were acted on, every one keeping rabbits ought to be able to produce economically a good deal of meat food for use in his household. It is computed that a doe rabbit having young on January 1 can have thirty-six young ones by December 31, counting six to a litter: and, as some of the earliest of these will by then be themselves having young ones, the progeny of the one doe rabbit will probably be more than 100 in the course of a single year.

INSECT NOTES.

SUMMARY OF ENTOMOLOGICAL INFORMATION DURING 1914.

In accordance with the practice which has been followed for several years past of summarizing the information which has been presented in the Insect Notes, the present article deals with the entomological information which has appeared in the *Agricultural News* during the year 1914.

The summary for the preceding year was presented in three articles of the present volume at pages 26, 42, and 58.

The insect pests attacking sugar-cane were dealt with in eight numbers of the *Agricultural News*. Six of these articles were based on reports, as follows: An Entomologist's Visit to Demerara, Trinidad and Barbados, p. 138; Insect Pests and Fungoid Diseases in Barbados in 1912-13, pp. 170 and 186; Insect Pests of Sugar-cane in British Guiana, pp. 218 and 234; Moth Borers of Sugar-cane in British Guiana, p. 392.

The first of these reports is that of Mr. Geo. N. Walcott, Assistant Entomologist on the staff of the Porto Rico Board of Agriculture, who was engaged in the study of the natural enemies of soil grubs which attack the roots of the sugar-cane.

At the time of his visits, February and March 1913, Mr. Walcott found the moth borers (*Diatraea saccharalis*, *D. lineolata* and *D. canella*) the most serious pests of sugar-cane in Demerara. The remedies of which he learned were, the cutting out of dead-hearts, the collection of larvae and pupae, and the collection of eggs. He records two hymenopterous parasites of the eggs, *Trichogramma minutum*, and *Telenomus* sp., one which attacks the moth borer larva, *Iphiaulax* sp., and the Tachinid flies which have bred from the pupae.

Castnia licus was the other important pest of sugar-cane observed in British Guiana. The collection of the moths, and of the larvae and pupae are the remedies for this pest.

Mr. Walcott observed the froghopper (*Tomaspis varia*) in Trinidad, and remarked on the agricultural practice of allowing weeds and grass to grow in the fields and traces, and of abandoning fields of infested and diseased cane to become breeding places for these pests, thus forming an ideal environment for the propagation of large numbers of froghoppers and other pests. He described the methods of using the green muscardine fungus (*Metarrhizium anisopliae*) including the development on layers of cooked rice in specially constructed culture cabinets, and its application in the field by means of blowers mounted on flat cars on the estate tram lines. The giant moth borer (*Castnia licus*) was also observed in Trinidad, where the only means of control seemed to be the collection of the adult moths by means of nets.

In Barbados, the moth borer was found in greatest abundance, and Mr. Walcott was of opinion that the injury caused by this insect was as great, if not greater, in Barbados than in Demerara

The root borer (*Diaprepes abbreviatus*) was considered the most severe pest in Barbados.

The report on Insect Pests of Sugar-cane in British Guiana, mentioned above as having been reviewed on page 234, is that of Mr. H. B. Moore, Entomologist on estates of Messrs. Curtis, Campbell & Co.

Mr. Moore's work was largely connected with the control of the moth borers, and especially with the study of natural enemies. In the cutting out of dead-hearts on seventeen estates the number of caterpillars recorded as captured was 25,583,987. The number of egg clusters collected on twelve estates was 180,000.

In this report stress is laid on the importance of the proper care of refuse cane tops which, if left in the fields, are a prolific source of infestation for the next crop. The report records a new egg parasite, *Aphaneurus alecto*, and two parasites of the moth borer larvae *Iphiaulax medianus* and *Cremnops parfasciatus*, as well as those previously well known, and some of minor importance.

Mr. Moore estimates, that in the canes that go to the mill, the injuries by the moth borer are sufficient to cause a loss of 20,000 tons of sugar in the colony, in addition to the loss of canes cut out as dead-hearts.

Termites were considered to rank next in importance to the smaller moth borers as cane pests in British Guiana. These were principally of two species, *Eutermes costaricensis* and *Mirotermes nigritus*. Termites nests to the number of 460,000 were destroyed on eight estates during the year.

The giant moth borer (*Castnia licus*) was collected in large numbers. On seventeen estates, the collection amounted to 1,970,000 caterpillars and moths.

Another report from British Guiana, which dealt entirely with the smaller moth borers, was that reviewed at page 392, by Mr. J. J. Quelch, B.Sc., Entomologist on the group of estates just mentioned. This report deals entirely with the results of the collecting of egg clusters of moth borer, which indicates that this line of control, properly carried out, should have the effect of reducing the number of these pests.

The Annual Report of the Government Economic Biologist, Mr. G. E. Bodkin, B.A., was reviewed at page 218, under the heading Insect Pests in British Guiana. Mr. Bodkin mentions his six months' trip to the United States under the provision of a Carnegie Scholarship.

The list of sugar-cane pests given is rather a long one, but those in addition to the well-known ones already referred to are of minor importance.

The insect pests in Barbados were mentioned on pages 170 and 186, where the report of the Local Department for the year 1912-13 was reviewed. The work with insect pests was carried out by Mr. W. Nowell, D. I. C., then Assistant Superintendent of that Department.

