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AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

OF THE

IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

DIEU ET MON DROIT

VOLUME XI.

JANUARY TO DECEMBER, 1912.

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ERRATA IN VOLUME XI.

Page 41, column 2, line 12, for *Agrtculture* read 'Agriculture'.
„ 91, column 2, line 18, from bottom, for paeked read 'packed'.
„ 108, column 2, paragraph 5, line 1, for *Gardener's* read '*Gardeners*'.'
„ 108, column 2, paragraph 5, line 4, for grafting clay wax read 'grafting clay or wax'.
„ marked 112 in No. 260 should be 128.
„ 166, column 2, line 18 from bottom, for *Tholonnii* read '*Tholonii*'.
„ 196, column 1, paragraph 1, line 26, for Rivère read 'Rivière'.
„ 202, column 1, line 6, for *fasciatus* read '*fasciata*'.
„ 252, column 2, paragraph 4, line 5, for 2,105 tons value £42,755 read '2,275 tons value £45,543'.
„ 263, column 1, paragraph 2, line 8, delete bracket after *Gazetteer*.
„ 265, column 2, line 7, for Page read 'Pape.'
„ 286, column 1, paragraph 3, line 1, for foreward read 'foreword'.
„ 354, column 1, line 3 above footnote, for renumerative read 'remunerative'.
„ 415, column 1, line 11, for *Leptosphaeria* read '*Leptospora*'.

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CONTENTS.

The Colour of Soils.

THE practical importance of the colour of soils arises from the circumstances that it possesses an influence as regards the amount of absorption of the energy of the sun, and often that it serves as a guide to the condition of the soil with reference to drainage, to the kind of crops that may be raised in the soil, and to the proper method of cultivation. These matters are given attention in Bulletin No. 79 of the Bureau of Soils, of the United States Department of Agriculture, and much of the information in this is employed in the following article.

It is important to realize at the outset that the colours of soils are not pure colours; they may be best described as shades or tints. This arises chiefly from the fact that the material which is responsible most usually for the colour of soils is ferric oxide, a compound which varies itself in colour, and, in the soil, is tinted on account of the presence of other materials. Many colours are found in soils, but it is possible to select a few that are characteristic; in relation to their origin, they are dependent primarily upon the relative proportions present of white mineral, and organic, matter, and of ferric oxide. A convenient classification has for its main features white, black, and red, with greyish between the first two, brownish between the two last, and yellowish between the red and white. In a general way whitish or grey soils are not of much agricultural value; in wet climates they are generally wanting in organic matter. Soils may also be white from an accumulation of alkali, and from their containing a high proportion of gypsum.

It is well recognized that yellowish soils are very common, and it is generally considered that their colour is due to the presence of small amounts of ferric oxide, more or less combined with water, or 'hydrated', as it is usually expressed. Wherever agriculture is carried on, black soils are held in high estimation. They often contain a high percentage of lime, and their colour is considered to be due to the formation of black humus compounds through action between the organic bodies and the lime present in them: such soils are common, over calcareous rocks, in the West Indies. As regards the colour of sandstone and of ordinary soils. the usual opinion is that this is due to a film of coloured oxides, hydroxides and organic matter, which surrounds the different particles.

In regard to the interests of the practical agriculturist, the colour of a soil may serve as an indication of the presence of some useful plant food constituent. Soils which are light in colour and claycy in texture generally contain greater amounts of potash than those found in the other kinds: while as has been indicated, an abundance of organic matter is usually present in black soils. From a theoretical point of view, the colour of soils is often useful as an indication of their origin. It has been stated, from the practical aspect, that the capacity of a soil to absorb heat is indicated by its colour, this, however, is not usually of great importance in the tropics, where the soil is not often subjected to cooling, to any great degree.

A large amount of investigation as to the causes of colour in the soil has been made, and the results of the earlier considerations of the subject are summarized in the Bulletin mentioned, in the following way. 'Black or blackish soils of different shades owe their colour to varying amounts of humic or organic substances formed by the decay, under oxidizing conditions, of the plant and animal tissues left in the soil; the presence of a considerable proportion of lime carbonate in the soil facilitates such decomposition and is indicated by a pronounced black colour. Red and yellow soils owe their colour principally to a coating of ferric oxide, more or less hydrated, on the soil grains. Two theories are extant. According to the first, the ferric oxide is more highly hydrated in yellow soils than in red soils. According to the second, the difference in colour is due to the relative amount of ferric oxide the soil contains, and there is no essential difference in the hydration of the ferric oxide in red and yellow soils, respectively.'

The changes in the iron compounds present in the soil take place in several ways. Iron sulphides, in the presence of moisture and oxygen, turn to sulphate, which is dissolved, and the sulphuric acid, travelling more quickly through the soil, leaves behind the ferric oxide which is deposited as a coating on the particles. This separation of iron from its salts may be demonstrated readily by filtering solutions of them through thicknesses of soil.

Further, the less oxidized iron compounds, known as ferrous salts, are much more soluble than the ferric compounds, especially in water containing carbon dioxide, and therefore iron is removed by the solution of these. This removal is aided by the presence of dissolved organic matter. It might be concluded that these actions would result in the quick washing away of the iron compounds in a soil: the ease with which the ferrous compounds are oxidized, however, to the almost insoluble ferric compounds causes deposition to take place quickly where air is present, and the loss of the iron compounds is thus prevented.

The subject requires further consideration in view of the circumstance that soluble organic matter, particularly where there is not free access for air, can reduce ferric oxide to the ferrous compounds which, if carbon dioxide is present in solution, are freely carried away. An interesting demonstration of this may be seen in red soils, near a root or beneath a leaf, where the particles have become whitened because of the reduction of ferric oxide by the organic matter present in such situations, and the subsequent removal of the more soluble ferrous compounds.

A review of the work done in connexion with the subject and the results of more recent investigations show that the colour of a hydrated ferric oxide is partly at least determined by the amount of water combined with it: generally speaking, however, the fact of the difference in colour between red and yellow soils arises from a difference in the thickness of the film of material that colours the particles. Moreover, there exists another indication that the colour of a soil is not due alone to the amount of hydration of the iron oxides present in it, in the circumstance that, though this is comparatively rare, a red soil may become yellow. This can be demonstrated practically by placing a bright red soil in a long tube, covering it with an equal depth of leaf mould, and pouring distilled water through the tube from day to day; the upper end of the soil column becomes light-yellow in colour, and iron compounds are found in the water which has passed through.

The suggestion is made that red soils have resulted from the weathering of rocks having a large content of ferro-magnesian minerals; they may also be formed by the weathering, during a long time, of soils that originally contained a smaller proportion of ferric oxide. The source of yellow soils is probably the acid rocks, which do not contain much iron oxide, but possess on the other hand a large proportion of quartz; as has been indicated, the weathering of these gives eventually a red soil.

The facts brought forward indicate sufficiently that the colour of a soil depends mainly on the amount of organic matter and ferric oxide that it contains. Further, the most probable explanation of the difference in colour between red and yellow soils is that the particles of the former are surrounded by a film of ferric oxide thicker than that which is present on those of the yellow soils. Lastly, the transportation of ferric oxide through soils is explained by its reduction to ferrous compounds by dissolved organic matter, and removal of the more soluble ferrous compounds, thus formed, in water containing carbon dioxide.

SEAWEED AS MANURE

The following information concerning seaweed as manure is given in the concluding part of Leaflet No. 254 (August 1911) of the *Board of Agriculture and Fisheries*:—

It is difficult to form an estimate of the money value of seaweed to the farmer. The fertilizing material present in 1 ton of seaweed possessing the average composition would cost 8*s.* to 10*s.*, if purchased from a dealer in the form of a merchantable manure in a finely divided state ready for putting on to the land. This value is arrived at by allowing 12*s.* for each per cent. of nitrogen, 4*s.* for each per cent. of potash, and 3*s.* for each per cent. of phosphoric acid. No account is taken of the sodium, calcium and magnesium salts, which on most soils, but especially light soils, would be distinctly beneficial; nor is any allowance made for a possible stimulating effect of the iodides present. It does not, however, follow that seaweed is worth 8*s.* to 10*s.* a ton on every farm near the sea coast. The question of availability of its constituents —i e., of its decomposition under various conditions —would have to be ascertained by careful trials before even a tentative estimate of its money value could be made.

In farm practice, seaweed more or less takes the place of dung, but there are several important differences. Seaweed contains no fibre, and, consequently, does not produce the black, structureless material characteristic of the dung heap; in decomposing it forms soluble substances which easily wash away. For the same reason it decomposes more completely than dung. It is even said to facilitate the decomposition of dung on light soils and in dry districts, but there is no definite proof of this. A ton of dung and seaweed would break down in the soil more quickly than a ton of dung alone, and would therefore have less of a drying effect if put on late. The freedom of seaweed from weed seeds and from spores of disease organisms is of considerable advantage on light soils where weeds are common, or on soils liable to such diseases as finger-and toe, the spores of which can hardly be kept out of dung.

Experiments to test the manurial value of seaweed have been made at Trondhjem, at the Rhode Island Experiment Station, and by a few workers in Great Britain. In Hendrick's trials, seaweed proved fully as effective as dung, for early pototoes, so far as quantity of produce was concerned, but it somewhat retarded ripening. On the other hand, seaweed and superphosphate proved better than dung and superphosphate. It is, however, on such gross feeding crops as mangolds and the cabbage tribe that seaweed would be expected to show its fullest effects.

Reference has already been made to the fact that seaweed decomposes more completely than dung, and is converted into soluble or gaseous substances. It should therefore not be allowed to rot in heaps by itself, but should be put straight on to the land, or, if this is not practicable, mixed with any dung which will absorb some of the decomposition products. The value of a heap of seaweed is much lessened by exposure to rain, but exceptions to this rule may arise in the case of special garden crops.

Analysis shows that the seaweeds have not all equal value as manure. The long, broad, leaf-like Laminaria is richer than Fucus, the common black weed of the rocks. Seaweed cut or thrown up in the early part of the year is richer than that obtained late in summer or autumn.

On the other hand, the foreign species gathered with the seaweed, Zostera, Salicornia, and Glyceria, are distinctly poorer in composition, and contain a certain amount of fibre that does not readily decompose. They are therefore of less fertilizing value, as the practical man has already discovered. In Jersey, Zostera is gathered from the shallow sandy bays and heaped up in alternate layers with dung, but it is not usually applied direct to the land. Very thick, fleshy fronds of Laminaria may decompose so slowly in the soil, that on light land they may do some harm, by opening up the soil and drying it out.

The high manurial value of seaweed has already been pointed out. On the basis of the current unit values, the fertilizing materials in 1 ton of fresh seaweed would, in a finished manure, cost about 10*s.*, and in 1 ton of dried seaweed about 40*s.* to 65*s.* The amount obtainable must be enormous, and it is worthy of consideration whether it cannot be more widely utilized than it is at present, especially by farmers near the coast.

Sugar from Shredded Cane.—At the Wisconsin Sugar Company at Menomonee Falls, nothing further has been done with the dried shredded cane received from Cuba last year. It is still stored up in the sheds of the United States Sugar Company at Madison, and it is said that it has not deteriorated in value. The management is planning to improve the facilities to work up the cane as soon as this year's campaign is over, and it is believed that all the obstacles met heretofore will be overcome, if not entirely, then sufficient to produce results. (The *Cuba Review*, November 1911.)

Sugar Imports into the United States.—From the monthly summary to September 30 of the United States Department of Commerce and Labour, we find that the imports of sugar into the United States for the nine months then ending, from foreign countries, including about 100,000 tons, however, from the Philippines, aggregated 1,789,000 short tons, valued at 85 millions of dollars, these standing as against 1,883,000 short tons during the same period last year, then valued at 103 millions of dollars. Of these sugars 1,600,000 tons, valued at 75 millions of dollars, came from Cuba, and the year before Cuba sent 1,781,000 short tons, valued at 97 millions of dollars. Very little sugar had come from Java up to the date given, the same amounting to 103,000 short tons, valued at $4,858,000. We note this autumn, beet sugars have again made their appearance in the imports and about 12,000 short tons are reported as having come in, valued at $593,000. (The *Louisiana Planter*, November 25, 1911.)

FRUITS AND FRUIT TREES.

TRIAL OF THE LYON BEAN IN ST. LUCIA.

The following account of an experiment conducted in St. Lucia with the Lyon bean (*Stizolobium niveum*) has been received from Mr. A. J. Brooks, Assistant Agricultural Superintendent, through Mr. J. C. Moore, the Agricultural Superintendent:—

Seeds of this bean were obtained from the Florida Experiment Station by the Imperial Commissioner of Agriculture and forwarded to St. Lucia for trial.

The seed was sown in the field in the usual way, two beans being sown in each hole 4 feet apart both ways, the habit of growth being like the Bengal bean but not quite so dense.

Flowers were formed four months after sowing and the seed matured four weeks later.

At no period did the growth cover in the soil, and Para and Johnson grass grew through it easily.

Examination of the roots showed but few nodules.

BANANAS AND COFFEE IN COSTA RICA.

BANANAS. The total export of bananas during 1910 was 9,097,285 bunches, having been a decrease of 2·86 per cent. from the quantity exported during 1909.

The exports of bananas during the last five years have been as follows:—

	Bunches.
1906	8,872,729
1907	10,165,759
1908	10,060,009
1909	9,365,690
1910	9,097,285

The total area under bananas at the end of 1910 was 62,500 acres, and new plantations amounting to 3,000 acres were made during the year.

The United Fruit Company is carrying on extensive improvements in the cultivation of many of their older plantations.

The bananas exported in 1910 were shipped as follows:—

Destination.	Bunches.
United States	8,000,249
United Kingdom	1,097,036
Total	9,097,285

COFFEE. The coffee exported during the crop year of 1909-10 amounted to 233,693 bags, of which 59·41 per cent. was shipped in husk.

The crop was 40,000 bags in excess of that of the previous year, the increase having been in the provinces of Heredia and San José; while the crops in the province of Cartago and on the Atlantic slope were very small. (From *Diplomatic and Consular Reports*, No. 4800 Annual Series, p. 3.)

THE AROMATIC GRASS OILS.

The following is given as an introduction to useful and important information concerning the aromatic grass oils, presented in the last issue of the *Bulletin of the Imperial Institute*, Vol. IX, No. 3, p. 241. Further facts will be supplied in the next issue of the Bulletin:—

The designation aromatic grass oils may be conveniently used to group together the several important volatile oils derived from members of the genera Cymbopogon, Andropogon and Vetiveria, belonging to the grass order (N.O. Gramínaceae). The group includes a number of oils which are not only of very considerable commercial importance, but have presented, and indeed still present, problems of great botanical and chemical interest. The principal oils concerned are the following:—

CITRONELLA OIL. Produced principally in Ceylon and Java.

LEMON GRASS OIL. Distilled chiefly in India, though important quantities are now being made in Java, Uganda, the West Indies, and elsewhere.

PALMAROSA OIL. Prepared chiefly in India.

VETIVER OIL. Distilled in Réunion, but probably mostly made from vetiver grass roots imported into Europe from India, Java and elsewhere.

As a result of the revision of the genera concerned, by Dr. Stapf at Kew, supplemented to some extent by Mr. J. F. Jowitt's work in Ceylon, a number of the botanical problems connected with the exact determination of the sources of these oils have been solved, though certain points have not yet been completely cleared up (compare *Kew Bulletin*, 1906, p 297), and, in particular, as will be shown later, there is still some difficulty in correlating the botanical classification of some of the grasses with the chemical composition of the oils they yield. On the chemical side, perhaps the most important practical problem is that of finding a satisfactory means of judging the quality of citronella oil, and fixing a standard on which this oil should be purchased. This matter has received much attention in this country recently, and at the present time an attempt is being made by a group of experts in London to find a solution of this problem. (*Perfumery and Essential Oil Record*, 1911, 2, 172.)

During the last few years a large number of oils belonging to this group have been received at the Imperial Institute for examination, and the results of this work are of interest not only as contributing in some measure to the solution of some of the problems indicated above, but also as affording information regarding new sources of supply of some of the oils of this group already known in commerce. In addition, the oils of a number of Cymbopogon species have been examined for the first time. The present account is confined to the factors of commercial importance in connexion with the oils discussed, and for details of scientific importance readers are referred to a paper on 'The Aromatic Grass Oils', communicated by Dr. S. S. Pickles, of the Scientific and Technical Department of the Imperial Institute, to the International Congress of Tropical Agriculture and Colonial Development, held at Brussels in 1910, and which will be published shortly in the proceedings of that Congress.

THE CULTIVATION OF CAMPHOR.

The following extracts, presenting details of camphor cultivation, are taken from the *Yearbook* of the United States Department of Agriculture, for 1910, p. 452. They refer particularly to conditions in that country; but possess an interest, in the West Indies:—

The camphor tree is hardy where the winter temperature does not fall below 15 F., but even at this temperature some loss of small branches will occur if the tree continues to grow until late in the season and has not become completely dormant before the frost comes. The tree easily adapts itself to new conditions, and can be grown on a wide range of soils; in fact, it can be grown on any soils except on very low land where water stands part of the year. The maximum growth occurs, however, on a rich, well-drained soil.

For commercial cultivation it is probably best to plant on low-priced sandy land, since in this situation the trees do well with less cost for cultivation and a smaller initial cost of land.

PROPAGATION Camphor can be propagated by seed, cuttings, and root cuttings, but for commercial purposes the first method is to be preferred, except in cases of special varieties having some valuable characteristic which would not be reproduced by the seed. In propagation by seed great care should be taken in the selection of the land for the seed bed. If possible, a rich, well-drained soil which has been under cultivation in previous years should be found. If this is not possible, new land can be used; but in either case land infested with Bermuda grass [Devil's grass—*Cynodon Dactylon*] or maiden cane cannot be used, since the roots of these grasses will take up the moisture in the soil and prevent the germination of the seed.

THE SEED AND SEED BED. Too much emphasis cannot be placed on the preparation of the seed bed, since after the seeds are planted no cultivation can be given for three months.

In size and shape, camphor seed resembles the common wild black cherry, consisting of a small stone surrounded by a fleshy pulp covered with a thin black skin.

The seed bed should be prepared before the seeds are gathered, and as soon as secured the berries should be planted fresh with the pulp left on. For convenience in future handling, the seed should be planted in hills 3½ feet by 1½ feet, with three seeds to the hill, and covered about 2 inches deep. This method will require about 24 quarts of seed per acre and will produce enough trees for setting out 16 acres of field planting.

CULTIVATION. The seeds will begin to come up about three months after planting, but four or five months are often required for a full stand. The percentage of germination is very low, and only about one-half the seeds may be expected to grow. Cultivation should begin as soon as possible, and as soon as a full stand is obtained the plants should be thinned to one in a hill and given a good dressing of high-grade fertilizer.

The first season the plants should make a growth of 12 to 18 inches, with a very large and vigorous root system. The treatment the second year should be the same, and at twenty-six months from planting the plants should be from 2 to 3 feet high and well-branched. At this time they are ready for field setting.

PREPARATION OF LAND FOR PLANTING. The land should be well prepared by deep ploughing early in the fall and again worked just before the trees are set The trees can be dug with a tree digger, and should be cut back very severely. All leaves and small twigs should be removed and the tree well headed back. The tap root should be cut back to 12 inches, and all the small laterals removed.

The trees should be set at the depth at which they were in the seed bed, and a small basin formed by the soil about them for the reception of water. One application of water should be given when the trees are set and one or two later on, as needed, if the rainfall is scanty. No growth will take place in the roots if dry soil is allowed to remain in contact with them, but too much water will cause the roots to sour and die.

The Late Sir Joseph Dalton Hooker, O.M.—It is with much regret that the death is recorded of Sir Joseph Dalton Hooker, O.M., G.C.S.I., D.C.L., F.R.S., etc., sometime Director of the Royal Botanic Gardens, Kew, who is regarded generally as having been the greatest botanist of his time. The larger part of Sir Joseph's scientific career was occupied in travel, chiefly for the purposes of botanical exploration; though this was interrupted during the periods 1855 to 1865 and 1855 to 1885, in which he was respectively Assistant Director, and Director of Kew Gardens, being succeeded in the latter post by his son-in-law, Sir W. T. Thiselton-Dyer. Among other places, Sir Joseph's travels took him to the Antarctic and the Southern Seas, the Himalayas, Palestine, North Africa and the Rocky Mountains. He received the Order of Merit in 1907, on his 90th birthday.

Sir Joseph Hooker will be remembered in this part of the world chiefly for the special interest that he took in the West Indies, particularly during the time that he was at Kew.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date December 18, with reference to the sales of West Indian Sea Island cotton :—

Owing to the absence of desirable qualities, no business in West Indian Sea Islands has been reported since our last report, with the exception of a few bales of Stains.

We expect the new crop will command good prices.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending December 16, is as follows:—

We have had a continuance of the demand, resulting in the sales quoted, taking such offerings as the factors are willing to dispose of at prices now current.

The limited supply of bright, sound cotton was sought after, not being sufficient to satisfy the demand.

The crop is still estimated at 4,500 bales, which, with 1,400 bales brought over from last year, would make an available supply of 5,900 bales. The sales so far have been nearly 3,000 bales, so you will note that one half of the total supply has been disposed of.

The above sales included several crop lots, viz: 67 bales Jno. J. Mikell; 47 bales, Palmetto Bluff, sold at 40c.; and 15 bales, D.W.E., at 45c.

We quote :—

Extra Fine,	32c. = 18*d.*, c.i.f., & 5 per cent.
Fine to Fully	26c. to 28c. = 15*d.* to 16*d.* c.i.f. & 5 per cent.
Fine to Fully Fine off in preparation	18c. to 20c. = 10½*d.* to 11½*d.* „ „ „

Cotton Cultivation in Southern Siam.—Among the articles of export may be noted an item of 8,983 piculs (about 530 tons) of cotton, valued at £9,615, all consigned to Hong Kong. A Japanese syndicate has been interested in the cultivation of cotton in this district for some time past. The export, however, does not tend to increase, and the local exhibits at the recent Exhibition of Agriculture and Commerce in Bangkok were pronounced to be generally poor. It is thought that the climate and soil of Southern Siam should prove suitable for the growing of cotton. The introduction of superior varieties from other countries may, perhaps, be productive of good results; the high cost of labour is, however, a severe handicap to planters. Experiments have been made with Egyptian cotton, but the results have not been very satisfactory, the staple turning out little better than that of local varieties. (The *Monthly Magazine* of the Incorporated Chamber of Commerce of Liverpool, November 1911.)

THE EGYPTIAN COTTON CROP.

The following interesting account of the Egyptian cotton crop is taken from the *Journal of the Royal Society of Arts* for December 1, 1911:—

Since the publication of an article on Egyptian cotton in this Journal on October 14, 1910, some more experience has been gained by those who devote their attention to the culture of the most important crop in the country of the Nile. Attention was then drawn to the gradual deterioration of the crop, which for long has held the highest place in the cotton market for quality, if not for quantity. The chief causes of the falling off of the Egyptian crop have been stated by the experts to be (1) over irrigation; (2) exhaustion of the land; (3) insufficiency of new, good seed; and (4) the gradual admixture of the crop with 'Hindi' cotton, this being the name of an undesirable type of cotton with a short, weak fibre, that injures the high grade of Egyptian varieties by infesting them with hybrids. [See *Agricultural News*, Vol. X, p. 310.]

In August 1910, a Department of Agriculture was formed at Cairo, with a suitable staff, to study and deal with questions that have up till now been referred to the Khedivial Agricultural Society. The Egyptian crop of 1909-10 was very poor in quantity, and, owing to the smallness of the supply, prices were exorbitantly high. The market was already threatened by American enterprise, for the manufacturers of the States knew how to produce an imitation of the goods made with Egyptian cotton, which, if not so satisfactory, answered many purposes. The Egyptian crop of 1910-11 was so surprisingly good, and reached so high a figure, that harvest thanksgivings were held in Cairo churches, and the experts, who continued to utter warnings, were altogether in the minority.

The new Department of Agriculture had signified to the farmers and peasant cultivators that it was quite ready to offer advice with regard to selection of seed or cultivation, but the good crop of last summer gave such a feeling of security that the fellah appears to have taken even less care than usual. In the month of June a severe attack of cotton worm, a much-dreaded insect pest, made its appearance. The Agricultural Department organized a special system of inspection, that was continued throughout the summer. Although all available means were adopted, the scourge raged throughout the summer. The only practical remedy was to kill the coming generation—not so much the already matured worm, but rather the small house that the pupa forms for itself, composed of earth and lime, and lined with a kind of silk. This is very hard, and needs breaking up in order to get at the pupa within and drown it. The loss by cotton worm this year is estimated at £5,000,000.

Simultaneously with the cotton worm plague, came the news that the United States Department of Agriculture has been developing the culture of Egyptian cotton in the United States. [See *Agricultural News*, Vol. X, pp. 151, 230.] The only good results on a considerable scale have been obtained in the Colorado River region, where the climate and other conditions are similar to those in the Nile Valley, and are suited to the long staple Egyptian cotton. Six hundred thousand acres of good land will soon be growing Egyptian cotton in the Imperial, Yuma, Salt, and Gila Valleys. A fifth of this acreage could produce the amount of Egyptian cotton imported each year for the use of New England mills.

An invention has been perfected for the prevention of cotton worm—a kiosk in the shape of a trap. A demonstration was given in June in a field near the Gaffaria Canal, in the presence of a number of well-known persons. The door was closed and sealed. When officially opened in the morning it was found that more than a thousand moths had been captured during the night. Numbers of eggs were also found in the kiosk, such as are laid by the cotton worm upon the leaves of the plant. Something may certainly be hoped from the invention; at the same time it will be some time before it can be placed on the market.

To regulate the use of cotton seed—a matter in which Egyptian farmers have been very careless—the Agricultural Department issues circulars to the heads of villages and government cashiers in the provinces, detailing the manner in which carefully selected cotton seed will be put on sale at the markets of the Egyptian Markets Company, and the facilities to be accorded to farmers in the payment of the price of such seed. The seed is delivered in sealed sacks.

The most hopeful point in the outlook of the Egyptian cotton market is that, since the arrival of Lord Kitchener at the British Agency, the long-discussed plan of draining the Delta is being put in hand. By this means the subsoil water resulting from the irrigation, will be drained off. The enormous cost of the undertaking has prevented the Government from taking up the matter before

A well-known Egyptian, writing to one of the native papers in Cairo last August, suggested as a remedy for the deterioration of the crop, that the whole country should be restrained from planting cotton for a year. He points out that although the remedy is heroic, the price of cotton would rise during the years following, owing to the great yield of the crop on one hand and its superior quality on the other.

The crop of 1911-12 is likely to be unfortunate. The temperature nearly all through the summer has been rather below the normal, which was not favourable, the crop being liable to have its growth checked under these circumstances. In upper Egypt the crop suffered from fogs and blight, and from attacks of boll worm. As the cotton worm appeared early it attacked chiefly the early bolls which usually give the best cotton, so that both in quality and quantity this season's crop is likely to be inferior to last year's.

In spite of the shortness of the supply, prices are lower than they have ever been. Mr. James I. Craig, M.A., F.R.S.E., Director of the Computation Office of the Survey Department, has lately published some cotton statistics. His general conclusion is: 'The causes of the decrease in yield have been largely beyond the control of human agency, but this does not mean that they will be beyond human control in the future.' Some of his conclusions are as follows: 'The rate of decrease is less in Upper Egypt than in Lower Egypt, but still the decrease exists there also. Part of the decrease in the general average yield for all Egypt may be accounted for by the lower average fertility of Upper Egypt; extension of cotton cultivation to poorer land in Lower Egypt may account for some of the decrease, but scarcely for all. None of these causes, however, will account for the fluctuations about the fairly steady rate of decrease. Change of rotation from one of three years to one of two years may account for some of the decrease, but scarcely for all . . . The cultivation of cotton is probably less intensive now than fifteen years ago . . . The value of the crop per head of the agricultural population has nearly doubled in fifteen years.'

SUBSTITUTES AND ADULTERANTS FOR FUSTIC WOOD.

Circular 184, recently issued under the title *Fustic Wood: Its Substitutes and Adulterants*, by the Bureau of Forest Service of the United States Department of Agriculture, commences by stating that microscopic study of a large number of samples of so-called fustic wood, submitted to the Forest Service, has shown that the substitution exists of several different woods for true fustic, and that this is adulterated by the admixture of them, in a chipped or ground condition. It then proceeds to give the following information:—

True fustic wood which yields the valuable yellow, brown, and green dyestuffs, comes from the fustic tree (*Chlorophora tinctoria*, Gaud. = *Maclura tinctoria*, D. Don = *Morus tinctoria*, L.), a native of the West Indies and tropical America. The tree is also called old fustic, fustic mulberry, Cuba wood, yellow wood, and mora. It should not be confused, however, with the true mora (*Dimorphandra Mora*, B. and H. = *Mora excelsa*, Benth.) of British Guiana, Venezuela, and part of Central America, the wood of which is readily distinguished from that of freshly cut fustic by its reddish-brown colour. The fustic tree attains a height of from 25 to 50 feet, and a diameter of 2 feet or more. The nearly white sap wood is very thin, and the greater portion of the tree therefore is heart wood, the only part put to commercial use. Freshly cut heart wood is light yellow, but after exposure to air and light becomes a yellowish brown. A cubic foot of seasoned wood weighs approximately 50 lb.

Most of the fustic wood used in Europe comes from South America, while the bulk of that consumed in the United States comes from Mexico and the British West Indies. The amount entered at United States ports for immediate consumption during the year ending June 30, 1909, together with the withdrawals from warehouses for later use, was 2,466 tons, valued at $34,752. The average value per ton for 1909 was $14·09, an increase over that of the previous year of $1·99.

Fustic wood is usually imported in sticks from 2 to 4 feet long and from 3 to 8 inches in diameter, but appears also in the form of chips, powder, aqueous extract, and paste or lake. The greater part of the supply, however, comes on the market in either chips or large pieces. While it is possible with a microscope to detect fibres of other woods mixed with ground fustic, it is often impossible, from the fibres alone, to identify them, because the distinguishing characters of the fibres have been obliterated by grinding. It is comparatively easy, however, to identify the different woods before they are powdered or ground into pulp.

After giving illustrated descriptions of woods used for substitution and adulteration, the Circular concludes with an account of the microscopic structure of fustic wood.

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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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in the present number treats of the subject of the Colour of Soils. This is dealt with largely with reference to its origin, and its significance in practical agriculture.

Pages 4 and 5 contain, among other matters, an article giving general information concerning the aromatic grass oils.

An interesting note on an unusual manner of flowering of the papaw plant (*Carica Papaya*) appears on page 9.

In this issue, the plan has been followed that was adopted in regard to the first instalment of Insect Notes for the year, in the last volume of the *Agricultural News*, of giving a summary of the information presented as Insect Notes during the preceding year. A similar article appeared under the heading Fungus Notes, in the last issue.

On page 11 is presented an interesting account of wild rubber in the Congo. This should be read in connexion with the description of cultivated rubbers in the Congo, given on page 341 of the last volume of the *Agricultural News*.

The Students' Corner of this issue, on page 13, is concerned with the presentation of the results obtained in the recent examinations, held in connexion with the Courses of Reading in practical agriculture, of this Department.

The Use of the Prickly Pear in Making Whitewash.

The use of the sections of the stem—commonly called leaves—of prickly pear (*Opuntia* spp.) in making whitewash is frequently met with in the West Indies.

In regard to this matter, a note contained in *The Colonizer* for November 1910, drawing attention to a similar employment of the prickly pear in Uruguay, is of some interest. It is stated that the white colour of the farm buildings in that State serves for special attraction, even during the wet season.

The mode of employing the 'leaves' is stated to be to slice them, macerate them in water for twenty-four hours, and then to add the lime and mix well. The endurance of whitewash thus made forms a matter for particular comment.

Trade and Agriculture of the Gold Coast.

Colonial Reports—Annual, No. 683, contains the Annual Report for 1910 on the Northern Territories of the Gold Coast, from which the following particulars regarding trade and agriculture are taken.

'One must be possessed of great optimism to be able to throw out hopes of much export trade from the Northern Territories, at any rate for some years to come. The great bar to such trade is, of course, the existing lack of transport facilities.'

As regards internal trade, this has never been great, nor—as long as existing conditions continue—is it likely to improve much. The population, at the best of times barely self-supporting in foodstuffs, is at present working at a disadvantage, owing to the increasing calls for labour on account of building, road-making and transport. The money paid out for labour is of no great use to the people, who, as regards outside trade, are peculiarly apathetic. As a matter of fact, it is probable that most of the silver and copper coinage paid out is made into ornaments, whilst the cowrie is still the main currency for the purchase of foodstuffs, that from time to time appear in the local markets in small quantities.

At the same time, both the cola and cattle trades are undoubtedly increasing, as is shown by statistics given in provincial reports. From these it is found that no less than 35,722 cattle and 70,213 sheep and goats entered the Protectorate at Wa, Bawku, and Navarro during the year under review, while 3,860 cattle and 16,813 sheep and goats passed down country through Salaga alone. As regards cola, 30,526 loads passed out of the Protectorate to the north through the same stations, a load as here quoted, being reckoned at 60 lb. It might be added that the cattle trade is in the hands of Moshis, Hausas and Fulanis, none of whom are inhabitants of the country.

'Although agriculturally inclined, the native's methods of tilling the soil are still primitive. Cultivation of land by the rotation of crops he thoroughly understands; but, unfortunately, no system of top dressing is practised. This is a great pity as in every village and hamlet, particularly where cattle are kept, tons of excellent manure are wasted yearly.'

Cambodia Cotton in Madras.

It is stated in the *Agricultural Journal of India* for October 1911, p. 365, that Cambodia cotton is probably of the same species as American Upland, resembling it very closely, but being, in the climate of Madras, much hardier and more vigorous and yielding a stronger and fuller lint than either newly introduced American or acclimatized Dharwar American. It responds readily to irrigation, on account of its possession of a tapering taproot which branches freely near the surface of the soil. This protection from drought renders it possible to manure heavily Cambodia cotton, and thus to obtain large yields: the same circumstance explains, however, why it cannot resist prolonged drought if grown on black cotton soils with the aid of rain alone.

The Flowers of the Papaw Plant.

It is well known in the West Indies that, although the male and female flowers of the papaw tree are usually produced on separate trees, flowers possessing both characteristics (hermaphrodite flowers) and arising in female inflorescences, are often found, and that it is also possible to cause a 'male' tree to bear female flowers and ultimately fruits, by cutting it back.

L'Agriculture Pratique des Pays Chauds for October 1911 gives attention to an exceptional case, where hermaphrodite flowers arose in a male inflorescence, in a note which describes a plant in the Jardin Colonial in Upper Guinea, near Kindia. This plant had already borne male flowers, without fruiting, when suddenly at its full flowering time, it produced long axillary inflorescences containing gamopetalous flowers with normally developed stamens and a rudimentary ovary. At the time of reporting, three fruits had appeared, each about 4 inches long, and soon after a young fruit about half as large. One of the fruits was plucked, and was found to contain numerous normal ovules. It was not expected, however, that these would attain a true maturity, as their stalks were exhibiting a yellowish tint which indicated premature ripening.

In presenting the note, mention is also made of the observation of a similar phenomenon, about 1887, by a French authority and by travellers in Central Africa.

The Lower Limit of Available Soil Moisture.

The *Experiment Station Record*, Vol. XXV, p. 214, gives a method, proposed by Messrs. L. J. Briggs and H. L. Shantz, for determining the lower limit of available soil moisture. This consists in growing plants in a small glass pot, evaporation from the soil surface being prevented by means of a seal of wax which is melted and poured over the soil surface. In the case of monocotyledons, this wax seal can be applied immediately after planting the seeds, and the seedlings will grow readily through the wax, forming a perfect seal around the stems. In that of dicotyledons, the wax, which is usually a mixture of paraffin and vaseline having a low melting point and low heat conductivity, can be melted and poured around the stems of the seedlings without injury. During growth, the pots are immersed in a water bath to avoid condensation of the soil moisture on the pot walls. The water in this bath is stirred constantly to keep the temperature uniform, and a temperature of about 70° and a relative humidity of about 85 per cent. are maintained. The amount of water added to the soil at the beginning depends upon the texture, and will vary from 5 per cent. for sand to 30 per cent. for clay. As soon as the plants show unmistakable signs of wilting, the moisture in the soil in the pots is determined, and this is taken as a measure of the non-available soil water.

Tests of the method with Kubanka wheat seedlings indicate that the probable error of the mean of the determinations from twelve pots or more does not usually exceed 0·1 per cent. of actual soil moisture, which is fully comparable to the accuracy with which the soil itself can be defined through its physical properties.

In these tests, the mean non-available moisture was 2·59 per cent. in fine sand, 9·66 per cent. in fine sandy loam, and 16·3 per cent. in clay loam. The method is stated to be particularly adapted to the study of transpiration.

Camphor in Formosa, 1910.

The shipments of camphor, the production of which is a Government monopoly, from Formosa during 1910, amounted to 6,486,272 lb.: of this 35,072 lb. only was taken by Japan. According to *Diplomatic and Consular Reports*, No. 4769 Annual Series, it is stated that Japanese refiners have to pay an amount which means 1*d*. per lb. more, for crude camphor, than those in Europe and America, and there has therefore been a strong movement among consumers in Japan to induce the Government to sell the article at the same price in the home and foreign markets. The matter is of particular importance, as the manufacture of celluloid has been taken up recently in Japan. An order has now been issued by the Formosan Government that, from April 1, 1911, the price of camphor exported to Europe shall be raised from £7 5*s*. to £7 10*s*. per case.

The output of 1910 did not reach the estimate, which is the same as the quantity authorized to be produced, namely, 7,706,000 lb. The distillation of camphor from the leaves is still in the experimental stage.

All the camphor oil was sent to Japan for the extraction of its camphor.

The Japanese Government has taken strong measures for the subjugation of the savages in the interior of Formosa, and a speedy increase is taking place in the area of forest land under control. The proportion of oil to camphor is much higher from the trees in the south than in the north, and as the new areas are chiefly in the north, this is a matter of much importance.

The Government is encouraging the planting of camphor trees, particularly by the distribution of seedlings from its nurseries

INSECT NOTES.

SUMMARY OF INFORMATION GIVEN DURING 1911.

In the *Agricultural News* for February 4, and 18, 1911 (see Vol. X, pp. 42 and 56), an article appeared entitled A Summary of Entomological Information in the *Agricultural News* and *West Indian Bulletin* during the year 1910. Similarly, the object of the present paper is to summarize the information relating to Entomological subjects which has been published in the *Agricultural News*, Vol. X, during 1911.