The sugar-cane pests dealt with in the report are the brown hard back (*Phytalus smithi*), and the root borer (*Diaprepes abbreviatus*). The root borer continued to be a pest on a limited area: the collection of the adults on one estate during the year amounted to 69,700, the numbers for the two weeks ending October 28 and November 4, being 7,500 and 7,700, respectively.

The brown hard back continues to be satisfactorily controlled by its parasite, *Tiphia paralella*.

The report adds nothing to our knowledge of the control of these two cane pests, but it is of considerable interest since it records much that is new in their life-histories.

The article entitled Sugar-cane Pests in the Leeward Islands is a review of a pamphlet with that title, No. 75 of the Pamphlet Series of the Imperial Department of Agriculture. This pamphlet gives a list of the better-known pests of sugar-cane, and deals at length with some of those which have recently been demonstrated to be pests.

These are the brown hard back, that of Antigua being *Lachnosterna* sp., and that of St. Kitts, *Lachnosterna patruelis*.

The Antigua brown hard back has been known to be present in cane fields for several years, attacking, and causing the death of newly planted canes, and it has also been known as a serious pest of Indian corn and onions. The remedy suggested for its control is the use of Indian corn as a trap crop, and collecting the grubs in December or January from the soil about the roots of the well-grown or ripening corn plants.

The St. Kitts brown hard back (*L. patruelis*) occurs in large numbers in the soil of certain cane fields, but the exact nature and extent of the damage caused by this insect have not been determined.

The Leeward Islands root borer (*Exophthalmus esuriens*), has in the past few years come to be recognized as a pest of importance. The adult insect has long been known to be of common occurrence throughout those islands, but it is only recently that the injury caused by its grubs has been recognized.

The article entitled Root Borers, which appeared at page 250, discussed the recent occurrence of this pest on a large scale, and referred to its discovery in Barbados where it was feeding on one of the sisal plants, *Agave sisalana*. In this article mention was also made of the occurrence of the insect, referred to in Martinique as *Exophthalmus esuriens*, which is probably identical with the Barbados root borer (*Diaprepes abbreviatus*).

To return to the sugar-cane pests of the Leeward Islands, the termites which attack sugar-cane in St. Kitts belong to one species (*Leucotermes tenuis*), attacking canes at all stages, but inflicting greatest damage on the ripening plants; while *Eutermes haitiensis* in Antigua is most noticeable from its injuries to newly planted cane cuttings.

Leucotermes tenuis is not known to build any nest, and the remedy suggested is a rotation of crops, such as growing cotton and green dressings for several years on infested fields, and exercising care to plant no infected material. In Antigua *Eutermes haitensis*, which builds large and generally conspicuous nests, may be controlled by the destruction of their nests.

Insect pests of cotton have been noticed in two issues: at page 186, under the heading Insect Pests at Barbados 1912-13, the leaf-blister mite of cotton is mentioned as having spread to all cotton-growing areas in the island. The system of allowing the old cotton to remain standing in the fields, often until the new crop is planted, accounts for the infection of many fields.

In St. Kitts an ordinary and well-known cockroach (*Periplaneta australasiae*) has appeared as a pest attacking young cotton seedlings. A poison bait of Paris green and corn meal has been tried experimentally, apparently with successful results (see p. 344).

On page 250 an abstract of an article on the Citrus Root Nematode appears. This nematode is given as *Telelenchulus semipenetrans*, Cobb. It is of wide distribution, and is not known to attack any other plants than citrus.

Coco-nut pests are mentioned on page 21, in the review of the report of the Government Economic Biologist, British Guiana. The borers in the stem of the coco-nut plant include the moths *Castnia licus* and *C. daedalus*, and the weevils, *Rhynchophorus palmarum*, *Metamasius hemipterus*, and *Rhina barbirostris*. The caterpillars of *Brassolis sophorae*, *Sibine trimacula*, and a skipper butterfly feed upon the leaves. The beetles *Dycinetus bidentatus* and *Strategus alveus* destroy young coco-nut plants.

Three papers on ants have appeared during the year, on pages 298, 376, and 392.

The first of these gives an account of the acrobat ant (*Cremasto gaster*); the second gives an interesting account of the life-history and habits of a species of ant (*Technomyrmex albipes*) in the Seychelles; while the third deals with a method of exterminating the Argentine ant in the United States.

The Insect Notes, on page 74, give an account of Termites, and a list of West Indian species recently identified, with a brief account of the life-history, and descriptions of the several different forms or castes ordinarily found in a community of these insects.

In the following number, at page 90, a list of West Indian ticks is given, as well as an account of scarabee or Jacobs, with directions for planting sweet potatoes from a nursery, in order to reduce the chances of infection by this pest.

The article entitled The Eradication of Mosquitoes by Bats (p. 106) gives an abstract of an interesting account of the beneficial effects of bats in reducing the number of mosquitoes in a locality in Texas.

A brief account of the Mediterranean fruit fly in Uganda appeared at page 122.