SUGAR. On page 122, an account appears of the palm weevil (*Rhynchophorus palmarum*) attacking sugar-cane in Trinidad, and it is also mentioned that the cocoa-nut moth (*Castnia daedalus*) has in one instance at least been known to attack the sugar-cane in British Guiana. The frog-hopper of the sugar-cane (*Tomaspis varia*, Fabr.) formed the subject of an article on page 154 where, in a review of Dr. Gough's work in Trinidad, it was shown that spraying with kerosene emulsion and kerosene lysol emulsion is likely to be successful. A specially designed spraying nozzle is also mentioned in this connexion. Trap lights were also discussed. The use of the frog-hopper fungus was mentioned as likely to be of considerable value in connexion with the control of this pest. Burning the trash in the field destroys many frog-hopper eggs.

The sugar-cane borers which are known as pests in British Guiana are mentioned on the same page (154) in a review of a report by Mr. Quelch. This deals principally with the giant moth borer (*Castnia licus*). Mention is made of the smaller moth borer (*Diatrea saccharalis*), and it is recorded that three species have been in the past included under one name. These are *D. saccharalis*, *D. canella* and *D. lineolata*. The burning of trash is believed to drive away and destroy many parasites and other natural enemies of these pests. The moth borer (*D. saccharalis*) is a pest of canes in Louisiana. On page 170 certain experiments proposed for the control of this insect in that State by the United States Department of Agriculture were outlined.

The root borer of sugar-cane (*Diaprepes abbreviatus*) occurs as a pest in restricted localities in Barbados. An account of this insect with figures of the grub and adult appeared on page 218; in this, the egg was described, and also the habit of the adults of hiding in the leaves of Indian corn and other plants, where they may be found and collected.

The occurrence of a new sugar-cane pest in Mauritius was mentioned on page 314. This is an unidentified beetle, the larva of which feeds on the roots of the sugar-cane, causing serious injury. It is probably an introduced insect more nearly related to the hard-backs and May beetles than to the root-borer.

CORN. The moth borer, as a pest of Indian corn, was discussed on page 74, in a review of Circular No. 116 of the Bureau of Entomology of the United States Department of Agriculture. This insect is known in the Southern States, where it is a serious pest, as the larger corn-stalk borer.

COTTON. On page 378, in an article entitled Notes on the Cotton Worm, the unusually severe outbreak of this pest in the United States is mentioned. It is also recorded that the cotton worm moth occurred at Philadelphia, Pennsylvania, and Amherst, Massachusetts, in considerable numbers. The question is raised as to whether these occurrences were the result of migration, or whether the insect has another food plant beside cotton on which it can breed north of the cotton belt. Experiments with cotton stainers in Montserrat were recorded on page 138, and an account of the cotton stainer of Trinidad, with methods of control, is given on page 394.

OTHER CROPS. A fruit fly attacking cacao in Uganda is recorded on page 26. The mango weevil (*Cryptorhynchus mangiferae*) formed the subject of a brief note on page 58, and of a somewhat larger one on page 282. The occurrence of a Cecidomyiid fly on mangoes in St. Vincent was described on page 10. A note on cocoa-nut pests appeared on page 138, in which several insects are included in addition to those previously recorded in the *Agricultural News*. A note on page 362 was entitled Some Insect Injuries to Ground Nuts.

POLLINATION. Interesting examples of the part played by insects in plant fertilization are given in the articles, Insect Pollination of an Aroid Plant, p. 234; The Pollination of Yucca Flowers, p. 250; and The Pollination of the Smyrna Fig, p. 266.

SCALE INSECTS. A note on the green scale (*Coccus viridis*) in Ceylon, page 106, and an article on the Locomotion of Young Scale Insects page 330, contained the only information published during the year in respect of scale insects, except two, which had special reference to the control of these insects by a natural enemy. These articles were entitled To Increase the Numbers of the Black Scale Parasite (p. 10), and the Parasitism of the Black Scale. The black scale (*Saissetia nigra*) has been a severe pest of cotton, but its parasite, *Zalophothrix mirum*, has assumed a satisfactory control over it (p. 202).

INSECT DISEASES. On page 410, an account is given of a bacterial disease of the grasshopper (*Schistocerca pallens*) in Yucatan, where it seems to be of considerable value in reducing the numbers of the insect, which often occurs as a pest in that country.

TICKS. On page 314, the article Information Concerning Ticks contains a general account of the injuries and losses caused by these animal parasites, and also a list of the ticks recorded from the West Indies, with their distribution as it is known at present; this shows that much more information in regard to these pests ought to be available.

GENERAL. The article entitled The House-Fly and Man, p. 330, reviews the danger to be apprehended from the house-fly as a disease carrier, and suggests measures for controlling this insect. The Insect Notes headed An Insect New to the West Indies record the occurrence of a borer (*Bartocera rubus*) in trees, in St. Croix and Trinidad; they appeared on page 106. Mosquito-destroying fish in Lagos and Uganda are briefly mentioned on page 346.

On page 218, an article on Entomology in Southern Nigeria refers to certain insect pests of crops which are the same as, or similar to, the pests of the same crops in the West Indies. The account of the control of the Argentine ant, on page 346, describes the use of poison sugar bait which successfully controlled the Argentine ant in a limited district.

The article entitled Some Useful Insecticides, p. 378, gives formulas for making several preparations which have been found to be of value in California in the control of the peach tree borer.

On page 362, Pest Laws in Porto Rico are briefly outlined. An illustrated article on Peripatus, that interesting modern representative of the ancient ancestors of insects, is given on page 186.

A brief account of the organization and work of the Entomological Research Committee for Tropical Africa is given on page 90. The article entitled The Control of Insect Pests, p. 122, was taken from the first of a series of lectures by H. Maxwell-Lefroy at the Imperial College of Science and Technology, while on page 170 there is given an outline of the courses in Economic Entomology at this institution.

POULTRY NOTES.

THE FATTENING OF POULTRY.

Some of the following conclusions, reached in Bulletin 140 of the Bureau of Animal Industry of the United States Department of Agriculture, entitled Fattening Poultry, are of interest to poultry keepers in the West Indies. It should be stated that in experiment A, the stock was of better quality than in B, while in the food of the latter, oat flour was used instead of the low-grade wheat flour in A, and a small amount of tallow was added. Again, in experiment A, the birds were fed more than once at each meal, the number of meals per day being three; while in B, two meals were given daily, with one feed, only, at each. Lastly, the birds in experiment A were shipped by express, and those in B, chiefly in live stock cars.

(1) The Plymouth Rock and other varieties of general-purpose fowls make more economical gains in fattening than the Mediterranean class, such as Leghorns.

(2) Chickens of the same breed vary greatly in their ability to put on flesh. This variation may lead to gross error in drawing conclusions from experiments in feeding poultry which deal with only a small number of birds.

(3) Muslin or duck cloth can be used to good advantage to replace the windows or part of the walls of feeding stations.

(4) If a feeding station is properly constructed, good ventilation can be secured without having a large open space in the top of the building, such as a monitor top. Such buildings can be constructed more cheaply than those with a large amount of air space, per bird, by using muslin curtains for the walls.

(5) The use of portable feeding batteries is more easily adapted to varying conditions, involves less labour, and turns the birds out in better condition than the stationary batteries.

(6) Low-grade wheat flour is a more economical feed than oat flour in fattening rations for chickens, at the present prices of grain.

(7) The average person will get better results in fattening by feeding three times rather than twice daily.

(8) The amount of grain required to produce a pound of flesh in fattening chickens varied in experiment A from 1·92 to 5·35 ℔., with an average of 3·26 ℔.; while in experiment B the amount varied from 1·29 to 8·45. ℔, with an average of 3·26 ℔.

The total cost of feed per pound of gain varied from 3·71c. to 10·37c., and averaged 6·45c. in experiment A, while in experiment B, the cost varied from 3·15c. to 19·90c., and averaged 7·74c

The cost of labour for a pound of gain in flesh varied from 0·88c. to 2·81c., and averaged 1·40c. in experiment A, while in experiment B, the cost varied from 1·14c. to 5·63c., and averaged 2·59c.

The cost of both feed and labour to produce a pound of gain in fattening varied from 4·61c. to 13·14c., and averaged 7·85c. in experiment A; and it varied from 4·35c. to 27·20c., and averaged 10·33c. in experiment B.

The average total cost of feed and labour per pound of gain for all the birds in experiments A and B was 9·09c.; the average cost of feed alone, 7·10c.

(9) The cheaper gains were made in the shorter feeding periods (seven or eight days) and by the light chickens.

(10) Hens make poorer gains than chickens in crate fattening. Fattening hens by this method is profitable only under certain conditions.

WILD RUBBER IN THE CONGO.

The last volume of the *Agricultural News*, p. 341, contained an account of rubber cultivation in the Congo, taken from *The Board of Trade Journal* for August 31, 1911. The following information concerning wild rubber, in that State, is extracted from the same source:—

Among the numerous latex-yielding plants to be found in the vast forest lands of the Congo, the most common are those mentioned below:—

Landolphia owariensis, which is perhaps the best known liana, is spread throughout the rubber areas of the country. It is a vigorous vine, and the result of a test made by a botanist shows that a liana of this species, having a circumference of 18 inches at a height of 3 feet above the ground, produced 31·7 oz. of latex at the first tapping and 1·65 oz. at the second, thus giving an annual yield of 33·35 oz.

Landolphia Klainei and Clitandra Arnoldiana (= *C. orientalis*) are widely scattered throughout the Lower and Middle Congo, the Kasai, Kwango and the Ubangi. The former produces an excellent black rubber when the latex is immersed in boiling water, and experiments with the latter have yielded good results.

Carpodinus gracilis, of which the rhizomes yield a good quality of rubber.

Landolphia droogmansiana, which attains a great height and considerable thickness, is best known in the Mayumbe, where it is worked.

Landolphia Thollonii is best known in the Kasai. It grows in a sandy soil, and is remarkable for the extraordinary development of the rhizomes, which measure ½-inch in diameter, and are interwoven in large, mesh-like clusters below the surface.

Carpodinus Gentilii is a liana that attains some 12 inches in circumference. It is best known in the Bangala, Uele, and other districts to the north of the Equator.

Wild rubber, in districts in which it has been worked on an extensive scale, is now becoming scarce in places. Many of the large rubber zones have been worked out completely, and the industry is at a standstill until the forests shall have had time to recover. Some of the plants, such as *Landolphia Klainei* and *Clitandra Arnoldiana*, are known to have attained 50 feet in height and 4 to 5 inches in circumference in four years, but expert opinion differs too widely to allow of any estimation of the period of growth of wild rubber, which it is supposed may be anything between twenty-five and fifty years. There are, of course, still vast areas of virgin rubber forest, but these are at remote distances from the present lines of communication, and are consequently difficult of access and unprofitable, owing to the lack of means of transport. In some of the remaining accessible districts, where rubber is still plentiful, labour difficulties have interfered with the progress of the industry. Rubber is now cultivated in other countries by such improved methods as to threaten, in course of time, to displace the inferior wild product on the market.

GLEANINGS.

The *Textile Mercury* for October 21, 1911, states that the Russian cotton crop amounted to about 900,000 bales, which is a decrease on the quantity of the previous year by 50,000 bales.

It is reported by H. M. Consul at Para that the exports of rubber from Para, Manaos, Iquitos, and Itacoatiara during the crop year ending June 30, 1910-11, were respectively as follows: 14,976,291, 16,088,277, 2,371,572 and 96,566 kilos., making a total of 33,532,706 kilos.

Information has been supplied by the German Consul in Santo Domingo, to the *Nachrichten für Handel und Industrie*, to the effect that the amount of cacao exported from the Republic in January to June 1911, was 13,200 metric tons. The quantity for the previous similar period was 11,750 metric tons.

The *Chemical Trade Journal*, 1911, p. 74, states that the figures published by the Nitrate Syndicate show that the production of nitrate of soda in 1910 was larger by 350,253 tons than in 1909, the output being 2,436,182 tons. The average price in Europe during the former year is estimated to be about £1 lower than in 1909.

Information from the Agricultural Superintendent of St. Vincent shows that in November last, 2,000 Para rubber seeds were received by the Agricultural Department, one half of which were sown in the nursery at the Station and the rest sent to Three Rivers estate. At the time of reporting, all the seed was germinating well.

An abstract is contained, in the *Journal of the Chemical Society*, 1911, p. 430, of a paper which describes experiments which showed that applications of starch and sucrose to the soil, each separately at the rate of 1 ton per acre, caused large decreases in the yield of barley. The treated soil was subjected to examination, and it was found that it contained a largely increased growth of bacteria and moulds.

At the end of November last it was reported from Montserrat that the prospects for the cotton crop continued to be good, and that picking would be carried on until a much later date than that of last year. On some estates, the percentage of lint has been low. Flower-bud maggot was found in several places, and attacks of the cotton worm have been severe in all parts of the island, the greatest damage having been done in the northern districts.

Particulars have been received of a roller cotton gin, described as the D.C. Hand Gin, and supplied by Norman Pain Pearse, 28 Queen Street, London, E.C., to whom application should be made for information and prices. This requires only one person to operate it, and is made in two sizes, one of which will deal with 10 to 16 lb. of seed cotton in an hour, while the other gives an output 15 per cent. greater. The latter is recommended particularly for use on experiment farms.

The Sea Island cotton crop for 1910-11 was not so big as the previous year's. The total number of bales was 87,911, being a reduction of 8,807 on the crop of 1909-10. The bales were distributed as follows: Great Britain, 16,505 bales; the Continent 6,430; and the United States, 61,125. This year's crop has suffered through storm and rain, and the harvesting, although favoured by good weather, is being held back through the want of efficient labour. (The *Textile Mercury*, October 14, 1911.)

Colonial Reports—Annual, No. 691, shows that there was an increase in the importation of rice into Hong Kong, during 1910, over the quantity for the previous similar period. The total reported imports are stated to have been 4,298,194 tons as against 4,195,968 tons in 1909; though these figures are not entirely reliable. The increase was undoubtedly due to the almost total failure of the Chinese first crops, owing to continuous drought, and to the partial failure of the second crop in parts of Kwangtung.

The *Financial Times* states that, according to the *Dépêche Coloniale* (Paris), the French Ministry of Colonies proposes to send a special commission for the purpose of selecting either Fort-de-France, Martinique, or Point-à-Pitre, Guadeloupe, as a port of call in connexion with the opening of the Panama Canal and for the general development of French influence in the Caribbean Sea. It is considered that Point-à-Pitre possesses the greatest advantages for the purpose, on account of the superiority of its harbour, and there is likely to be the additional inducement that the local authority will abolish the harbour and pilot dues.

An investigation of the turning back of the water current in the sweet potato is described in the New Jersey *Stations Report* for 1909, p. 343. The method of experimentation was to grow a piece of the main stem, with a side branch, in a pot, and then to root the growing vine with its branches at intervals of 2 feet, in pots, water being subsequently supplied to the rooted parts of the branches, but not to the main stem. Observations showed that the water current was turned back from its normal direction, so that the plant grew from that supplied to the side branches.

The *Experiment Station Record* for June 1911, p. 645, gives an account of tapping experiments that have been conducted with young trees of *Funtumia elastica*, at Amani, German East Africa. The largest yield was obtained with the quarter-section method of tapping, but it is the opinion of the author that, in a general way, the herring-bone system will give the best results. It was found profitable to tap trees six years old. There was an increase in the quantity of the latex with the age and diameter of the trees, though slender trees sometimes gave relatively large yields. Attention is drawn to the fact that some trees give high returns, but do not sustain them from year to year; so that in selecting seed it should be taken from plants which yield well continuously.

STUDENTS' CORNER.

RESULTS OF AGRICULTURAL EXAMINATIONS.

The results obtained by candidates in the last Preliminary, Intermediate and Final Examinations, held in October and November last, in connexion with the Courses of Reading of the Imperial Department of Agriculture, are as follows:—

PRELIMINARY EXAMINATION.

Centre.	Name.	Result.
St. Lucia	Clauzel, W. C.	3rd class
	Derrel, D. J.	3rd ,,
Dominica	Auguste, H.	2nd ,,
	Cuffy, G. T.	3rd ,,
Montserrat	Ross, R.	3rd ,,
Antigua	Athill, S. V.	3rd ,,

Seven candidates presented themselves for examination in this stage, of which six passed, as is shown.

INTERMEDIATE EXAMINATION.

Centre.	Name.	Result.
Montserrat	Howes, S. W.	2nd class
Antigua	Gomes, C. A.	3rd ,,
	Stamers, A. L.	3rd ,,

For the Intermediate Examination, four candidates presented themselves, and as is shown, three passed. Among these, success was obtained in the special subjects, as follows: Howes, S. W., Cotton and Limes; Gomes, C. A., Sugar—General, and Cotton; Stamers, A. L., Sugar—General, and Provision Crops.

FINAL EXAMINATION.

Centre.	Name.	Result.
Antigua	Hallpike, C. J. A.	3rd class
	Shepherd, C. H.	3rd ,,

For this stage there were four candidates, and two passed, in accordance with the particulars given in the above list. These obtained success in the special subjects, as follows: Hallpike, C. J. A., Sugar—General, and Cotton; Shepherd, C. H., Sugar—General, and Cotton.

The two candidates who failed in the Final Examination showed a fair knowledge of the theoretical side of the subjects, and dealt with these in a way that would have been fairly creditable in the Intermediate Examination, but was not up to the standard required for the Final. The evidences of their practical ability were also greatly lacking, and these facts preventedthem from being classed.

The Local Examiners at the different centres were as follows:—

Mr. G. Barnard ,, C. R. Kennaway ,, J. C. Moore ,, A. J. Brooks	St. Lucia
,, J. Jones ,, G. A. Jones	Dominica
The Hon. F. Driver The Rev. Canon Haines Mr. W. Robson	Montserrat
Mr. R. S. D. Goodwin ,, J. J. Roden ,, H. A. Tempany, B.Sc. ,, T. Jackson	Antigua

Although the percentages of passes obtained by the candidates were high, particularly in the Preliminary and Intermediate stages, there was no case where a pre-eminently good knowledge of the subjects was shown. This was apparently due to the fact that candidates had been mostly content to pursue their work and studies only to such a degree as seemed necessary for them to attain the pass mark, and to the circumstance that they did not answer thoroughly the questions attempted by them. Credit cannot be given for the possession of knowledge that is merely implied, and it is recommended that students following the Reading Courses should try to gain a more intimate acquaintance with the subjects, and that they should practice the answering of questions in order that they may acquire the ability to do this in a methodical, complete and speedy manner.

Anthrax Serum for Human Anthrax.—The results of the serum treatment of anthrax in veterinary practice have awakened interest in the specific treatment of anthrax in human medicine to such an extent that Sobernheim's anthrax serum has been used on an increasing scale as an addition to the older forms of medicinal treatment. Recently Koelsch has again drawn attention to the value of this serum. It is best given intravenously in doses of 10 c.c., repeated several times. The most conservative local treatment should be used with it. Beyer used pyocyanase for the local treatment. In the two cases reported by him the infection occurred in a tannery. One patient had a pustule on the right cheek. He was given two intravenous injections, and the pustule was treated locally with pyocyanase. The case ran an afebrile course and ended in recovery, so that there was practically no scar to be seen. In the other case there was fever and oedema extending to the eyelids. The treatment consisted of three injections of serum, amounting altogether to 50 c.c., and moist dressings with pyocyanase. On the fourth day a complication occurred in the form of erysipelas, starting from the primary lesion. The pustule healed, but a scar was left which necessitated a plastic operation.

The serum injections should be commenced as soon as anthrax is diagnosed. It is therefore advisable, in vocations in which anthrax infection is known by experience to be liable to occur, that serum be kept at hand so that too much time may not be lost in procuring it. (From E. Merck's *Annual Report of Recent Advances in Pharmaceutical Chemistry and Therapeutics*, 1910, p. 331.)

The Third International Rubber and Allied Trades Exposition.—In the last number of the *Agricultural News*, p. 412, it was stated that information had been received by the Commissioner of Agriculture, from the Organizing Manager, Mr. A. Staines Manders, to the effect that this exposition will be held at the New Grand Central Palace, 46th and 47th Street and Lexington Avenue, New York City, from September 23 to October 3, 1912 The Commissioner has since been informed, further, by the Organizing Manager that, in order to render more information available concerning the participating countries, planters will be encouraged to exhibit other products, besides rubber, and that it will be advisable to have full information prepared, in booklet form, for distribution to visitors.

FUNGUS NOTES.

EXPERIMENTS ON THE CONTROL OF LEAF RUST OF GROUND NUTS.

A leaf rust of ground nuts, due to *Uredo arachidis*, has been of common occurrence in the West Indies during recent years, and has been under more particular observation in the experiment plots planted with imported American varieties, in Dominica, Montserrat and St. Kitts. Some account of it is given in the *West Indian Bulletin*, Vol. IX, pp. 157 and 167.

The disease appears to be more usually confined to the older leaves, but this is not always the case; while the opinions of different observers throughout the islands as to the amount of damage due to it have been somewhat conflicting. The same is true with regard to the effect of control measures in reducing its prevalence. In the season of 1909, Mr. W. Robson, Curator of the Botanic Station, Montserrat, expressed the opinion that it undoubtedly affected the yield obtainable, by shortening the life of the plants and causing shrink- of the nuts. In the following year, Mr. A. J. Brooks, then Master-in-Charge of the Agricultural School, Dominica, conducted experiments to compare the weight of nuts from, and the number produced by, infected and healthy plants. He found that the presence of the fungus did not have any appreciable effect on the values obtained in each case, and concluded that the damage due to it was negligible. Moreover, he reported that spraying with Bordeaux mixture and dusting the plants with a mixture of lime and sulphur did not reduce its spread. But in the same year, Mr. Robson found that the results obtained by spraying with Bordeaux mixture supported the theory that the fungus shortens the life of the plants. His results were based on the general appearance of the sprayed and unsprayed plots, and on comparisons of the yields obtained from each. He found that the sections sprayed remained green for a longer period than those unsprayed, and that the fungus appeared on the control plots in some quantity at a date when it was absent on the sprayed portions. In the case of each variety grown, the yield of nuts from the sprayed portion was in excess of that from the control plot. It should be noted, however, that the fungus appeared eventually to some extent on the sprayed plots, as well as on the controls. This is possibly due to the fact that spraying was commenced at too early a date, or perhaps a third application was advisable. The plots were planted on July 7, and were sprayed on August 23 and September 17, while the rust did not appear at all until the beginning of October; so that a third application at the commencement of the month might have been of service. Mr. Robson found that Bordeaux mixture adhered well, but that an application of lime and sulphur made on August 23 was washed off by a shower which fell soon afterwards. (See Reports on the Botanic Station and Experiment Plots, Montserrat, 1910-11, pp. 12 and 13.)

These results are at variance with those obtained in the same year in Dominica, but were confirmed to a certain extent at that time by Mr. F. R. Shepherd, Agricultural Superintendent, St. Kitts, who reported that rust appeared on the plants in the experiment plots when the vines were maturing, but that spraying with Bordeaux mixture gave good results. No evidence is available to show on what basis this statement is made, so that its value in this discussion is limited.

In the present season, Mr. Robson repeated the previous experiments. In a summary of the results obtained, the following information is given. Rust was prevalent in all the plots under cultivation at the Botanic Station, Montserrat, but the Carolina Running variety appeared to suffer most, and the Gambia least of all. Spraying experiments with Bordeaux mixture did not yield any definite results; in fact they indicated rather that little or no damage is caused by the fungus. It was noticed that the actual number of rust pustules on the sprayed portion was very small as compared with the number on the unsprayed; but tests of the yield and quality of the nuts from each set of plots showed no consistent results. It should be noted, however, that the virulence of the attack was not nearly so marked as it has been in previous years, and this may account to some extent for the inconsistent weights of nuts recorded from the different plots of sprayed and unsprayed varieties.

This last piece of evidence appears to be in agreement with that obtained in Dominica in 1910, and is decidedly at variance, as regards yield of nuts, with the data recorded in Montserrat in 1910. It seems possible that the nature of the season may have some effect on the amount of damage resulting from the attacks of rust; while another factor is probably the time of application of the fungicide, as well as the number of applications made. The evidence available at present seems to indicate that the damage due to the rust fungus is so small that applications of fungicides, even when effective, are not economically justifiable, as the resulting increase in yield is insufficient to cover their cost. Further experiments should, however, be conducted in order that, if possible, some definite conclusions may be arrived at.

EXPORTS FROM THE SEYCHELLES, 1910.

The following account regarding the exports and trade prospects in the Seychelles is given in *Colonial Reports*—Annual, No. 693, p 9.

The export of copra has risen steadily, and with improved methods of cultivation should continue to progress.

The export of soap and other products of the cocoa-nut palm will only show an increase when there is a considerable fall in the price of copra, but the quantity of nuts collected is steadily advancing.

A moderate crop of vanilla was harvested. Vanilla plantations are being gradually restricted to the higher zones of the mountains owing to successive dry seasons. With the legislation in France and the United States restricting artificial substitutes, there has been a continuance of the remunerative prices of the past two years, and as there is a growing reluctance on the part of manufacturers to use the artificial vanillin, there seems no reason why vanilla cultivation should not continue to form one of the principal industries of the Colony. I am aware that this opinion is contrary to that of a number of experts. When in England in 1907, I was told by a distinguished man of science, whose researches have been mainly connected with tropical products, that plantation vanilla was in its death throes. In that year the Seychelles crop realized a million rupees, the price rose steadily (apart from a temporary drop in 1908) and good prices have ruled ever since. It is not as if vanilla has to be cultivated at the expense of less capricious products: the orchid will grow and thrive where cocoa-nuts and rubber will not. It is true that the yield fluctuates considerably, but even the famine harvest of 1909 (11 tons) realized over Rs. 200,000, and was third in value in the exports for that year.

Calipee has risen to sixth on the list of exports. The whole of the commodity is absorbed in the United Kingdom.

Tortoise-shell may show a very substantial increase in future years, as artificial rearing in enclosed areas is being tried, and the promoters appear confident of success. If the hawksbill turtle can be reared to maturity, the profit in these ventures should prove enormous.

Straw plait from the coco de-mer straw has been tried, but the venture does not promise well. In any case the restricted area of the growth of these palms would tell against any considerable expansion.

The manufacture of rum is likely to cease, as the natives of Seychelles, though inveterate drinkers of this spirit, show a decided aversion to the locally manufactured article. The distillery is no longer working, and the total stock has been exported by the assignees in the bankruptcy of the firm which carried on the business. The stock was offered for sale locally, and the highest tender was at the rate of 5c. a litre.

WEST INDIAN PRODUCTS.

DRUGS AND SPICES ON THE LONDON MARKET.

Mr. J. R. Jackson. A.L.S., has forwarded the following report on the London drug and spice market, for the month of November 1911:—

The month of November has not been marked by any great changes, either in prices or demand, since our report for October. Commencing with a very quiet tone, accompanied, perhaps, with a slight increase in the prices of a few well-known drugs, there was, in the middle of the month, a slight drop in the price of Buchu leaves, which have maintained a high position for some months past. This fall was said to be due to the prospect of an early arrival of the new crop of leaves from the Cape. At the auctions in the last week of the month, a slight improvement was noticeable, both in the quantities disposed of, and in the prices realized for drugs generally. No product of the West Indies, however, calls for any special comment.

GINGER.

At the first auction on the 1st of the month, some 600 bags of Cochin were offered, and 200 bags washed rough sold at 46*s.* to 46*s* 6*d.*; slightly wormy realized 44*s.* Some cases of Calicut were brought forward, the reserve prices for which were: bold cut 92*s.* 6*d.*, and small cut 72*s.* 6*d.*; 76 bags of partly mouldy limed Japan were sold without reserve at 40*s.* per cwt. A week later the sales were as follows: out of a total of 401 bags of Cochin brought forward without reserve, only 41 sold at 69*s.* 6*d.* to 70*s.* for good small; washed rough Cochin was bought in at 46*s.* per cwt. At the end of the month, though the quantities offered were large, the sales were slow, and most of the offerings were bought in; thus 50 barrels from Jamaica were bought in at 56*s.* for small, bright, but wormy; 843 bags and 63 cases Cochin and Calicut were held at 90*s.* to 95*s.* for finest, down to 45*s.* to 50*s.* for washed Cochin.

NUTMEGS, MACE AND PIMENTO.

On the 1st of the month nutmegs were represented by 89 packages of West Indian, and 102 packages of eastern; the former were partly sold at the following rates: wormy and broken 160's 4½*d.*, 124's to 140's 4¼*d.* The latter, namely the eastern, were also partly sold, 63's fetching 1*s.*, 78's 8*d.* and 95's 6½*d.* A fortnight later, 88 packages of West Indian were offered, and partly sold at the following prices: 63's to 69's 8¼*d.* to 9*d.*, 71's to 75's 7*d.* to 8*d.*, 98's 5½*d.* and 112's 6½*d.* On the 22nd, as many as 411 packages of West Indian were brought forward and nearly all sold at prices of ¼*d.* to ½*d.* per lb. advance on previous rates. On the 15th, West Indian mace fetched from 2*s* 4*d.* to 2*s.* 6*d.* per lb. and eastern 2*s.* 2*d.* to 2*s.* 6*d.*, and on the 22nd the same prices were realized for the bulk of a consignment of 128 packages of West Indian. Pimento at the first auction was represented by 50 bags, all of which were bought in at 2¾*d.* per lb., a price that has been maintained throughout the month at private sales. At the last auction on the 29th, 83 barrels of St. Vincent arrowroot were brought forward, only 20 of which sold at 3⅝*d.* per lb. for good manufacturing

SARSAPARILLA.

At the first drug sale on the 2nd of the month, grey Jamaica sarsaparilla was represented by 13 bales, all of which found buyers at 1*s.* 8*d.* to 1*s* 10*d.* per lb., 15 bales of Lima-Jamaica were also brought forward, and 9 sold at 1*s.* 1*d.* for fair, and 1*s.* for part coarse; only 3 bales of native Jamaica were offered and sold, 2 of which, consisting of yellow and red mixed, realized 10*d.* per lb. On the 16th, another consignment of 13 bales of native Jamaica was offered and all sold, fetching 1*s.* 10*d.* per lb. for fair grey, part slightly roughish; the rest, sea-damaged, was sold at 1*s.* 6*d.* per lb. Six bales of Lima-Jamaica were also offered, but were held at 1*s.* 2*d.*, while 4 bales of native Jamaica, all that were offered, sold at 1*s* 1*d.* per lb for good red, and 10*d.* per lb. for dull red. On November 30, grey Jamaica was entirely absent from auction, Lima-Jamaica and Native Jamaica being the only kinds offered, and of these only 3 bales of each, all of which sold at the following prices, Lima-Jamaica, part coarse 1*s.* 2*d.* and fair hanks 1*s.* 3*d.* per lb. while native Jamaica realized 1*s* 1*d* for good red, 10½*d.* for red and yellow mixed, and 9*d.* for dull red.

KOLA, LIME JUICE, LIME OIL, AND TAMARINDS.

At auction on the 1st of the month, a single bag of kola from Samoa, mostly in halves, dried, and of a darkish colour, fetched 3*d.* per lb. A fortnight later, kola was represented by 26 bags of Jamaica, all of which sold at from 3⅝*d.* to 4*d.* per lb. for fair partly washed, chiefly in bright halves, while one bag of ordinary dried West Indian halves realized 4*d.* per lb. At the end of the month these prices were still maintained, 13 bags of West Indian being thus disposed of, while for good bold bright St. Lucia 4*d.* was wanted. Some 6 bags of fair Ceylon, chiefly in halves, were also offered and sold at 3½*d.* per lb Lime juice was represented at auction on the 1st of the month by 10 barrels of raw Dominican, which sold at 1*s.* 3½*d.* per gallon for fair palish, while 20 hogsheads of browner kind were bought in at 1*s.* 2*d.* per gallon. A fortnight later, 7 hogsheads of dark to ordinary brown Antigua were offered and bought in at 1*s.* 4*d*, and fair at 1*s.* 3*d.* At the beginning of the month fair distilled West Indian oil of lime was sold at 1*s.* 1*d.* to 1*s.* 2*d.* per lb., 5*s.* 3*d.* being quoted for hand pressed. A fortnight later, 1*s.* 2*d.* per lb. was paid for 4 cases of fair West Indian distilled. For Barbados tamarinds 16*s.* has been paid in bond, and for Antigua 12*s.* 6*d.* to 13*s.* The former are reported to be scarce.

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR, December 19, 1911; Messrs. E. A. DE PASS & Co., December 8, 1911.

ARROWROOT—$3\frac{1}{2}d$ to $3\frac{3}{4}d$.
BALATA—Sheet, 3/6; block, 2/4 per lb.
BEESWAX—£7 5*s.* to £7 10*s.*
CACAO—Trinidad, 60/- to 70/- per cwt.; Grenada, 54/- to 59/6; Jamaica, 51/- to 58/-.
COFFEE—Jamaica, 70/- to 120/- per cwt.
COPRA—West Indian, £25 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—49/- to 64/- per cwt.
ISINGLASS—No quotations.
HONEY—No quotation.
LIME JUICE—Raw, 1/1 to 1/4; concentrated, £18 12*s.* 6*d.* to £19 10*s.*; Otto of limes (hand pressed), 5/3.
LOGWOOD—No quotations.
MACE—Firm.
NUTMEGS—Firm.
PIMENTO—Common, $2\frac{9}{16}d.$; fair, $2\frac{5}{8}d.$; good, $2\frac{11}{16}d.$; per lb.
RUBBER—Para, fine hard, $4/4\frac{1}{2}$; fine soft, 4/1; Castilloa, 4/1 per lb.
RUM—Jamaica, 1/8 to 5/-.
SUGAR—Crystals, 19/6 to 22/6; Muscovado, 15/- to 17/6; Syrup, 14/- to 18/3 per cwt.; Molasses, no quotations.

New York.—Messrs. GILLESPIE BROS. & Co., December 15, 1911

CACAO—Caracas, $12\frac{1}{2}$c. to $12\frac{3}{4}$c.; Grenada, 12c. to $12\frac{1}{4}$c.; Trinidad, 12c. to $12\frac{1}{2}$c. per lb.; Jamaica, 10c. to 12c.
COCOA-NUTS—Jamaica, select, \$29·00 to \$31·00; culls, \$16·00 to \$17·00; Trinidad, select, \$29·00 to \$31·00; culls, \$16·00 to \$17·00 per M.
COFFEE—Jamaica, $14\frac{1}{4}$c. to 15c. per lb.
GINGER—$8\frac{3}{4}$c. to 9c. per lb.
GOAT SKINS—Jamaica, 53c.; Antigua and Barbados, 48c. to 52c.; St. Thomas and St. Kitts, 46c. to 48c. per lb.
GRAPE-FRUIT—Jamaica, \$2·50 to \$3·00.
LIMES—\$3·00 to \$4 00.
MACE—50c. to 54c. per lb.
NUTMEGS—110's, $12\frac{1}{2}$c.
ORANGES—Jamaica, \$2·00 to \$2·25 per box.
PIMENTO—$2\frac{5}{8}d.$ per lb.
SUGAR—Centrifugals, 96°, $4\frac{7}{8}$c. per lb.; Muscovados, 89°, $4\frac{1}{8}$c.; Molasses, 89°, $4\frac{3}{8}$c. per lb., all duty paid.

Trinidad,—Messrs. GORDON, GRANT & Co., December 26, 1911.

CACAO—Venezuelan, \$12 60 per fanega; Trinidad, \$12·40.
COCOA-NUT OIL—95c. per Imperial gallon.
COFFEE—Venezuelan, 17c. per lb.
COPRA—\$4·25 per 100 lb.
DHAL—\$4·00 to \$4·10.
ONIONS—\$2 75 to \$3·00 per 100 lb.
PEAS, SPLIT—\$6·75 to \$7·00 per bag.
POTATOES—English, \$2·50 to \$2·75 per 100 lb.
RICE—Yellow, \$4·75 to 4·80; White, \$5·75 to \$6·00 per bag.
SUGAR—American crushed, no quotations.

Barbados,—Messrs. JAMES A. LYNCH & Co., December 30, 1911; Messrs. T. S. GARRAWAY & Co., January 1, 1911; Messrs. LEACOCK & Co., December 22, 1911; Messrs. E. THORNE, Limited, December 5, 1911.

CACAO—\$12·00 to \$12·50 per 100 lb.
COTTON SEED—\$26·00 per ton.
COTTON SEED OIL—50c. per wine gallon.
COTTON SEED CAKE MEAL—\$24·00 per ton, c.i.f., neighbouring islands.
HAY—\$1·50 to \$2·00 per 100 lb.
MANURES—Nitrate of soda, \$65·00; Cacao manure, \$42·00 to \$48·00; Sulphate of ammonia, \$75·00 to \$80·00 per ton.
MOLASSES—No quotations.
ONIONS—\$2·40 to \$3·50 per 100 lb
PEAS, SPLIT—\$6·75 to \$6·80 per bag of 210 lb.; Canada, \$3·90 to \$4·10 per bag of 120 lb.
POTATOES—Nova Scotia, \$2·50 to \$3·25 per 160 lb.
RICE—Ballam, \$4·90 to \$5·30 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
SUGAR—American granulated, \$6·00 per 100 lb.

British Guiana.—Messrs. WIETING & RICHTER, December 23, 1911; Messrs. SANDBACH, PARKER & Co., December 8, 1911.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	\$12·50 per 200 lb.	\$13·00 per 200 lb.
BALATA—Venezuela block	No quotation	Prohibited
Demerara sheet	70c. per lb.	70c.
CACAO—Native	15c. per lb.	11c. per lb.
CASSAVA—	72c.	No quotation
CASSAVA STARCH—	——	No quotation
COCOA-NUTS—	\$12 to \$16 per M	\$10 to \$16 per M., peeled and selected
COFFEE—Creole	18c. per lb.	18c. per lb.
Jamaica and Rio	18c. to 19c. per lb.	20c. per lb.
Liberian	$14\frac{1}{2}$c. per lb.	14c. per lb.
DHAL—	\$3·75 per bag of 168 lb.	\$3·75 per bag of 168 lb.
Green Dhal	\$3·00	——
EDDOES—	\$1·20	——
MOLASSES—Yellow	None	——
ONIONS—Teneriffe	——	——
Madeira	$5\frac{1}{2}$c. to 6c.	5c. to 6c.
PEAS—Split	\$7·00 per bag (210 lb.)	\$7·00 to \$7·25 per bag (210 lb.)
Marseilles	\$3·25	No quotation
PLANTAINS—	20c. to 40c.	——
POTATOES—Nova Scotia	\$3·25 to \$4·00	\$3·50
Lisbon	——	No quotation
POTATOES—Sweet, B'bados	\$1·68 per bag	——
RICE—Ballam	No quotation	——
Creole	\$5 00	\$5·00 to \$5·25
TANNIAS—	\$1·44	——
YAMS—White	\$2·88	——
Buck	\$3·12	——
SUGAR—Dark crystals	\$3·20	\$3·20 to \$3 25
Yellow	\$3·80	\$3·75
White	\$4·75 to \$5 00	——
Molasses	\$3·10 to \$3·25	——
TIMBER—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	\$3·75 to \$6·00 per M.	\$4·00 to \$6·00 per M.
,, Cordwood	\$1·80 to \$2·00 per ton	No quotation.

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AGRICULTURAL NEWS.

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

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CONTENTS.

The Use of Latex in Plants.

THE actual function of latex in plants is still a matter of uncertainty, although the consideration and study of the subject have been given more attention in recent years, since the advent of the largely increased interest in rubber-yielding plants. It seems fair to state, however, that speculations and observations in this connexion have suffered from the bias engendered by the amount of regard that has been given to the fact that rubber is obtainable from the latex of many plants, under the proper conditions: sufficient attention has not been paid to the circumstance that several substances other than caoutchouc are yielded by latex. This has probably led to an incorrect view as to the actual uses and real composition of the milky juice of plants from which rubber may be separated.

The matter receives treatment in a broad manner in an article* by Keith Bancroft, B.A., Mycologist to the Department of Agriculture of the Federated Malay States, and it will be well to bring forward a few of the considerations that are dealt with in this article.

Reference is first made to the fact that many plants contain substances that are the products of life processes, and that neither the use of these to the plants nor the manner of their formation is at present capable of being explained. Some of these substances are of large economic importance, and they are nearly all poisonous to animal life. The latter property doubtless gives assistance in the protection of the plant from animals which may desire to feed upon it, or injure it in other ways, but it cannot be held definitely that this is a primary function of the poisonous substances. There are other matters that are of no use as plant food, which are not necessarily harmful to animals, but serve to attract insects; these are useful, in their special way, but it would be claiming a great deal definitely to assert that they were formed originally for this particular purpose.

Returning again to the circumstance that rubber can be obtained from the latex of many plants, less is

*The *Agricultural Bulletin of the Straits and Federated Malay States*, September 1911, p. 276.

probably known of the significance of the presence of this, or of the substances that produce it, than has been ascertained regarding the manner of formation and function of other bodies, such as ethereal oils, resins, colouring matter, alkaloids and glucosides. Latex itself contains, in a watery medium, resins, rubber, oils, tannins, proteids, sugars, starch. alkaloids, ferments and salts. It occurs, in plants, in tubes of two kinds, called laticiferous vessels and laticiferous cells. the former originating by the joining together of independent cells and the latter by the special growth of cells whose origin is said to be traceable even when the plant is an embryo contained in the seed. In either case, the tubes are living cells connected by branches to form a close network extending throughout the plant.

The interest of these latex tubes is increased further when regard is paid to the circumstance that, when they are present, they are associated in the stems and leaves with the system of vessels which carries to all its parts the food that has been manufactured by the plant. The circumstance of this association, combined with the fact that, as has been indicated, latex is rich in substances that are of nutritive value to the plant, leads to the suggestion that the tubes in which the latex is carried have their use as a means of conveying food material from one part of the plant to another. This suggestion receives support from the fact that, where latex tubes are well developed, the plant food carrying tissues that are normally present in ordinary plants are often much less strongly developed, and there is the additional circumstance that latex in the seeds of Euphorbia becomes poorer in food bodies during germination, only to gain an increase in these useful substances when the young plant becomes self-supporting. The argument for the validity of the suggestion only requires completion by the experimental assurance that the latex actually travels through the tissues of the plant; this has been obtained by Schwendener, who has observed the circulation of latex in transparent seedlings of Chelidonium. It is therefore concluded that the tissues carrying latex in plants are concerned in the conduction of food materials that are of use in their nutrition.

The latex tubes possess, however, another use. As has been stated, the milky juice in them also contains substances that cannot be made use of by the plant, as food. These are called excretory substances, or end products, the latter designation being applied because, as far as is known, they cannot be converted by the plant into any kind of bodies that may be useful in feeding the organism. Among end products are included the resins, gum-resins and gum-mucilages, and their presence in the latex tubes points to the use of these in serving the function of excretion. It is probable that, as far as rubber is concerned, this does not actually exist as such, in the latex; but that it is formed, during coagulation, from simpler, similar bodies. Caoutchouc is therefore regarded as an end product; though the real significance of the fact that it can be formed in latex is not yet understood. It can only be stated that the presence of enzymes in the latex, together with the other substances, is suggestive of the usefulness to the plant of the possibility that quick changes may take place in its composition.

Such considerations have reference to the essential part that latex may play in regard to the physiological processes that are necessary to the life of the plant. In dealing with them, it must not be forgotten that the property of the juice of a plant to coagulate, when it has been damaged, is of much assistance toward the healing of wounds; that the presence of hairs containing latex, on the leaves nearest to the flowers, serves sometimes to protect these from hurt by animals; and that certain of the last are prevented from attacking many plants, through their possession of a latex containing poisonous substances. It is considered, however, that these functions are incidental. The real functions of latex, as has been explained, are regarded as being nutritive and excretory.

The present position of the subject is summarized, at the end of the article, as follows. 'The relation of the latex to the life of the parent possesses far more than a scientific interest. The recognition of the laticiferous tubes as a means of conducting plastic food material is of itself of primary importance inasmuch as such problems of practical importance as tapping, as systems of tapping, bark renewal, etc., are closely connected with it, while an accurate knowledge of the significance and mode of formation of caoutchouc must be of considerable value to the practical cultivator.'

Information received from Dominica shows that the plant distribution by the Agricultural Department in that island, during December 1911, comprised 5,807 plants, including limes 3,825, spineless limes 200, cacao 275, Para rubber 1,300, sour orange 100, grafted mangoes 13, budded citrus 12, miscellaneous 12. In Antigua, the following distribution was made, in the same month: limes 3,353, miscellaneous 181, cacao 56, cocoa-nuts 50, cane plants 6,600.

SUGAR INDUSTRY.

SUGAR FROM SHREDDED CANE.

A note on this appeared in the last issue of the *Agricultural News.* The following further information is contained in the *International Sugar Journal* for December 1911:—

Considerable interest has been caused by the announcement made not may months ago (see *International Sugar Journal*, 1911, 160, 219) that a system had been devised for shredding and drying sugar-cane and then transporting the dried shreds to a distant mill where the juice could be expressed. The particular experiment was carried out on cane grown in Cuba, and then shipped to a beet sugar factory in Madison, Wisconsin. We now learn that the trial has proved very promising, the purity of the juice extracted having been only slightly inferior to that of the original juice sampled at the time the cane was shred. The sugar crystallized well, but attempts to utilize the pulp for making paper were not very successful. It may, however, be pointed out that the shredders were too small to do much work, so that no concise data could be drawn therefrom; but as it was resolved to repeat the experiments this year with better and more powerful machinery, more will be heard ere long of the process. It is apparent that this new idea has not yet got beyond the experimental stage, and that nothing definite as to the technical—not to mention the financial—aspects of the process is available. And it may be assumed that the cost of drying rapidly the shredded cane will be a formidable item in the total expense. It would, therefore, be as well for other interested parties to wait a more detailed report ere seeking to embark on a similar experiment.

SUGAR IN THE PHILIPPINES. 1910.

The following particulars regarding the Philippine sugar industry in 1910 are given in a report by H. M. Acting Vice-Consul at Manila, issued as Diplomatic and Consular Reports, No. 4810 Annual Series:—

Sugar to the amount of 119,511 tons was exported, to the value of £1,505,080. This shows an increase in value but decrease in quality. The explanation of the satisfactory state of this industry is found in the high prices prevailing and the increased exportation to the free market of the United States. The amount sent there fell short of 100,000 tons, or not quite a third of the free trade limit. In view of the increased activity on sugar estates in 1911 and the large profits to be obtained, further development of this industry is assured.

I am indebted to a resident British merchant for the following:—

The United States markets took the high grade sugars, only such low sugars as were unsaleable in the United States going to the China markets.

The falling off in the production was undoubtedly due in part to the steady decline of the industry on account of previous low prices, but more particularly to the cattle disease, which practically wiped out the available animals for ploughing purposes, etc. Planting to meet the better demand owing to sugars being admitted into the United States free of import duty, and the successful means taken to eliminate cattle disease, have not yet had their effect on shipments.

There is little doubt but that the removal of the duty has now had the effect of staving off the steady decline of the Philippine sugar industry. Low prices and antiquated methods of planting and milling had made planting become almost unremunerative. Now the industry has apparently a bright future before it. American capital has entered the field, and a large estate in Mindoro is being cultivated on modern methods, and modern machinery installed. The native planters are endeavouring to improve their methods and output, and sugar centrals are being organized which will greatly improve the quality and increase the quantity of production. The restriction imposed by the United States tariff to 300,000 tons allowed to be imported duty free yearly, however, looms largely before those interested in the industry, who live in hopes that this restriction may ultimately be removed.

The labour question, however, still remains a vital one, and this may seriously affect the progress of the industry, scarcity of reliable labour being felt all over the islands.

DEPARTMENT NEWS.

Mr. P. T. Saunders, M.R.C.V.S., Veterinary Officer on the Staff of the Imperial Department of Agriculture, returned to Barbados from St. Lucia, by the S.S. 'St. Thomas', on January 10, 1912.

Agriculturists and Agricultural Investigation.—It is evident (and no slur upon them) that few agriculturists, as the term is generally applied, could undertake work of investigation, and hence a marked difference is at once seen between those who study and those who practise agriculture. The practical farmer need not study many of the subjects which are essential to the scientific expert. He should, it is true, be able to appreciate them, but for a farmer to analyse his own soils, and treat the diseases of his own cattle, or to trouble his mind too much about bacteria or cryptogams, might easily distract his attention from practical details. Farming is not, and it is to be hoped it will never be, one of the 'learned professions'. In order to be successful, the farmer must thoroughly understand tillages, and the 'management' of stock. He must know how to deal with men, and be thoroughly acquainted with all the ins and outs of marketing. He should be a good judge of stock, and resourceful in surmounting weather difficulties. He requires keen observing faculties, and is essentially an out-door man. He should be, in fact, very much what he is as represented by the best type of farmers, and it is a question whether some of their qualities might not be sacrificed by attempting to graft a scholar's nature upon them. It is also worthy of remark that the qualities of a first-rate farmer are acquired in early youth by contact with older men of the same tastes. Intelligence ought to be fostered by good general education and reading, but to spend too much time in the laboratory or the lecture room may implant tastes inimical to the best conduct of practical business in the field and on the market. (Extract from a letter in *The Field* for September 2, 1911, p. 567.)

FRUITS AND FRUIT TREES.

MANGO CULTIVATION.

In India, the mango takes the first place among fruits, and the time when it is in season is of much importance in the greater part of that country, both to rich and to poor. In different States, the value of the fruit and the prices that are obtainable for it vary to a great extent; where the tree is common, it is natural that the prices are the lowest; but good value is given for imported superior varieties. It is pointed out in an article on the subject of mango cultivation, contained in the *Agricultural Journal of India* for October 1911, p. 405, from which the information in this article is taken, that very different opinions are held in India as to whether the production of mangoes is profitable, or not. Many of the large mango gardens that exist were planted by rich men, who raised the fruit with the object of obtaining superior varieties for their own use, rather than production for profit. In other cases, where the commercial motive has entered, there has been little care with regard to selection, either with respect to soils or varieties of the fruit.

In India, all successful mango gardens are found on sites where the soil is at least 5 feet deep, and moist, with good drainage. The opinion is not held in that country that the tree will grow equally well in deep and shallow soils.

Even when the plants are growing in a suitable soil and under the proper climatic conditions, they are very uncertain in regard to the bearing of fruit, and forecasts of the crop are likely to be at fault. Most of the well-known commercial varieties, in India, are usually dependable in this respect, and can be relied upon to give some yield, at any rate, every year. The following interesting fact is stated in the article: 'If half the number of existing trees were to bear fruit every year, the local markets would be glutted, and people would be compelled to find new methods of exporting surplus fruit to foreign countries.' The Alphonse and the Mulgoba are mentioned specially as shy-bearing trees. There is a large variation in different parts of India, in the time of blossoming of the trees, and fruit growers definitely ascertain this in order that they may make arrangements for their own advantage.

The greatest enemy, in India, to mango blossoms is said to be plant lice (aphids). These insects weaken the plants when they are blossoming, by sucking the sap, and cause the formation of a thick viscid substance, on the flowers, which interferes with pollination, and injures the growing fruits. It is supposed that heavy rains are useful in washing away this substance, and recommendations are made for cleansing the trees by syringing with pure water or with a mixture of soapsuds and kerosene oil, or by spraying the trees with weak Bordeaux mixture or iron sulphate, before the blossoms appear.

When the different varieties of mangoes are grown in various parts of India, it is found that the quality of the fruit is influenced to some extent by the locality, and it is supposed that most kinds gain their best development in Hyderabad.

With regard to the water supply for the trees, it has been found that the best results are obtained by careful irrigation on well-drained slopes. It is advised that abundant irrigation should be given to mango plants during the vigorous time of their growth; that is to say, until they attain their eighth or tenth year. In order to assist in obtaining good supplies of fruit from well-grown trees, it is recommended that, under the special conditions, the whole of the ground beneath them should be well dug with a pick-axe and exposed in this state for two months after the rains are over, as the adoption of this course induces the trees to form flowers. The soil should be allowed to remain in this state for about forty days after the time of flowering. Irrigation in the earlier stages of fruiting often causes dropping of the fruits.

The special conditions that are considered in the article lead to the advice that mango trees should be manured with well-rotted litter, at the time of the rains, once every two or three years; high manuring is said, however, to cause the fruit to deteriorate in quality. The safest manure for mango trees is stated to be leaf mould. Unirrigated trees should not receive applications of strong manures after the rains, as such applications are likely to cause their death.

The Imperial Department of Agriculture is offering a bonus of £20 for the importation of a stallion horse into Tortola before March 1, 1912. Among the conditions are: that the Commissioner of Agriculture must be satisfied that the animal is suited to the purpose for which it is imported; that the importer must not export the animal from the island for at least five years; and that during this time he must be prepared to allow not less than twenty services in a year, for a fee not exceeding 10s. for each animal.

THE POISONING OF CATTLE BY SORGHUM.

The number of deaths among the dairy cattle in Queensland, in the year 1903, led the Department of Agriculture in that State to a strict investigation concerning sorghum, with a view of determining whether the mortality among the cows was due to any poisonous constituents the plant contained.

It was shown that in some cases fields of sorghum, with only a dividing fence between, gave entirely different feeding results, although the sorghum from each field was fed to the cattle at similar stages of its growth. One herd would be affected on one side of the fence, while the herd on the other side, in a field immediately adjacent, thrived on the succulent fodder. In each field the cows were grazing on young sorghum.

Dr. Maxwell and Mr. J. C. Brunnich, Chemists of the Queensland Department, undertook to solve the problem, which seemed at the time to have certain elements of mystery. It was naturally a puzzling situation to dairy farmers. Without definite proof they could not be convinced that the sorghum was responsible for the death of their cattle.

It has been known to science for some years that sorghum and similar plants, grown in rich soils, were more liable to contain highly dangerous amounts of hydrocyanic acid—commonly known as prussic acid—than when grown in soils poor in nitrogen. It was found that the nature of different soils very largely governed the amount of those poisonous properties in the plant. This explained why some cows were affected through eating sorghum in one field, while those in an adjoining field, consuming the same class of material, did well. The changing character of the soil varied the amounts of prussic acid.

In a specific case it was noticed that one field—in which cattle were immune—gradually sloped upwards. The analysis of the soil from this field showed a deficiency in nitrogen.

To test the relation between the incorporation of the prussic acid in the growing sorghum plant and the ratio of the nitrogen in the soil, several plantings of sorghum were made in the Botanic Gardens at Brisbane, in soil composed almost exclusively of sand. One series of plants was not given any special manurial assistance, while another series was manured with nitrate of soda, a manure whose chief element is nitrogen. This experiment was made in order to see whether the supply of additional nitrogen to the soil would increase the amount of prussic acid in the growing plant—nitrogen being an element of that poison.

Mr. Brunnich made repeated analyses which showed, with almost mathematical precision, that the supply of available nitrogen increases the amount of poison that sorghum and other plants are capable of making and storing up within their composition.

Determining the stages in the growth of sorghum when the poison in it would be at the danger limit, was a very interesting and valuable phase of the investigation. It was found by the experiments that sorghum grown in highly rich nitrogenous soils could not be freely fed to animals with safety until the plant is preparing to seed.

The sorghum plant—grown under the conditions described—when very young, and from the age of three up to seven weeks, contains distinctly dangerous amounts of prussic acid. After that age the poison rapidly disappears by decomposition, the nitrogen passing over into other and strictly nutritious elements of food. When the flowering stage is reached, not more than a trace of the poison is found.

As the growth of the plant does not entirely depend upon the age or the number of weeks since it was planted, it is as well to speak of its stages of development. It may be generally stated that the sorghum plant is not safe for feeding until it reaches the flowering or seeding stage.

Dr. Maxwell reported that even sorghum, and such plants as may be known to contain dangerous amounts of prussic acid, may be judiciously used a green mixture with dry hay chaff to make the feed tasty to animals. When diluted in this way, the green sorghum being very carefully stirred up and mixed with large quantities of the dry feed, no harm will follow. The dry feed is, in this way, also made capable of use. (The *Agricultural Gazette of New South Wales*, Vol. XXII, p. 967.)

THE PRODUCTION OF SULPHATE OF AMMONIA.

The report of the Chief Inspector of Alkali Works for 1910 shows that there were 543 works or separate processes for the manufacture of sulphate of ammonia in England and Wales, as compared with 536 in 1909 and 526 in 1908, the number having steadily increased from 449 in 1904. In Scotland the number of such works was 104. There were also fifty-seven gas liquor works in England and five in Scotland.

Sulphate of ammonia is chiefly obtained as a by-product from coal. When this is treated for the production of coal-gas or for the manufacture of coke used in iron smelting, an 'ammoniacal liquor' results, which forms the raw material for the manufacture of ammonium salts. The distillation of the bituminous shales used in the Scotch paraffin industry also yields a certain amount, and the ammonia produced in other manufactures in which coal and similar substances are used, in iron works, from producer gas plants, and from carbonizing works, is also collected. The quantity of sulphate of ammonia produced in the United Kingdom was 367,587 tons in 1910, as compared with 349,143 tons in the previous year, and 325,228 tons in 1908.

These figures show an increase over the production of 1909 with the exception of that in iron works, which remained practically stationary. The supply from coke ovens shows an increase of nearly 10,000 tons. In 1904 the production in coke-oven works was only 20,000 tons. The total production in 1910 was 368,000 tons, and 284,000 were exported, so that the balance remaining for home consumption for all purposes amounted to 84,000 tons, as compared with 85,000 tons in 1909 and 91,000 tons in 1908. The exports of sulphate of ammonia are principally to the United States, Japan, Spain, Java and Italy.

An expansion of ammonia production is anticipated, owing to the further erection of recovery plants connected with the manufacture of coke and fuel gas. Recent improvements in design of sulphate of ammonia plant suitable even for small gas works is likely to add to the total of sulphate of ammonia production by enabling many small or inconveniently situated works to produce sulphate more economically than heretofore, whilst the recovery of this substance from peat continues to receive attention, and may prove a further source of production. (From the *Journal of the Board of Agriculture*, Vol. XVIII, p. 767.)

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date December 18, with reference to the sales of West Indian Sea Island cotton:—

Owing to the absence of desirable qualities, no business in West Indian Sea Islands has been reported since our last report, with the exception of a few bales of Stains.

We expect the new crop will command good prices.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending December 23, is as follows:—

There was sufficient demand throughout the week to take the limited offerings of all grades, at very steady prices; so the market closed firm at our last quotations. The supply of Fully Fine and Extra Fine is very small, the crop consisting largely of cotton more or less off in preparation. These lower grades are selling at 18c. and 20c., and look relatively very cheap in comparison with the prices ruling for Georgias and Floridas.

Although the United States Census Bureau reports 4,802 bales ginned to December 13, the Factors still think the total crop will not much exceed 5,000 bales, as the gins are very generally closed.

We quote:—

Extra Fine	32c. = 18*d*., c.i.f., & 5 per cent.
Fine to Fully	26c. to 28c. = 15*d*. to 16*d*. c.i.f. & 5 per cent.
Fine to Fully Fine, off in preparation	18c. to 20c. = 10½*d*. to 11½*d*. " " "

EGYPTIAN COTTON.

The following information, which is of interest in the West Indies, is given concerning Egyptian cotton in the *Textile Institute Journal*, Vol. II, No. 1, p. 57. It may be explained that the 'count' of a cotton is the number of hanks in 1 lb., a hank being a length of 840 yards of the yarn; it is obtained by dividing the number of Troy grains in 1 lb. (7,000) by the weight of 1 hank (840 yards).

The Institute has received an enquiry from the Egyptian Government relative to the use of Egyptian cotton in Great Britain, the information being required to serve as a guide in the course to be adopted for improving the quality of that cotton.

As was pointed out in the covering letter accompanying the reply, and as will be readily seen by practical men in the fine cotton trade, it was not possible, owing to the nature of the questions asked, to give anything more than approximate replies, though great care was taken to have these as nearly in accordance with actual facts and conditions as could possibly be obtained.

The memorandum is set out in the form of question and answer, as follows:—

1. Into what kinds of yarn, or 'counts', is Egyptian cotton spun?

Generally speaking, from 60's to 149's for use in manufacturing fine goods. Coarser counts, however, as low as 6's, are occasionally spun for special purposes.

2. The comparative values of such yarns with those of American cottons.

It is difficult to give an answer of any value to this, for the comparative values vary greatly from time to time. When Egyptian is dear, the better qualities of American are used in its place, and often remain in use when Egyptian again becomes normal in price.

3. What proportion of Egyptian yarn is taken by (a) the manufacturers of fabrics, (b) the sewing thread spinners, (c) the exporters?

A fair average would be (a) 15 per cent., (b) 25 per cent., (c) 30 per cent.

4. In what class of fabrics is Egyptian yarn wholly or partially employed?

Fine goods of high class quality such as ladies' and children's dress goods and underclothing, gents' shirts, pillow cases, lace curtains, thread, embroidery cloths, velvets, hosiery, gloves, and waterproof fabrics: also where strength and smoothness are required, such as cycle and motor tyres, healds, jacquard harness, and imitation of horse hair for upholstery purposes.

5. To what countries is Egyptian yarn exported?

To all countries, but principally to the English-speaking countries and the wealthier countries of Europe.

Owing to the deterioration of Egyptian cotton, efforts are continually being made to find other cottons suitable for the fine fabrics which have hitherto been made almost exclusively of Egyptian. A spinner taking up a special grade will probably be doing so to meet special demands, and it is important that he should have a fairly constant supply of this grade, so as to be able to cater year after year for the demands of his customers. The quality of Egyptian cotton is now so unreliable that he cannot be sure of doing this, and the result is bad both for the spinner and the Egyptian producer.

COTTON EXPORTS FROM THE WEST INDIES, 1910-11.

The following table gives the exports of cotton from the West Indian colonies mentioned, during the season October, 1910 to September 30, 1911:—

Colony.	Weight in pounds.	Estimated value, £.
Barbados	726,573	42,343
St. Vincent	558,786	44,237
Montserrat	404,753	30,362
Nevis	344,395	24,603
St. Kitts	329,322	24,067
Anguilla	148,595	10,207
Antigua	96,992	6,795
Virgin Islands	50,337	3,180
Trinidad and Tobago	6,056	456
Grenada and Carriacou *	274,224	10,205
	2,940,033	£196,458

* This colony shipped only 8,643 lb. of Sea Island cotton lint, valued at £566, the rest being Marie Galante.

This statement is prepared from returns made by the Customs Authorities in each case.

COPRA IN THE PHILIPPINES.

The Philippine Islands shipped abroad 116,374 metric tons of copra in the calendar year 1910, and the average price for the year was about 3½c. gold per lb. The price increased during the year from about 3c. to 4c. gold per lb in the last quarter.

The steady growth of the trade is indicated by the fact that shipments increased from 168,473,499 lb., valued at $5,461,680, in 1908, to 232,728,116 lb. valued at $6,657,740, in 1909, and to 254,156,982 lb., valued at $9,153,951, in 1910 (fiscal years in each case), and that there was an increase from 113,463 metric tons in the fiscal year to 116,374 metric tons in the calendar year of 1910.

Because of the high price, due chiefly to the extraordinary demand for vegetable oils, and because of the strong demand generally, there is something of a boom in the cocoa-nut business in the Islands, and the increase in trade is having a marked effect, not only on the Islands themselves, but upon shipping in the Far East and other lines of business.

IMPORTANCE OF THE CROP. In the Philippines the export of copra is now the second largest element in the foreign trade, comprising almost a fourth (23 per cent.) of the whole, and being exceeded only by hemp. Cocoa-nut planting is being carried on more extensively than ever before. Six years ago there was a period of high prices, during which time extensive plantings were made, and these trees will come into production this year. Indications are that the export of the product during 1911 will exceed all previous years in volume, while, owing to the shortage of other oil-producing crops, the prevailing high prices may continue for some time.

Naturally, such conditions are leading to a general expansion of business in all lines connected with cocao-nut planting and plantation supplies.

GROWTH OF TRADE WITH THE UNITED STATES. Exports of copra from the Philippines to the United States have more than kept pace with the increased imports into the latter country due to the demand for cocoa-nut oil. The total of imports of copra into the United States during the fiscal years 1908, 1909 and 1910 were $481,232, $666,820, and $762,560, respectively, and the imports thereof from the Philippines were $213,999, $273,497, and $416,074 respectively.

The increase in imports of copra into the United States during the three years was about 58 per cent., while the increase in imports from the Philippines was about 90 per cent. Nevertheless, most of the product went to France, mostly to Marseilles, where the great cocoa-nut oil factories are largely dependent upon the Philippines for their copra supplies. France took $6,114,324 worth of the product in the last fiscal year. Germany, particularly Mannheim, takes an increasing quantity, while Spain maintains a trade long established. (*Daily Consular and Trade Reports*.)

MAIZE IN THE UNITED STATES.

The following information is summarized in the *Modern Sugar Planter* for December 23, 1911. from an official statement issued by the United States Census Bureau on December 15:—

GENERAL SUMMARY. The area of corn harvested increased from 94,913,673 acres in 1899 to 98,383,033 acres in 1909, a gain of 3,469,360 acres, or 3·7 per cent. Notwithstanding this expansion in acreage, there was a decrease in production, which fell from 2,666,324,000 bushels in 1899 to 2,552,190,000 bushels in 1909, a decrease of over 100,000,000 bushels, or 4·3 per cent. The average production per acre, doubtless by reason of temporary weather conditions, fell from 28·1 bushels to 25·9 bushels. On the other hand, the value of the corn crop increased enormously, from $828,192,000 to $1,438,554,000, a gain of over $600,000,000, or 73·7 per cent. The average value of corn per bushel thus advanced from 31c. to over 56c., or about 83 per cent.

The increase in the acreage of corn from 1899 to 1909 was very much less in either of the two preceding decades. The area in corn rose from 62,368,504 acres in 1879 to 72,087,752 acres in 1889, to 94,913,673 acres in 1899, and to 98,383,033 acres in 1909. The corn acreage in 1909 exceeded that of 1879 by about 58 per cent. whereas the population of the country during the same period increased a little over 80 per cent. The production of corn in 1879 was 1,754,592,000 bushels, as compared with 2,552,190,000 bushels in 1909.

DISTRIBUTION OF ACREAGE. Of the total of 98,383,033 acres in corn in 1909 the two North Central divisions contained nearly ⅗—21,910,559 acres lying in the Eastern section and 35,945,297 acres lying in the Western section. About ¼ of the area planted in corn is found in the two South Central divisions; the South Central States lying east of Mississippi River having an acreage of 11,328,268...... There is also a considerable acreage, 11,386,984, in the South Atlantic division, while the four remaining divisions—New England, Middle Atlantic, Mountain, and Pacific—aggregate only 2,899,858 acres.

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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NOTES AND COMMENTS.

Contents of Present Issue.

The subject dealt with in the editorial of the present issue is The Use of Latex in Plants. This gives attention to considerations other than those arising from the fact that such latex often contains rubber.

An interesting article on the poisoning of cattle by sorghum appears on page 21.

On page 23, a table is given which presents information concerning the production of cotton in the West Indies, during the crop season 1910-11.

The Insect Notes will be found on page 26. They deal with information that has been compiled concerning the occurrence of insect pests in the Lesser Antilles during last year.

The Students' Corner, on page 29, contains part of the questions that were set for the recent examinations conducted in connexion with the Courses of Reading of the Department. The remainder of the questions will be given in succeeding numbers of the *Agricultural News.*

The Fungus Notes are contained on pages 30 and 31. They give a report on the occurrence of fungus diseases in the Lesser Antilles during the years 1910 and 1911.

An interesting article, affording information concerning the weights of seeds from Para rubber trees, is presented on page 31.

Assimilation of the Nitrogen of the Air by Fungi.

The *Bulletin of the Torrey Botanical Club* for 1911, p 135, contains an account of trials that were conducted with Penicillium, *Aspergillus niger*, Alternaria and three species of Fusarium, for the purpose of determining if nitrogen from the air is fixed by these fungi. The results were negative in all cases, and the suggestion is made that the different experience of others who have made trial of the matter has arisen from errors in the manner of carrying out the work, or from confusion as to the actual fungi which formed the subjects of the experimentation. Support is given to the latter supposition by the circumstance that it appears that nitrogen can be fixed by some strains of fungi; while others that are very similar do not possess the property.

A Newly Described Factor in Nutrition.

Recent work by investigators has demonstrated the existence of substances that are contained in the outer protoplasmic layer of all cells, which are soluble in organic solvents, much in the same way as fats. Their presence appears to be necessary to the life-processes that take place in the protoplasm, and they are particularly abundant in the nerve tissues. Most of them contain both phosphorus and nitrogen, but little is known as to their constitution and properties. They are termed Lipoids. A note in *Nature* for November 30, 1911, p. 157, draws attention to information concerning lipoids which appeared in Part V of the *Zeitschrift für Biologie*, where it is pointed out that indications have been obtained that the presence of certain constituents, in very small quantity, is necessary in diets in addition to proteids, carbohydrates, fats and mineral sults. The view of the matter has received recent support in experiments that have been conducted with rice in connexion with the disease known as beri-beri.

In the work described in the latter-mentioned publication, food was given to mice after it had been extracted very thoroughly with alcohol and ether; the result was that the animals died, and the indication was thus obtained that some essential constituent had been taken from the food. Even when mineral salts and fats (the latter of which had been removed by the extraction with ether) were added to the treated food, this was found to be still incapable of supporting life. On the other hand, however, when the alcohol and ether were evaporated from the extracted substances, and the latter were added to the treated food, the mice to which it was administered continued to live.

It was proved, further, that the essential substance, or substances, is present in milk, by adding this to food that had received treatment with alcohol and ether; then mice were fed successfully on the mixture, and were still in good condition at the end of six weeks.

Certain of the lipoids have been obtained in a pure state, but as has been indicated, little has been ascertained as to their constitution.

If the conclusions reached so far are supported, the subject of nutrition will require to be treated in a different manner from that which has been adopted in the past.

Calcium Cyanamide and Nitrate of Lime.

Several references to these manures have been made from time to time (see *Agricultural News*, Vol. IX, and Vol. X, pp. 57, 168, 232, 328, and 344). Further information concerning them is contained in an abstract of a paper presented in the *Journal of the Board of Agriculture* for July 1911, p. 328.

The manures mentioned were compared experimentally with nitrate of soda and sulphate of ammonia, the quantities applied being such that each manure afforded an equal amount of nitrogen; the crop employed was oats.

The results obtained were very similar with all the manures, though nitrate of lime appeared to cause a greater formation of grain, while sulphate of ammonia seemed to bring about an increase in the weight of the straw.

Agricultural Conditions in Samoa.

A short note on Samoa, contained in the *Bulletin of the Bureau of Agricultural Intelligence and of Plant Diseases* for June 1911, p. 1213, points out that the average temperature in this tropical island is 25·7° C., with an annual rainfall of 137 to 240 inches, precipitation being received on or about 200 days in the year; the climate is, on the whole, healthy.

The nature of the soil and climate would enable all tropical products to be raised, but the best success has been obtained with cacao, cocoa-nuts, and rubber from *Hevea brasiliensis* and *Ficus elastica*. The most useful products, next in order, are bananas and pineapples. Very good timber for use in buildings is obtained in the island.

Cattle are raised, and are descended chiefly from Hereford stock originally obtained from New Zealand. Horse-breeding is carried out successfully on a small scale, good stud animals, chiefly of English blood, being obtained from New Zealand and Australia for the purpose. Pig-raising also forms a small industry.

Changes in the Arsenic in Dipping Fluids.

The observation has been made recently in the United States that when arsenical fluids, used for dipping cattle, are mixed and allowed to stand, a loss of arsenic from the solution takes place. Enquiry has been made into the subject, and the results are contained in Circular 182 of the Bureau of Animal Industry of that Department.

The investigations have shown that the sodium arsenite in the fluids is oxidized to sodium arsenate through the action of bacteria, whose identity has not been established. The process of oxidation often takes place quickly, the rate being dependent on the number of organisms present or being produced.

It is suggested that the bacteria responsible for the change may gain access to the fluids through the water used in making the mixtures, through the air, or through excrementitious or other matter brought in by the treated cattle.

Sufficient information is not yet available for setting a limit to the time which dipping fluids may be kept. It is advised that, under the circumstances dealt with, any that have been mixed should not be used after a few weeks have elapsed, unless there is positive evidence that there has been no loss of sodium arsenite.

The St Vincent Handbook, 1911.

A copy of this has been received, through the Agricultural Superintendent, St. Vincent, by the courtesy of its editor, Mr. Robert M. Anderson. Although it is not an official publication, the fact that the information has been obtained from Government and other authentic records makes this reliable.

In its 342 pages, the book presents a calendar, with summaries of events; an account of the island itself with its history, geography and geology; a description of places of interest; information as to the political constitution, and civil and other establishments of the Colony; agriculture in St. Vincent; information of the usual nature concerning postage, duties, fees and other similar matters; a description of various parts of the island and of the Grenadines; an account of the various institutions in St. Vincent; professional and business information; and concludes with the presentation of other equally useful matter, followed by an index.

The Handbook is produced in an attractive style, which makes reference easy; and contains a number of good illustrations.

Cacao and Cotton in the Congo.

Agricultural matters in the Congo have received attention recently, in the last volume of the *Agricultural News*, pp. 341, 344 and 375, and on p. 11 of this volume. Further details are contained in the *Board of Trade Journal* for September 21, 1911. Success is being obtained with cacao, which has been cultivated experimentally since 1908, in the Mayumbe; the exports from this district increased from 646 metric tons in 1908 to 769 metric tons in 1909; it is readily sold in Antwerp. The area in cacao cultivation is to be increased with the aid of a railway.

In the district of the Equator, which is supposed to be better suited for cacao-growing, an important plantation has been started on a large scale, and attention is also being given to smaller trials.

The cultivation of cotton by the natives is being encouraged by the distribution of seed and the supply of information concerning cultivation; the result has been, so far, that a small number of villages has profited by the growing of the crop. The matter is merely in its initial stages; but further trials are to be made, especially as it is considered that cotton-growing on a large scale would become a remunerative enterprise. In order that assistance may be given, the Government Botanic Stations in the Lower Congo have been instructed to conduct experiments in cotton-growing, and for the purpose seeds of the better-known American varieties are being imported.

INSECT NOTES.

INSECT PESTS IN THE WEST INDIES IN 1911.

Brief accounts of the occurrence of insect pests in 1909 and 1910 were given in Vol. IX of the *Agricultural News* (see pp. 10 and 410), and it is proposed to present herewith a similar account for the year 1911.

The information contained in these notes has been obtained by the same means as that presented in the notes for 1910; that is, it has been furnished by the Agricultural Officers in the Windward and Leeward Islands in response to a request from the Imperial Commissioner of Agriculture. The reference to the root borer of the sugar-cane in Barbados is the result of personal observation by the Entomologist on the Staff of the Imperial Department.

A Report on the Prevalence of Some Pests and Diseases in the West Indies for the year 1909-10 appeared in the *West Indian Bulletin*, Vol. XI, pp. 73-106. This was issued in January 1911, and contained information in regard to pests and diseases for the period from March 1909 to July 1910. A similar report covering the period from July 1910 to the end of December 1911 will appear in a number of the *West Indian Bulletin* soon to be issued.

OF SUGAR-CANE. The moth borer (*Diatraea saccharalis*) was reported as occurring in all the sugar-growing districts, but was not more abundant than usual.

The weevil borer (*Sphenophorus sericeus*) occurred in unusual numbers in St. Kitts, in connexion with an attack of termites. This was on the estate where termites have previously been recorded as attacking sugar-cane, but not in the same field. It would seem that the fields in which previous attacks occurred have been freed of these pests by the planting of cotton for a few years.

The root borer of sugar-cane (*Diaprepes abbreviatus*) occurred again as a pest of sugar-cane in Barbados, and caused a considerable amount of loss on a few estates, in the crops reaped in the early months of the year. During June and July, the adults were collected in large numbers; they were found hiding among the leaves of canes growing on land where root borer was previously abundant in canes. This method of collection should produce marked results in reducing the numbers of larvae in future attacks.

At the end of the year (November and December), with the advent of a period of dry weather, the evidences of the presence of the root borer were to be seen in the dead and dying canes in certain fields within the infested area.

The pink mealy-bug of sugar-cane (*Pseudococcus calceolariae*) was rather more abundant in Antigua than usual. An unidentified caterpillar, which may prove to be the larva of *Thermesia gemmatalis*, caused a small amount of damage by its attacks on the leaves of sugar-cane in Antigua; slight attacks of grasshoppers (*Schistocerca pallens*), on young canes, were reported in that island and in St. Kitts.

OF COTTON. The cotton worm (*Alabama argillacea*) continues to be efficiently controlled in St. Vincent by its natural enemies. This insect has been more abundant in other islands during 1911 than in the two previous years, Montserrat, Antigua, St. Kitts and Nevis having experienced repeated, severe attacks. In the Virgin Islands, as in St. Vincent, natural enemies controlled the cotton worm and no insecticides were necessary. Cotton stainers occurred in about the usual amount towards the end of the crop season in most of the islands. In Montserrat, however, they were more than usually abundant in one district, while in St. Kitts it is specially noted that these insects were absent from the cotton fields. The black scale of cotton (*Saissetia nigra*) rarely occurs in abundance in any of the West Indian islands at the present time, as it is efficiently controlled by its parasite *Zalophothrix mirum*. The white Scale (*Hemichionaspis minor*) occurred at the end of the cotton season on old plants, but caused no damage.