The control of the onion thrips in the United States is the subject of an article on page 154. Spraying with nicotin sulphate 3·2 oz., cresol soap 3 pints, and water 50 gallons, at intervals of from seven to ten days, is recommended as a satisfactory control measure. An article on Insects and Pain was presented on page 312, and one on the insect pests of peas and beans, on page 376.

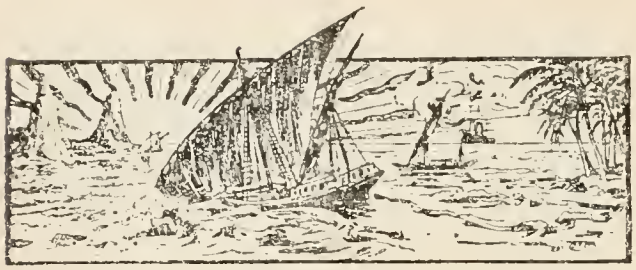
A description of a wood-boring moth, *Duomitus punctiter*, and its attacks on a variety of trees in several West Indian islands, appears at page 328. The same insect was mentioned as occurring in Barbados at page 186.

Naphthalene, as an insecticide, was discussed in two articles on pages 154 and 360, where its use for the control of fleas in a house, and for fleas on cats and dogs was mentioned. A statement of several other ways for using naphthalene was made, an important one being for the protection of stored grain from the attacks of weevils and moths.

Naphthalene enters also into the preparation of Paranaph and Scalo, two preparations for use in controlling scale and other insects. In these preparations the mixture of kerosene and soap is influenced to a considerable extent by the action of naphthalene. This is discussed in the article Paranaph and Scalo, on page 282.

The Insect Notes in the issue for November on page 376 was entitled The Effect of Insecticides on Certain Plants.

The Origin of Domestic Fowls.—Probably the many varieties of the domestic fowl originated from at least two distinct species. In an article in the *Journal of Heredity*, July 1914, C. B. Davenport thinks that besides the Jungle Fowl (*Gallus ferrugineus*), which is still found wild in India, the Aseel or Malay Fowl, which has been domesticated in the East for over 3000 years, has contributed to the formation of the modern breeds of the domestic fowl. He thinks that the Jungle Fowl is the foundation stock of the nervous, agile, egg-laying breeds—the Leghorn, Minorca, Spanish, etc.—breeds derived from the stock that first spread over Europe, brought probably from Persia. The Malay Fowl, probably coming to the West from China, has transmitted its size and heavy build to the modern fine, general purpose breeds—Plymouth Rock, Wyandotte, Orpington, etc.



GLEANINGS.

Practically the entire Hawaiian crop of sugar for 1914 is now harvested. It will run to slightly over 625,000 short tons, 25,000 more than the previous high output. (The *Louisiana Planter*, November 14, 1914.)

It is possible that the final sugar crop of Cuba for 1914 may reach something like 2,600,000 tons. Within two or three years Cuba will almost surely exceed in its sugar production the 3,000,000 ton line that is estimated generally for the British East Indies. (*Ibid.*)

Colonial Reports—Annual, No. 809, shows that the imports into the Bahamas during the year ended December 31, 1913, were valued at £403,529 as against £358,111 in 1912. The exports for the same period were £263,954 and £276,115, respectively.

The export of bananas from Costa Rica during 1913 was 11,170,812 bunches worth £1,068,977 more than half of the total exports. The total area under cultivation in this crop was 95,400 acres. (*Diplomatic and Consular Reports*, Annual Series, No. 5363.)

During 1913 the Gold Coast exported 113,239,980 lb. of cacao, valued at £2,489,218, compared with 86,568,481 lb. of a value of £1,642,733 in 1912. This increase was largely due to the fact that a greater number of farms had come into bearing; also that a large proportion of the crop of 1912-13, being late, was shipped in 1913. (*Colonial Reports*—Annual, No. 806.)

In Bulletin 279, Ohio Agricultural Experiment Station, the conclusion is reached that liming has added materially to the yield of corn under every treatment, and on the untreated land. It is also stated that the conclusion seems to be justified that lime applied to the corn crop in liberal quantity has encouraged the production of nitrates for several succeeding crops.

The mail steamer which arrived at Tilbury on October 28, brought over, as a gift for the wounded soldiers and sailors from certain planters in Dominica, 19 barrels of fresh limes, besides 6 cases of oranges and grape-fruit from the Botanic Gardens. A first shipment of 150 cases of oranges and limes were to be forwarded from Trinidad for the same purpose by the mail of October 27. It is also anticipated that fruit is forthcoming from Jamaica, so that it may soon be possible to send fruit to the base hospitals in France and Flanders. (The *West India Committee Circular*, November 17, 1914.)

In a letter received by the Imperial Commissioner of Agriculture dated October 22, 1914, from Mr. Leslie Gordon Corrie, President of the Queensland Acclimatization Society, it is stated with respect to some sugar-cane cuttings: 'The cuttings arrived safely by parcel post from Antigua in excellent condition. The packing in damp charcoal on this occasion was a complete success. The close boxes are right and you just hit the right amount of moisture.'

The cultivation of ground nuts is by far the most important industry in Gambia. Of exports to the value of £867,187 the value of ground nuts (64,169 tons) was £622,398. The *Colonial Report* for 1913, No. 805, says that the ground nut is likely to continue to be the only article actively cultivated for exportation as long as it is in good demand, until some more easily grown crop for which there is a market is discovered by the local non-strenuous agriculturists.