The flower-bud maggot (*Contarinia gossypii*) was reported again from Antigua in the early part of the year, and in November it made its appearance in Montserrat. This is the first authentic record of the occurrence of this pest outside of Antigua. In Montserrat the distribution is general, but the attack, so for, has not been severe.

The leaf-blister mite (*Eriophyes gossypii*) did not occur in serious abundance in 1911, generally, but in Montserrat and Nevis it was more prevalent than for several years past.

In Grenada the green soldier bug (*Nezara viridula*) occurred as a pest of cotton in one district, and a hard-back beetle caused the loss of cotton blossoms on a few plants by eating into the base of the flowers.

A mealy-bug on the stems of old cotton plants was reported toward the end of the year from Montserrat. This insect had not caused any serious damage, and seemed to be well parasitized.

OF CACAO. Thrips (*Heliothrips rubrocinctus*) occurred in Grenada and St. Vincent in sufficient numbers to cause several severe attacks. In St. Lucia and Dominica they were present, but only in small numbers.

The cacao beetle (*Steirastoma depressum*) was common in one district in Grenada, but was not reported from any of the other islands. No damage was reported from scale insects, or mealy-bug, on cacao during 1911.

ON LIMES. Scale insects on limes and other citrus crops occurred to about the same extent as in previous years. In Dominica they were rather less abundant than usual, apparently on account of the efficient control, maintained by natural enemies, which was due largely to the very favourable weather conditions which prevailed. In St. Vincent, on the other hand, the natural enemies of scale insects do not exercise a controlling influence, and the attacks of these pests continue to be troublesome. In St Lucia the rust mite (*Phytoptus oleivorus*) was reported.

OF RUBBER. Castilloa was attacked as usual by mealy-bugs and scale insects. The common mealy-bug (*Pseudococcus citri*) and the Akee fringed scale (*Asterolecanium pustulans*) are recognized pests of this tree. The habit of Castilloa of shedding its leaves annually, and the presence of fungoid parasites of scale insects in the moist localities where this tree is grown, minimise the effect of these pests, generally. Castilloa growing in unfavourable situations is liable to severe attacks. This plant is also annually attacked in Dominica by a white scale, probably *Diaspis* sp.

OF SWEET POTATOES. This crop was unusually free from attacks of Scarabee (*Cryptorhynchus batatae*). Sporadic attacks of the sweet potato caterpillar (*Protoparce cingulata*) were reported in Antigua and the Virgin Islands.

OF GREEN DRESSINGS. Attacks of leaf eating caterpillars were experienced in Grenada, St. Vincent, Montserrat and Antigua. These were generally due to the woolly pyrol meth (*Thermesia gemmatalis*), the larva of which is a well known pest of these crops. In St. Kitts the horse bean (*Canavalia ensiformis*) has been generally adopted by planters for a green dressing crop, as it seems to be less liable to attacks by caterpillars than other dressings. A red spider in Dominica caused some injury to Bengal beans, Jerusalem pea, and to horse bean in its later stages, and pigeon peas were injured by a green fly.

OF GROUND NUTS. In Montserrat the ripening nuts were attacked by mealy-bug, and in one instance a caterpillar was reported to be feeding on the leaves.

OF ONIONS. This crop was attacked by caterpillars, in Montserrat, Antigua and Nevis, in which last island a poisoned bait was used with success. Severe attacks of Thrips were recorded in Montserrat, in several localities.

OF INDIAN CORN. The corn ear worm occurred in some numbers in several islands. The boll worm (*Heliothis obsoleta*) and the corn ear worm (*Laphygma frugiperda*) are here included together under the common name of the latter. Toward the end of the year an attack of *Laphygma frugiperda* and the moth borer of the sugar-cane (*Diatraea saccharalis*) on Indian corn was reported from Montserrat.

LIVE STOCK.

ZEBU CATTLE RESISTANT TO TEXAS FEVER.

The Twenty-sixth Annual Report of the Bureau of Animal Industry, recently issued, contains the following, relative to the immunity of Zebu cattle:—

About thirty years ago a number of the so-called Brahman cattle of India was introduced into southern Texas by A. H. Pierce, a stockman of Pierce, Texas. These animals were crossed with our domestic cattle, and the resulting influence on the herds was markedly apparent. One of the most interesting observations was that their progeny remained relatively free from ticks while other stock in the same pasture would be literally covered with these pests. The cattle ticks are present in such enormous quantities in this section of Texas as to make cattle-raising much less profitable than it should be. This is due not so much to the fact that these ticks carry the Texas fever micro-organism as to their great blood-sucking powers as external parasites. The Brahman grade cattle appear likewise to be less affected by other parasites and pestiferous insects such as mosquitoes, hornflies, gadflies, etc., and to withstand better the warm, dry climate and other semitropical conditions present in the Gulf Coast section of the United States than do the native cattle. . . . .

The sebum secreted by the sebaceous glands of the skin has a peculiar odour which seems to be repugnant to insect life. The hide, while it may be as thin as in our domestic animals, still appears to be much tougher and is more difficult to penetrate with a hypodermic needle. The hair is quite short and does not provide favourable shelter for the development of ticks. These three factors are probably responsible for the slight amount of tick molestation which these animals experience.

Dr. Farrington, Assistant Chief of that Bureau, in commenting on that statement, says :—

It has recently been reported to this office that the descendants of the 1906 importation have proved, and are proving, fully as resistant to the Texas fever ticks as the members of the earlier importations, and in consequence acquire a large growth, and are always in superior condition and thrift.

There were thirty-three animals in the importation of 1906, and at the present time half-blood and three-quarter-blood descendants in large numbers have been carefully observed and all have proved very satisfactory in their resistance to infection with Texas fever.

Mr. A. P. Borden, of Pierce, Texas, the leading authority on these importations, says that every year proves more conclusively the desirability of crosses between the cattle of India and our common cattle from West Europe as producers of live-stock products in Texas and the Southwest generally. (*American Breeders' Magazine*, Vol. II, No. 3, p. 233.)

THE PHILIPPINE CARABAO.

Information is given concerning the Philippine carabao, or water buffalo, in the *Philippine Agricultural Journal* for September 1911, and from this the following extracts are taken :—

The carabao is the most important domestic animal in the Philippines. Upon these animals the agriculture of the islands is largely dependent, probably more than 90 per cent. of the draft work, of all kinds, being performed by them. They are used in preparing the land for planting, in cultivation, and in transporting the crops to market. The carabao cart is the only conveyance for thousands of families. The milk, which is of good quality, is used in the Philippines practically to the exclusion of all other kinds. After their usefulness as draft animals has passed they are slaughtered, the meat used for food, and the hides made into leather.

There are in the islands more than 713,121 carabaos. The numbers are increasing, but not in proportion to the demand. About 10,000 are imported annually from Indo-China.

A good many cattle are used, especially for road work and for sugar-cane cultivation. That the carabaos are inferior to cattle, for most lines of work, is the opinion of many. However, the prejudice in favour of the carabao is so strong with the labouring class, that they usually prefer these animals. The carabao is treated better and given more attention than any other class of domestic animals in the islands.

The great advantage that the carabao has over the other draft animals is his ability to work easily in mud, where cattle would be of little value and a horse would be useless. This trait is of great importance in this country, as most of the rice is planted in paddies during the rainy season, and the land is prepared in a semi-liquid state. For this work the carabao is the only animal in existence that is at all satisfactory. The greater strength of the carabao enables him to haul larger loads than would be possible for cattle—an important advantage, as both cattle and carabaos are usually worked singly with a man in charge of each animal.

In the absence of mud, carabaos are inferior to cattle as draft animals; they are much slower, are unable to work as long at a time, cannot perform labour in the sun as well, are more susceptible to disease and do not increase as rapidly.

The native carabaos are much the same in all parts of the country and are all draft animals, there being no milking strains among them, as in India. The local animal is smaller than those imported from Indo-China, but is superior for work purposes, being hardier, stronger and more willing.

Though carabaos do not breed as rapidly as cattle, the period of gestation being longer and the dam usually not breeding until the calf is weaned, still they increase rapidly with but little mortality among the calves. As with other classes of stock, no care is given to the breeding or the improvement of these important animals by most of the people raising them. Though the Philippine carabaos will compare favourably with those of other countries, much could be done toward their improvement by selection.

GLEANINGS.

It is reported by H.M. Legation at Caracas, that the crop of coffee in Venezuela during the season of 1911 was abundant, and that the high prices that are being obtained will add materially to the present prosperity of the country.

The second forecast of the cotton crop of Eastern Bengal and Assam, which amounts to about 0·4 per cent. of the total area under cotton in India, is the same as that given in the first estimate, namely, 101,300 acres. The prospects are good, in some districts, to fair in others.

The importance with which *Tephrosia purpurea* and the soy bean are regarded in Ceylon is shown by the fact that, for the second distribution of seeds during 1911, among members of the Agricultural Society, there were obtained 15 cwt. of the seed of the former and 1 ton of that of the soy bean.

It is announced by the Principal Collector of Customs at Colombo that an All Ceylon Exhibition will be held in that island during the present year, under the patronage of the Governor of the Colony. It is intended that the exhibition shall include the showing of working machinery, both as models and in the practical form.

The cotton crop in Russian Central Asia and the Caucasus is said to be excellent. In the largest portion of the province of Ferghana the yield is equal to that of last year, while in Samarkand it is superior. In the Trans-Caspian and Trans-Caucasian provinces a good yield is expected. (The *Textile Mercury*, October 14, 1911, p. 311.)

In connexion with the scheme devised with the assistance of the Board of Agriculture and Fisheries, for agricultural research in England and Wales (see *Agricultural News*, Vol. X, p. 341), the Board has awarded twelve research scholarships in agricultural science. These are of the annual value of £150, and are to be held for three years, during which time the holders will be either trained for research, or for taking up the position of agricultural adviser.

According to *Diplomatic and Consular Reports*, No. 4789 Annual Series, the exports of soy beans from the Port of Dairen (Kwantung) during 1910 amounted to 342,620 tons; in 1909 and 1908, they were 462,423 and 206,653 tons, respectively. The similar figures for soy bean cake were 249,921, 306,276 and 201,088 tons. A large increase in the amount of soy beans sent to Europe has taken place, while the exports to China have diminished. By far the greatest quantity of soy bean cake goes to Japan.

A report from Nevis states that, by the end of November, about 50,000 lb. of seed-cotton had been gathered in the island, from plants established in June. There was a slight improvement in the condition of the sugar-cane crop, but more rain was needed. A small quantity of cacao and vanilla had been reaped at Maddens; of the latter a good crop was expected. At Pinneys, the cocoa-nuts were bearing well, and the younger plants were making very good progress.

In the *Bulletin of the Bureau of Agricultural Intelligence and of Plant Diseases* for June 1911, there is contained an abstract of a paper setting forth the results of investigations relating to the action of manganese sulphate on plants. The work that has been done leads to the conclusion that any beneficial action arising from the use of manganese sulphate is due to the presence of the sulphuric acid radicle rather than to the manganese, which actually seems to retard plant growth, but may be prevented from doing this by using it with salts of iron.

Particulars of the census of Barbados are published in a Supplement to the *Official Gazette* for December 7, 1911. These show that the population of Barbados on April 2, 1911, was 171,983, giving a decrease during the last two decades of 10,323. Statistics are given further which demonstrate that by natural increase the population should have attained, during the period mentioned, the number of 221,688. This is a difference of 49,705, in which the removal of the troops accounts for 1,080 and the remaining loss of 48,625 is to be attributed to emigration.

Comptes Rendus de l'Académie des Sciences for February 20, 1911, describes experiments which were made for the purpose of investigating the influence of various organic acids on the germination of seeds. Where the acids were supplied, the seedlings obtained were larger than where the seeds were not in contact with the acid solutions. There was thus actual assistance in nutrition, and consideration of the results leads to the conclusion that the aid given to germination by certain basic substances does not arise from the neutralization of acids by them, as has been supposed formerly.

Note is made of the Report on the Gold, Diamond and Forest Industries of British Guiana, 1910-11, issued in an attractive and useful form by the Institute of Mines and Forests, of the Colony, at the price of 1s. 6*d*. This contains, among other interesting information, the statement that correspondence has taken place between the Secretary of the Institute and the Chairman of the British Cotton Growing Association with reference to the quality of the cotton grown in the interior of British Guiana by the Aborigines, and that several samples, which were favourably reported upon, were sent to the Association.

Attention is drawn, in the *Agricultural Journal of the Union of South Africa* for October 1911, p. 395, to a clock gun for scaring birds and vermin from cultivated lands. It is automatic in action but simple in construction, and has been patented by Mr. Charles Millichamp, Presteigne, Radnorshire, South Wales. It holds nine 16 pin-fire cartridges and can be set to explode these at intervals lasting from 15 minutes to 1½ hours; it can also be set to fire a shot at any required time. Supplied with the figure of a man, the gun costs £2 12*s*. 6*d*.; without the figure, its price is 10*s*. 6*d*. less. Special cartrigdes are obtainable at 4*s*. 3*d*. for 100, or 11*s*. 6*d*. for a box of 250 cartridges, carriage paid in the British Isles. All the prices given are those in Great Britain.

STUDENTS' CORNER.

AGRICULTURAL EXAMINATIONS.

The questions set in the recent Examinations, held in connexion with the Courses of Reading of the Department, are published below for the information and guidance of students taking up these Courses.

PRELIMINARY EXAMINATION.

(1) Give, with sketches, an account of any dicotyledonous seed that you have examined, stating the uses to the plant of the different parts. (2) How do plants absorb water, and what purposes are fulfilled by the water thus absorbed? (3) Write an account of the different types of soil with which you are acquainted. (4) Describe the structure of any common leaf. How would you show that changes take place in living leaves, in the presence of light? (5) State the advantages that are to be found in a well-drained soil. (6) Give a description, with sketches, of any flower that you have examined, and show how it is pollinated. (7) What are the different stages in the germination of (1) any dicotyledonous seed, (2) any monocotyledonous seed, that you have observed? (8) Explain, giving examples where it is possible, five of the following terms: (a) parasite, (b) medullary rays, (c) ruminating animal, (d) albuminous seed, (e) composite flower, (f) stomata, (g) drupe, (h) coulter, (k) tap-root, (l) tilth. (9) State exactly why leguminous plants are usually preferred as green dressings. (10) Write an account, illustrated by diagrams, of any form of cultivator that you have examined. (11) Enumerate the different processes that take place in the digestion of food by the cow. (12) Describe the action of the heart, in warm blooded animals. (13) Give a description, with sketches, of any method of budding with which you are acquainted, stating why it is possible to propagate plants by this means.

INTERMEDIATE EXAMINATION.

GENERAL AGRICULTURAL SCIENCE.

(1) Give a brief account of the ways in which nitrogen is (a) artificially supplied, (b) naturally supplied, to plants. (2) How would you conduct an experiment, with a crop with which you are familiar, to demonstrate the good effects of proper tillage? (3) Using any crop with which you have had practical experience, state how you would raise seedlings of the plant, in a nursery; and give such particulars as you can of the changes that are known to take place during the germination of the seed. (4) Write a description of any scheme of drainage with which you are familiar. What are the general objects of draining the soil? (5) Describe the structure of a leaf as it is seen in a preparation under the microscope, stating how the different parts take their share in the work that has to be done by the leaf. (6) Give an account of the different kinds of soil that are found in your district, and show how they derive their properties from the kinds of material of which they are composed. (6) What are the properties and uses of any one of the artificial manures that you have seen employed in practice? State for what purposes the manure is specially utilized. (8) How is water enabled to travel through plants, and by what means does it move upwards through the soil? (9) Describe carefully the way in which any plant that you may choose as an illustration is (a) grafted, or (b) budded, or (c) raised from cuttings. (10) Give an account of the skeleton of the horse, or of the ox, and state in what way it differs from that of the pig. (11) Give a description of (a) the life-history, (b) the means of control, of any insect pest with which you are familiar. (12) How do fungi obtain their food, and how are they propagated? Give an account of the preparation and use of some fungicide.

INTERMEDIATE EXAMINATION.

SPECIAL CROP SUBJECTS.

Sugar Industry.

PART I.—GENERAL. (1) Give a careful description of any fungus disease of sugar-cane of which you have had experience, stating the means by which it may be controlled. (2) How is the land prepared for the sugar-cane crop and cultivated during its growth, in your district. If possible, suggest any improvements in the methods employed, giving reasons for your suggestions. (3) Write an account of the special characters of three varieties of cane on which you have made observations, stating which of them is best suited to the conditions with which you are familiar, and why. (4) Describe a method of manuring, for sugar-cane, and if possible give an account of the general results of any experiments that form a guide as to the best manurial treatment for this crop, in your district. (5) Supply particulars of the life-history of the weevil borer of the sugar-cane. State the kind of damage done by this pest, and the measures for its control. (6) Write a short account of the underground system of the sugar-cane. (7) Give particulars concerning some rotations of crops that are suitable for employment with sugar-cane, where you have had experience in the growing of the latter. (8) How is sugar-cane planted, and what preliminary treatment should the planting material receive?

PART II.—MUSCOVADO SUGAR. (1) Describe the process of clarification of cane juice, pointing out what is essential for securing good clarification. (2) What advantages are derived from the use of steam-heated pans as compared with the employment of fire-heated pans, for finishing the concentration of syrup? (3) How is it ascertained when the boiling of the syrup, in making muscovado sugar, has been carried to a sufficient degree. (4) Hydrometers, or saccharometers, are commonly employed in muscovado factories. Discuss their use.

PART III.—VACUUM PAN SUGAR. (1) Describe, in brief outline, the structure and mode of working of a triple effect evaporator. (2) Give an account of a satisfactory method of treating the juice from the time it leaves the mill until it is ready to be taken into the triple effect. (3) Write a description of a method of producing 'second sugar' from molasses. (4) What matters are essential to good extraction of juice by mills? How can you ascertain if the work is satisfactory?

Graft-hybrids. A résumé of recent researches into the nature of 'graft-hybrids', culminating in the periclinal and sectorial chimæras obtained by Professor H. Winkler and E. Heuer, is contributed by Dr. H Fischer to *Naturwissenschaftliche Wochenschrift* (September 24). A description is given of the five composite types produced from grafts of the tomato and common nightshade by making an incision and so developing a new shoot from the point of union of scion and stock; and an illustration is supplied of the most complex combination, where the different branches represent the species *nigrum*, *Lycopersicum*, *Koelreuterianum*, *Gaertnerianum*, and *tubingense*. It is also explained how the solution was evolved by Dr. E. Baur from a study of the arrangement of coloured and colourless areas in the leaves of zonal pelargoniums. In both phenomena there is a mere juxtaposition of tissues derived from two original types, so that the term 'graft-hybrid' proves to be a misnomer, and chimæra is accurately applied. (*Nature*, November 30, 1911, p. 154.)

FUNGUS NOTES.

A REPORT ON FUNGUS DISEASES DURING THE YEARS 1910 AND 1911.

In the *West Indian Bulletin*, Vol. XI, p. 73, appeared an account of the prevalence of some fungus diseases during the years 1909-10. This report dealt with observations up to June 1910, and these were communicated on forms, containing a list of the commoner diseases, sent out from the Head Office. In order to bring the information up to date for the forthcoming Agricultural Conference in Trinidad, similar forms were again sent to the various agricultural officers in the different islands, with a request that they would fill them in, as before. On this occasion two forms were supplied to each Department. The first related to a period from June 1910 to March 1911, and the second to one commencing in April 1911, and closing at the beginning of December of that year. The first period will be referred to as period A, and the second as period B. The information thus obtained is abstracted in this article. A further account of it will be published in a forthcoming number of the *West Indian Bulletin*, containing papers presented before the Agricultural Conference. It may be noted that no reports were obtained from Grenada and St. Lucia for period A.

SUGAR-CANE. The root disease of this crop occurs in all the islands of the Windward and Leeward groups where sugar-cane is grown, with the possible exception of the Virgin Islands, in which its effect, if any, is negligible. In Antigua it was very noticeable in both periods, particularly in dry months and on ratoon canes in heavy soils. In St. Kitts it was more in evidence in period B, which was dry, and it was noted that the variety B.208 was particularly affected, in certain districts.

The common rind fungus, *Melanconium sacchari*, was not more in evidence than usual during either period. In St. Vincent it is mainly confined to the Bourbon cane, while in St. Kitts B.208 is believed to be susceptible to the disease. In Antigua, in period B, it was common on over-ripe canes, and on canes attacked by root disease. The distinction between this and the red rot is not well recognized in many of the islands, but a disease was recorded from St. Lucia in period B which agreed with typical red rot in its symptoms, while material examined by the Mycologist showed the fructifications of *Colletotrichum falcatum*, to which true red rot is due.

COTTON. Anthracnose (*Colletotrichum gossypii*) was fairly prevalent in the wetter districts of St. Vincent, in period A, and throughout the island in the wet season of period B. Reports from Nevis emphasize its occurrence in damp districts only, while in Montserrat it is not clearly recognized as a disease of any importance, and is probably of quite rare occurrence. It was found to be causing some damage on a field in a newly started cotton cultivation in Grenada. Bacterial boll disease, together with angular leaf spot and black arm—which are believed to be of similar origin—was fairly prevalent in St. Vincent and St. Kitts in period A, when its spread was apparently encouraged by wet weather. This was noted as occurring in St. Vincent in September and October, but the dates of the heavy rains are not recorded in St. Kitts. It was also found in Montserrat to some extent in the same period, while black arm appeared at the end of the season. In period B, it caused much damage during the abnormally wet season in St. Vincent. In Montserrat, St. Kitts and Nevis the season was very dry up to the beginning of September, and the various forms of the disease were not much in evidence. A few cases of angular leaf spot were seen in St. Kitts, and of this and black arm in Nevis; but in the latter island no boll disease was noted.

The West Indian leaf mildew was fairly prevalent in St. Vincent, in October and November 1910; that is in period A. It was also fairly common in Antigua, while in Montserrat it was more noticeable than in previous seasons, and one field which was attacked early in the season was, by October, rendered leafless; in spite of this, it gave a good crop. The mildew was not observed at all in Nevis, in either period, nor in St. Kitts in period B. In St. Vincent, however, in the latter, it was prevalent after October owing to the wet weather, while it was also fairly common on fields of older cotton in Antigua. In Montserrat it was not much in evidence.

Certain miscellaneous diseases were also reported, of which the most important, from Montserrat, is a disease of bolls borne on branches near the ground. The infected tissues exhibit a soft rot, and a species of Pythium or Phytophthora occurs on them. The disease is responsible for some loss, and will receive further investigation.

CACAO. Root disease occurred in damp situations in Grenada, in period B, when it was also found to be fairly common in St. Lucia Of the other diseases canker and black rot of pods, both due to *Phytophthora Faberi*, are the most important. In Dominica, canker occurred on delicate varieties of cacao in both periods, while in the second it was found to be always associated with pod disease; in St. Kitts, a few cases that occurred in periods A and B were successfully treated. Die-back, due to *Thyridaria tarda*, is known to occur throughout St. Lucia, but no special outbreak was recorded. In all the islands, increased attention to proper sanitation is resulting in keeping under adequate control both this disease and brown rot of pods due to the same fungus. None of the other cacao diseases were at all in evidence, except that in Grenada an outbreak of thread and horse-hair blights occurred on nutmegs in one district, and in a few instances individual cacao trees were infected.

LIMES. Black root disease (*Rosellinia* sp.) occurred on limes, cacao, and pois doux in sporadic instances, on estates in the interior of Dominica, while red root disease of limes (*Sphaerostilbe* sp.) was also observed to be present in the same way in a similar locality. These diseases have only recently been described, so that they are not recorded previous to period B. (See *Agricultural News*, Vol. X, pp. 366 and 382.)

A peculiar form of root disease, sometimes associated with the presence of the brackets of *Fomes lucidus*, occurred in Montserrat and Antigua in both periods, but in the latter island it was not spreading at all rapidly.

The only other disease noted was Melanose of limes, seen in Montserrat and Antigua, in period B.

RUBBER-PRODUCING PLANTS. A disease of Hevea seedlings appeared in the nurseries of the Dominica Botanic Gardens in period A, and at one time assumed threatening proportions. This was, however, controlled by spraying the plants with Bordeaux mixture, and by the use of a mixture of lime and sulphur. The exact cause was not determined. It did not re-appear in period B.

A disease believed to be identical with the black root disease of limes, and in any case due to a species of Rosellinia, was found on young Castilloa trees in Grenada, in period B. In St. Lucia, one instance of the disease was noted; while in Dominica it only occurred where Castilloa was grown under unsuitable conditions. Both these records apply to period B.

GROUND NUTS. The unidentified root disease of this crop was very little in evidence during either period, though the Spanish variety was again attacked, in Nevis, in period A. The leaf spot due to *Cercospora personata* was entirely absent from the experiment plots in Dominica, in period A, though it had caused serious damage in the previous season. No experiment plots of ground nuts were grown in this island, in period B.

Rust (*Uredo arachidis*) is recorded in Dominica, Montserrat and St. Kitts, in period A, and in Montserrat in period B. In the latter island spraying experiments with Bordeaux mixture were conducted on the experiment plots in both periods, but the results obtained were somewhat contradictory. (See the last number of the *Agricultural News*, p. 14.) It was noted in period B that the Carolina Running variety suffered most, and the Gambia least, from this malady.

The only other point of interest in these reports, in relation to a specific crop, is the decrease, during both periods, of the root disease of Indian corn in Antigua and St. Kitts. In the latter Presidency, corn is not grown to any extent, so that it is a matter of relatively small importance, but in Antigua the condition was at one time of a serious nature.

The reports close with some account of the prevalence of mistletoe and love vine, and with information concerning the weather conditions incident in each island during the periods dealt with, since these are always of importance in connexion with the prevalence of plant diseases.

Pencil Cedar.—In a recent letter to the Commissioner of Agriculture for the West Indies, Mr. J. C. Moore, Agricultural Superintendent for St. Lucia, reports the discovery of a juniper from the Petit Piton in that island. Some fourteen years ago he had been informed by Mr. Evelyn, then Chief Clerk at the Government Office at St. Lucia, that a coniferous tree was found on the top of this Piton, and that it was the pencil cedar. It was, however, not until quite recently that Mr. C. Devaux succeeded in securing specimens from that almost inaccessible locality. There are, according to him, only half-a-dozen trees there, and they are stunted by wind. The altitude of the station where the tree grows is given as 2,460 feet. A fruiting specimen, together with a section of a branch to show the wood, have been received at Kew from the Commissioner of Agriculture. The tree proves to be *Juniperus barbadensis*, L., a species closely related to *J. virginiana*, L., and *J. bermudiana*, L., with both of which it is frequently confused, as has been pointed out by Professor Sargent (Sylva of North America, XIV, p. 89, t. 738.) The area of this tree on the continent is distinctly littoral, extending on the Atlantic coast from Southern Georgia to about 27° N. lat. in Florida, and on the Gulf coast of Florida from about 27° N. lat., but it also includes a number of widely scattered stations in the West Indies, as the Bahamas, San Domingo, and the Blue Mountains of Jamaica, as well as St. Lucia. In Barbados it was in existence at least until 1830, when Maycock (Flora Barbadensis, p. 395) recorded it from there as a 'by no means common tree'. Since that time it has not been mentioned as occurring in the island. In the Blue Mountains of Jamaica it is now rare, and ranges from 3,500 to 6,000 feet; in San Domingo it was found at 5,000 feet, and in St. Lucia, as stated above, at 2,460 feet. These mountain stations evidently represent only the last remains of a former much wider vertical range in the islands, where, as in Florida, the tree was much sought for on account of its highly priced wood. (From Miscellaneous Notes in the *Kew Bulletin*, 1911, p. 377.)

WEIGHTS OF SEEDS FROM PARA RUBBER TREES.

Accounts were given in the last volume of the *Agricultural News*, pages 111 and 363, of observations made by the Grenada Agricultural Department in regard to the weight of Para rubber seeds. In connexion with the subject, the following further information appears in an article by Mr. L. Lewton-Brain, Director of Agriculture of the Federated Malay States, in the *Agricultural Bulletin of the Straits and Federated Malay States*, November 1911, p. 355:—

Messrs. Macmillan and Petch state that they find a large difference between the weight of seed from tapped and untapped trees, the latter being considerably heavier. The figures they give are 9·1 lb., against 7·8 lb. per 1,000 seeds, a difference of 1·3 lb. or 16⅔ per cent. on the weight of seeds from tapped trees.

To see whether the difference is an actual one, and if so, what it would amount to here, an extensive series of weighings was carried out. Trees of the same age in the Experiment Plantation and the Public Gardens, Kuala Lumpur, gave an excellent opportunity for comparison. The following are the actual results:—

Tapped.				Untapped.			
300	seeds	weighed	2·65 lb.	300	seeds	weighed	2·93 lb.
300	,,	,,	2·69 ,,	300	,,	,,	2·90 ,,
300	,,	,,	2·48 ,,	300	,,	,,	2·88 ,,
300	,,	,,	2·81 ,,	300	,,	,,	2·76 ,,
300	,,	,,	2·56 ,,	300	,,	,,	2·80 ,,
300	,,	,,	2·42 ,,	300	,,	,,	2·71 ,,
300	,,	,,	2·70 ,,	300	,,	,,	2·70 ,,
300	,,	,,	2·60 ,,	300	,,	,,	2·71 ,,
300	,,	,,	2·47 ,,	300	,,	,,	2·72 ,,
300	,,	,,	2·55 ,,	300	,,	,,	2·81 ,,
300	,,	,,	2·34 ,,	300	,,	,,	2·84 ,,
300	,,	,,	2·41 ,,	300	,,	,,	2·73 ,,
300	,,	,,	2·50 ,,	300	,,	,,	2·74 ,,
300	,,	,,	2·31 ,,	300	,,	,,	2·77 ,,
300	,,	,,	2·39 ,,	300	,,	,,	2·80 ,,
300	,,	,,	2·53 ,,	300	,,	,,	2·81 ,,
4,800	,,	,,	40·39 lb.	4,800	,,	,,	44·61 lb.

Average was 8·4 lb. per 1000. Average was 9·3 per 1000.

It will be noted that not only is the average weight per 1,000 seeds distinctly higher from the untapped trees, but that only one weighing of seeds from tapped trees gave a higher total than the lowest weighing of the untapped trees. The seeds were collected fresh every morning and weighed immediately. The difference is 0·9 lb. per 1,000 seeds, or 10·7 per cent.—not quite so great as the Ceylon figures. That this difference is entirely due to the extra weight of the kernels, the husks remaining nearly constant, is shown by the following test:—

No. of seeds.	Weight of kernels.	Weight of shells.	Total.
Tapped trees 2,000	10 lb. 11 oz.	6 lb. 4¾ oz.	16 lb. 15¾ oz.
Untapped trees 2,000	12 lb. 1½ oz.	6 lb. 4¾ oz.	18 lb. 6¼ oz.

It will be interesting to see what the difference in germination between the two sets of seeds will be, after different periods of storage. A series of experiments is in progress to test this point, and will be reported on later, when complete.

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR, December 19, 1911; Messrs. E. A. DE PASS & Co., December 8, 1911.

ARROWROOT—$3\frac{1}{2}d$ to $3\frac{3}{4}d$.
BALATA—Sheet, 3/6; block, 2/4 per lb.
BEESWAX—£7 5s. to £7 10s.
CACAO—Trinidad, 60/- to 70/- per cwt.; Grenada, 54/- to 59/6; Jamaica, 51/- to 58/-.
COFFEE—Jamaica, 70/- to 120/- per cwt.
COPRA—West Indian, £25 10s. per ton.
COTTON—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, no quotations.
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—49/- to 64/- per cwt.
ISINGLASS—No quotations.
HONEY—No quotation.
LIME JUICE—Raw, 1/1 to 1/4; concentrated, £18 12s. 6d. to £19 10s.; Otto of limes (hand pressed), 5/3.
LOGWOOD—No quotations.
MACE—Firm.
NUTMEGS—Firm.
PIMENTO—Common, $2\frac{9}{16}d.$; fair, $2\frac{5}{8}d.$; good, $2\frac{11}{16}d.$; per lb.
RUBBER—Para, fine hard, 4/4½; fine soft, 4/1; Castilloa, 4/1 per lb.
RUM—Jamaica, 1/8 to 5/-.
SUGAR—Crystals, 19/6 to 22/6; Muscovado, 15/- to 17/6; Syrup, 14/- to 18/3 per cwt.; Molasses, no quotations.

New York.—Messrs. GILLESPIE BROS. & Co., December 15, 1911.

CACAO—Caracas, 12½c. to 12¾c.; Grenada, 12c. to 12¼c.; Trinidad; 12c. to 12½c. per lb.; Jamaica, 10c. to 12c.
COCOA-NUTS—Jamaica, select, \$29·00 to \$31·00; culls, \$16·00 to \$17·00; Trinidad, select, \$29·00 to \$31·00; culls, \$16·00 to \$17·00 per M.
COFFEE—Jamaica, 14¼c. to 15c. per lb.
GINGER—8¾c. to 9c. per lb.
GOAT SKINS—Jamaica, 53c.; Antigua and Barbados, 48c. to 52c.; St. Thomas and St. Kitts, 46c. to 48c. per lb.
GRAPE-FRUIT—Jamaica, \$2·50 to \$3·00.
LIMES—\$3·00 to \$4·00.
MACE—50c. to 54c. per lb.
NUTMEGS—110's, 12½c.
ORANGES—Jamaica, \$2·00 to \$2·25 per box.
PIMENTO—$2\frac{3}{4}d.$ per lb.
SUGAR—Centrifugals, 96°, 4⅞c. per lb.; Muscovados, 89°, 4⅛c.; Molasses, 89°, 4⅜c. per lb., all duty paid.

Trinidad,—Messrs. GORDON, GRANT & Co., January 8, 1911.

CACAO—Venezuelan, \$12·25 to \$12·50 per fanega; Trinidad, \$11·75 to \$12·15.
COCOA-NUT OIL—95c. per Imperial gallon.
COFFEE—Venezuelan, 16c. per lb.
COPRA—\$4·25 per 100 lb.
DHAL—\$4·00 to \$4·10.
ONIONS—\$2·75 to \$3·00 per 100 lb.
PEAS, SPLIT—\$6·75 to \$7·00 per bag.
POTATOES—English, \$2·50 to \$2·75 per 100 lb.
RICE—Yellow, \$4·70 to \$4·75; White, \$5·75 to \$6·00 per bag.
SUGAR—American crushed, no quotations.

Barbados,—Messrs. JAMES A. LYNCH & Co., December 30, 1911; Messrs. T. S. GARRAWAY & Co., January 1, 1911; Messrs. LEACOCK & Co., December 22, 1911; Messrs. E. THORNE, Limited, December 5, 1911.

CACAO—\$12·00 to \$12·50 per 100 lb.
COTTON SEED—\$26·00 per ton.
COTTON SEED OIL—50c. per wine gallon.
COTTON SEED CAKE MEAL—\$24·00 per ton, c.i.f., neighbouring islands.
HAY—\$1·50 to \$2·00 per 100 lb.
MANURES—Nitrate of soda, \$65·00; Cacao manure, \$42·00 to \$48·00; Sulphate of ammonia, \$75·00 to \$80·00 per ton.
MOLASSES—No quotations.
ONIONS—\$2·40 to \$3·50 per 100 lb.
PEAS, SPLIT—\$6·75 to \$6·80 per bag of 210 lb.; Canada, \$3·90 to \$4·10 per bag of 120 lb.
POTATOES—Nova Scotia, \$2·50 to \$3·25 per 160 lb.
RICE—Ballam, \$4·90 to \$5·30 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
SUGAR—American granulated, \$6·00 per 100 lb.

British Guiana.—Messrs. WIETING & RICHTER, January 6, 1911; Messrs. SANDBACH, PARKER & Co., December 8, 1911.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	\$12·50 per 200 lb.	\$13·00 per 200 lb.
BALATA—Venezuela block	No quotation	Prohibited
Demerara sheet	70c. per lb.	70c.
CACAO—Native	15c. per lb.	11c. per lb.
CASSAVA—	72c.	No quotation
CASSAVA STARCH—	——	No quotation
COCOA-NUTS—	\$12 to \$16 per M	\$10 to \$16 per M., peeled and selected
COFFEE—Creole	18c. per lb.	18c. per lb.
Jamaica and Rio	18c. to 19c. per lb.	20c. per lb.
Liberian	13c. per lb.	14c. per lb.
DHAL—	\$3·75 per bag of 168 lb.	\$3·75 per bag of 168 lb.
Green Dhal	\$3·00	——
EDDOES—	\$1·20	——
MOLASSES—Yellow	None	——
ONIONS—Teneriffe	——	——
Madeira	5½c. to 6c.	5c. to 6c.
PEAS—Split	\$7·25 per bag (210 lb.)	\$7·00 to \$7·25 per bag (210 lb.)
Marseilles	\$3·25	No quotation
PLANTAINS—	20c. to 40c.	——
POTATOES—Nova Scotia	\$3·25 to \$4·00	\$3·50
Lisbon	——	No quotation
POTATOES—Sweet, B'bados	\$1·68 per bag	——
RICE—Ballam	No quotation	——
Creole	\$5·00	\$5·00 to \$5·25
TANNIAS—	\$1·44	——
YAMS—White	\$2·88	——
Buck	\$3·12	——
SUGAR—Dark crystals	\$3·20	\$3·20 to \$3 25
Yellow	\$3·80	\$3·75
White	\$4·75 to \$5·00	——
Molasses	\$2 90 to \$3·10	——
TIMBER—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	\$3·75 to \$6·00 per M.	\$4·00 to \$6·00 per M.
,, Cordwood	\$1·80 to \$2·00 per ton	No quotation.

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CONTENTS.

Mendelism in Relation to Seedling Sugar-Canes.

DURING the eleven years which this present century has now run, methods of producing new and improved varieties of plants and animals have undergone an almost complete transformation, owing to the precision and purpose introduced into them by the application of principles first enunciated by the Abbot Mendel. The success attending the work that has been carried out in the case of many other species of plants and animals has led of late to the somewhat casual suggestion that the same principle should be applied to the formation of synthesized sugar-cane seedlings, produced by crossing parents, each of which contains one desirable character that is absent in the other. The characters that have been suggested for combination in this manner in one strain or group of individuals are: high sucrose content, heavy tonnage of cane per acre, disease resistance, low fibre content, and the like attributes of economic importance. The adjective casual has been applied to this suggestion, because there is reason to think that, in some instances, it has been made without an adequate understanding of the nature of the characters to which Mendel's principles are applicable, and of the many peculiar difficulties experienced in the case of the sugar-cane as opposed to that of other plants.

In order to arrive at a reasonable estimate of the possibility of applying the methods under discussion to the case of the sugar-cane, some understanding of the nature of variation, and of its inheritance, is necessary; this renders possible a clear comprehension of the class of characters that is likely to show segregation or inheritance, and disabuses the mind of misconceptions arising through incomplete acquaintance with definitions of some of the terms employed, particularly such phrases as 'a pure line' and 'breeding true'. Light may also be shed on this question by a consideration of the evidence as to the nature of variation in seedling sugar-canes that is available from previous records; while even more illuminating is a true comprehension of the real nature of the very characters with which it has been proposed to work.

True variation, as opposed to fluctuation, is of two kinds—continuous and discontinuous: the latter kind is also known as mutation. Individuals exhibiting continuous variation show an evenly graded series lying between two extremes. Those which vary discontinuously may be collected into a few well-marked groups. Individuals may show, in addition to variation, small changes induced during the development of each by the external influences to which it has been subject. Such changes are known as fluctuations. A group of individuals exhibiting some well-marked character, as for example tallness, may show small differences, due to fluctuation, within itself: but so long as the offspring does not show changes in height that are quite outside the limits of this fluctuation, that group is said to breed true, and if the breeding can be continued for several generations without the appearence of any marked mutant forms, the line is said to be pure. On the other hand, when very marked changes in height occur in the offspring of the first generation, some of the individuals of the group, if not all, must be regarded as impure for the character of tallness. Mendel's principles apply only to very simple characters such as tallness or dwarfness, seed characters, flower colour and the like, when these vary discontinuously: they show what offspring may be expected to arise when individuals, breeding true to one character, are crossed with those breeding true to its opposite, and when the resulting seedlings are fertilized among themselves.

The principles also show how the characters are distributed, when an individual breeding true to the presence of one desirable attribute and the absence of another, is crossed with a second individual showing the absence of the first and the presence of the second. It is from such a cross that new forms, breeding true to both desirable characters, may be synthesized. It may be stated finally, that continuous variation is believed to be caused by a large number of indeterminable factors, while mutation is probably due to one or a few definite determinants, and that the inheritance of continuous variation is different from that of discontinuous, and does not follow Mendel's laws: while fluctuation is not inherited at all.

In order to commence Mendelian experiments on a sound basis, it is necessary to have a knowledge of the nature of the variation in the characters chosen, a certainty of the purity of the parent strains as regards those characters, and a knowledge of the simple nature of the characters themselves, and of the probable number of determinants which go to form each; in short, to possess a satisfactory analytical basis from which to commence synthesis.

In the production of seedling sugar-canes in the past, it has not been necessary to attach any great importance to an exact knowledge of parentage. In the earliest work, the parents were sometimes quite unknown. Later, the female parent was known, but the male was uncertain: while only recently have canes been bred, for several generations, whose parentage is known on both sides throughout. Naturally, also, most seedling canes must be regarded as complex hybrids until definite information is available to contradict this assumption. Under such circumstances, there is naturally no very precise understanding of the type of variation exhibited by the different characters of the sugar-cane; furthermore, no strain of canes could be selected which is known to breed true to any character desired. Thus the former records cannot supply two of the items necessary for the analysis postulated, and at present there is no other source from which the knowledge could possibly be obtained.

As regards the characters themselves those most carefully studied and recorded are of purely economic importance, and a very short consideration will show that they are either too ill-defined or too complex in themselves to permit of the expectation that they will behave as Mendelian units. If, for example, the sucrose content be considered, it appears possible that it is subject to continuous variation, though, on the other hand, certain canes exhibit a fairly constant value for this quality. It is not, moreover, sufficiently defined to enable a judgment to be formed as to the actual nature of its variation, since errors arise in the interpretation of the chemical analysis upon which it is based, owing to differences in the ripeness of canes, to the extent to which they have dried before being crushed, and to other external causes. Possibly, if the character were expressed as concentration of sugar in the sap of the storage cells of any strain when quite ripe, it might be found to be definite, and subject to discontinuous variation. At present, such a character is not likely to serve as a Mendelian unit. Again, tonnage of cane per acre may be an effect of the production of many short canes to the stool, or of a few long shoots, as well as of intermediate conditions: so that any mathematical valuation of this is not in reality a definite character at all. Disease resistance is another vague character, not properly defined or understood, that may be inversely dependent on sucrose content of juice. The employment of other economic characters is subject to similar objections. Thus it would appear that, in every way, the necessary analytical data are not forthcoming.

Certain botanical characters, which have been to some extent overlooked in the past, appear to be of a simpler and more definite nature, and to fall into clearly differentiated groups. Such are the characters of the nodes, internodes and eye-buds: and there are probably certain others. It is possible that careful study would reveal the nature of variation and inheritance in these: that this would result in a far better understanding of the classification of the sugar-cane and in the accumulation of sufficient knowledge to pave the way for experiments with economic characters. These experiments would first be of an analytical nature, and later might be directed toward the desired synthetical result.

In view of the points considered above, it will seem that experiment station workers would be ill-advised to divert their attention from the present methods of producing improved varieties of sugar-cane, and to sacrifice the knowledge and experience gained, merely in exchange for haphazard attempts to synthesize new strains along Mendelian lines. In the absence of the necessary analytical data, and in view of the practical difficulties in the way, such attempts would be almost certain to be barren of results. The principal efforts should be directed along the present lines, though casual experiments in Mendelism of the nature of side issues, would not interfere with such efforts and might lead to valuable information. But if a definite course of Mendelian investigation is to be undertaken, it should be carried out by a limited number of suitably placed, special stations, working along their particular lines, and unembarrassed by economic considerations. Their function would be to obtain the necessary analytical knowledge, possibly by commencing with a study of the variation and inheritance of botanical characters, and thence to proceed to the synthesis of economically valuable strains of sugar-cane.

Rubber-Planting in Formosa.—Permission was granted last year to a Japanese syndicate to form a rubber plantation, and some 3,500 acres of waste land in Kagi Prefecture were leased for this purpose. Central American rubber (*Castilloa elastica*), Ceara rubber (*Manihot Glaziovii*), Para rubber (*Hevea brasiliensis*), Assam rubber (*Ficus elastica*) trees are to be planted, together with bananas, pine apples, and lemon trees, while plantations of other trees will be made to protect the more valuable trees from wind and against fire. It is expected that the undertaking will be completed in six years.

The Government horticultural nurseries near Kagi are raising large numbers of the above-named trees in a plantation of 25 acres for distribution to the peasants, who will be encouraged to plant them and taught their proper management. (*Diplomatic and Consular Reports*, No 4769 Annual Series, p. 12.)

THE USES OF EUCALYPTUS.

These are mostly concerned with the medicinal properties that are possessed by the oil that can be extracted from the leaves; as an antiseptic, this is of peculiar use. Advantage may be taken of a useful summary, of the ways in which Eucalyptus may be employed, which is given in *L'Agriculture Pratique des Pays Chauds* for November 1911, in which it is pointed out that, to Baron F. von Müller, Director of the Botanical Garden of Melbourne, must be attributed not only the discovery of a large number of species, but the first experiments in the distillation of the leaves. Further, it is to Bosisto, a chemist of Melbourne, that the extension of the Eucalyptus oil industry must be credited, as well as the discovery of various uses to which it may be applied.

As far as is known, *Eucalyptus amygdalina* is the species that is richest in essential oils, though its rate of growth is far smaller than that of *E. globulus* The researches of Bosisto have shown that the species from which the leaves have most commonly been submitted to distillation give returns of essential oil in the following order: *E. amygdalina*, *E. oleosa*, *E. leucoxylon*, *E. goniocalyx*, *E. globulus* and *E. obliqua*. Of these, as regards *E. globulus*, the inferiority in the yield of oil is compensated for in its vigorous growth and its abundant foliage. In any case, it is a fact that the amount that can be obtained from each species depends upon the season and the locality.

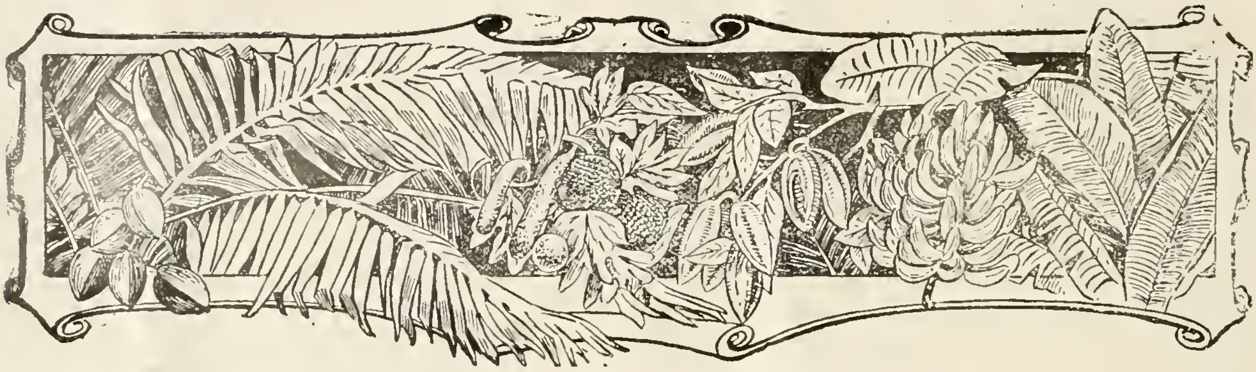
It is a characteristic of *E. rostrata* that it flourishes in inundated lands and in those subjected to sudden, heavy rainfall. *E. oleosa*, on the other hand, is particularly fitted for cultivation in dry and desert regions.

The article quoted above, which presents this information, goes on to say that the researches commenced by Baron von Müller, and continued by Bosisto and Osborne, have shown that eucalyptus oil dissolves, among other substances used for making varnish and such preparations, camphor, pine resins, mastic, gum Elemi, sandarac, asphalt, Xanthorrhea resin, dragon's blood, benzoin, copal, amber and wax, but not gutta-percha.

The ash obtained from different kinds of Eucalyptus yields 5 to 27 per cent of potash. A ton of the leaves of *E. globulus* will give over 10 lb. of pearl ash; while a similar quantity of the green wood furnishes more than 2 lb , and the dry wood at least 6 lb.

In pharmacy, the leaves of Eucalyptus and the oil are employed in many different ways: for pills, cachets, fumigants, washes, injections, sweets, pastilles, infusions, cigarettes for asthma, oils, aromatic vinegars, salts, soap, dental powders and pastes, insecticides, remedies for diseases of silk worms and bees, protection from mildew, fever remedies, colds, bronchial affections and those of the throat and lungs, neuralgia, depression, cholera, vesical catarrh, uraemia, chronic rheumatism, gout, congestion of the brain and of the lungs, for protection against mosquitoes, and even for the purpose of reducing adipose tissue. Lastly, the oil is largely made use of in perfumery. The matter does not conclude here, for, as it is pleasingly expressed by Morel, even after filling the place of a remedy for the greater number of ills, the products of Eucalyptus may be employed for embalming the bodies of those who have died because they were ignorant of its benefits.

After mentioning other, similar uses of the oil and resin of Eucalyptus, the article goes on to state that, although too much may have been claimed for such products scientific research has shown that they possess a real value, and that, particularly, the leaves of *E. globulus*—especially those from young trees—are endowed with antiseptic properties that are capable of utilization in many different ways.



FRUITS AND FRUIT TREES.

THE DOMINICA LIME IN ENGLAND.

Success is attending an experiment designed to secure for the Dominica lime, one of the fruits grown within the Empire which is little known in this country, a share of the popularity enjoyed in the United Kingdon by the lemon. It is claimed that this product of the West Indies cannot only be used for every purpose for which the better-known lemon is employed, but that, weight for weight it contains more juice. Mr. Algernon E Aspinall, Secretary of the West India Committee, who with the Exhibition Committee of Dominica is responsible for the experiment, informed a *Morning Post* representative yesterday that practical results had undoubtedly been achieved by their efforts to secure support in this country for what is, next to the banana, the most important fruit produced in the West Indies on a commercial basis. 'The West Indian Produce Association', he said, 'is now importing about 100 boxes every mail, and the great point gained is that limes are now obtainable on a commercial basis at Covent Garden. The cultivation of the lime tree is by far the largest industry of Dominica, the exports of limes and lime products from that island being five or six times as great as those of Montserrat, which through judicious advertisement, has been so closely identified in the public mind with the fruit. The lime is already well known and appreciated in America. In 1910 there were 27,427 barrels shipped from Dominica, the bulk going to the United States. Our efforts are being directed to making that fruit better known in this country, and thus developing a trade with one of our colonies. For one thing, we realize that the United States offers a less safe market than that of the United Kingdom, for the Americans have practically shut down the business done in oranges from the British West Indies by imposing a duty, with a view to protecting their own orange growers.'

On its merits, Mr. Aspinall considers the Dominica lime will become more popular in this country. 'The future is decidedly hopeful', he said. 'Of course, a few hot summers like the last will help us enormously. We shall still continue the experiment of distributing samples of limes, with literature, in suitable directions, and showing the fruit at exhibitions, and Dominica is now considering proposals submitted by the West India Committee for advertising the fruit on a more extensive scale next year.' Mr. Aspinall mentioned that the only obstacle met with in popularizing the Dominica lime had been the complaint that it did not keep so well as the lemon, but that could be overcome by keeping each lime wrapped up until it was used. (The *Morning Post*, December 29, 1911.)

THE SUGAR CONTENT OF ORANGES.

An abstract of a paper describing work on this subject, and appearing in the *California Cultivator* for May 18, 1911, is produced here from the *Bulletin of the Bureau of Agricultural Intelligence and of Plant Diseases* for June 1911, p. 1245:—

The writer carried out a number of analyses of Valencia oranges of varying degrees of ripeness, and dividing each into three parts estimated the amount of acid (as citric acid), grape sugar and cane sugar. The work was carried out in the chemical laboratory of the Bonita High School, Arizona, on Valencia oranges taken from the neighbouring orchards.

The following results were obtained, per cent.

	Stalk end.	Middle.	Top.
I. Green.			
Acid	2·49	3·32	2·27
Grape sugar......	4·16	3·87	4·00
Cane sugar........	3·24	4·60	5·32
II. Middle ripe.			
Acid	2·41	2·66	2·13
Grape sugar......	2·62	3·08	3·30
Cane sugar.	2·54	4·82	5·34
III. Ripe.			
Acid	2·57	2·61	2·06
Grape sugar......	3·25	3·92	4·30
Cane sugar........	4·73	5·45	6·02

From the results it is seen that (1) the acid decreases with age to a slight extent, with the larger percentage in the middle portion: consequently to produce a fruit with the minimum amount of acid, a long narrow shape is required; (2) the grape sugar (glucose or dextrose) varies slightly in amount in different parts of the orange, but as this substance does not add much to the sweetness of the orange, consideration of it may be neglected; (3) the cane sugar generally increases throughout the fruit with age, but is more highly developed in the top (navel end): as a very little of this sugar serves to increase the sweetness, a development of this end would ensure a sweeter fruit.

LIVE STOCK.

JIBBING IN HORSES.

Jibbing is a vice of horses which shows itself in continuous unwillingness of the animal to submit to control; the horse is obstinate, and this consciously. It not only reduces the animal's usefulness, but constitutes a general danger. The subject is dealt with, in a complete manner, in *Veterinary Pathology*, by Friedburger and Frohner. We may distinguish between absolute and relative jibbing. The former renders the animal useless for all purposes, but the latter, which is much commoner, affects only certain kinds of work, such as rider's jibbing, carriage jibbing, jibbing in double harness. The evil is commonest in mares, and particularly in half-wild breeds.

The cause of jibbing is usually to be found in improper or brutal treatment of the animal when being broken in, or in some senseless and cruel punishment, to which influences high-spirited and well-bred animals are very susceptible. Malicious teasing and irritation, as well as recovery from painful skin-injuries, may also give rise to jibbing. Among temporary causes, ruttishness in mares must be named. How far heredity or pathological conditions of the brain may conduce to jibbing is not well known.

Jibbing may be partly active and partly passive, though both are often combined. An active jibber may stand still when at work, and offer resistance to all attempts to urge it on. It behaves violently in some cases, and may do serious damage to the carriage or occupants. Saddle-horses try to throw their rider by bucking, or rearing, or may try to knock him off against trees, walls, etc. Sometimes, they throw themselves in their attempts to do so. At such times, the horse shews great excitement, a fiery eye, palpitation, trembling, quickened breathing, and sweating. In rarer cases, there may be perfect mania, so that at last the animal is led away half stupid, and utterly exhausted. Such animals are usually good-tempered in the stable.

In passive jibbing, the animal while at work suddenly stops as though spellbound, backs into the harness, and stops the vehicle intentionally, and cannot by any means, kind or severe, be got to move a step forward. It may attempt to turn back. If allowed to remain quiet for some little time, it will usually go on of its own accord. If not, it will probably need to be unharnessed, or allowed to return home.

A horse must not be regarded as jibbing if it refuses to work when put to unaccustomed or excessive tasks, or because of illness, or bodily pain such as arises from an uncomfortable collar or badly-fitting harness. A crupper that is too tight is a very common cause of kicking, and also of actual jibbing. In dealing with special cases, jibbing must not be confused with shying.

Confirmed jibbers are incurable, but in early cases, and more particularly during the development of the vice, improvement may be obtained by kind treatment and gentle handling, and above all, by patience, but never by compulsion. In general, it may be stated that jibbers are incurable, though many horsemen have their own ideas and practices as regards the matter. Cases are known in which, for a time at least, a jibber may lay aside the vice, in well-accustomed surroundings.

It will be seen then, that owners of horses, and more especially of young horses, should endeavour to supervise personally the work of their grooms, with particular regard to the prevention of cruelty and abuse, for it is certain that by this means fewer horses would be ruined, and also that not inconsiderable financial loss would be averted.

SOME NOTES ON THE MULE.

As is commonly recognized, the mule is probably the most generally useful, as a working animal, among the Equidae. It is capable of great endurance, tolerates thirst well, and can put up with changes of housing, weather, and food, about which it is not fastidious. The toughness of the hide helps to preserve it from galls.

Mules are usually contented, intelligent animals; and while resenting violence, they appreciate proper handling. They are particularly free kickers, are often shy with strangers, and are sensitive in the region of the head; but with attendants who understand them, they are by no means troublesome, and are easy to look after and keep in condition. Being a near relation of the horse, and with a digestive system entirely similar, mules may be treated according to all the general rules for the care of horses, and if equal attention be paid to their stable management and feeding, they are much easier to keep in condition when in hard work. In the West Indies, the general rule is to pen mules, but the better plan is to keep them in stalls, as by this the animals are more likely to receive greater individual attention, and better care generally.

In selecting a mule, the first consideration must be to find the animal best suited to the purpose for which it is required. The shape of the back, especially in pack mules used for carrying cacao, is of supreme importance. It should be straight from wither to croup, or inclined to be roach-backed, rather than hollow. It should be short, well covered with muscle, and broad and level on the top. A long back is a weak back, and if hollow and narrow, possesses the worst shape. The body should be well ribbed up, and not lacking in girth; while the chest should be deep and broad between the shoulders. The quarters should be well developed and muscular. In the pack mule, the strength of the quarters is of more importance than the shape of the fore-hand. In moving up and down hill, this necessity for powerful quarters is apparent. The withers are naturally broad and low and the shoulder looks upright; but the low wither is not a disadvantage, and the mule is proverbially a sure stepper. The neck is straight and short, and should be strong and muscular. The legs are slender, but as long as they are short and clean, and straight in front, no great amount of bone is necessary. Mules are often cow-hocked behind, but if they are free from disease, this defect is not a drawbrack. Spavin, however, is a fairly common cause of unfitness, especially in hilly districts. The feet generally appear to be boxed in, but they are strong and hard-wearing: the horn is tough, thick, and grows quickly. As a rule, the feet are inclined to grow high at the heels, and this is a matter which requires frequent attention. The age at which mules are fit for work is, as in the case of the horse, four years: they are more suited for this at five, and still more so at six, years of age. It is, however, a common practice to work them when three years old. The teeth of the mule resemble those of the horse in most particulars, the main difference being that those of the mule are narrower. The age may be gauged by exactly the same marks as are employed in the case of the horse.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date December 30, with reference to the sales of West Indian Sea Island cotton :—

Since our last report, about 250 bales of West Indian Sea Islands have been sold, chiefly St. Vincent and Montserrat, from $17\frac{1}{2}d.$ to $19d.$, St. Croix at $15d.$, and a few St. Vincent at $20d.$

The market remains steady, in view of the fact that Carolina Sea Islands are a bad crop this year, both in quantity and quality.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending December 30, is as follows:—

There was a demand for the limited offerings, which consisted principally of cotton more or less off in preparation. The supply of the better grades, Fully Fine and Extra Fine, is very small, and has been largely disposed of.

The crop has been nearly all marketed, therefore the receipts from now on will be very small.

There is in stock about 1,000 bales old crop cotton, which is being held by the owners in expectation of higher prices later on.

We quote :—

Extra Fine	32c. = $18d.$, c.i.f., & 5 per cent.
Fine to Fully	26c. to 28c. = $15d.$ to $16d.$ c.i.f. & 5 per cent.
Fine to Fully Fine, off in preparation	18c. to 25c. = $10\frac{1}{2}d.$ to $14\frac{1}{4}d.$,, ,, ,,

ARRANGEMENT OF PARTS IN THE COTTON PLANT.

Bulletin No. 222 of the Bureau of Plant Industry of the United States Department of Agriculture has been issued under this title. It contains the results of a study of the way in which the different organs of the cotton plant are arranged: for, as is claimed at the commencement of the bulletin: 'changes of behaviour that are of serious economic importance may be brought about by changing the number and arrangement of the parts of the plants, even without altering the characteristics of the leaves, flowers, or other component units of the structure.' The following is taken from the conclusions given in the Bulletin :—

The cotton plant has two kinds of branches, differing in arrangement as well as in other characters. Fruiting branches develop laterally from extra-axillary buds at the side of the axillary buds, which produce the limbs. Extra-axillary buds may develop into vegetative branches and replace fruiting branches, but no normal fruiting branches are produced by axillary buds.

The leaves of the limbs and vegetative branches of the cotton plant have the same spiral arrangement as those of the main stem, though the direction of the spiral on the limbs and vegetative branches may be opposed to that on the main stalk. Each internode of the fruiting branch is twisted in the opposite direction from the one preceding, bringing the leaves to two alternating series along the sides of the branch and the flowers into an upright position.

The involucre of the cotton flower is composed of three bracts, two of equal size and one smaller. The small bract is always on the outer or distal side of the flower, toward the end of the branch. Two bractlets frequently appear on either side of the small bract in the United States upland varieties, while in certain Central American types a complete series of six is sometimes developed, one on either side of the three bracts. The teeth of the bracts when twisted follow the same direction as the overlapping of the petals.

The calyx of the cotton flower has five lobes distinctly unequal in size, two large, two small, and one intermediate. One of the small lobes stands opposite the small bract of the involucre, between two large lobes. The arrangement of the other lobes varies in relation to that of other parts of the flower.

Small flap-like organs are often inserted between the calyx and the petals, arranged in alternation with the calyx lobes. These intra-calicary organs may be considered as supernumerary calyx lobes, or as representing free stipular elements of the calyx lobes. In either case, they support the view that the calyx lobes are homologous with the bracts of the outer involucre. In other words, the calyx of the cotton plant may be looked upon as an inner involucre.

The petals of the cotton flower are opposite the lobes of the staminal column, and overlap in the same direction as the stamens are bent. This direction conforms to the twisting of the internode of the branch bearing the flower, and is reversed in the flowers at each succeeding node.

The stamens are arranged on the staminal column in five vertical rows, about the pistil, opposite the petals, and turn in the same direction as the overlapping of the petals. The paired positions and frequent branching of the stamens suggest the development of the compound staminal column by the subdivision of a few primitive stamens.

There is a persistent irregularity in the number of carpels in the flowers and fruits of the same plant The range of normal variation is from two to four carpels in the Egyptian cotton, and from three to five carpels in the upland cotton. When the number is five, the stigmas and carpels alternate with the petals and the lobes of the staminal column.

THE QUANTITY OF SULPHUR IN SOILS.

The *Agricultural News* of August 5, 1911, contained an editorial article which pointed out that the importance of sulphur in the life of the plant had been under-estimated, chiefly because the methods of analysis commonly employed do not serve for the detection of the whole of the quantity of that element that is present; certain proportions are lost during the manipulations concerned in the investigations, and are therefore not accounted for in giving the results.

The matter obtains further attention in an article by P. de Sornay, Assistant Director of the Station Agronomique, Mauritius, in the *International Sugar Journal* for September 1911, which describes work devised to show that the method that is used for ascertaining the quantity of sulphur, as sulphuric acid, in soils, does not succeed in presenting a true idea of the proportion of the element that is present.

It is first pointed out that, in Mauritius, certain varieties of sugar-cane take up a greater amount of sulphuric acid than of phosphoric acid, from the soil; while in Hawaii the contrary condition obtains. In both cases, the sulphuric acid content of the leaves is about the same. Analyses of rain-water in Mauritius have shown that this contains an amount of sulphuric acid that serves to supply over 50 ℔. of sulphuric acid—equivalent to more than four times as much sodium sulphate—per acre; so that rain is a by no means unimportant source of the sulphur required by the cane. Humus contains a proportion of sulphur which becomes useful to plants by being oxidized to sulphates, in which form it is absorbed. The special usefulness of the element for plants is constituted in the fact that it is necessary for the formation of the important nitrogenous bodies known as albuminoids.

In methods for estimating sulphur in soils which entail the use of concentrated nitric acid as a first step, the presence of iron and aluminium in high proportions is sufficient to prevent the sulphur compounds from being completely dissolved, so that they are not detected subsequently. When hydrochloric acid is used, the preliminary solution is more efficient, owing to the greater solubility of iron and aluminium in that acid. That this condition obtains in practice was shown by extracting a sample of soil with nitric acid, and then treating the insoluble residue with hydrochloric acid, when in all cases it was demonstrated that the employment of nitric acid had not been sufficient for the solution of the sulphur. Further, calcination always gave still higher figures for the sulphur content of the soil, because it causes the oxidation of the organic sulphur that is present and, in addition, assists in the dissolving action of the acids that are employed subsequently. There are losses, however, even when calcination is used, for the carbon present causes reduction to sulphides, which are driven off by heat, and the high temperature is also sufficient to cause volatilization of the sulphur contained in some of the organic matter in the soil, before this can become oxidized, and fixed.

The researches of the author have led to the adoption of a method of determining sulphur in soils, in which the efficiency of calcination is increased by mixing with potassium nitrate the samples taken, before they are heated, so that complete oxidation to sulphate is obtained. Cases have been found, however, in which the use of potassium nitrate in this way did not result in the detection of sulphur in greater amounts than those given when it was not employed, and these occurred chiefly in regard to examples that did not possess a high humus content.

The advice finally given in regard to the matter is that, for the determination of sulphur in soils, calcination should be carried out after the addition of potassium nitrate, and that extraction of the calcined mass should be effected with hydrochloric acid. Details are presented of the manipulation required in the adoption of this method.

BENEFIT TO CROPS FROM GROWING THEM WITH LEGUMES.

Work has been done recently at the Agricultural Experiment Station of the College of Agriculture, Cornell University, for the purpose of ascertaining, on a practical scale, if the growing of leguminous crops with other plants results in any benefit to the latter, besides that arising from the addition of nitrogen that legumes are able to effect with the aid of the nodule organisms in the roots. A positive answer to the question appears to have been obtained, and this is expressed in the following way, in a summary to Bulletin No. 294 of the Station, dealing with the work:—

Timothy grown with alfalfa contained a greater percentage of protein than did timothy grown alone. The same was true of timothy grown with red clover.

Oats grown with peas had a higher protein content than oats grown alone. The yield of the mixed oats and peas, when cut for hay, was considerably greater than the yield of oats alone.

The increased value of the non-legume, due to its greater nitrogen content, when grown with a legume, is of some economic importance. A method for increasing the protein content of certain forage crops by growing them with legumes is thus suggested.

The increased supply of available nitrogen, which these results indicate to be due to the presence of the legume, must have a very important influence on the yield of the non-legume on soils where nitrogen is the limiting factor in the growth of the crop.

Soil on which alfalfa had grown for five years contained more nitrates than did soil which had grown timothy for the same length of time. Sections of these same plants kept bare of vegetation for the summer gave similar results.

The rate of nitrification of ammonium sulphate was greater in alfalfa soil than in timothy soil, thus indicating an influence of the plant on the conditions favouring nitrification. The higher protein content of non-legumes growing with legumes than of the non-legumes growing alone is probably due to the more active nitrification caused by the presence of the legume.

The nitrifying power of a soil which grew alfalfa for five years and which was then kept bare of vegetation for a summer was greater than that of adjacent plots on which timothy had been grown for the same length of time, and which was likewise kept bare for a summer. This indicates a benefit arising from the influence of the legume on the rate at which nitrification goes on in the soil even after the crop has been removed.

Alfalfa grown on soil in need of lime contained a higher percentage of protein when lime was added to the soil than when none was added. The weed *Erigeron annuus* growing with the alfalfa possessed a higher protein content when grown on the limed soil. Ammonium sulphate, when added to the limed and to the unlimed soil, nitrified more rapidly in the former.

The greater protein content of a non-legume when grown with a legume on a soil containing sufficient lime, as compared with one deficient in lime, is apparently due to the more abundant formation of nitrates under these conditions.

EDITORIAL NOTICES.

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial of the present issue deals with the subject of Mendelism in Relation to Seedling Sugar-canes. While pointing out the usefulness of the present method of seedling cane production, it emphasizes the fact that any work on strictly Mendelian lines should be carried out at a few carefully chosen special centres.

An article on page 35 gives information concerning many of the uses to which eucalyptus oil is put.

Two articles appear under the heading Live Stock, on page 37, entitled Jibbing in Horses and Some Notes on the Mule.

Methods of determining the quantity of sulphur in soils receive attention in an abstract that is presented on page 39. The work described shows that the ordinary methods for finding the proportion of sulphur in soils are likely to give results that are too low, and suggestions are made for obtaining greater accuracy.

The Insect Notes, on page 42, present articles dealing with The Melon or Cotton Aphis and The Nature of the Light Emitted by Fire-flies.

The Students' Corner continues the presentation of the questions that were set for the examinations recently conducted in connexion with the Courses of Reading of the Department. The matter will be concluded in the next issue of the *Agricultural News.*

The Soft Rot of Ginger in Bengal forms the subject of the Fungus Notes, on page 46.

Antigua: A Handbook of General Information.

This has been prepared by Mr, H. A. Tempany, B.Sc., F.I.C., F.C.S., Government Analyst and Superintendent of Agriculture for the Leeward Islands. The booklet contains forty-nine pages, dealing with the following matters: a general account and history of Antigua; information concerning the physical, geological, scenic, and meteorological features of the island; accounts dealing with the population, principal towns, Government, revenue and expenditure, and industrial conditions of the Colony. This is followed by information treating in a broad manner of the sugar and cotton industries, and of others of agricultural note. The handbook concludes with details concerning the natural resources of Antigua, and of its trade, together with information under the headings: education, ecclesiastical, judicial, medical, water-supply, roads, labour, and stock, concluding with matters relating to municipal, commercial and social affairs, and to the Department of Agriculture.

The handbook has been produced in a useful form, with attractive type, and the inclusion of several very good illustrations adds to its interest.

Agricultural Possibilities in Honduras.

The following information with regard to the agricultural possibilities in Honduras and the crops already grown is taken from articles in The *Pan-American Union*, pp. 993-1005, June 1911, and The *Stateman's Year-Book*, 1911, p. 943, abstracted in the *Bulletin of the Bureau of Agricultural Intelligence and of Plant Diseases*, July 1911, p. 1581.

In the centre of the country is a large and fertile valley 42 miles from north to south and 24 miles from east to west, said to have an elevation of 1,900 feet. Very little of this land is cultivated at the present time, though there are occasional fields on the hill-sides where native products are raised. With the aid of modern methods of agriculture, the soil of this district might be induced to yield valuable crops.

The most important products at the present time are bananas, coffee and cocoa-nuts, the first- and last-mentioned being grown along the Atlantic Coast. Rubber is produced in slowly-increasing quantities; while sarsaparilla, vanilla, tobacco, maize (for local consumption), oranges, lemons and beans are also grown, with indigo, rice and wheat in small quantities. Cacao receives very little attention, though it could be raised on a large scale and would form a valuable addition to the other products. Sugar-cane is also cultivated fairly extensively, and manufactured into a native rum, or Guaro: the manufacture is a Government monopoly. The country contains a large variety of trees, of which mahogany and cedar are exported, and it is also rich in medicinal plants.

Cattle-breeding is carried on extensively, and about 150,400 acres are under pasture. Cattle and hides are valuable items on the export list. In addition, dairy farming is conducted on a small scale, though the chief product, cheese, is of an inferior quality, and prepared by crude methods.

Agricultural Pupils at the Dominica Botanic Station.

Information has been received from Mr. J. Jones Curator of the Botanic Station, Dominica, that, after notices appearing in the *Official Gazette* and the local press, nine applications were received at the Botanic Station for three vacancies, as pupils under the new scheme of agricultural instruction (see *Agricultural News*, Vol. X, p. 242). On January 3, seven of the applicants presented themselves for examination, and as a result of this the four following have been selected as pupils on probation: F. J. Lawrence, La Plaine (75 per cent.): S. J. Jules, Soufrière, and V. J. Laronde La Plaine (70 per cent. each); E Joseph, Dublanc (65 per cent.)

Spraying to Kill Weeds.

Attention is drawn, in Circular No. 102 of the Ohio Agricultural Experiment Station, to the obvious fact that in spraying for killing weeds the substances used must be such as will destroy the weeds without causing injury to the crop that is being grown. A useful circumstance in connexion with the matter is that it has been found that the sprays used for weed destruction injure nearly all crops and weeds possessing broad leaves, while all weeds with narrow leaves are most likely to escape injury. It follows from this that such plants as alfalfa and soy bean will be killed by the substances which destroy broad-leaved weeds, while sedges and various grass weeds will not be destroyed by spraying with solutions that are not injurious to the grasses and cereal crops. The matter is briefly summarised by saying that, in Ohio, weed sprays, when properly adapted, should be available for the destructson of the larger portion of the pasture and grain field-infesting weeds, when the methods are rightly and economically developed.

Among the spray solutions tested, the following have been found most useful :—

Common salt solution, containing 3 lb. of salt to the gallon of water, applied at the rate of 50 to 75 gallons per acre.

Iron sulphate (copperas) solution, containing $\frac{3}{4}$- to 2 lb. of iron sulphate to the gallon of water; that is 100 lb. of iron sulphate to 52 gallons of water. This is employed at the rate of 50 to 75 gallons per acre.

Calcium chloride solution of the same strength as the salt solution, and used at the same rate.

Sodium arsenite solution, at a strength of $1\frac{1}{2}$ lb. of sodium arsenite to 50 gallons of water.

Copper sulphate (blue vitriol) solution at a strength of 8 to 10 lb. in 50 gallons of water; this is applied at the rate of 40 to 50 gallons per acre.

In commenting on these solutions, the circular points out, among other matters, that sodium arsenite is a very active poison and rather dangerous to use, and that the tests have shown that calcium chloride is very effective, but appears to be slightly inferior to common salt.

In dealing with the application of weed sprays, the circular states: 'The chemical solutions used as sprays to kill weeds should be applied, as all other sprays, by means of suitable spray nozzles, which deposit the solution as a fine mist upon the surface of the leaves of the plant. One can use almost any good spray pump which will give good pressure, and direct the spray nozzles after the manner used in orchards and vineyards, or the traction potato sprayers can be so adjusted as to spray the whole area, instead of the row spaces only, thus applying the spray more satisfactorily.'

Oil from Tobacco Seed.

A note in the *Journal d'Agrteulture Tropicale* for November 1911 states that the suggestion is being made in the United States of America that tobacco shall be cultivated with the object of obtaining seed for the production of oil. The oil content of the seed is about 15 per cent. of its weight; its quality is very good and it is easily obtained. In its production, after being bruised, the seeds are mixed with a certain quantity of warm water, and the paste made in this way is submitted to great pressure. The oil thus expressed is obtained mixed with impurities, and in order to eliminate albuminoid matters by coagulation it is heated gently, when these matters sink to the bottom, the pure oil being left floating above them.

The growing importance of drying oils renders the subject of great interest, especially where the seed may be utilized as a by-product in the production of leaf. It remains to be seen, however, if the growing of tobacco for its leaves has any effect on the oil content of the seeds.

The Absorption of Fat in Relation to Water-Drinking.

An abstract is made, in the *Experiment Station Record*, Vol. XXV, p. 268, of a paper dealing with recent work that has been conducted for the purpose of ascertaining the effect of copious and moderate water-drinking with meals on the absorption of fat by the human body.

The experiments were made with subjects placed on a uniform diet, small amounts of water being taken for the first and last periods of the experiment, the quantities in the intermediate time being large.

With the large amounts of water, the quantity of fat absorbed into the system increased; there was a reduction in the proportion when the amount of water allowed was halved.

The better digestion and absorption of fat, when large quantities of water were drunk are attributed to any or all of the following causes: (1) increased secretion of gastric juice and of pancreatic juice: (2) increased acidity of the contents of the small intestine, which brings about a greater secretion of pancreatic juice and bile; (3) an increase in peristaltic action; (4) greater blood pressure, due to rapidly absorbed water; (5) greater ease in the breaking up of the fat, on account of the presence of large amounts of water.

INSECT NOTES.

THE MELON OR COTTON APHIS.

The University of Nebraska has recently issued a Press Bulletin (No. 34, June 1911) entitled The Control of the Melon Aphis (*Aphis gossypii*, Glover). The following is an abstract of that bulletin, but as this insect is known in the West Indies on account of its attacks on the cotton plant rather than on account of its importance as a pest of melons, these notes are given a heading which indicates that fact.

The melon aphis is the most serious pest of melons and cucumbers in many localities in the United States where these crops are largely grown. It is recorded as badly affecting cotton in the Southern States, Mexico, Brazil, South Africa and Australia, and is probably of tropical origin.

INJURY. The loss of crops in Nebraska alone from the melon aphis aggregates thousands of dollars annually.

This insect possesses sucking mouth parts, by means of which it punctures the plant tissues and sucks out the sap. It occurs most generally on the under side of the leaves, which assume a wrinkled and distorted appearance. The melon aphis is capable of remarkably rapid reproduction, and the feeding of the enormous numbers of individuals quickly results in the death of the leaves, and eventually of the plants.

Aphids secrete a sweetish, sticky substance, known as honey-dew, which forms a coating on the under side of the leaves. The cast skins of the insects are held by the honey-dew, and this results in an appearance which is characteristic of the attacks of aphids. In the West Indies this honey-dew supports the fungus growth known as black blight.