Experiments on cane crushing carried out by the Agricultural Research Institute, Pusa, recorded in Bulletin No. 42, 1914, prove that with care a very high extraction has been obtained from the ordinary bullock mill of three rollers largely used in India. In 1913 the extraction varied from 87·2 to 71·3 per cent., according to the variety of cane experimented with. Such a high efficiency however cannot be maintained by the cultivators for any length of time with their very often underfed cattle.

In storing kafir (Guinea corn) in large bins, great care must be taken that the grain does not heat The kafir seed is hard and flinty and often not as dry as it appears. The grain should not be put into bins in large quantities until it is thoroughly dry, and until it has been well cleaned. Kafir grain that contains dust, dirt, and chaff will heat worse in the bin than clean grain. Grain that is to be used for planting purposes should never be threshed and stored in bins. (Kansas *Agricultural Experiment Station*, Bulletin No. 198.)

During a recent visit to St. Kitts and Nevis, Dr. H. A. Tempany, the Superintendent of Agriculture for the Leeward Islands, addressed meetings on the subject of the situation of the cotton industry existing in the two islands at present. In these addresses Dr. Tempany took very nearly the same lines as in his address to the Agricultural and Commercial Society of Antigua, reviewed already in these columns. He pointed out that in St. Kitts a further extension of sugar-cane growing might be advisable. In both islands he believed that it would be well to increase largely the area under cultivation of maize. The growing and export of onions, on the lines which are being found profitable in Antigua, was also advocated by him, as a helpful industry during this time of depression in the cotton trade.

In the hydrometer used for the rubber content of Hevea latex, the instrument is graduated in density figures on the stem, and a table is issued with each instrument. Special hydrometers are issued by the scientific apparatus makers, graduated at 84°F. for use in the Tropics, since it is often impossible even in a laboratory in the Tropics to reduce the temperature of the liquid to be tested to 60°F., the temperature at which most densities are calculated in temperate climates. With instruments which are graduated at 84°F. the density of the liquid is compared with water, taken as 1·0000 at 84°F., which is found to be approximately the shade temperature in this country. (*Agricultural Bulletin of the Federated Malay States*, July 1914.)

STUDENTS' CORNER.

THE NECESSITY FOR READING.

In most of the numbers of the *Agricultural News*, the Students' Corner has to be filled with practical advice on agricultural matters, because naturally the agriculturist has to be occupied for most of his time in the practical details of the administration of his estate. It would be a great mistake, however, for any planter to think that he had quite done all that he ought to do to make himself an efficient planter, to fulfill his own ideal in fact—for all men have ideals of what they ought to be in their special line of life—if he was satisfied with performing his daily routine with exactness, and even with diligence. The young planter must remember that the business of agriculture is a most serious, important, and complex one. No planter can ever think that he has come to a complete knowledge of his business. That cannot be obtained in any business whatever. So he must ever be a student, ever learning, ever willing to be taught. For knowledge is progressive. If one only considers how many common-places of agricultural science to-day were absolutely unknown to our ancestors, one is led to acknowledge, that to keep abreast of the perpetual advance in knowledge, one must study. No one can make all researches in every branch of science for himself, but he has the advantage of being able to avail himself of the researches of specialists in every department, through their published results. Thus the planter ought to be a reader. Of course the planter's life, if he is conscientious, is a very busy one. He cannot devote hours and days to the book study of any subject. But he can, and must, if he wants to be more than a human machine, find time to read what results have been obtained by the studies of others in the lines in which he is particularly interested. It is quite a mistake to think that a young planter, even if for example he has successfully passed the final examination in practical agriculture of the Imperial Department of Agriculture, has attained his end. Rightly looked at, it is only the beginning of his life's work. The passing of the examination shows that he has got a grounding in the principles of agricultural science, and has even gone further, and has begun to put those principles into practice; but the continual improvement of that practice is to be his life's work, which improvement can only come by knowledge, and knowledge can only come by study. Nowadays there is no excuse for the intelligent planter not keeping himself acquainted with the progress of science. It is true that his business is a most complex one, as was said before. He ought to know enough of business to follow the markets, and estimate the prospects of profit on his crop; he ought to know something of veterinary science, in the interests of his animals; some knowledge of geology, so as to think intelligently of his soils; some acquaintance with entomology, so as to maintain more accurately the fight against his worst enemies, insects of all kinds: and most certainly some knowledge of botany, to enable him to deal on scientific lines with the plants he cultivates; these all are more or less subjects with which the ideal planter is concerned. The specialists whose business it is to devote themselves to one or other of these sciences place their brains at the disposal of anyone, in their published books. In these islands, the planter, of whatever crop, can find no difficulty in finding material for study in the publications issued by the Imperial Department. Canes, limes, cacao, corn, coco-nuts, all form the subjects of pamphlets, embodying the results of the most recent investigations. Veterinary science, insect pests and fungus diseases of local importance, are also treated in the same way. And should a student like to make deeper investigations into any special branch of science, there are the more technical papers in the *West Indian Bulletin*, while the *Agricultural News* from time to time has notices of the newest books on agricultural science. So the keen planter must keep on reading. He must cultivate his brains with the same care that he cultivates his land, and the more he cultivates his brains, the better is he likely to cultivate his land.

Although the planter has to be a very complex man, and to have some knowledge of many subjects, yet he must almost certainly have to be more or less of a specialist in some one direction. For instance the planter of canes may be interested theoretically in cacao, but his studies would have to be more particularly directed towards canes and all connected with their cultivation and manufacture.

It is well to be an all-round man, but every man should strive to know at least one subject well. To know one subject; and here comes in the last bit of advice. Just as it has been said above that attention confined to the practical routine of the work on a plantation is not everything, so it must be emphasized that the acquaintance with books about agriculture or any other science is not everything. Practical experience and observation must be stimulated and directed by reading, and reading must be checked and verified by practical observation. So the way to work is, after having made observations from actual facts, to go to the books on the subject, and find out what those facts mean to the men who have studied them. On the other hand, after reading up a subject, the student should verify the conclusions by his own observations, or find grounds from his own personal observations to dissent from those conclusions. In this way he will become, what as a student he ought to aim at being in his own small way, really a scientist, which means literally a man who knows.

Sulphuric Acid for the Destruction of Weeds.—After trials of sulphate of copper, sulphate of iron, and sulphuric acid in varying strengths, the author concludes that sulphuric acid in 6, 8 or 10 per cent. solutions (the degree of strength depending upon local conditions) is the most satisfactory spray to use. The solution was applied at the rate of 107 gallons per acre, and killed most of the annual weeds, but it did not perceptibly retard the growth of wheat, although the lower leaves were killed. This solution had the advantage of being effective in three or four hours, while the other solutions required three or four days. The sulphuric acid solution also had a fertilizing effect on the soil. (The *Journal of the Board of Agriculture*, November 1914.)

Up to the time of the Messina earthquake, when large stocks of orange oil were destroyed, there was practically no sale of this in London from the West Indies, the Silician brands entirely holding the market. An impetus was then given to the Jamaica growers by the higher prices that were offered. The Jamaica industry, it is stated, suffers from lack of centralization. The Jamaica peasants, with hand machines and bottles, collect and rind the fruit under the trees. After 'settling', the oil is decanted, clarified, and shipped to London in copper drums. (*Gardeners' Chronicle*, October 17, 1914.)

FUNGUS NOTES.

SUMMARY OF INFORMATION CONCERNING PLANT DISEASES GIVEN IN 1914.

In accordance with past custom, there is given below a resumé of the articles and reviews which have appeared under the heading of Fungus Notes during the year.

SUGAR-CANE. Two papers giving the results of recent work on sugar-cane diseases in India are reviewed on page 62. The authors regard red rot, due to *Colletotrichum falcatum*, as the most serious of these diseases, and discuss the methods of infection, and the possibility of reducing the prevalence of the disease by means of sett selection. Three new diseases: a wilt, a collar rot, and a leaf spot, are announced and described.

CITRUS TREES. On page 238 a description is given of a new fungus, of the genus *Atichia*, occurring on lime leaves in Dominica. It is of no economic importance. The *Rosellinia* root disease of lime trees is the subject of an article on pages 364-5, written as an outcome of a recent visit to Dominica by the Mycologist of this Department, made in order to investigate the extent and condition of its occurrence in that island. The nature of the disease and the measures to be adopted for its prevention are discussed at some length.

CACAO. The *Rosellinia* root disease of cacao, prevalent in St. Lucia, is dealt with in the Mycologist's report on a visit made to the affected districts in the early part of the year, given on pages 94-5. The Dominica article mentioned above should be read in connexion with this report. The species occurring in St. Lucia is not the same as the one generally found on limes in Dominica, but the diseases they produce are essentially alike in their characters.

COTTON. An article dealing with a physiological affection, known as leaf-cut, which occurs in the United States, is reproduced in full on pages 126-7. It is of interest in the West Indies because of the occurrence of a disease with similar symptoms in St. Croix, St. Kitts, and Nevis. An article on the subject of the latter disease will appear in an early number of the *West Indian Bulletin*.

An interesting suggestion with regard to the treatment of cotton seed with hot water for the purpose of freeing it from anthracnose infection is reproduced on page 396. The method has not yet been fully worked out or tested, but should it prove successful it will be worth the serious attention of cotton growers in those islands, such as St. Vincent, where the moist climate favours the development of this disease.

COCO-NUTS. Further information concerning bud-rot in India, summarized on page 286, confirms the view already current that the disease in India is quite different in its nature from that known by the same popular name in the West Indies, the former being due to the fungus *Pythium palmivorum*, which is not known to exist in the New World. In connexion with this fungus a note is given on page 222 effectively discrediting an alleged record of its occurrence in Mexico.

MISCELLANEOUS PLANT DISEASES.

Pine-apples: During a visit to St. Kitts the Mycologist found a disease occurring in the Experiment Station, which agrees in all respects with the base-rot of pine-apple plants, due to *Thielaviopsis paradoxa*, first described from Hawaii. It attacks the underground portion of the stems of cuttings or young plants, and produces a sickly yellowish appearance of the leaves. It is likely to be difficult to deal with in a sugar-cane country, since that crop supplies an abundance of infective material. Information as to the disease is given on page 190, and particulars as to the fruit rot of pine-apples due to the same fungus, will be found on page 222.