LIFE-HISTORY. The life-history of the melon aphis is not yet known in all its details. In Nebraska, the first aphids to appear on melons and cucumbers are seen in June; they are winged females, which have probably flown into the fields from weeds on which they have spent the winter. Cool, rainy weather during the spring seems to be especially favourable to the rapid multiplication of these insects. The over-wintered females give birth to six to twelve young per day for some time. The young grow rapidly, and in about eight days become wingless adults capable of producing another generation of young. The adult insect is a soft bodied, sluggish plant louse from $\frac{1}{20}$- to $\frac{1}{12}$-inch in length: the wing expanse of the winged forms is from $\frac{1}{5}$- to $\frac{1}{4}$-inch.

The colour of this insect is variable, the individuals of any colony often range from a uniform pale green through all degrees of mottling to a pale yellow or almost black.

CONTROL. The melon aphis is attacked by a large number of natural enemies, including internal hymenopterous parasites and several kinds of predaceous insects such as lady bird beetles and their larvae, and the larvae of Syrphus flies and lace-wing flies.

Artificial control includes the processes of spraying and fumigating. In spraying, the under surface of the leaves must be reached by the spray fluid. For this purpose, a nozzle extension with a bend near the end to which the Vermorel nozzle is attached may be made from a short length of gas pipe. The leaves of melons and cucumbers are tender, and much force must not be used in applying the spray as they may be injured.

Kerosene emulsion and other strong, oily washes are not recommended for use on these plants, since they often injure the leaves A mixture of soap and tobacco is prepared by dissolving $1\frac{1}{2}$ lb. of soap in 2 quarts of water and adding an equal amount of strong tobacco decoction. This is diluted at the rate of 1 part to 4 parts of water. A commercial product of tobacco known as Black Leaf Extract is very useful for this purpose. It is diluted at the rate of 1 part to 50 of water, and at this strength is effective against the aphis, and does not injure the tender leaves

Fumigation with carbon bisulphide is useful in dealing with a limited number of plants. A tight tub, bucket, box etc. inverted over the plants makes a satisfactory fumigating chamber in which carbon bisulphide at the rate of 1 teaspoonful per cubic foot of enclosed space may be evaporated. This treatment will kill the aphis and not injure the plants. For use on a large scale, cages or tents are recommended. These are 4×6 feet in area and about 8 inches to 1 foot in height, made of light wooden frames covered with cloth which may be oiled to render it more impervious, although good results are obtained even when the oiling is omitted. The enclosed plants are fumigated for fifteen minutes, by means of a commercial tobacco fumigant such as 'To-bak-ine' 'Nico-fume'.

Clean culture is strongly recommended as a means of reducing the numbers of this pest. All old vines should be collected and burned as soon as the crop is harvested, and all weeds in the fields and vicinity should also be destroyed, since these harbour the aphis during winter.

THE NATURE OF THE LIGHT EMITTED BY FIRE-FLIES.

The nature of the light emitted by fire-flies has been the subject of speculation for many years, and it has generally been described as phosphorescent. An article in *Nature* for November 23, 1911, from which the following notes are abstracted, gives results of experiments in testing the light given by fire-flies, by means of photographic plates.

The investigators who carried out the experiments, state that they observed the beautiful green fluorescence of the light emitted by an insect of the genus Luciola, of the family Malacodermidae, and were led to enquire whether the light was of the nature of the X-rays produced in the Crookes tube.

An enquiry was instituted to see how this light affected photographic plates, especially when media of several sorts were interposed between the plates and the source of light. The media tried were wood, dark-brown leather, flesh (mutton) and black paper. After several trials, it was found that the plates were affected after exposure for two hours through flesh and black paper, and three hours through leather and wood.

The trials showed further that, as far as its effect on photographic plates is concerned, insect light is similar in intensity to lamplight, but it also has the important characteristic that this intensity is not varied, even when objects opaque to ordinary light are interposed between the insect and the plate. This light is intercepted by glass, in which respect also it differs from ordinary light.

It is concluded that the light of the fire-fly experimented with is not phosphorescent. It may, on the other hand, be premature to conclude that the light rays emitted by the insect are the same as X-rays, but it may safely be asserted that they are similar to the X rays and the ultra violet light, in that they render certain opaque media transparent, and are intercepted by glass.

AGRICULTURE IN BOLIVIA.

The following information respecting the cultivation of coffee, cacao, and the sugar-cane in Bolivia has been extracted by the British Vice-Consul at La Paz from the *Boletin de la Officina Nacional de Estadistica*:—

The most fertile region of the Republic of Bolivia is the north-east and the north-west, including a great part of the Department of La Paz, some portion of Chuquisaca and the Department of Cochabamba, Santa Cruz, and the Beni. This region includes the mountainous zone and also that of the plains. In the mountainous zone, cut by deep valleys, the perpetual snow line is at 5,000 metres. The region between 2,500 and 5,000 metres in height is called the 'puna', and produces very little. Valleys are met with between 1,600 and 2,500 metres high, and the Yungas, that is, the slopes of the Cordillera Real where the tributary rivers of the Amazon spring forth, lies between 800 and 1,600 metres high. In the valleys and in the Yungas, coffee, cacao, and the sugar-cane are cultivated

The centre of coffee cultivation is the Yungas provinces of the La Paz Department, and the coffee grown there is generally considered to be the best in quality. The province of Apolobamba of the same Department, and the provinces of Sara, Velasca, Chiquitos, and the Cordillera, of the Department of Santo Cruz, produce a good second-class coffee. The product is also cultivated in the Department of Chuquisaca, but on a very small scale. The production of the Yungas provinces of La Paz, which is relatively small at present, could be considerably increased, but the cultivation of cacao appears to be more in favour with the agriculturists of this region. Coffee is exported, Chile and the Argentine being the principal countries of destination.

The production of cacao is much less than that of coffee. It is chiefly cultivated in the Department of Santa Cruz, although even there conditions are such that the production could be increased. The best quality of cacao is that grown in the province of Apolobamba in the Departnent of La Paz. This cacao is much appreciated by local connoisseurs, and is known under the name of 'Pepita de Misiones' or 'Cocoa of Cavinas', from the Franciscan Mission, no longer existing, where it was cultivated. From this spot, which was on the left bank of the navigable rivier Madidi, all the region became abundantly supplied with cacao plants, some widely disseminated and others in large groups, which continue up to the banks of the river Madre de Dios. Being so widely spread and in such vast quantities, it is in thought that the production of cacao is one of the most promising future industries of Bolivia.

The cultivation of the sugar-cane is carried on in the Department of Santa Cruz, where abundant quantities are produced, principally in the provinces of Velasco, Chiquitos, Cordillera, and Vallegrande. Only a part of this production is used in the manufacture of sugar, which, notwithstanding its good quality, cannot compete with foreign imported sugar in other parts of the country, as it is handicapped too severely by the cost of transport in the interior of the Republic.

The sugar-cane is also cultivated to a certain extent in the province of Azero of the Department of Chuquisaca, the Yungas of the La Paz Department, and in the provinces of Mizque, Totora, and Chaparé of the Department of Cochabamba. All this production is employed in the manufacture of spirits and molasses. (From *The Board of Trade Journal*, November 23, 1911, p. 380.)

THE THIRD INTERNATIONAL CONGRESS OF TROPICAL AGRICULTURE.

As has been stated already, the British section of the International Association of Tropical Agriculture and Colonial Development, founded at the close of the first International Congress of Tropical Agriculture held in Paris in 1905, will be responsible for the organization of the third Congress to be held in London in May 1913, and Professor Wyndham Dunstan, L.L.D., F.R.S., etc., the President, and Dr. Henry, the Secretary of the British Section, and others, are already at work making the necessary arrangements. The Association has its headquarters in Paris, and is governed by an International Board, from which an Executive Committee of five to seven administrators is selected.

The work is mainly devoted tc promoting investigations into questions of special importance to tropical agriculture, to publishing the results of these enquiries, and to organizing International Congresses for the discussion of the problems of Tropical Agriculture and Colonial Development. Two Congresses have been held already, and, as is stated above, it is proposed to hold the third Congress in London in May 1913.

Subscriptions for joining the British Section, £1 per annum, payable on January 1, of each year, may be paid by crossed cheque cr money order, to the order of the Secretary, International Association of Tropical Agriculture and Colonial Development, British Section, and, in the case cf money orders should be drawn on the General Post Office, London. Letters and subscriptions should be addressed to: The Secretary, British Section, International Association of Tropical Agriculture and Colonial Development, Imperial Institute, London, S.W.

Members of the British Section will have the privilege of taking part in the London Congress without further special payment. They will also receive all the publications of the International Association. In addition, the quarterly *Bulletin of the Imperial Institute* will be issued to them free of charge. A reading and writing room will be reserved at the Imperial Institute for the use of members of the Section when in London, and members will also be entitled to make use of the General Library and Reading Rooms of the Imperial Institute. (From *Tropical Life*, December 1911.)

TRADE OF SIERRA LEONE, 1910.

Exports are valued, for statistical purposes, at their initial cost, plus all charges incurred up to actual shipment on board the exporting vessel, but exclusive of the expenses of conveyance to the port of destination.

The total exports for the year under review amounted to £1,249,367, including specie £199,350, showing an increase of £267,901 over the value of the exports for the previous year.

This is the first time on record that the value of the exports of the Colony has reached a million sterling.

The principal items contributing to the increase are: ginger, kola nuts, palm kernels, and specie; while palm oil. and, as is to be expected, rice, show a decrease.

The value of the produce and manufactures of the Colony increased from £529,849, in 1908, to £759,917 in 1909 and £967,625 in 1910, respectively. (From *Colonial Reports—Annual*, No. 694, p. 12.)

GLEANINGS.

Information has been received from Mr. R. F. Parkinson, Honorary Secretary of the Barbados Goat Society, that the first prize of $10, offered by the Commissioner of Agriculture in Class III at the Society's Show on December 13, was won by his goat Chamy.

A report by H. M. Minister at Panama shows that the exports from the Republic in 1910 reached £364,059; in 1909 and 1908 they were £300,495 and £351,427, respectively. In 1910 the value of the bananas exported was £189,456, and that of rubber £35,127.

The *Proceedings of the Agricultural Society of Trinidad and Tobago* for December 1911, gives the exports of cacao from Trinidad during that month as 3,293,651 ℔. It is also shown that the total export of cacao from Trinidad for last year was 46,790,353 ℔., as compared with 57,839,074 ℔. in 1910, and 51,575,109 ℔. in 1909.

The Board of Trade Journal for November 16, 1911, gives information showing that, up to September 21, 1911, the exports of rice from Saigon, Indo-China, had reached about 600,000 tons, and that about 40,000 tons remained to be shipped on existing contracts. Further shipments than this are prohibited, on account of the scarcity of rice in the country.

The *Bulletin of the Bureau of Agricultural Intelligence and of Plant Diseases* for March 1911 gives an account of experiments for the purpose of comparing the results from the inoculation of soil with nitro-bacterine, with nitragin, and with naturally inoculated soil. Both in a former series, and in the trials under review, the best results were obtained from the use of naturally inoculated soil.

According to the *Textile Mercury*, for November 1911, the cotton crop of Acapulco, Mexico, in 1910, amounted to 1,830,831 ℔. It was smaller than that of the preceding years, largely on account of the substitution of sesame for cotton in the section. The production of cotton has decreased for some years. The raising of sesame seed on a commercial scale commenced about fifteen years ago.

The British Acting Vice-Consul at Yokohoma reports, under date November 15, that the loofah crop of Japan this year amounts to 20,000,000 pieces, as compared with an estimated total last year of 13,000,000 pieces. A stock of 2,000,000 pieces remains over from last year. Owing partly to increased production and partly to the bad quality of the loofas grown, the prices, so far, are considerably lower than those paid last year. The market cannot yet be regarded as being in anything like a settled condition. (*The Board of Trade Journal*, December 28, 1911.)

The exports of copra from the Philippine Islands amount to more than one quarter of the total production in the islands. In 1910, they were 118,500 tons; of this quantity the United Kingdom took 4,000 tons, France 75,000 and other European countries 32,000 tons. There is a steady increase in the demand, and the high prices obtainable are encouraging the natives to give more attention to the production of copra in the Philippines.

Diplomatic and Consular Reports, No. 4788 Annual Series, dealing with the trade and shipping of Cartagena during 1910, shows that the chief exports to the United States were as follows: coffee 5,566 tons, value £161,445; lumber 4,934 tons, valued at £19,781; ivory nuts 2,102 tons, valued at £36,891; sugar 1,221 tons, valued at £14,610; hides 1,092 tons, valued at £89,393; rubber 230 tons, valued at £63,389; cocoa-nuts 983 tons, value £6,356.

A report of a tour made by the Chief Forestry Officer, Uganda, for the purpose of inspecting the principal estates in the Chagwe District is contained in the *Official Gazette* for November 30, 1911. The Inspector expresses himself as having been favourably impressed with the growth of *Hevea brasiliensis* on most of the estates, saying that this compares very favourably with the development attained by the tree in the Federated Malay States. He utters a warning, however, against the practice of interplanting; such crops as Ceara rubber, coffee, cacao and chillies having been employed in this connexion.

The *Ceylon Administration Reports*, 1910-11, Part IV, contains information concerning school gardens, given by the Superintendent. According to this, the number of school gardens in the island has increased from 224, in the previous year, to 246. It seems that some of the best progress is being made in the Tamil districts, where the schoolboys are described as born agriculturists. Regret is expressed that, generally, sufficient emphasis has not been placed on the educational value of the gardens, in the past; but it is intended that definite arrangements shall be adopted for: 'bringing the garden into closer touch with the routine work of the school.'

In the *Scotsman* for December 26, 1911, it is stated that H. M. Legation at Copenhagen reports that a discussion has been taking place in the Danish press as to the future of the Islands of St. Thomas and St. Croix, in connexion with the Panama Canal. The statement is further made that a lighthouse is to be erected on the north-west point of St. Croix, and that a thorough survey is being made of the waters round St. Thomas, while the harbour is being deepened to 30-32 feet in places where a greater depth is necessary. The need is expressed for the acquirement of an adequate floating dock, a wireless telegraph station and ample repairing facilities for ships and engines.

Information has been obtained by the Board of Trade, from H. M. Trade Commissioner for Australia, concerning the production of ramie fibre in the States where it is grown, namely New South Wales and Queensland, the details having been furnished in the first instance by the Agricultural Departments of those States. In the first mentioned State the crop has only been raised on an experimental scale, notwithstanding the fact that the Commonwealth Government encourages fibre-growing by granting a bonus of 10 to 20 per cent. on its market value. The growing of ramie has existed in Queensland for several years, but not to any extent, chiefly because of the fact that no satisfactory method of decortication, where labour is dear, has been devised.

STUDENTS' CORNER.

AGRICULTURAL EXAMINATIONS.

The following is the continuation of the questions set in the recent examinations, held in connexion with the Courses of Reading of the Department, the first having appeared in the last number of the *Agricultural News*. They will be completed in the next number of this journal.

INTERMEDIATE EXAMINATION.—(*Concluded.*)

SPECIAL CROP SUBJECTS.—(*Continued.*)

Cacao.

(1) Give an account of the precautions to be taken in connection with the pruning of cacao trees. (2) Write a description of the disease known as the black rot of cacao pods (3) What arrangements would you make on an estate for grafting cacao, and at what time of the year is it best for this to be done? (4) Give particulars of a method of draining cacao land, under conditions with which you are familiar. (5) Provide a list of insect pests of cacao that you have observed, and supply a description of the life history of any one of them. (6) Describe the proper treatment of young cacao plants, in a nursery. (7) To what processes are cacao 'beans' subjected after removal from the 'pods' and what are the reasons for the various stages of these processes? (8) Give an account of any good system for the manuring of cacao.

Limes.

(1) Write an account of methods that are suggested for the control of scale insects on lime trees. (2) Describe the manner in which lime plants are raised from seed. (3) Give shortly your experience of any method of lime-crushing that you have seen employed. (4) How is concentrated lime juice manufactured, and how is the proper degree of concentration ascertained? (5) State any precautions that should be observed in the harvesting of limes for shipment. (6) Give an account of any good system of manuring lime trees. (7) Write a description of a method of laying out a lime plantation. (8) Give particulars of the more general properties of either essential oil of limes or citrate of lime, stating the use in commerce of the one with which you deal.

Cotton.

(1) Make an examination of the sample of seed cotton provided, and express the results of the examination in tabular form. (2) Write a general account of any manurial experiments with cotton with which you may be acquainted, stating broadly their results. (3) Give particulars of the methods of control that are adopted for leaf-blister mite. (4) State the purposes for which the cotton seed produced on estates may be utilized. (5) Give an account of a method of cotton cultivation with which you have had experience. (6) Write a description of two fungus diseases of cotton that you have observed. (7) Describe an example of the case of the control of one insect by another which preys upon it, the pest in this instance being one found on cotton. (8) Discuss the importance of the removal and destruction of old cotton bushes, at the proper time.

Provision Crops.

(1) Give an account with any experiment with a provision crop that you have observed, or of which you have studied the description, stating its object and apparent results. (2) Write a description of the life-history of an insect pest of the sweet potato, suggesting measures for its control. (3) Give particulars concerning the planting, cultivation and harvesting of a field of eddoes. (4) Describe the yam plant, and give particulars of what you consider to be the best method of cultivation for yams. (5) Supply an account of any fungus disease of maize, and indicate the precautions that should be taken in order to prevent its spread. (6) State the best method of raising onions, under conditions with which you are familiar. (7) How would you conduct corn selection on an estate, in order to obtain an improved product? (8) What are the chief uses of provision crops, on an estate?

FINAL EXAMINATION.

GENERAL SUBJECTS.

A. PRODUCTION OF PLANTS. (1) Give a full account of the manurial and cultural treatment required previous to, and during, the growing of any crop with which you are familiar, stating the reasons for the procedure at the different stages. (2) Taking any economic plant with which you have had practical experience, discuss the means by which it may be protected, as far as possible, from the introduction and spread of insect pests, under estate conditions. (3) Write an account of the life-history of a plant that is of commercial importance, describing it carefully at the different periods of growth.

B. PRODUCTION OF ANIMALS. (1) Give particulars as to the feeding of any estate animal, under all the conditions of life and use to which it is ordinarily subjected. (2) Write an account of the means that you consider to be suited best for the improvement of working stock, in your district. (3) Give an account of any good type of working animal with which you have had practical experience.

C. CONSTRUCTION ON ESTATES. Give a description, with simple drawings, of the interior arrangements of any building employed directly for agricultural production on an estate. (2) What information can you give concerning methods for the preservation of the timber in wooden buildings and posts, under ordinary conditions in the West Indies. (3) Write an account of any recent improvement, of which you possess direct knowledge, in regard to machinery employed in connexion with agricultural production.

D. ECONOMICS OF PLANTING. (1) Provide such information as you can as to the way in which the labour-supply, on an estate, is arranged and managed so as to obtain the best and most economical use of it. (2) Give particulars as to the quantity and kind of agricultural implements required for the work on any estate of a stated size. (3) Supply details as to the cost of packing, for export, any kind of agricultural produce with which you are practically familiar, indicating any circumstances, in connexion with this, that you consider to be matters of false economy.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture left Barbados on January 15, 1912, by the R.M.S. 'Arcadian', for Trinidad, in order to give attention to matters connected with the West Indian Agricultural Conference commencing on January 23.

FUNGUS NOTES.

SOFT ROT OF GINGER IN BENGAL.

This disease affords a useful example of the damage that may be inflicted by a soil saprophyte when it is able to function as a facultative parasite upon the underground portions of living plants; at the same time, the account of its usual source of origin and general effects shows how practical and purely empirical methods of cultivation of a crop may be profoundly influenced by the presence of a disease, of unknown cause, whose proper treatment has not been fully elucidated. The information concerning this disease is taken from an article in the *Agricultural Journal of India*, Vol. VI, Part II, by W. McRae, M.A., B.Sc., Supernumerary Mycologist to the Government of India.

The soil most suitable for the cultivation of ginger is a light sandy loam or a well drained loam. Usually, ground is chosen that has remained fallow for three years or more, and is in consequence generally over-run by grass. When the crop has been harvested, the field is not again planted in ginger for a period varying from three to ten years, five years being a common time. This long interval is said to be necessary because the crop makes heavy demands on the food content of the soil, and because it is liable to a disease when planted more frequently in the same spot. Unoccupied land is plentiful in that part of Bengal where ginger is grown, so that there is no need for the rotation which other conditions would render imperative.

In preparing it for this crop, the land is reduced to a very fine state of tilth and a most efficient system of drainage is employed, to prevent the accumulation of stagnant water, since good drainage is one of the most essential requisites. The 'seed' is planted out in March and by the middle of August or September, the plants are about 1½ feet high. Then a disease attacks them, and causes the leaves to turn yellow. Good cultivators recognize this disease and its infectious nature, and pull up the yellow-leaved plants and throw them into an out-of-the way corner. Removal continues until the end of September, after which time the diseased plants are allowed to grow until late in November when they become partially mature. They are then harvested and sold as spoiled ginger. The main, healthy, portion of the crop is not taken up until January or February.

'The first outward indication of the disease in the growing crop is a general but slight paleness of the leaves of a shoot, then the tips of the leaves turn yellow and this yellowing gradually spreads along the leaf towards the leaf-sheath, often more rapidly along the margins. Then the leaf tissue dies and becomes scarious from the tip, the dead area gradually extending towards the leaf sheath, following in the wake of the yellow discoloration. The leaves droop and hang down along the stem, till finally the whole shoot becomes dry and withered. Meanwhile the collar, that part of the aerial stem between the place where it arises from the rhizome and where it emerges from the ground, becomes of a pale, translucent brown colour, and, by the time the leaves are well yellowed, it is very watery and soft, so that the whole shoot can easily be lifted off, breaking away at this point, though not falling over spontaneously. This soft rot also extends beyond the collar into the rhizome. The rotting is accelerated by the combined action of other fungi, and of small eel-worms and the larvae of flies, which act as secondary agents. Both the discoloration and softening extend to the whole rhizome, which gradually rots and disintegrates, forming a loose watery mass of putrefying tissue, enclosed by the tough rind. The vascular strands lie isolated inside. The roots attached to the affected parts also present the same symptoms.'

The disease is attributed to a fungus, *Pythium gracile*, found by Butler on ginger, in the Bombay Presidency, in 1902, and also by McRae in Bengal in the case under consideration. This forms zoosporangia on the outer surface of the substance on which it lives, and oospores inside the substratum. The latter arise from the fusion of the contents of a male organ, or antheridium, with those of a spherical female organ, known as an oogonium. The fungus has been found to attack certain green algae in Europe, and is also known to live as a saprophyte on decaying humus in the soil. Both Butler and McRae found that eelworms were also present on diseased rhizomes of ginger, in many cases; but in early stages of the disease the fungus alone occurred. No inoculation experiments have been conducted, but in view of the regular occurrence of *Pythium gracile* alone in early stages of the disease, there can be little room for doubt that it is the cause.

In many cases, dissection of the plant shows that infection has come from the plant sets, and this seems to be the method whereby the disease is usually introduced into the growing crop. In some cases young buds below the ground, or just above the surface, were found to be diseased, the infected portion extending only for a very short distance. A connexion was also traced between an affected shoot and an adjacent bud below ground, that had been destroyed by the disease.

'It may be noted that the disease appears with the advent of the rains and becomes epidemic only when the rains have fairly well set in and the ground is wet. In damp fields where the soil is stiff and retains water the attack is always more severe, while on sandy loam the disease does not usually reach an epidemic stage. When the rainy season is about at a close, the removal of diseased plants (by the cultivators) ceases and any later attacked plants are allowed to remain in the ground to do what they can before being finally taken up and sold as inferior quality ginger. The cultivator has learned by experience that, after the rainy season is over, there is little fear of the disease spreading much.' It may be noted that this habit of leaving infected plants in the field, and that of pulling off the tops of diseased plants earlier in the season without taking steps to remove all the infected rhizome as well, must be largely responsible for the general occurrence of the disease in the district and for the necessity of allowing the land to lie fallow for so long a period between successive crops.

Experiment plots of ginger planted with four varieties obtained from Jamaica, Cochin, Calicut and Bengal have been maintained annually since 1905-6 at the Experimental Farm near Rangpur. No ginger is grown in the immediate neighbourhood. In 1907 all the plots were badly attacked by disease, but subsequent methods of treatment have succeeded in eradicating it almost entirely, in that situation. The remedial measures suggested for the general control of the disease resulting from the experiments mentioned are as follows :—

'1. On harvesting the crop all the rhizomes should be removed from the ground. Diseased ones ought never to be left on the ground. They should be collected with as many of the roots attached as possible and burned or buried deeply in a place where ginger is not grown. The shoots of diseased plants should also be gathered and burned

'2. Ginger should not be grown on the same land for at least three years

'3. The seed should be got from a place that is free from disease. Great care should be taken to ensure that the seed is healthy. Yet it is not always possible to recognize by the naked eye alone the early stages of disease in a rhizome. If any of the buds are bad, the whole piece should be suspected and discarded.

'4. Whenever disease occurs in a field, the affected plants should be dug out whole with the larger roots attached and should be destroyed by fire. It is not enough to pull the shoot off by the collar The rhizome must be got out too. By breaking the shoots off at the collar or by detaching the larger roots an opening is given for liberating the infection into the soil. Infected plants should never be thrown down in the field to rot but removed to the edge of the field and burned.

'5. Water should never be allowed to lie or stagnate in a ginger field. Air and water should be able to move freely in the upper layers of soil, surrounding the tubers.'

AGRICULTURE IN SOUTHERN NIGERIA, 1910.

The area of land cultivated with crops for export is small compared with the enormous areas under native food crops. This is amply exemplified by the imports of food stuffs into the country, the total value of which works out at about 1s. per head of the population.

Cotton, cacao and maize are the three most important crops exported.

COTTON. The cotton harvest has fluctuated considerably during the last five years. The exports of cotton lint and seed were 21,601 cwt. and 43,300 cwt., in 1910, as compared with 43,686 cwt. and 90,971 cwt. in 1909.

The exports of cotton lint during 1910 were 16 per cent. lower than the average export of this staple during the last five years. This decrease is attributed by the native grower to adverse climatic conditions in the shape of a deficient rainfall and strong harmattan winds. It is, however, considered that the area of cotton planted was less than in the preceding years. More than 400 tons of cotton seeds were distributed, a quantity sufficient to plant about 36,500 acres of land.

CACAO. The cacao industry shows steady improvement; the exports of this product were 30 per cent. greater than those of the previous year.

The exports of cacao in 1910 amounted to 6,567,181 lb.; in 1909 they were 5,019,119 lb.

At present the exports are mainly supplied from the Western Province, but the farmers in the Eastern Province are being encouraged to take up cacao cultivation. During 1910, 1,112 cacao fruits were distributed to intending planters.

MAIZE. Less maize was exported than during any of the preceding four years. This decrease the farmers likewise state was due to unfavourable weather obtaining during the growing season. An enormous amount of damage was, however, caused by weevils and other grain eating insects.

Maize amounting to 5,096 tons was exported in 1910; in the previous year the quantity was 10,163 tons.

RUBBER-TAPPING EXPERIMENTS. Tapping experiments were conducted by the Agricultural Department on Pará rubber trees in three different districts, and on Ceará rubber trees in two different districts. The trees forming the subject of the investigations were *Hevea brasiliensis* and *Manihot Glaziovii*, and the best yields were usually obtained with the former.

ENTOMOLOGY. The Entomologist was able to get a large portion of his collection of insects named at the South Kensington Museum and these will form the nucleus of the collection it is proposed to maintain for reference purposes.

AGRICULTURAL SHOW, LAGOS. A most successful Agricultural Show was held in Lagos during December. Samples of crops from all parts of the Colony and Protectorate were entered for competition; the friendly rivalry thus engendered must tend to encourage agricultural development. (Information taken from *Colonial Reports*—Annual, No. 695, p. 15.)

RAT DESTRUCTION

The following information regarding this interesting subject is contained in the Annual Report of the Director of Agriculture, Cyprus, for 1910-11. Some of the conclusions are similar to those given on page 139 of Vol. IX of the *Agricultural News*, in a review of The Rat Problem, by W. R. Boelter.

The rat problem yet remains unsolved Complaints are general throughout the carob districts of the damage and loss caused annually by these rodents, a loss which it is difficult to estimate but which cannot be inconsiderable. The danger of the indiscriminate use of the common rat poisons is obvious, and limits the field of experiment to some three or four special preparations which are now regarded elsewhere as the most effective for use on a large scale. No preparation, however, no matter how excellent, would be employed by the peasantry unless extremely cheap, and herein lies the greatest difficulty of all. Danysz Virus, Ratin, barium carbonate and Tropical Ratin are all well known and are highly recommended by their respective supporters whether public bodies or private individuals.

Danysz Virus is a bacteriological preparation of which great things were expected, but the hopes raised do not appear to have been entirely realized. Its virulence is said to be not very stable, and its effect is therefore uncertain. While having the advantage of being harmless to all but rats and mice, it has the disadvantage that rats which survive the infection of the virus are rendered immune.

Ratin is also a bacteriological preparation, highly recommended by leading authorities. It has become the Danish State remedy and is used by the German Government. This Department has imported small quantities for experimental purposes for the last three years, but so far it has not been very successful. It has the drawback of not retaining its strength beyond three months. After many fruitless enquiries the Department succeeded last year in obtaining from Munich a small packet of 'Pain Baryté', a preparation based on barium carbonate. It is one of the most recent products of science for the destruction of rats; but the reports to hand of the trials made in the island are not very encouraging. Tropical Ratin, being a poison, is thought to be too expensive for field use.

A bacteriological preparation causing a fatal epidemic among those creatures and harmless to all others, at a price within the reach of the villagers—if such can be found—is the great desideratum, and the Department will continue to experiment with those named and with any new preparations; but there seems good reason for the belief that the most effective method, although the most expensive for the Government, is that of offering a price per tail.

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR, January 2, 1912; Messrs. E. A. DE PASS & Co., December 22, 1911.

ARROWROOT—3½*d*.
BALATA—Sheet, 3/4 ; block, 2/4 per lb.
BEESWAX—£7 5*s*.
CACAO—Trinidad, 60/- to 70/- per cwt. ; Grenada, 53/- to 57/6; Jamaica, 50/- to 56/-.
COFFEE—Jamaica, 73/6 to 82/6 per cwt.
COPRA—West Indian, £25 10*s*. per ton.
COTTON—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 15*d*. to 20*d*.
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—49/- to 64/- per cwt.
ISINGLASS—No quotations.
HONEY—No quotation.
LIME JUICE—Raw, 1/1 to 1/4; concentrated, £18 10*s*. to £18 17*s*. 6*d*.; Otto of limes (hand pressed), 5/-.
LOGWOOD—No quotations.
MACE—Firm.
NUTMEGS—Firm.
PIMENTO—Common, $2\frac{9}{16}$*d*.; fair, $2\frac{5}{8}$*d*.; good, $2\frac{11}{16}$*d*.; per lb.
RUBBER—Para, fine hard, 4/3½ fine soft, 4/1½; Castilloa, 3/9 per lb.
RUM—Jamaica, 1/8 to 5/-.
SUGAR—Crystals, 19/- to 21/9; Muscovado, 15/- to 17/6; Syrup, 15/- to 16/6 per cwt.; Molasses, no quotations.

New York.—Messrs. GILLESPIE BROS. & Co., December 15, 1911

CACAO—Caracas, 12½c. to 12¾c.; Grenada, 12c. to 12¼c ; Trinidad, 12c. to 12½c. per lb.; Jamaica, 10c. to 12c.
COCOA-NUTS—Jamaica, select, $29·00 to $31·00; culls, $16·00 to $17·00; Trinidad, select, $29·00 to $31·00; culls, $16·00 to $17·00 per M.
COFFEE—Jamaica, 14¼c. to 15c. per lb.
GINGER—8¾c. to 9c. per lb.
GOAT SKINS—Jamaica, 53c.; Antigua and Barbados, 48c. to 52c.; St. Thomas and St. Kitts, 46c. to 48c. per lb
GRAPE-FRUIT—Jamaica, $2·50 to $3·00.
LIMES—$3·00 to $4·00.
MACE—50c. to 54c. per lb.
NUTMEGS—110's, 12½c.
ORANGES—Jamaica, $2·00 to $2·25 per box.
PIMENTO—$2\frac{5}{8}$*d*. per lb.
SUGAR—Centrifugals, 96°, $4\frac{7}{8}$c. per lb.; Muscovados, 89°, $4\frac{1}{8}$c.; Molasses, 89°, $4\frac{3}{8}$c. per lb., all duty paid.

Trinidad.—Messrs. GORDON, GRANT & Co., January 8, 1912

CACAO—Venezuelan, $12·25 to $12·50 per fanega; Trinidad, $11·75 to $12·15.
COCOA-NUT OIL—95c. per Imperial gallon.
COFFEE—Venezuelan, 16c. per lb.
COPRA—$4·25 per 100 lb.
DHAL—$4·00 to $4·10.
ONIONS—$2·75 to $3·00 per 100 lb.
PEAS, SPLIT—$6·75 to $7·00 per bag.
POTATOES—English, $2·50 to $2·75 per 100 lb.
RICE—Yellow, $4·70 to $4·75; White, $5·75 to $6·00 per bag.
SUGAR—American crushed, no quotations.

Barbados.—Messrs. JAMES A. LYNCH & Co., January 13, 1912; Messrs. T. S. GARRAWAY & Co., January 15, 1912; Messrs LEACOCK & Co., January 5, 1912; Messrs. E. THORNE, Limited, December 5, 1911.

CACAO—$11·00 to $12·50 per 100 lb.
COTTON SEED—$26·00 per ton.
COTTON SEED OIL—50c. per wine gallon.
COTTON SEED CAKE MEAL—$24·00 per ton, c.i.f., neighbouring islands.
HAY—$1·50 to $2·00 per 100 lb.
MANURES—Nitrate of soda, $65·00 ; Cacao manure, $42·00 to $48·00; Sulphate of ammonia, $75·00 to $80·00 per ton.
MOLASSES—No quotations.
ONIONS—$3·50 to $4·00 per 100 lb
PEAS. SPLIT—$6·75 to $7·00 per bag of 210 lb.; Canada, $2·75 to $4·10 per bag of 120 lb.
POTATOES—Nova Scotia, $2·50 to $2·75 per 160 lb.
RICE—Ballam, $4·85 to $5·30 per 190 lb.; Patna, no quotations; Rangoon. no quotations.
SUGAR—American granulated, $6·00 per 100 lb.

British Guiana.—Messrs. WIETING & RICHTER, January 6, 1912; Messrs. SANDBACH, PARKER & Co, December 8, 1911.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	$12·50 per 200 lb.	$13·00 per 200 lb
BALATA—Venezuela block	No quotation	Prohibited
Demerara sheet	70c. per lb.	70c.
CACAO—Native	15c. per lb.	11c. per lb.
CASSAVA—	72c.	No quotation
CASSAVA STARCH—	——	No quotation
COCOA-NUTS—	$12 to $16 per M	$10 to $16 per M., peeled and selected
COFFEE—Creole	18c. per lb.	18c. per lb.
Jamaica and Rio	18c. to 19c per lb.	20c. per lb.
Liberian	13c. per lb.	14c. per lb.
DHAL—	$3·75 per bag of 168 lb.	$3·75 per bag of 168 lb.
Green Dhal	$3·00	——
EDDOES—	$1·20	——
MOLASSES—Yellow	None	——
ONIONS—Teneriffe	——	——
Madeira	5½c. to 6c.	5c. to 6c.
PEAS—Split	$7·25 per bag (210 lb.)	$7·00 to $7·25 per bag (210 lb.)
Marseilles	$3·25	No quotation
PLANTAINS—	20c. to 40c.	——
POTATOES—Nova Scotia	$3·25 to $4·00	$3·50
Lisbon	——	No quotation
POTATOES-Sweet, B'bados	$1·68 per bag	——
RICE—Ballam	No quotation	——
Creole	$5·00	$5·00 to $5·25
TANNIAS—	$1·44	——
YAMS—White	$2·88	——
Buck	$3·12	——
SUGAR—Dark crystals	$3·20	$3·20 to $3·25
Yellow	$3·80	$3·75
White	$4·75 to $5·00	——
Molasses	$2·90 to $3·10	——
TIMBER—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$3·75 to $6·00 per M.	$4·00 to $6·00 per M.
,, Cordwood	$1·80 to $2·00 per ton	No quotation.

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OF THE

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CONTENTS.

The West Indian Agricultural Conference, 1912.

I.

THE eighth West Indian Agricultural Conference was opened at the Victoria Institute, Port-of-Spain, Trinidad, on January 23, 1912, by His Excellency the Governor, Sir George R. Le Hunt, G.C.M.G. In his opening address, in welcoming the Delegates from England, from the West Indies, and from British Guiana, as well as from Dutch Guiana, His Excellency referred to the personal pleasure afforded him by the opportunity for renewing past acquaintanceships, and while regretting that the time of year was not such as to show agricultural matters at their best, in Trinidad, expressed the hope that the conditions would be such as to afford the most favourable opportunities of viewing those matters. After reference to occurrences of local interest, in which the Delegates were invited to take part, and expression of his wishes for the success of the Conference, His Excellency called upon the Commissioner of Agriculture, as President, to deliver his address.

In this address, a review of general matters, leading up to the time of the Conference, was followed by a more detailed account of the progress and state of the chief industries in the West Indies, as well as of the various schemes that are being carried out with a view to the encouragement and improvement of agriculture. At the conclusion of this section, Dr. Watts employed the succeeding portion of his address in reviewing the progress that has been made in the last fifteen years, showing the evolution that had taken place, previous to this period, from the independently existing botanical and chemical lines of work to the association between the different workers that had come into being, by 1897—the year of the visit of the West India Royal Commission. The subsequent Imperial recognition and support of the work that was being done gave most useful encouragement, and led to very important results both as regards the widening of the sphere of agricultural effort and the extended diffusion of agricultural knowledge.

Proceeding, the President referred to the danger that exists, on the part of local agricultural organizations, that they may be led to a desire to emphasize their importance and independence in the direction of bringing about their comparative isolation—a desire that arises from the very circumstance that they have been fostered successfully in the past. While admitting the usefulness of such a tendency, in some directions, Dr. Watts laid stress upon the necessity for the existence of some counteracting influence for the purpose of preventing loss of efficiency and of ensuring co-operation among agriculturists in different colonies.