Tomatoes: On page 174 two tomato diseases, the blossom-end rot of the fruit, and the *Cladosporium* disease of the leaves are recorded as occurring in Barbados. A description is given and remedial measures suggested.

Sweet Potatoes: The sweet potato appears to be singularly free from diseases in the West Indies, considering the long list of fungus troubles in the United States. In order to facilitate recognition should they be met with, a summary of the known diseases is given on page 110.

Ground Nuts: Some encouraging results obtained in Montserrat from the spraying of ground nuts for the control of leaf rust are reported on page 380.

Immortel: A note on the canker which threatens to kill out this useful cacao shade tree in St. Lucia is included in the report of the Mycologist's visit on page 94. Cultures of a bacterium suspected to be the cause of the disease have since been obtained, but the investigation has been suspended owing to pressure of other work.

Imphee: In connexion with the occurrence of sorghum smut in Montserrat, the simple and effective methods available for the destruction of its spores on the seed are described on page 316.

Leguminous Plants: An article on *Fusarium* wilt of legumes, and the occurrence of *Neocosmospora vasinfecta* on *Tephrosia candida* in Montserrat appears on page 348.

Effect of Grass on the Growth of Trees: Though not strictly speaking a plant disease, the possible toxic effects of grass growing above the roots of trees appear well worth attention in the light of the Woburn experiments, and a summary of the results obtained from these will be found on page 302.

Damping off of Seedlings: Two useful notes concerning the prevention of this familiar trouble appear on pages 158 and 380.

FUNGICIDES. A method of making Bordeaux mixture more adhesive by the addition of casein is noted on page 46. More recently the use of milk for this purpose has been suggested. An important article on the purchase and use of liver of sulphur, dealing with the great variation found in commercial samples of this substance, and its tendency to rapid deterioration unless properly stored, is reproduced on pages 254-5.

Several notes on the subject of soil sterilization have appeared during the year. The methods of working, and the plant required when soil is moved into boxes for sterilization with steam or formalin, are given on pages 78-9; methods of sterilising soils *in situ* are outlined on pages 95, 158, and 380; while a method involving the use of carbon bisulphide in emulsion is described on pages 202-3. The last named is now being tested on a considerable scale in Dominica.

Instructions for the generation of formaldehyde gas for the fumigation of fruit, etc. are given on page 222 in connexion with the storage of pine-apples.

ENTOMOGENOUS FUNGI. A note on the effective control of scale insects in St. Lucia by fungi appeared on page 94, and articles on the use of the green muscardine fungus in Samoa for the control of the rhinoceros beetle, a pest of coco-nuts, were reviewed on page 78 and under Insect Notes on page 10. The same fungus has been in use for some years in Trinidad against the froghopper, and has been found on larvae of the sugar-cane root borer in Barbados.

VETERINARY NOTES.

EPIZOOTIC LYMPHANGITIS.

The information which is presented herewith, is one of the papers appearing in Pamphlet No. 77, and is much the same as that contained in a paper by Mr. P. T. Saunders, M.R.C.V.S., which appeared in the *West Indian Bulletin*, Vol. XIV, p. 167.

This disease which is often known in the West Indies as Erysipelas, is a specific contagious disease of the Equidae, due to an organism which is a fungus.

Asses, mules, and horses are affected in the order named, and the disease has been seen, though very rarely, in the ox. It is of almost world-wide distribution, and has existed in the West Indies for some considerable time. It was at one time confused with farcy, and later was known as African farcy, Japanese farcy, or river farcy; in America it is generally known as mycotic lymphangitis.

The cause of the disease is the fungus organism *Cryptococcus* [Saccharomyces] *farciminosis*, which may be seen in the pus discharged from the ulcers, under a comparatively low power of the microscope, as oval or pear-shaped bodies, the chief characteristic of which is that they possess a double outline of the envelope.

The incubative period is a long one, an animal seldom showing symptoms of the disease until two months after infection, while the time is often longer, and may be extended to six months.

Infection generally results through wounds, such as may occur from barbed wire, or the bite of ticks. Flies may often be the medium of infection, and the disease under ordinary conditions may also be spread by harness, and stable utensils.

The disease is almost always chronic in its course, and of long duration. The constitutional symptoms accompanying it are not very marked, or may be altogether absent. Slight fever may occur, the temperature seldom exceeding 102° F. The appetite remains good, except in advanced cases, and there is not much tendency to lose condition except at the later stages.

The lesions are almost entirely confined to the skin, and, though almost any part of the body may be affected, the hind legs are said to be the commonest sites. In the West Indies, however, it has been observed that the forelegs are most often affected. In a wound, if infestation results, the natural healing processes are arrested, profuse, pale granulations appear, and a thin pus is discharged. The wound gradually gets larger, and in a time varying from a week to months, the surrounding lymphatic vessels show as cords. In other cases, even six months after healing, a hard tumour forms, up to the size of a pigeon's egg, which later softens and bursts, discharging a thick well-formed, or a yellow and oily pus. The cavity of the ulcer fills with fleshy buds, and the adjacent lymphatics are inflamed. Buds later form on these inflamed cords, which burst in their turn. Coalescence may leave large suppurating sores which, in common with the ulcers, show no tendency to heal. Healing, which is always slow and difficult, may, however, take place; but, meanwhile, fresh buds and cords form. In some cases the inflammation is diffuse, and multiple abscesses may form. Healing of the ulcers may occur in from one to six months, or, in the absence of treatment, death may occur from exhaustion; though specific lung diseases may also be the cause of death.