The subjects of the address then dealt with the latest phase in the relationships between agricultural departments and those whom it is their function to advise. This is the growth of large agricultural concerns, commercial in nature, in which expert knowledge regarding special matters passes beyond the scope of agricultural departments. In regard to those matters, such corporations will provide for themselves, while the agricultural departments will find their chief work in the direction of making investigations for the control of pests and diseases and in showing how the results of research may be applied in agricultural practice.

In dealing with these and other similar matters, Dr. Watts drew special attention to the circumstance of the continued growth of the interests served by agricultural departments and to the concomitant necessity for change and adaptation to new conditions. He laid stress, further, on the responsibility that attaches to the Executive, where the Government is largely concerned with the administration of such affairs, in the proper direction of the changes that have to be made, pointing out that: 'the immediate assistance and encouragement of agricultural affairs in their widest sense have become prominent features in the Government administration of the colonies:' and that: 'We have now reached the period when the study of agricultural needs and difficulties, and the encouragement of efforts to open new lines of development, must be regarded as constituting an object of care on the part of Colonial Governments that is as legitimate for their attention as the concerns of education, health and public order.'

After a vote of thanks to His Excellency for opening the Conference, and to Dr. Watts for his address, had been proposed and seconded by His Honour E. J. Cameron, Administrator of St. Lucia, and Professor Carmody, Director of Agriculture, Trinidad and Tobago, and after His Excellency had made suitable acknowledgement, Dr. Watts took charge of the proceedings of the Conference, and called upon Professor Carmody to read a paper on Agricultural Progress in Trinidad and Tobago. In this, it was explained first of all that the Trinidad Department of Agriculture was constituted in November 1908, and in it are included: (1) the Government Laboratory: (2) the St. Clair Experiment Station, and the Botanic Gardens in Trinidad and Tobago; (3) the Stock Farms in Trinidad and Tobago: (4) the experiments at St. Augustine Estate; (5) the experiments at the River Estate. The other agricultural authorities in the island are the Board of Agriculture, the Agricultural Society and the Permanent Exhibition Committee, and the four institutions control together a yearly expenditure of over £18,000.

The space that is at disposal does not admit of the presentation of an abstract dealing with every part of Professor Carmody's interesting paper. It must suffice to say that it included an account of agricultural progress in Trinidad, the present state of the chief agricultural industries, the schemes of experimentation followed by the Department, and the means of diffusion of information, by publications or otherwise; it served to show how closely the agricultural interests of the colony are served by the Department. At the conclusion of the paper, and after the making of several necessary Presidential announcements, the Conference stood adjourned until the next morning.

Further editorial attention will be given to the recent Agricultural Conference, in the next issue of the *Agricultural News*.

Sakellaridis Cotton.—A new form of cotton has recently been established in Egypt, which is known by the name of the discoverer, M. Sakellaridis, who found the plant about six years ago among a crop of Mitafifi on his estate at Birket-el-Sab in the Gharbia Province. It is stated that this cotton matures earlier than Mitafifi, and that it flourishes in those districts in which Mitafifi is usually grown but which are unsuitable for Yannovitch. The new variety was grown in 1910 on a fairly large scale in several places in the Gharbia and Sharguira Provinces.

A sample of Sakellaridis cotton has been forwarded to the Imperial Institute by the Director-General of Agriculture in Egypt, and has been examined with the following results. The cotton was soft, silky, lustrous, cream-coloured with a faintly reddish tinge, of good strength, and about 1·4 to 1·7 inches long. It was of excellent quality, being regarded by experts as superior to the best Egyptian Yannovitch, and was valued at 14½*d.* per lb. (with 'fine' Yannovitch at 13⅞*d.* per lb.). The fibre was finer and more silky than that of Yannovitch, and was slightly paler in colour. (*Bulletin of the Imperial Institute*, Vol. IX, p. 288.)

SUGAR INDUSTRY.

THE JAVA SUGAR CROP.

An article in the *International Sugar Journal* for January 1912, by H. C. Prinsen Geerligs, states that, although there has been no appreciable increase in the area planted in cane, in Java, the production of sugar has reached a record amount, being about 1½ million metric tons, as far as has been estimated at present. The large production was partly due to the favourable meteorological conditions during the year. These are enabled to produce their full results in the season in which they occur, as all the sugar-cane in Java is freshly planted each year, invariably in irrigated lands. The existence of irrigation is effective in ensuring a crop, but there is no doubt that conditions are greatly improved by a good distribution of rain and sunshine. The rainy season commenced early, lasted a long time, and kept the cane fresh during the whole of the grinding season. There was only one disadvantage, namely that the wet weather caused grinding operations to be commenced later, and made them longer than the usual 120 days. Java sugar was therefore comparatively late in the market.

The total area under cane was 328,000 acres, and the average output of sugar in the island, over the whole area, was 4·51 tons per acre. In the results from the different factories, the sugar extracted per cent. of cane varied between the limits 8·12 and 12·24 Relating to this matter the following statement is made: 'It appears increasingly probable that the extremely high returns obtained during the last decade are a consequence of the steady propagation of the new cane varieties obtained by cross-fertilization of different cane types.'

Of the many new varieties only two, known as No. 100 and No. 247, appear to have been planted generally. The former was raised at the Experiment Station, and is best suited to a light soil; it ripens within a year after planting and is soft and juicy, without much fibre, so that it does not supply sufficient megass for working up its juice. The characteristics of No. 247, which has been raised by a young planter in the island, are almost opposite in nature to those of No. 100. It is similar in that it yields large crops; it grows best in a stiff soil and is fittest for reaping after fourteen months. It can, however, stand over for a long time without losing its quality, whereas No. 100 quickly deteriorates after maturity.

An interesting table is given which makes it evident that the new seedling canes are greatly superior to the old Java cane, but this is not the sole cause of the greater return for: 'Although it appears that the variety of the cane accounts for a great deal of the increase in output, this is not exclusively due to the kind of cane; the steady improvements in the manuring of the land, the intensive tillage of the soil, and, in general, the care bestowed in the treatment of the canes have also to be given their due credit.' A review is presented of the hearty state of co-operation that exists in Java between the Experiment Stations and the sugar planters, and it is stated that the Experiment Stations have been established again, for a fresh term of five years, at an annual expenditure of £33,000; in addition, a special branch has been opened for the purpose of carrying on Mendelian experiments with sugar-cane.

Investigations with mills have shown that the addition of another mill to a treble crushing plant improves the extraction greatly, and increases the dryness of the megass from the last mill to such an extent that its fuel value is greatly enhanced; this result confirms the work of Deerr, of two years ago. In extraction by a 14-roller mill (quadruple crushing), the best way to carry out maceration is to apply water to the megass coming from the first and second mills and to bring all the last mill juice in contact with the megass from the third one.

As has been shown already in the *Agricultural News*, the production of white sugar in Java has greatly increased. In 1900-1 the total amount of sugar imported into British India from Java was 225,247 cwt., all of which was raw sugar; while in the year 1910-11 it amounted to 8,758,715 cwt., and of this all was white sugar except about 200,000 cwt. For the manufacture of white sugar, at first, carbonatation was always used, but in 1902 sulphitation, by neutralizing over-tempered juice by a current of sulphur dioxide, from a sulphur furnace, was adopted. The differences between the two processes are pointed out, namely that only part of the juice in sulphitation is filtered, so that it gives a less limpid molasses, and an inferior crystal as compared with that from carbonatation, so that the final molasses of the latter can be reduced to a lower quotient of purity: secondly that the sulphitation process is more elastic: when raw sugar is obtaining good prices, sulphitation can be dispensed with, whereas carbonatation must continue; the probability of the existence of the third difference is expressed that it is imaginary: it consists in the statement that the cost of carbonatation is about 4*d.* per cwt. higher than that of sulphitation. It is likely that the actual greater cost is much lower than this, and the advantages of working, in carbonatation, make it probable that all factories producing white sugar will eventually adopt this method. An account is given of a process in which sulphitation is combined with carbonatation by sulphitating the clarified juice to a proper degree of acidity just before it reaches the evaporators.

In Java, in making white sugar, it is usual to cure the sugars twice, instead of washing the crystals in the centrifugals in which they have been freed from the molasses. The latter method entails the loss of already crystallized sugar, which eventually finds its way into the molasses. In the method of double spinning the sugars are cured, as far as possible, in the first centrifugal, without the addition of water. The next process is to mix the sugar completely with clairce, to centrifugal it a second time, and wash and steam it until it becomes completely white. The washings are used partly for treating new lots of the coloured sugar, and the excess is kept out of the molasses by being returned to the clarified juice 'Careful investigations have shown that, when working in the way just described, no further unaccountable loss is suffered than in making raw sugar. The only requisite is a good size of pan, ample cooling capacity, a sufficient number of centrifugals, and above all good technical knowledge, plenty of skilled labour, thorough pan boilers, and an efficient control. It is not sufficient to get good machinery, and a good prescription for working, it is indispensable to have at the same time the right men to work them.'

FRUITS AND FRUIT TREES.

CITRUS FRUIT HANDLING AND SHIPPING IN FLORIDA.

The investigations of citrus fruit handling and shipping in Florida were continued during the season 1910-11 on a broader and more comprehensive scale than has been possible in previous years. The lines of work included: (1) a comparison of fruit picked and handled carefully with ordinary picking and handling, and a comprehensive study of the effect of washing; (2) shipping experiments with carefully picked and packed fruit, and fruit picked and packed in the ordinary commercial way, part of each lot being packed and shipped as soon as practicable after picking, and part being delayed several days before packing and shipping; (3) inspection of oranges in the fields and packing houses for the determination of mechanically injured fruit and fruit with long stems, with demonstrations of the effect of such injuries on the keeping qualities of the fruit; (4) a determination of the percentages of 'stem-end' decay in oranges shipped to Washington, and the study of the occurrence of the stem-end rot under different conditions, including shipping experiments with fruit from sprayed and nonsprayed sections of experimental groves.

The washing experiments, which were carried on in thirty-two packing houses, using thirteen different types of washing machines, showed that an appreciable increase in the decay was due to the washing treatment. The increase in the decay was greater in fruit which had received ordinary commercial handling than in the same type of fruit carefully picked and handled. The results indicate that, where washing is carried on, a chance for injury followed by decay occurs, but that where this method of cleaning is necessary to place the fruit in presentable condition, the decay due to the necessary extra handling may be held at a minimum by care in handling the fruit in picking and grading, and in manipulating the washing machines.

Shipping experiments, including seventy-nine experimental series shipped from various points in Florida to Washington, D.C., showed 0·6 per cent. of decay in all carefully picked and packed fruit, while the fruit from the same groves, given ordinary commercial picking aad packing, developed 7 per cent. decay from blue mould. The effect of careful handling continued through a three-weeks' market holding test, the carefully handled fruit after this length of time showing less than 2 per cent. of decay, while the commercially picked and packed showed more than 14 per cent.

Results of the stem-end rot investigation showed no apparent relation between handling and the occurrence of this disease in transit or on the market Spraying experiments and the use of different disinfectants in the water used in washing the fruit yielded indeterminate results.

The inspections to determine the amount of injury being done in picking and handling covered all the citrus districts of Florida, and in this work nearly 70,000 oranges were handled. A comparison of the work of the picking crews where the labour was paid by the day and by the box shows that equal percentages of injuries were made by both, unless the work is done under the supervision of a capable foreman. In some instances the box-paid labourers were found to do as well or better than those under the day paid plan, where no attempt at supervision was made.

The results of these lines of investigation corroborate in every respect the earlier work of the bureau, both in California and in Florida, and show definitely the relation between the type of handling given the fruit and the decay in transit and after arrival in market. The Florida orange, when carefully handled, has been shown to have good carrying qualities, and a notable improvement in the reduction of the losses from decay has resulted from the bureau work. (*Report of the Chief of the Bureau of Plant Industry*, 1911; United States Department of Agriculture.)

NEW MANGOES FOR THE WEST INDIES.

The following has been received from Mr. J. Jones, Curator of the Botanic Station, Dominica, with reference to a former article which appeared under this title:—

The *Agricultural News* of June 10, 1911, p. 180, contains a brief article on new mangoes for the West Indies. In it the statement occurs that arrangements had been made to ship from the Royal Botanic Gardens, Calcutta, to Dominica, twelve grafted mango plants comprising the following varieties: Alphonse, Langra, Kheershapottee and Bhadoorea.

The plants were duly shipped to Dominica by way of Kew Gardens, where the case was opened and the plants examined. On their arrival at Dominica, it was found that seven out of the twelve plants had survived, and that all the varieties had been secured. The results are given below:—

Alphonse	3	living		
Langra	1	,,	2	dead
Kheershapottee	1	,,	2	,,
Bhadoorea	2	,,	1	,,

In addition to the above, two varieties of mangoes imported from Bombay, namely Daramia and Pairi, were presented to the Gardens by Dr. H. A. A. Nicholls, C.M.G., a few months ago (see *Agricultural News* as above). The Dominica Botanic Gardens now possess six of the leading kinds of Indian mangoes, from which it is hoped, in due time, to propagate largely for distribution locally, and to agricultural establishments in other parts of the world.

CACAO PRIZE COMPETITION IN TRINIDAD.

A list of the rules in the cacao prize competition, 1912-13, held under the Cocoa Prize Competition Committee of the Board of Agriculture, Trinidad, has been received from the Secretary to the Board and is reproduced below:—

(1) Prizes will be awarded for good cultivation of cacao.

(2) The prizes will be awarded in two classes:—
Class I: For Peasant Proprietors owning not more than 16 acres altogether and in one piece.
Class II: For Contractors

(3) No Peasant Proprietor will be allowed to compete in Class I unless he or she has 5 acres in bearing cacao, and no Contractor will be allowed to compete in Class II who has less than 3 acres in trees three years old at the time of entry.

(4) No person can compete in more than one class.

(5) Prizes will not be awarded unless there are at least 50 competitors in each class in each district.

(6) Prizes to be given in each district as follows:—

	1st.	2nd.	3rd.	4th.	5th.	6th.	7th.
Class 1. Peas. Prop.	$90	$65	$45	$30	$20	—	—
,, 2. Contractors.	85	60	40	25	15	$10	$5

(7) The two districts in which prizes will be offered for competition in 1912-13 will be:—
(1) St. Anne and Diego Martin.
(2) Savana Grande.

(8) The competition will be for the period April 1, 1912, to March 31, 1913.

(9) In judging, marks will be given under the following heads:—

(1) Tillage	50 points
(2) Sanitation of the cacao field and treatment of diseases	30 ,,
(3) General, including crop records, live stock and any special features	20 ,,

(10) The method of cultivation and condition of the trees, together with the circumstances of each cultivation, the characteristics of the locality and the implements used, will be considered by the Judges. In judging, the condition of young cultivation, if any, will be taken into account.

(11) The Judges may withhold, or alter the value of, any or all of the prizes if the cultivations entered for competition are not considered of sufficient merit.

(12) Due notice will be given before the judging commences, and the decision of the Judges in all cases will be final.

(13) Application for entry forms will be made to a source to be chosen by the Committee.

GERMINATION TRIALS OF PARA RUBBER SEEDS IN ST. LUCIA.

The following account of experiments in the germination of Para rubber seeds, conducted by Mr. A. J. Brooks, Assistant Agricultural Superintendent, St. Lucia, has been received from Mr. J. C. Moore, Agricultural Superintendent in that island:—

A consignment of Para rubber seeds was recently imported from Singapore, and arrangements were made for their being raised at the Experiment Station. Seed beds 80 feet long and 5 feet wide were prepared a few weeks previous to the arrival of the seeds The seeds were sown 2 inches deep, in rows 7 inches apart both ways Trials were made to ascertain if a high germination could be obtained by special treatment of the seed previous to sowing. Upon arrival, the seeds were unpacked, and all mixed together in one heap to ensure uniformity. The seeds which were found to be showing signs of germination were removed and sown separately; these were equal to about 7 per cent. of the total consignment A similar quantity of seed was then taken, and the shell of each seed was carefully cracked, and then placed in a vessel of water and allowed to remain for two hours. Other seed was then taken and soaked in water for twenty-four hours without previously having the shell cracked. The remainder of the seed was sown immediately upon arrival, without any previous treatment.

From the following table, it will be seen that the seed soaked for twenty-four hours without cracking gave the best results:

Treatment of seed.	Number sown.	Germinated successfully.	Percentage germination
Untreated	1,999	544	27·2
Cracked, and soaked 2 hours	511	167	32·5
Soaked 24 hours	4,048	1,616	39·9
Showing signs of germination	541	386	71·3
Total	7,099	2,713	(38·2)

The plants are now two months old, and with one or two exceptions are growing strongly

In forwarding the account, Mr. Moore states that 708 seeds, taken indiscriminately from the same consignment, and sown at the Botanic Station, after being soaked for fifteen hours, have produced 412 plants, most of which are now growing well. The difference in the results obtained, as compared with those in the experiment described above. is attributed to a variation among the seeds in vitality, when they were packed; as the manner of packing was uniform throughout, and the conditions of transit appear to have been uniform, also.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture left Barbados on February 11, 1912, by the S.S. 'Ocamo', for the purpose of making official visits to St. Vincent and the Northern Islands, in connexion with the agricultural interests of those colonies. Dr. Watts is expected to return to Barbados on March 16, by the S.S. 'Guiana', and will probably visit St. Lucia while on the journey.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date January 16, 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, and prices remain very firm.

The sales are chiefly composed of Montserrat cotton at 18*d.* to 19*d.*, with a few from other islands at similar prices. About 10 bales St. Vincent were sold at 21*d.*

A similar report, dated January 29, is as follows:—

Since our last report, about 100 bales of West Indian Sea Island cotton have been sold, chiefly Montserrat, on the basis of 18*d.* for sound quality.

The market remains firm, and good qualities command firm prices.

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

There has been a good demand during the week for such odd bags of Bright Fine up to Extra Fine to be had at from 26c. to 32c., and also for all the small offerings of off cotton, for which factors have been able to get 1c. to 2c. advance over previous prices. Consequently factors are firmer in their prices for all grades. The planters' crop lots continue to be neglected Although nominally held at full prices, factors would be willing to make concessions to effect sales. The old crop cotton is still being held off the market, in expectation of higher prices later.

We quote :—

Extra Fine	32c. = 18*d.*, c.i.f., & 5 per cent.
Fine to Fully Fine	26c. to 28c. = 15*d.* to 16*d.* c.i.f. & 5 per cent.
Fine to Extra Fine, off in preparation	18c. to 25c. = $10\frac{1}{2}$*d.* to $14\frac{1}{4}$*d.* ,, ,, ,,

THE BRITISH COTTON GROWING ASSOCIATION.

The following account of a recent meeting of the British Cotton Growing Association has just been received:—

The Ninety-fifth Meeting of the Council of the British Cotton Growing Association was held at the Offices of the Association, 15, Cross Street, Manchester, on Tuesday, January 9. In the absence of the President (The Right Hon. the Earl of Derby, G.C V.O., owing to indisposition), Mr. John E Newton occupied the Chair.

INDIA. Arrangements have been made for the Government Agricultural Department to plant 4,000 acres in Sind under American cotton. This experiment is being watched with much interest, and should it be successful it will lead to a considerable increase in the cultivation of longer stapled cotton in India.

WEST AFRICA. At the request of the Government, the Association is arranging for the importation of some Cape wagons, in order to assist in the transport of the cotton to the Ilorin ginnery, in Northern Nigeria. It is hoped that this means of transit will solve the difficulty which is experienced in transporting cotton to the ginneries from districts lying some distance from the railway.

The purchases of cotton in Lagos for last year were 5,408 bales, against 5,626 bales for 1910. The reports of the growing crop are very satisfactory, and the outlook is, at the present time, more promising than it has been in any previous year.

UGANDA. It was reported that last year's crop in Uganda amounted to over 19,000 bales, which is by far the largest quantity of cotton produced in one year in any British colony up to the present time, and satisfaction was expressed at the rapid increase in the quantity of cotton which the Association is now dealing with from the different colonies on the east side of Africa.

RHODESIA. Mr. Percival, the Association's Manager in Nyasaland, has recently made a tour of inspection in the Fort Jameson district of North East Rhodesia, and is very hopeful of the future for cotton in this district. He states that the farmers are tackling the labour problem in a most determined manner by introducing the very latest disc ploughs and harrows, whilst the transport question is not proving so serious as it had been anticipated.

NYASALAND. Although, owing to the unfavourable climatic conditions during the past season, the yield per acre has been disappointing, the cotton which is now beginning to come forward is of good quality, and the prices realized should recompense planters to some extent for the shortage of their crop.

A statement of the position of the Association's capital, that is given, shows that a sum of £25,000 was still required, in order to complete the total authorized capital of £500,000.

THE NECESSITY FOR PHOSPHORUS IN NUTRITION.

The cause, or causes, of such diseases as beri-beri has been under investigation for some time, and the results of observation tend in an increasing degree to show that they lie in the direction of faulty or insufficient nutrition. In the *Annals of Tropical Medicine and Parasitology* for August 1, 1911, the matter is given attention by G. C. E. Simpson, B.A., M.B., B.Sc., and E. S. Edie, M.A., B.Sc., from the laboratories of Tropical Medicine and of Bio-Chemistry, Liverpool University. These investigators were asked recently by Professor Ross to enquire into the relation of the organic phosphorus content of various diets to diseases of nutrition, particularly beri-beri. Shortly after the work had commenced, Schaumann's monograph on the subject appeared in the Archives for Ship and Tropical Hygiene, and in this the subject was found to have been dealt with so completely, that the writers of the article from which this information is taken thought it only necessary to confine their attention to confirming some of the newer facts, and investigating further some of the matters arising from Schaumann's results. The importance of these has led the writers to devote the greater part of their article to an abstract of the more important sections of his monograph.

Schaumann commences with an historical review of the previous theories of the cause of beri-beri, and of the work of himself and others, which has shown that the disease is not due to specific infection, contamination of food with poisonous bodies, or to the production of such bodies in the food, and the article quoted gives a short account of the work of the various investigators. The matter of importance is that Schaumann, and Fraser and Stanton, discovered independently that the influence of food in producing beri-beri in man, or neuritis in fowls, increases with the decrease of the percentage of phosphorus in the diet. It was thought by Schaumann that the principle providing the phosphorus was nucleic acid, but the work of Grijns did not confirm this supposition, though a hot water extract of nuclein was found to cause a slight postponement of death, in neuritic birds.

This portion of Schaumann's work is followed by a consideration of the theories attributing beri-beri to faulty nutrition, and he points out that Nocht lays special stress on the fact: 'it is not a question of defect of the main components of food stuffs—proteid, carbohydrate and fat—but of some subtle defect of the less known constituents, enzymes, complements, compound proteids, etc.' On Schaumann's part, however, there is the tendency to consider the substance or substances of importance to be organic compounds of phosphorus, and his work was outlined with the object of considering other possible causes, and of investigating the influence of phosphorus compounds, both organic and inorganic. His first results show that no part is played by an excess of oxalic acid or other poisonous products, or by a deficiency in autolytic enzymes in the food, either in the production of beri-beri or of polyneuritis in fowls, nor that the fault in diet is concerned with either deficiency of proteins or of inorganic salts. He draws attention to the fact of the presence of phosphorus, in specially large amounts, in the organs possessing the most complicated and important functions; he adverts, further, to the circumstance that the chief organic phosphorus compounds are mostly assimilated by the digestive system as such, without the previous formation of phosphoric acid, and that man and the higher animals can store any excess of such compounds, to be drawn upon when they are supplied insufficiently in the diet.

These matters are important in the light of the opinion of Albu and Neuberg that animal life is dependent for the necessary phosphorus compounds, as for proteids and carbohydrates, on the power of plants to build up these substances from simpler bodies. The earlier experiments of Schaumann were not strictly conclusive in the matter of showing the necessity for the provision of organically combined phosphorus in the diet. Further trials with pigeons showed, however, that feeding with polished rice or rice bread, which contain little phosphorus, always caused the death of the birds. The condition was not altered by the inclusion of such substances as dried egg-albumen, albumen metaphosphate, calcium glycero-phosphate, and inorganic salts (with or without phosphates); these are accordingly classed as non-protective substances. The meal or bran from the outer parts of the rice grain, which is removed in milling, had the effect of keeping the birds healthy when it was added to the polished rice and rice meal; it is therefore called a protective substance. Other protective substances are wheat and bran, and dried brewer's yeast. It is a fact of some interest that all these protective substances contain similar amounts of phosphorus. Other trials were made in order to discover what substances could exert a curative action; among these were yeast nuclein, dried pressed yeast, the beans of *Phaseolus radiatus*, dry yellow peas, and may organic extractives of plants containing phosphorus.

As regards the beans mentioned, a pepsin-hydrochloric acid extract of them was found by Schaumann to be a powerful curative agent. It is suggested by this investigator that the phosphatic bodies may serve as sources of energy in the nervous system, so that the curative action depends on their power to cause the central nervous system to overcome the hindrance of the nerves that have degenerated during the course of the disease. Researches were made by Schaumann on other animals than pigeons, and short accounts of these are given in the article from which this information is taken.

Among the conclusions reached are that: food stuffs causing polyneuritis in animals are deficient in phosphorus or in certain organic compounds of that element; certain substances can exert a curative action, while others can not; some substances, rich in organic phosphorus, possess both a protective and a curative effect; the influence shown by organic phosphorus compounds prepared from the natural protective substances is only moderate and transient; the protective or curative effect shown is apparently due to the collective action of several organic compounds of phosphorus, rather than to any one; the changes undergone in the animal system by phosphorus and nitrogen, in the food, are very similar; polyneuritis in animals appears to be due to a lack in the diet, of certain organic phosphorus compounds, whose identity has yet to be established.

The article which is being dealt with concludes with interesting considerations regarding sailing ship beri-beri and tropical beri-beri, both of which appear to be due to the same causes as ordinary beri-beri, and a review of the researches of the writers states that the conclusions from these, as far as they have extended, fully agree with those of Schaumann. They include experiments that are of particular interest at the present time, as showing that pigeons fed on white meal bread succumbed to the diet, while those given Standard or wholemeal bread continued to thrive. It is the purpose of the writers to attempt to isolate the active principle which appears to contain the phosphorus in a form necessary to proper nutrition.

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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NOTES AND COMMENTS.

Contents of Present Issue.

The present number contains the first of a series of editorial articles, in which it is intended to present broadly the matters of chief importance that were under consideration at the recent Agricultural Conference.

Page 51 contains an abstract of a recent interesting article, which dealt with the Java sugar crop in 1911.

Information of interest, concerning new varieties of mangoes that have been introduced successfully into Dominica, is presented on page 52.

On page 55 will be found an article in which is put forward the most recent information arising from investigations as to the necessity for phosphorus in nutrition. The work that is dealt with has been carried out chiefly in regard to beri-beri, and neuritis in the lower animals.

The Insect Notes, on page 58, include two articles. These have respectively for their subjects the New Zealand Grass Grub, and Formalin as a Poison for the House-Fly.

In the Students' Corner, which appears on page 61, is given the conclusion of the questions set in the examinations in connexion with the Courses of Reading of the Department, of last year.

On page 62, the Fungus Notes have for their subject the latest information available concerning the causes of the occurrence of spots on Para rubber.

Australian Salt Bushes as Food for Stock.

In view of experiments that are being carried out under the Imperial Department of Agriculture, particularly by the Agricultural Department of Antigua, with Australian salt bushes, with relation to their use as forage, the following information, abstracted from the *Bulletin of the Imperial Institute*, 1911, p. 277, is of interest.

The plants have become acclimatized in Asia, America and Africa, where they are highly valued as auxiliary feed for stock. Most of the plants in the natural order to which the salt bushes belong (Chenopodiaceae) may be used for feeding cattle, but some of them are to be avoided, because they produce balls of cotton-like material, during protracted drought.

In a general way, it is considered that the best kinds of salt bush, when freshly cut, contain the following: water, about 75 per cent.: fat, 4 to 6 per cent.; protein, about 2·5 per cent.: digestible carbohydrates, 10 per cent.: fibre, 3 to 4 per cent.; ash, 5 to 10 per cent., of which about one-half is common salt. An advantage of the inclusion of a high proportion of salt bushes in the diet of animals has been stated to be a power to cure them of certain intestinal parasites. There is the additional advantage that their succulence renders them particularly useful where water is scarce.

Among the most important species of salt bushes are *Atriplex semibaccata* and *A. nummularia.* Of these, the former is a perennial which responds readily to cultivation, and is deeply rooted so that it withstands drought well. *A. nummularia* grows well under a wide range of conditions: it is more suited to cattle than to sheep feeding, on account of the fact that it may grow to a height of as much, even, as 15 feet.

Prize-Holdings Competitions in Grenada, 1911.

The results of these are dealt with in the Minutes of the Proceedings of the Committee of Management of the Agricultural and Commercial Society of Grenada, on the occasion of a meeting held on October 27, 1911: a copy of the minutes was received recently.

The judges in St. George's Parish, Messrs. J. B. Wells and D. G. Alexander, state that some of the work was fairly well done, pen manure and artificial manure being used in most cases. Advice was required by the peasants, particularly in regard to cacao-pruning.

In St. Mark's parish the judging was done by Messrs. W. Malins-Smith and A. H. B. Gall, who state that the standard of work was very creditable. Visits by the Agricultural Instructor, during the period of working, are required, and there should be greater efforts to obtain entries: while the competitors should be kept in close touch with the Agricultural and Commercial Society. A certain amount of suspicion as to the objects of the competitions still exists; this should be dispelled if greater attention is given to the competitors.

Messrs. W. H. Mignon and W. H. Alexander, who judged the holdings in St. Patrick's parish state that the draining was very insufficient and faulty; while the cultivators require instruction as to the proper method for the application of pen manure. The work of the Agricultural Instructor in this district has been productive of good results, though some indifference exists on the part of those who worked in the competition on the last occasion.

In St. Andrew's parish the results were disappointing, and did not compare well with those of the previous years, the chief failures being with those who have worked previously in the competition. The judges, Messrs. W. G. Lang and H. H. Preudhomme, recommend that mountain holdings should be allowed to compete separately from the others, on account of the difference in conditions. Especial praise is given to some of the mountain holdings, which have been worked excellently, chiefly on account of the assistance that has been afforded by a neighbouring planter. The judges continue to urge very strongly that all holdings should be visited by some of the Society's officers, as some of the work offered at present is very inferior.

The report on the competitions in St. David's parish, by Messrs. A. H. B. Gall and D. G. Alexander, states that the work was very second-rate when compared with that of previous competitions, except in the case of one competitor. The suggestion is made that the Agricultural Instructor should be provided with an assistant during part of the year, in order that more attention may be given to the holdings.

The judges of the competition in St. John's, Messrs. S. Parkinson and D. Lang, state that very little work above the ordinary standard was shown, except on the part of one competitor.

The Utilization of Ammonium Salts by Green Plants.

This matter receives attention in an abstract of a paper describing work on the subject, contained in the *Experiment Station Record*, Vol. XXV, p. 223. The plants employed were grown in sterilized liquid cultures, in sterilized soils of different structure, and in soils under normal crop conditions.

In liquid cultures where nitrification could not take place, it was found that certain ammonium salts are directly absorbed for food by green plants: this result is in accordance with those obtained by other investigators, which have received attention already in the *Agricultural News*. When the ammonium salts are absorbed rapidly, the nutritive liquid becomes acid; but if an ammonium salt such as ammonium magnesium phosphate, which is only slightly soluble, is employed, the amount of acidification is much smaller, and there is the additional advantage that the rate of the absorption of ammonium is much decreased, so that the plant is enabled to use it in the most thorough manner. The principal conditions affecting the action of different salts of ammonia, in sterile soils where nitrification is excluded, are the power of the soil to absorb ammonia and the amount of lime present.

It is concluded by the authors that ammonium sulphate is often wrongly considered to be inferior to nitrate of soda, as a source of nitrogen, because it is not employed with sufficient reference to its suitability for the particular soil or crop.

Changes in the Arsenic in Dipping Fluids.

This subject was considered in a note on page 25 of this volume of the *Agricultural News*, where it was stated that investigations conducted in the United States are said to have shown that the oxidation of sodium arsenite to sodium arsenate, in dipping fluids, takes place through the agency of bacteria.

In relation to the same subject, it is of interest that the *Journal of Agricultural Science* for October 1911, contains an account of work which shows that the oxidation of the arsenite takes place chiefly because of the presence of tar products in the fluids. The investigations showed that the change takes place especially quickly where wood tar is used in making up the mixtures.

The practical outcome of these experiments is expressed as the necessity for official analysis, at proper intervals, of arsenical dipping fluids, wherever the use of these is prescribed legally.

The Treatment of Yaws.

Several notes on work connected with the curative treatment of yaws are presented on page 86 of the *Experiment Station Record* for July 1911. In the first of these, success is claimed in trials conducted in the Philippine Islands in which the drug salvarsan, commonly known as '606' was employed. In ten to twenty days the cases presented a perfectly smooth, pigmented skin in the areas previously occupied by the yaws.

The matter is advanced further by work which is noted from the *British Medical Journal*, 1911, p. 360. In this, it was found that the blood serum of patients who had received Salvarsan was as effective as the drug, producing an improvement, and again that this property was shown by the serum of patients that had themselves received serum. It was demonstrated further, by control experiments, that the serum from yaws patients can produce the improvement, and this only when the patient is under the influence of salvarsan.

Additional work, conducted in Trinidad by the author whose conclusions have just been given, and described in the *British Medical Journal*, 1911, p. 618, has supported the fact of the curative action of serum from patients receiving salvarsan, but has shown that yaws tubercles in the nostril are not affected either by the drug or by the serum. Other conclusions are that a curative effect is exhibited by the administration of the milk of a goat injected with salvarsan, and attention is drawn to the only other organic compounds that are known to cause benefit in yaws.

INSECT NOTES.

THE NEW ZEALAND GRASS GRUB.

The New-Zealand grass grub (*Odontria zealandica*) is of great economic importance, both on account of the extreme abundance of the insect as a pest and of the value of the grass crop in New Zealand.

The following notes and the brief abstract from the article on this insect by Mr. A. H. Cockayne, Government Biologist, which appeared in the *Journal of the New Zealand Department of Agriculture*, September 15, 1911, p. 221, should be of interest to readers of the *Agricultural News*, in view of the fact that at the present time much is being written in different parts of the world about the attacks of root feeding insects which are more or less related to the one now under discussion.

In Barbados, the root borer (*Diaprepes abbreviatus*) feeds on the fibrous roots of the sugar-cane, and penetrates the underground stem system of the plant. A brief account of this insect, with illustrations and references, appeared in the *Agricultural News*, Vol. X, p. 218.

A new pest of sugar-cane has during the past year made its appearance in Mauritius, where a severe infestation including some 4,000 acres has occurred (see *Agricultural News*, Vol. X, p. 314). The new insect, which is not yet identified, is different from the well-known root feeding grub in that island, which is *Oryctes tarandus*.

In Samoa also (see *Agricultural News*, Vol. X, p. 409), a pest of sugar-cane has recently made its appearance. This is believed to be a new introduction, and is mentioned as a rhinoceros beetle (*Oryctes* sp.).

In the United States, *Ligyrus rugiceps* is known as a pest attacking the roots of Indian corn, and the May beetles of the genera Lachnosterna and Cyclocephala are well-known pests, which attack grasses and sugar-cane, in different localities. With the exception of *Diaprepes abbreviatus*, the insects mentioned are all of the same group of beetles. Diaprepes is a weevil, belonging to the Rhynchophora, while the others are classed among the Lamellicornia—a large group in which the grubs are largely root feeders, and the adults leaf feeders. The insects mentioned are all pests of related plants, such as grasses, Indian corn and sugar-cane.

The grass grub is a native of New Zealand. There are some twelve species of the genus Odontria known to occur in that island, but of these only *O. zealandica* has become a pest.

The adult beetles occur in November and December and deposit eggs in the ground, a little below the surface. The eggs hatch in about four weeks, and the grubs feed on the roots of various grasses, for a period of about six months, during which time they become full-grown. There is some uncertainty as to whether the pupal stage is entered upon at once, on the completion of the larval growth, or whether the grubs remain in the soil for some time before pupating. The adult beetles are leaf feeders, and often become a serious pest of fruit trees.

No satisfactory means of control of this pest seems to be known. The lack of labour in a country where the agricultural practice is extensive rather than intensive renders the collection by hand of adults and larvae more difficult and expensive than in those countries where labour is more plentiful.

FORMALIN AS A POISON FOR THE HOUSE-FLY.

Experiments carried out by Mr. R. I. Smith, B.Sc., Entomologist to the North Carolina Experiment Station, have continued to demonstrate the value of formalin as a poison to be used in the control of the house-fly (*Musca domestica*). The following notes are abstracted from a paper on this subject which appeared in the *Journal of Economic Entomology* for October 1911.

The horse barns and dairy at the North Carolina Agricultural and Mechanical College became infested with enormous number of flies, during June 1911, and the experiments referred to were undertaken in connexion with the work of reducing the numbers of these insects. In the milk room of the dairy the windows and doors were screened, and a mixture consisting of 1 oz. of formalin (40 per cent. formaldehyde) and 16 oz. (1 pint) of fresh milk was exposed in shallow plates. The flies at once began to feed greedily on the poisoned milk, and within a few minutes commenced to die. The poison was exposed to the flies at about 3 o'clock in one afternoon, and at about 8 a.m. the next day about 1 pint of flies was swept up from the floor. This amount would represent approximately 5,000 individuals.

The trials of this mixture, and of one in which one half of the milk was replaced by water, were repeated in the horse barn and the calf barn at the College and Experiment Station, where enormous numbers of flies were killed.

The use of the formalin mixtures also resulted in practically freeing the College mess hall of flies, in two days.

Mr. Smith records the successful use of this poison mixture by several others. It is stated, however, that when this mixture has been used in dwelling houses, it has not been as successful, except in the case of unscreened kitchens and dining rooms.

Casein Manufacture in Australia.—It is reported that a factory will be established at Lismore, in New South Wales, for the manufacture of casein. While the central depôt, or factory proper, will be at Lismore, receiving depôts for skimmed milk, or, as they are known in the trade, precipitating stations, will be established wherever a supply of from 2,000 to 3,000 gallons of skimmed milk can be obtained. At these stations the casein will be separated from the whey, and the product obtained forwarded to the head factory for final treatment. There will be collecting routes from these stations similar to those in the present system of cream-collecting, only the skimmed milk will be purchased at the farms, and the farmers will have no further risk. The whey left after the casein has been precipitated will be fed to pigs. Farmers who now feed pigs as the only means of using up the skimmed milk, and who desire to continue pig-breeding, will be able to buy back supplies of the whey from the precipitating station, corresponding to the amount of skimmed milk supplied. The price to be paid farmers will, it is estimated, be an increase of something like 100 per cent. on the value of the skimmed milk as pig feed. In other words, where the skimmed milk is now worth, say, $\frac{1}{4}d.$ a gallon, it will be worth $\frac{1}{2}d.$ when sold to the casein factory. These figures are not given as the actual rates, but they serve as an approximate estimate. (The *Chamber of Commerce Journal*, November 1911, p. 347.)