Diagnosis, especially in the earlier cases, is easy by means of the microscope. Clinically the inflamed cords and the ulcers which show no tendency to heal are almost sufficient. Differentiations may then be made from glanders or farcy by means of the mallein test, to which animals suffering from epizootic lymphangitis do not react. The fatality from this disease is about 10 per cent. or more.

The post-mortem appearances are almost entirely confined to the skin and lymphatics. Some of the lymphatics are blocked, others enlarged and inflamed; the skin may be greatly thickened. The lungs or other organs are seldom affected, but are occasionally, and in extreme cases; ulceration changes occur in the trachea, while bones and cartilages may be affected and even necrosed.

The disease is always serious because of its long duration and possible complications. Early cases are generally curable by vigorous treatment.

Treatment should be directed to the destruction of the virus. In early cases the buds should be opened, and treated with strong antiseptics or actual cautery. If cords are present, a strong blister may be of service by inducing resolution of the cord. The organism is particularly resistant to antiseptics, and a solution of the strength of 1 in 250 of corrosive sublimate is probably the best agent to employ. This, however, must be used cautiously, and its caustic effects must be borne in mind. Internal treatment has not yielded satisfactory results. Neosalvarsan has been used successfully by intravenous injection, but this treatment is too expensive and difficult to be practicable as an everyday method.

The prevention of the disease is very important, and in this lies the greatest measure of control. It may be effected by thorough and vigorous isolation of affected animals, rigid disinfection of stables and harness, and the products of the disease. The slaughter of affected animals is somewhat too drastic, though this was resorted to in the British Isles by the military authorities when the disease was found to have been conveyed by horses from South Africa. Wounds must be protected from the virus of the disease and from any agent, such as flies, which can convey it. Great care must also be exercised in the use of bandages and other stable appliances and utensils. An attendant upon an infected animal should not be allowed to attend healthy animals.

TREATMENT OF FISTULA IN HORSES.

'Blistering is often beneficial at the commencement of this trouble, but in most cases thorough surgical treatment is necessary before recovery takes place. Why fistulas are so troublesome to treat is because the tubular passages which lead from the surface-opening are lined by a false membrane. This membrane must be removed before the wound can permanently heal, and the best way to bring this about is to probe the wound, thus finding out the depth and direction of the tube or tubes; then open boldly with the knife these tubes, and apply the following lotion on some cotton wool:—

Corrosive sublimate	—	½ oz.
Methylated spirit	—	3 „
Water	—	3 „

'Apply every third day until the third application. Keep the wound clean, and apply lard or oil to the outside where the discharge runs.' Jas. Wright, in the *Queensland Agricultural Journal*, October 1914.

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR, December 1, 1914.

ARROWROOT—$1\frac{3}{4}d.$ to $4\frac{3}{4}d.$
BALATA—Sheet, 2/1; block, 1/9¼ per lb.
BEESWAX—No quotations.
CACAO—Trinidad, 65/- to 69/6 per cwt.; Grenada, 59/ to 63/-; Jamaica, no quotations.
COFFEE—Jamaica, no quotations.
COPRA—West Indian, £24 10*s.* per ton.
COTTON—Fully Fine no quotations; Floridas, no quotations; West Indian Sea Island, no quotations.
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—Quiet.
ISINGLASS—No quotations.
HONEY—No quotations.
LIME JUICE—Raw, 2/3 to 2/9; concentrated, £30: Otto of limes (hand-pressed), 8 - to 9/-.
LOGWOOD—No quotations.
MACE—9*d.* to 2/3-.
NUTMEGS—$4\frac{1}{4}d.$ to $5\frac{3}{4}d.$
PIMENTO—Quiet.
RUBBER—Para, fine hard, 2/8¼; fine soft, 2/1½; Castilloa, 1/9.
RUM—Jamaica, no quotations.

New York.—Messrs. GILLESPIE BROS., & Co., July 24, 1914.

CACAO—Caracas, 11½c. to 12c.; Grenada, 11c. to 11½c.; Trinidad, 11½c. to 11¾c.; Jamaica, 10c. to 11c.
COCO-NUTS—Jamaica and Trinidad, selects $20·00 to $21·00; culls, no quotations.
COFFEE—Jamaica, 9¾c. to 13½c. per lb.
GINGER—7½c. to 10c. per lb.
GOAT SKINS—Jamaica, 46c.; Antigua and Barbados, 43c. to 46c.; St. Thomas and St. Kitts, 40c. to 43c. per lb.
GRAPE FRUIT—Jamaica, $1·75 to $2·50.
LIMES.—$3·75 to $4·50.
MACE—45c. to 53c. per lb.
NUTMEGS—110's, 11¾c.
ORANGES—Jamaica, $2·00 to $2·50.
PIMENTO—3⅞c. per lb.
SUGAR—Centrifugals, 96°, 3·26c.; Muscovados, 89°, 2·88c.; Molasses, 89°, 2·61c., all duty paid.

Trinidad.—Messrs. GORDON, GRANT & Co., December 7, 1914.

CACAO—Venezuelan, no quotations; Trinidad, $14·25 to $14·75.
COCO-NUT OIL—84c. per Imperial gallon.
COFFEE—Venezuelan, 11½c. per lb.
COPRA—$4·00 per 100 lb.
DHAL—No quotations.
ONIONS—$2·25 per 100 lb.
PEAS, SPLIT—$8·00 per bag.
POTATOES—English $2·00 to $2·20 per 100 lb.
RICE—Yellow, $6·00; White $5·00 to $5·25 per bag.
SUGAR—American crushed, no quotations.

Barbados.—Messrs. JAMES A. LYNCH & Co., Ltd., December 12, 1914, Messrs. T. S. GARRAWAY & Co., December 14, 1914.

ARROWROOT—$4·00 to $4·25 per 100 lb.
CACAO—$8·50 to $10·00 per 100 lb.
COCO-NUTS—$16·00.
HAY—$1·70 per 100 lb.
MANURES—Nitrate of soda, no quotations; Cacao manure, $48·00 to $50·00; Sulphate of ammonia $78·00 to $85·00 per ton.
MOLASSES—No quotations.
ONIONS—$2·75 to $3·50 per 100 lb.
PEAS, SPLIT—No quotations; Canada, $6·00.
POTATOES—Nova Scotia, $2·85 per 160 lb.
RICE—Ballam, $5·75 to $6·05 per 100 lb.; Patna, no quotations; Rangoon, no quotations.
SUGAR—American granulated, $5·00 per 100 lb.

British Guiana. Messrs. WIETING & RICHTER, December 5, 1914; Messrs. SANDBACH, PARKER & Co., December 4, 1914.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	$7·00 to $8·00 per barrel of 200 lb.	$10·00
BALATA—Venezuela block	No quotation	——
Demerara sheet	——	——
CACAO—Native	11c. to 12c. per lb.	12c. per lb.
CASSAVA—	96c. to $1·08	——
CASSAVA STARCH—	——	——
COCO-NUTS—	$16 to $20 per M.	$23 per M.
COFFEE—Creole	——	16c. per lb.
Jamaica and Rio	14c. per lb.	16c. per lb.
Liberian	10c. per lb.	11c. per lb.
DHAL—	$5·25	$5·50 per bag of 168 lb.
Green Dhal	——	——
EDDOES—	$1·44	——
MOLASSES Yellow	None	——
ONIONS—Teneriffe	——	——
Madeira	4c.	——
PEAS—Split	——	$9·50 per bag. (210 lb.)
Marseilles	——	——
PLANTAINS—	24c. to 48c.	——
POTATOES—Nova Scotia	$2·75	$3·25 to $3·50
Lisbon	——	——
POTATOES—Sweet, B'bados	$2·16	——
RICE—Ballam	No quotation	——
Creole	$5·50 to $5·75	$5·50
TANNIAS—	$2·16 to $2·40	——
YAMS—White	$2·16	——
Buck	$2·40	——
SUGAR—Dark crystals	$3·45 to $3·50	$3·50
Yellow	$4·00 to $4·10	$4·00
White	$5·00 to $5·25	——
Molasses	——	——
TIMBER—GREENHEART	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M.
Cordwood	$1·80 to $2·00 per ton	——

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PAMPHLET SERIES.

The Pamphlets are written in a simple and popular manner and the information contained in them is especially adapted to West Indian conditions. They contain, amongst other subjects, summaries of the results of the experiment work on sugar-cane and manures, the full official reports of which have only a limited circulation. The number issued up to the present time is seventy-five. Those mentioned in the following list are still available; the rest are out of print.

Sugar Industry.

Seedling and other Canes at Barbados
in 1900, No. 3, price 2*d.*; in 1901, No. 13; in 1902, No. 19; in 1903, No. 26; in 1904, No. 32; price 4*d.* each.

Seedling Canes and Manurial Experiments at Barbados, in 1903-5, No. 40; in 1904-6, No. 44; in 1905-7, No. 49; in 1906-8, No. 59; in 1907-9, No. 62, No. 66, price 6*d.* each.

Seedling and other Canes in the Leeward Islands, in 1900-1, No. 12; in 1901-2, No. 20; in 1902-3, No. 27; price 2*d.* each; in 1903-4, No. 33; in 1904-5, No. 39; in 1905-6, No. 46; in 1906-7, No. 50; in 1907-8, No. 56; price 4*d.* each, in 1908-9, No. 63; in 1909-10, No. 67; price 6*d.* each.

Manurial Experiments with Sugar-cane in the Leeward Islands, in 1902-3, No. 30; in 1903-4, No. 36; in 1904-5, No. 42; in 1905-6, No. 47; in 1906-7, No. 51; in 1907-8, No. 57; in 1908-9, No. 64; in 1909-10, No. 68; price 4*d.* each.

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Printed at Office of *Agricultural Reporter*, 4 High Street, Bridgetown, Barbados.