EXPORTS FROM DOMINICA.

The following are the exports from Dominica, from January 1 to December 31, 1910 and 1911, as given in the *Official Gazette* for January 26 ,1912:—

	1911.	1910.
Bay leaves, cwt.	590	519
Cacao, cwt.	10,053	11,272
Coffee, ,, ...	78	26
Citrate of lime, cwt.	5,926	5,194
Essential oils :—		
Lime, ecuelled, gals.	892	1,018
,, distilled, ,, ...	5,471	5,761
Orange, gals.	65	119
Firewood, cords	252	235
Fruit, fresh :—		
Bananas, bunches	3,713	4,719
Cocoa-nuts	402,622	391,044
Limes, barrels	34,995	26,269
,, boxes	3,177	2,315
Oranges, barrels	983	760
,, boxes	1,641	2,487
Fruit Juices :—		
Lime, conc'd., gallons	131,683	162,878
,, raw, ,, ...	310,077	203,792
Hardwood, feet	31,272	23,439
Lime juice cordial, gals. ...	10,600	6,100
Limes, pickled, barrels	711	779

ENCOURAGEMENT OF RUBBER CULTIVATION IN PARA.

The information below, concerning the making of laws in the State of Pará for the encouragement of rubber-planting, is taken from the *Board of Trade Journal*, for December 28, 1911:—

Adverting to the notice on p. 635 of the *Board of Trade Journal* of June 22, 1911, relative to Laws in the State of Pará for the protection and extension of the rubber industry, H. M. Consul at Pará (Mr. G. A Pogson) reports the enactment of a further Law (No. 1,214, dated November 4), providing for the grant of concessions to national and foreign companies registered in the State for the cultivation of rubber (*Hevea brasiliensis*), cacao, nuts, etc.

The privileges offered include grants of public lands up to 200,000 hectares (about 494,000 acres); reduction of the export duties and State dues upon the rubber, etc., produced, by 50 per cent. during the first ten years from the date of the first shipment, decreasing by 10 per cent. for each ten-yearly period up to fifty years, reduction of State railway rates and of the freight charges of steamship lines subventioned by the State; waiving for ten years of the industrial and professional State and municipal imposts upon the company's premises.

The concessionaire companies will be obliged, among other things, to plant not less than 50,000 rubber trees during the first five years of the concession, and 20,000 trees annually after that period; to comply, as regards their produce, with the instructions of the Department of Agriculture; and to concede to the Government the supervision of the whole activity of the companies. In case of failure to plant a minimum of 50,000 rubber trees within the five years, the concession will become void.

The State Government will try to obtain from the Federal Government, on behalf of the concessionaires, a suspension of taxation as regards the importation of machinery and anything else required for the preparation and cultivation of the soil.

H.M. Consul suggests that British investors proposing to interest themselves in companies formed to obtain concessions under this Law might first of all put themselves in communication with the British Consulate at Pará.

The text and a translation of the Law may be seen by British traders at the Commercial Intelligence Branch of the Board of Trade, 73 Basinghall Street, London E.C.

HALF-YEARLY EXAMINATION OF THE AGRICULTURAL PUPILS, DOMINICA.

The following is the general report of the Examiner, Mr. F. W. South, B.A., on the half-yearly examination of the Agricultural Pupils, Dominica, held in December last :—

In continuation of the course pursued at the previous examinations, two papers were set on the part of the syllabus laid down for Preliminary Candidates in the Reading Courses Examination, commencing: Seeds—their structure and germination, and concluding with pollination and fertilization. The questions were of a practical character, or had reference to points requiring the use of simple powers of observation only.

Six boys sat for the examination. The best answers were written by P. Denis who obtained 82·5 per cent. of the total marks procurable. The average percentage of marks obtained by all the pupils was 72·1.

The answers to the questions were, on the whole good, and the standard of knowledge was remarkably uniform. The boys appear to have a good practical knowledge of agricultural methods, so far as they were exemplified in the questions, and also a sound understanding of the objects of these methods. A few points requiring comment are dealt with in the special reports on each paper.

The results obtained reflect very creditably on the teaching which the boys have received.

Sugar from Shredded Cane.—A bill prohibiting the exportation of sugar-cane in any form has been introduced into the Cuban Senate, according to advices received at the State Department on January 9, at Washington.

This is of course aimed at the process for shredding cane which has been carried on with more or less success for the last two years at a factory built on the lands of the Nipe Bay Company at Preston, Oriente Province. Full details of the work with illustrations of the mill built for shredding the cane, and of the pith and fibre were printed in the *Cuba Review* for May 1911. At that time the mill was undergoing alterations to pursue greater efficiency results. Not having reached the standard required for permanent and profitable work, shipments of the product had previously been sent to Madison, Wisconsin, and chemists from the Preston mill, who had gone north to witness the extraction of the sugar from the dried cane, came back somewhat enthusiastic.

Since then nothing much has been done, but within the last month much discussion of the process has arisen in Cuba, which has resulted in action by the Senate.

Havana despatches stated that planters were alarmed and that foreign consuls were investigating in order to report to their home offices. Some planters said it was difficult to estimate results by the new process, but that if successful, Cuba would become one vast cane field. (The *Cuba Review*, January 1912, p. 7.)

GLEANINGS.

The following were the chief exports from St. Vincent during December last: arrowroot 348,260 ℔., cacao 33,479 ℔., Sea Island cotton 90,625 ℔. (253 bales), cotton seed 114,782 ℔.

A report by H.M. Consul at Manila estimates the sugar crop of Panay and Negros in the Philippine Islands, for 1911-12, at 125,000 tons as compared with 136,250 tons in the season 1910-11.

During December 1911, the distribution from the St. Lucia Botanic Station included 140 cacao plants, 100 lime plants, 5 budded oranges, 1 grafted mango, 36 other plants, and 52 packets of seeds.

It has been reported by H.M. Consul at Tamsui that the sugar crop of Formosa was damaged to an extent that is estimated at about one-third, by two very severe typhoons which were experienced at the end of August last.

The St. Lucia *Gazette* for January 20, 1912, contains an announcement by the Agricultural Superintendent to the effect that the holdings entered for competition in the Cacao Prize-holdings Scheme, in the Soufrière district, will be judged after February 15, 1912.

The distribution from the Antigua Botanic Station during last month included: 139,864 cane cuttings, 444 cocoa-nut plants, 840 lime plants, 56 miscellaneous plants, 8,000 sweet potato cuttings, 20 packets of *Tephrosia candida* seeds, and 10 packets of miscellaneous seeds.

A meeting of the Permanent Exhibition Committee, Dominica, was held on January 12, at which it was decided not to take part in the London Fruit Show to be held in March next, nor at the International Rubber Exposition, in New York, on September 23 to October 3, 1912.

The United States Census Bureau at Washington reports recently that the amount of starch manufactured in that country during 1909 was 675,938,000 ℔. The value of this starch, which included all the different kinds that are commonly produced in the United States, was about £3,568,000.

The *Board of Trade Journal* for January 4, 1912, shows that the imports of cotton into the United Kingdom during the fifty-two weeks ended December 28 was 4,321,859 bales. Of this, 486,563 bales were Egyptian, 9,561 British West Indian, 5,599 British West African, 26,482 British East African, and 260 bales foreign East African.

The announcement is made that an International Engineering and Machinery Exhibition is to be held at Olympia from October 4 to 26 of this year. Information concerning this exhibition may be obtained from the Exhibition Managers, Machine Tool and Engineering Association, 104 High Holborn, W.C.

It is stated in the *Bulletin of the Official Intelligence Bureau*, Adelaide, that the Treasurer of the State of South Australia has announced the intention of the Government to undertake experiments in the growing of sugar beets. These are to be conducted along the banks of the River Murray, and it is suggested that a large area of swamp land shall be drained for intensive culture.

The report of the Government Veterinary Surgeon, St. Vincent, for December last, shows that the returns of deaths among stock in the island, during the month, indicate that these amounted to fifty-three. Among them, there were thirteen instances where the cause of death was not ascertained; but there was no suspicion of the presence of anthrax, either in the case of these or of any of the other deaths.

In the *Proceedings of the Royal Society*, 1911, No. B. 565, p. 338, an account is given of work which has shown that one of the carriers of sleeping sickness, *Glossina palpalis*, may become infected by feeding on natives suffering from sleeping sickness, whether they were in receipt of treatment by arsenic and other drugs, or not. Further it was proved that such insects, under either condition, retain their power of transmitting the disease.

According to the *Bulletin de l'Office Colonial*, June 1911, p. 204, the east coast of New Caledonia is specially suited to the cultivation of the cocoa-nut palm. During recent years this French colony has exported 7,000 tons of copra per annum, and the conditions suggest that a large extension of the cocoa-nut industry may well be brought about. As far as is known, the bud rot of the cocoa-nut palm does not exist in New Caledonia.

In the *Bulletin of the Bureau of Agricultural Intelligence and of Plant Diseases* for March 1911, an abstract is given of a paper describing a fibrous plant called Caroa, which grows in very large quantity in Brazil. The plant is produced from a bulb, and is of such rapid growth that after the fibre is removed, it takes but six months to reproduce a crop from 6 to 8 feet in length. It is stated that rope made from the fibre has a tensile strength ten times greater than similar Manila rope. One ton of fibre is obtainable from 20 tons of the green plant, and a large part of the wastage is said to be suitable for making paper.

The Commissioner of Agriculture has been informed by the Secretary of the British South Africa Company, that the Board has come to the conclusion that, as the climate and soil of Rhodesia are particularly suitable for growing oranges and lemons, the time has arrived when the industry should be placed under the direction and guidance of an expert in citrus cultivation. Enquiries are therefore being made for candidates possessing practical knowledge of all the stages of citrus production, from planting to the packing of the fruit for export. Communications in regard to the matter should be addressed to: The Secretary, the British South Africa Company, 2 London Wall Buildings, E.C.

STUDENTS' CORNER.

AGRICULTURAL EXAMINATIONS.

FINAL EXAMINATION.—(*Concluded.*)

SPECIAL SUBJECTS.

Sugar Industry.

GENERAL. (1) Taking an area of fifty acres of sugar-cane land, give an account of the expenses of preparing the land and establishing a crop of plant canes. (2) Give an account of the use of artificial manures for sugar-cane, under conditions with which you are familiar, with special reference to the best times for their application. (3) Write an account of your experience of root disease of the sugar-cane (*Marasmius* sp.), and discuss the measures that have been suggested for its control.

MUSCOVADO METHOD. (1) It has been suggested that, in making muscovado sugar, it may be advantageous to effect all the evaporation in steam-heated pans. Discuss this question, stating the advantages or disadvantages of the method. (2) Describe carefully processes for separating the molasses from muscovado sugar, and a method of storing the former; more than one method of separation should be described, and the merits compared. What precautions are necessary to obtain molasses of good quality? (3) What points are essential to good work in the mill of a muscovado factory, and how can you ascertain whether the mill is doing good or bad work? Is it desirable to employ multiple mills, such as those furnished with five or more rollers, in muscovado factories? Give reasons for your answer.

VACUUM PAN METHOD. (1) Discuss the advantages presented by mills possessing eleven and fourteen rollers, over those having five and eight. How can you best ascertain if the mills are doing good work? (2) Describe a suitable series of processes for producing 96° grey crystals and exhausted molasses, commencing your description at the point where the syrup leaves the triple effect. (3) Describe suitable methods for effecting the clarification of cane juice when making 96° grey crystals, stating what is essential to good work. What ill effects may imperfect clarification exert in the subsequent stages of manufacture? What modification in the method of clarification would you suggest in the event of having to deal with 'gummy' juice?

Cacao.

(1) Give a description of a method of cultivating cacao, indicating the times of the year at which the various operations have to be carried out. (2) Write an account of the principal fungus diseases of cacao, giving the measures for control in each case. (3) Supply details of the quantities and prices of the machinery and implements required for the fermentation, curing and preparation of cacao for market, on an estate bearing 25 acres of the crop. (Details concerning the necessary buildings are not required.)

Limes.

(1) How is citrate of lime manufactured? What are the advantages of the exportation of lime juice produce in this form? State how it is packed for shipment, and what precautions are necessary during its carriage. (2) Write a description of the cultural operations that are carried on during a year, on a lime estate, stating the object of each. (3) Give details of the apparatus and machinery required for crushing, and for the concentration of the juice from, the fruit usually available from 75 acres of lime trees, under circumstances with which you are familiar.

Cotton.

(1) Give an account of the arrangements that you would make on an estate for the picking of the cotton crop and the preparation of the seed-cotton for ginning. (2) Describe the methods that may be employed for controlling the black scale of cotton. (3) Supply details of your acquaintance with the cultivation of land for cotton, and of its manurial treatment.

Provision Crops.

(1) Describe methods that may be used for the improvement of corn (maize) both by selection and hybridization. (2) Give a careful description of the life-history and measures for control of any insect pest of provision crops, with which you are familiar. (3) What methods of cultivation are employed in the case of the principal provision crops in your district? Discuss the use of these crops in connexion with systems of rotation, under circumstances of which you have had experience.

Para Rubber Seed Oil.—The subject of the industrial application of the seeds of the Para rubber tree (*Hevea brasiliensis*) was dealt with in a previous number of this Bulletin (1911, 9, 35), when attention was again drawn to the fact that the seeds yield a liquid drying oil very similar in properties to linseed oil (see also this Bulletin, 1903, 1, 156; 1904, 2, 22). An investigation of the constituents of the oil has since been made by Messrs. Pickles and Hayworth in the laborarories of the Imperial Institute, and the results have been communicated to the Society of Public Analysts (see *Analyst*, 1911, 36, 491). The oil used in this investigation was extracted in this country from the kernels of undecorticated seeds. The kernels yielded 48·8 per cent. of oil, which was pale-yellow in colour, liquid at ordinary temperatures, and dried to a hard varnish in about twelve days on exposure to air. On examination the oil was found to have the following constants :—

Specific gravity at 15°/15° C.	0·9239
Acid value	29·9
Saponification value	185·6
Iodine value, per cent.	133·3
Titer test	33° C.
Hehner value, per cent.	96·4
Reichert-Meissl value	0·5

The composition of the mixed fatty acids was found to be as follows: saturated (solid) acids 8·4 per cent., consisting of stearic acid (m.p. 69° C.) and an acid or mixture of acids (m.p. 56·5° C.); unsaturated (liquid) acids 86 per cent., consisting of oleic acid 32·6 per cent., linoleic acid 50·9 per cent. and linolenic acid 2·5 per cent. (*Bulletin of the Imperial Institute*, Vol. IX, p. 286.)

FUNGUS NOTES.

SPOTS ON PARA RUBBER

Spots of various kinds on Para rubber, both sheet and crêpe, have been reported from Ceylon, the Malay States and Borneo. They appear a day or two after the latex has been coagulated, or somewhat later, while the rubber is drying. At first they were thought to be of little economic importance, as they were of rare occurrence, and were not found on smoked rubber, which formerly commanded the best price. Recently, however, the demand for smoked plantation rubber has decreased, and in the Malay States, at any rate, the number of cases of spotting has somewhat increased. In consequence of this, Bancroft has made investigations as to the cause of the spotting, and his results are published in the *Agricultural Bulletin of the Straits and Federated Malay States*, Vol. X, p 318. Previous observations by Brooks on the spotting of rubber in Borneo are given in the same publication, Vol. X, p. 16; while Petch's notes on the spotting of Para rubber in Ceylon may be found on pages 248 and 249 of The Physiology and Diseases of Hevea Brasiliensis.

A red or pink spot has been recorded on crêpe and sheet rubber from all three of the localities mentioned above. The spots appear while the rubber is drying, and vary in size from small isolated spots to areas 1 inch in diameter, while in some cases the discoloration is more diffuse. Petch states that the clear red spots found in Ceylon rubber usually fade if the rubber is kept for some time, but Bancroft found that the pink spots recorded in the Malay States did not fade after five months.

In addition to the pink spots, Bancroft describes blue and black spots which are limited to definite small areas, though the black spots may have a radial growth. Petch described black spots on white, wet biscuits in Ceylon, which he attributed to bacteria.

Brooks considered that the red spots found on rubber in Borneo were due to *Bacillus prodigiosus*, an organism found in pond and tap water in these countries, and it seemed possible that this was introduced when the latex was diluted. Previous to this, the spots on rubber in Ceylon had been attributed to a fungus, by Carruthers, and those in the Malay States to an alga, by Ridley. Petch was unable to find any micro organism in the red spots, and Bancroft could not find *Bacillus prodigiosus* in the red, nor any similar colour-forming bacterium in the blue spots. He did discover, however, that all three spots—red, blue and black—are due to fungi. To show this he cut thin sections of the spots, dissolved out the rubber with xylol, and found that there was a fungus left, in each case.

In the pink spots, this fungus has pink cell walls and produces structures that appear to be spores, at the tips of the hyphae. A fungus with hyphae of a dark colour occurs in the blue spots, and this also gives rise to structures that seem to be spores. The black spots show the presence of a fungus with a dark-brown mycelium, which up to the present appears to be sterile. It would seem that these black spots are in origin and nature different from those described by Petch in Ceylon.

The pink colour may be removed, according to Brooks, by prolonged soaking in methylated spirit, but such solvents render the rubber tacky. The blue colour does not disappear when the rubber is treated in this way.

The true origin of the spots in all these cases is a matter of some importance. If bacteria are responsible for them, infection probably takes place through the water used for diluting the latex; but if fungi are the cause, the spots are more likely to originate from air-borne spores. A more complete understanding of the whole matter is necessary before very definite remedial measures can be recommended. At present, Bancroft advises that spotted sheets should be removed from the drying house and kept apart from those that are not spotted, while drying should be conducted as rapidly as is convenient. Petch suggests that collecting cups, pails and other utensils should be sterilized with boiling water whenever damage of this nature appears on rubber, and states further, that periodical sterilization of utensils might well form part of the routine of estates. Where smoking is regularly practised, this form of damage does not occur, and preventive measures are not necessary.

THE GOGO VINE.

In the *Board of Trade Journal*, September 14 last, reference is made to samples of 'soap bark', the prepared bark of the gogo vine recently received from H. M. Consul at Manila, with the information that the material is suitable for the manufacture of soap and hair-washes.

From small specimens of the stem and prepared bark obtained from the Board of Trade, it has been possible to determine the material as the produce of *Entada scandens*. This is an immense climber cosmopolitan in the tropics, and may be readily recognized by its spirally twisted stems and huge pods, which are from 2 to 4 feet long, containing hard, polished, flat, circular seeds of a chestnut colour. So long ago as May 1855, the late Mr. T. C. Archer presented to the Museum a similarly prepared sample of the bark under the same vernacular name, with a note to the effect that it contains saponaceous properties, forms a lather with water, and is much used by Manila ladies for cleaning the hair. The following particulars as to the mode of preparing the bark and its local applications are gathered from The Medicinal Plants of the Philippines, by T. H. Pardo de Tavera, p. 106: 'The use made of the mashed bark of this tree is well known throughout the Philippines. Cut in strips and beaten thoroughly between stones, it is sold under the name of "gogo"; it is macerated in water, to which it imparts a reddish colour, and forms a substitute for soap. The Filipinos use this preparation for bathing, especially the hair, for which purpose there is no more useful or simple preparation. It cures pityriasis, and renders the hair very soft without drying it too much, as is usually the case with soap. The natives use it in treating the itch, washing the affected parts with the maceration, and at the same time briskly rubbing them with the bark; in this way they remove the crusts that shield the acari. The treatment is successful in direct proportion to the energy of rubbing.... The maceration of gogo is emetic and purgative; it is used in the treatment of asthma; it is exceedingly irritating, the slightest quantity that enters the eye causing severe smarting, and a slight conjunctivitis for one or two days.'

The seeds, which contain saponin, are stated to be used by the Nepalese in the preparation of a hair-wash. According to Watt (Dictionary of Economic Products, India), the most general use to which the seeds are applied in India is for crimping linen. The dhobis cut one side of the seed and scoop out the kernel; then they introduce two fingers into the cavity, and quickly stroke the damp linen forwards with its polished surface. This crimps it beautifully crossways. The seeds are made occasionally into snuff-boxes and other articles, and are often carried long distances by ocean currents. (From the *Kew Bulletin*, 1911, p. 474.)

EXPERIMENTS WITH TOBACCO IN CEYLON.

In a report by the late Chairman of the Tobacco Committee of the Ceylon Agricultural Society (Dr. J. C. Willis, M.A., late Director of Agriculture), it is pointed out that the results of past experiments in tobacco cultivation in Ceylon have shown conclusively that conditions are suitable for tobacco-growing and curing, for European consumption, on a large scale, in that island; and the opinion is given that, with proper supervision and careful experimentation, a profitable tobacco industry may be built up in a few years.

The area employed in the experiments, namely 20 acres, was unfortunately insufficient to give enough tobacco for proper fermentation, and the product sold at a low price. For the furtherance of the matter, it will be necessary to commence a long series of experiments with Sumatra and other tobaccos, in order to find out the best-growing seeds, and the best methods of cultivation and curing. It is considered that the yearly amount required for the work, including seed selection, will be not less than £1,670 for the next four or five years, or more.

These facts have led the Committee to conclude that it is not advisable to continue the trials on a commercial scale, particularly on account of the want of funds on the part of the Society. It records, however, its sense of the importance of such investigations, and expresses the hope that experiments in tobacco-growing may be taken up by the new Department of Agriculture, with the assistance of an expert, who would train a few officers in order that they may be in a position to succeed him, when his contract terminates.

EFFECT OF CULTIVATION ON POISONOUS SUBSTANCES IN PLANTS.

The note below is reproduced from the *Gardeners' Chronicle* for October 28, 1911. It is of interest to read it in relation to the article entitled The Poisoning of Cattle by Sorghum, appearing on page 21 of the last issue of the *Agricultural News*

It is generally recognized that plants which, in the wild state, contain poisonous substances of a nitrogenous character, tend, under the influence of cultivation, to contain a smaller amount of these toxic principles. Comes, for example, has stated that if a plant, which, in its wild state, was of therapeutic value, be cultivated for several generations on manured and irrigated soil, it becomes in time quite useless, owing to the disappearance of the active principles. A familiar example is afforded by the almond, the prussic-acid-forming glucoside of which, always present in bitter almonds, has disappeared from the cultivated sweet almond. Conflicting statements have been made of late years as to the toxicity of different varieties of Phaseolus beans, some of which have been proved to contain prussic acid in the form of a glucoside. Recently Messrs. Scurti and Tommasi, of the Rome Agricultural Chemical Experiment Station, have determined the effect of nitrogenous fertilizers on *Phaseolus vulgaris* and *P. multiflorus*, collecting and analysing the seeds in each case. Particular attention was directed to the amount of non-protein nitrogen, which is taken as a measure of the toxic principle. The results conclusively show the presence of a larger proportion of non-protein in the beans from the unmanured plants. The application of sodium nitrate, for example, reduces the amount of toxic nitrogen in the seeds to about one-third of that present in the seeds of similar plants grown on unmanured soil.

WEST INDIAN PRODUCTS.

DRUGS AND SPICES ON THE LONDON MARKET.

Mr. J. R. Jackson, A.L.S., has forwarded the following report on the London drug and spice market, for the month of December 1911:—

The month of December started with a very moderate amount of business in the matter of drugs, a position not unexpected, nor likely to increase, as the Christmas holidays and stock-taking seasons approach. The supplies brought forward, however, even up to the middle of the month, were very large. Practically no business was transacted in the last two weeks of the year, so that our report will, necessarily, be a brief one.

GINGER.

At auction on the 6th of the month there was no demand, and the whole of the offerings were bought in. On the 13th, again, there was no demand; some 200 bags of good, brown rough Calicut were offered, and bought in at 50*s.* per cwt., and 12 cases bold cut at 90*s.* There was no ginger offered after this month.

NUTMEGS, MACE AND PIMENTO.

On the 6th of the month, 32 packages of Eastern nutmegs were brought forward, and the bulk sold at 7½*d.* for 68's. No West Indian was offered. Of mace, 25 packages of West Indian were sold at 2*s.* 4*d.* to 2*s.* 5*d.* per ℔. Again on the 13th a steady sale was made of 66 packages of West Indian, good pale fetching 2*s.* 6*d.* per ℔., ordinary to fair 2*s.* 3*d.* to 2*s.* 4*d.*, red 2*s.* 1*d.* to 2*s.* 3*d.*, and broken 1*s.* 11*d.* to 2*s.* 1*d.* There has been but little demand for either pimento or arrowroot, but at the end of the month small sales of the latter were effected at 3½*d.* per ℔. for fair manufacturing St. Vincent.

SARSAPARILLA.

In the early part of the month supplies were exceedingly small, and there was a demand for grey Jamaica and native Jamaica, both of which were met at auction on the 14th, by the offerings of 16 bales of the first named and 17 bales of the latter; 14 bales of the grey Jamaica met with purchasers at 1*s.* 10*d.* for fair fibrous, and 1*s* 3*d.* for ordinary very coarse; and for 8 bales of the native Jamaica, 1*s.* per ℔. was paid for fair red, 11*d.* for dull red, and 8*d.* to 9½*d.* for part slightly damaged yellow: 8 bales of Lima-Jamaica were also offered, and all sold at 1*s.* to 1*s.* 1*d.* per ℔.

TAMARINDS, OIL OF LIME AND LIME JUICE

At the beginning of the month, West Indian tamarinds were firm and scarce; enquiries were made for Barbados, and 13*s.* in bond was paid for Antigua. There were fairly large arrivals of East Indian, one consignment, consisting of 43 casks fair Calcutta, fetching 12*s.* A fortnight later West Indian were still reported scarce, Antigua commanding 14*s.* and Barbados 17*s.*, in bond. Distilled oil of limes from Dominica fetched, in the middle of the month, 1*s.* 2*d.* per ℔., and for a case of hand pressed, 5*s.* 1*d.* was paid, although it was said to contain a quantity of orange oil. At the end of the month, no West Indian distilled oil of lime was to be had under 1*s* 4*d.* per ℔. West Indian lime juice continues scarce: 1*s.* 3*d.* per gallon is demanded for ordinary raw, while for better qualities 1*s.* 4*d.* to 1*s.* 6*d.* is asked.

MARKET REPORTS.

London.—The West India Committee Circular, January 16, 1912; Messrs. E. A. De Pass & Co., January 5, 1912.

Arrowroot—3½*d.*
Balata—Sheet, 3/6 ; block, 2/4 per lb.
Beeswax—£7 10*s.*
Cacao—Trinidad, 60/- to 70/- per cwt. ; Grenada, 52/- to 56/6; Jamaica, 49/6 to 56/6.
Coffee—Jamaica, 72/6 to 120/- per cwt.
Copra—West Indian, £26 per ton.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 18*d.* to 19*d.*
Fruit—No quotations.
Fustic—No quotations.
Ginger—49/- to 64/- per cwt.
Isinglass—No quotations.
Honey—No quotation.
Lime Juice—Raw, 1/2 to 1/4; concentrated, £18 10*s.* to £18 17*s.* 6*d.*; Otto of limes (hand pressed), no quotation.
Logwood—No quotations.
Mace—Firm.
Nutmegs—Firm.
Pimento—Common, 2$\frac{9}{16}$*d.*; fair, 2⅝*d.*; good, 2$\frac{11}{16}$*d.*; per lb.
Rubber—Para, fine hard, 4/5½; fine soft, 4/4; Castilloa, 4/2 per lb.
Rum—Jamaica, 1/8 to 5/-.
Sugar—Crystals, 18/6 to 20/3; Muscovado, 14/6 to 17/-; Syrup, 13/9 to 19/- per cwt.; Molasses, no quotations.

New York.—Messrs. Gillespie Bros. & Co., January 26, 1912

Cacao—Caracas, 12c. to 12¾c.; Grenada, 11¾c. to 12c.; Trinidad, 12c. to 12½c. per lb.; Jamaica, 10¼c. to 11⅛c.
Cocoa-nuts—Jamaica, select, \$24·00 to \$25·00; culls, \$15·00 to \$16·00; Trinidad, select, \$26·00 to \$27·00; culls, \$15·00 to \$16·00 per M.
Coffee—Jamaica, 14c. to 15c. per lb.
Ginger—8¾c. to 11c. per lb.
Goat Skins—Jamaica, 53c.; Antigua and Barbados, 48c. to 52c.; St. Thomas and St. Kitts, 46c. to 48c. per lb.
Grape-Fruit—Jamaica, \$3·00 to \$4·00.
Limes—\$5·00 to \$5·50.
Mace—50c. to 57c. per lb.
Nutmegs—110's, 14c.
Oranges—Jamaica, \$1·75 to \$2·25 per box.
Pimento—2⅝*d.* per lb.
Sugar—Centrifugals, 96°, 4·40c. per lb.; Muscovados, 89°, 3·90c.; Molasses, 89°, 3·64c. per lb., all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., February 5, 1912.

Cacao—Venezuelan, \$12·00 to \$12·40 per fanega; Trinidad, \$11·75 to \$12·00.
Cocoa-nut Oil—99c. per Imperial gallon.
Coffee—Venezuelan, 15½c. per lb.
Copra—\$4·35 per 100 lb.
Dhal—\$4·20 to \$4·25.
Onions—\$3·50 to \$4·50 per 100 lb.
Peas, Split—\$6·90 to \$7·00 per bag.
Potatoes—English, \$1·90 to \$2·00 per 100 lb.
Rice—Yellow, \$4·60 to \$4·70; White, \$6·00 to \$6·25 per bag.
Sugar—American crushed, no quotations

Barbados.—Messrs. James A. Lynch & Co., February 10, 1912; Messrs. T. S. Garraway & Co., February 12 1912; Messrs. Leacock & Co., January 19, 1912

Arrowroot—\$6·50 to \$7·00 per 100 lb.
Cacao—\$11·00 to \$12·00 per 100 lb.
Cocoa-nuts—\$16·00.
Hay—\$1·50 to \$1·80 per 100 lb.
Manures—Nitrate of soda, \$65·00 ; Cacao manure, \$42·00 to \$48·00; Sulphate of ammonia, \$75·00 to \$80·00 per ton.
Molasses—No quotations.
Onions—\$8·00 to \$10·00 per 100 lb
Peas, Split—\$6·75 to \$7·00 per bag of 210 lb.; Canada, \$2·75 to \$4·10 per bag of 120 lb.
Potatoes—Nova Scotia, \$2·00 to \$3·00 per 160 lb.
Rice—Ballam, \$4·85 to \$5·75 per 190 lb.; Patna, no quotations; Rangoon. no quotations.
Sugar—American granulated, \$5·50 per 100 lb.

British Guiana.—Messrs. Wieting & Richter, February 3, 1912; Messrs. Sandbach, Parker & Co, February 2, 1912.

Articles.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	—	\$13·00 per 200 lb
Balata—Venezuela block	No quotation	Prohibited
Demerara sheet	70c. per lb.	70c.
Cacao—Native	18½c. per lb.	13½c. per lb.
Cassava—	96c.	No quotation
Cassava Starch—	—	No quotation
Cocoa-nuts—	\$12 to \$16 per M	\$10 to \$16 per M., peeled and selected
Coffee—Creole	18c. per lb.	16c. per lb.
Jamaica and Rio	18c. per lb.	18½c. to 19c. per lb.
Liberian	13c. per lb.	12½c. per lb.
Dhal—	\$3·75 per bag of 168 lb.	\$3·80 per bag of 168 lb.
Green Dhal	\$4·50	—
Eddoes—	\$1·90	—
Molasses—Yellow	None	—
Onions—Teneriffe	—	—
Madeira	6c. to 7c.	8c.
Peas—Split	\$7·25 per bag (210 lb.)	\$7·60 per bag (210 lb.)
Marseilles	—	No quotation
Plantains—	20c. to 40c.	—
Potatoes—Nova Scotia	\$2·75 to \$3·00	\$2·75 to \$3·00
Lisbon	—	No quotation
Potatoes—Sweet, B'bados	\$1·20 per bag	—
Rice—Ballam	No quotation	—
Creole	\$5·00	\$5·00 to \$5·25
Tannias—	\$2·16	—
Yams—White	\$2·16	—
Buck	\$3·00	—
Sugar—Dark crystals	\$3·15 to \$3·20	\$3·20
Yellow	\$4·00 to \$4·25	\$4·00 to \$4·10
White	\$4·80 to \$5·00	—
Molasses	\$2·90 to \$3·00	—
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	\$3·75 to \$6·00 per M.	\$4·00 to \$6·00 per M.
,, Cordwood	\$1·80 to \$2·00 per ton	No quotation.

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AGRICULTURAL NEWS

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AGRICULTURAL NEWS.

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

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CONTENTS.

The West Indian Agricultural Conference, 1912.

II.

THE last number of the *Agricultural News* contained the first of a series of editorial articles dealing with the recent Agricultural Conference in Trinidad, and presented a general account of the chief proceedings at the opening of the Conference. It is now proposed to deal broadly with the chief matters that were elucidated in discussion, on the next two days, when subjects were taken up that are connected with cacao and sugar, and with plant diseases and pests, and cocoa-nut, lime, fruit and rice industries.

The discussion in regard to cacao brought forward the question as to whether spraying with Bordeaux mixture may be counted upon as a control measure for any fungus, whether the true cause of the disease is known or not; and it was affirmed, as the result of experience, that such spraying is effective, no matter what the origin of the fungus disease may be. If, however, as, for instance in the case of cacao canker, the disease has gained entrance into a plant, Bordeaux mixture can be of no avail as a remedy; stress may be placed on its use on the pods, as a preventive measure, because it is through the pods that canker affects the cacao plant. As regards the resistance of different varieties of cacao to this disease, Alligator cacao has been found in Trinidad to be particularly susceptible; while in Dominica, Calabacillo shows a greater immunity than Forastero cacao. The experience of several of the Delegates in relation to the occurrence of thrips under different conditions tended to show that the attacks of this pest are sometimes most severe where there is no shade, and sometimes where this is provided: it seemed the most general circumstance, however, that it will probably be found in the greatest amounts where sunlight has free access to the plants. Further evidence was brought forward to the effect that the pest is most likely to be present, in injurious numbers, in dry seasons, and in cultivations situated in low-lying lands.

The suggestion was made as to the existence of natural enemies of thrips, when it was stated that these are unknown, so far, in the West Indies. Attention was, however, drawn to the fact that a parasite of the pest has been discovered recently, in pear orchards, in California, the parasitism amounting, in some cases, to as much as 70 per cent.; this is to be introduced into the West Indies, by way of Trinidad, and the fact that the host belongs to the same species of thrips as is injurious in this part of the world renders it the more hopeful that it will prove to be a successful means of control. Under present conditions, in the West Indies, evidence points to the fact that cacao thrips is best kept in check by the adoption of proper methods of cultivation and manuring, to the end that the plants may be maintained in a state of good health.

Discussion relating to grafted cacao led to the consideration of the possibility and utility of making crosses between different varieties, in order to obtain forms possessing the best qualities of various kinds. It was stated that, in Dominica, hybrids had been obtained, and that it was intended to proceed further with the work of crossing. A matter of importance and utility in this connexion is that, when a desirable type is obtained in such a manner, it can be quickly perpetuated by grafting, with reasonable certainty that all the new individuals will possess the characteristics for which that type has been produced. Dealing, further, with the natural outcome of such work, namely the eventual acquirement of plantations containing trees belonging to one variety, although the advantages of the possession of uniform cultivations were admitted, attention was drawn to the greater chance that these possess of being destroyed by an epidemic of disease, as compared with that to which a mixed cultivation, possibly containing immune types, is subjected. A further advantage of mixed cultivations was also suggested, namely the circumstance that, in these, flowering and fruit-bearing take place at different periods, in the case of the various types, so that an economy in the matter of drying space is effected, because the coming to maturity of the pods takes place during a lengthened period.

Another matter connected with cacao cultivation had relation to the choice of types for planting under different conditions. In regard to this, it is obvious that the question awaiting solution is whether fine quality of the cacao, productivity of the plants, or resistance to disease, is the property that it is most desirable to acquire. A partial answer has been found, in experience, in the circumstance that some conditions have pointed to the advantage of employing low-lying lands for raising the commoner and more productive varieties. From what has been said, however, it is evident that the aim of future work will be to obtain forms possessing two, or even all three, of these eminently useful characteristics.

At the session for the discussion of matters relating to sugar, before the regular business was taken up, a resolution was brought forward, with the leave of the President of the Conference, expressing dismay at the threatened withdrawal of Great Britain from the Brussels Sugar Convention, and this was carried with acclamation. After the reading of papers dealing with experiments with sugar-cane, one of the first matters receiving attention was the fact of the inapplicability of Mendelian principles in the production of varieties, at the present time. In further discussion, the subject of the failure of the Bourbon cane came under notice, and the meeting was reminded that more than one variety existed, which was included under this name: while the interesting suggestion was made that the true Bourbon had maintained its good properties for so long a period because it was being reproduced, from time to time, by seed. In any case, practical evidence was brought forward that there existed the certainty, in many instances, that the yield of sugar had not decreased, from the old returns, under the cultivation of seedling canes.

Several papers were read which had relation to the subject of plant pests and diseases, and the question arose as to the possible existence of the danger that fungi that had been disseminated in districts, for the purpose of controlling scale insects and other insect pests, may themselves become dangerous to plants. No evidence has been found, in any case, to show that there is such a danger. One of the most interesting matters that came forward, in relation to such control, was the degree to which the fungus *Cephalosporium lecanii* had appeared to lessen the numbers of the mango shield scale in Grenada: the scale had disappeared from about three-quarters of the existing trees, since it had been disseminated from certain districts where it was doing its work as a parasite, and there is little doubt that the disappearance is due to the presence of the fungus; thus a cheap and effective method is in operation for the control of the mango shield scale, in that island. As was pointed out by the President, this kind of control of insect pests is a matter of recent development—a development which marks the existence of new lines of work, in the West Indies as well as other parts of the world.

Among pests that received a considerable amount of attention, in discussion, were the cotton stainers, and evidence was adduced to show that, where cotton picking is completed early, and the plants are removed some time before the next crop is sown, the numbers of cotton stainers in the fields are very largely reduced. This matter is not sufficient, however, to account for the instances of the sudden disappearance of cotton stainers, from certain districts, that have taken place from time to time, and these have not yet received explanation. Another subject in which interest was evinced particularly was the parasitism of plant lice by insects, and it was stated that examples showing such parasitism had been received, but that actual determinations of the parasites have not yet been made.

At the end of the session, the President drew the attention of members of the Conference to the booklet to be issued by the Imperial Department of Agriculture, entitled Insect Pests of the Lesser Antilles, and prepared by Mr. H. A. Ballou, M.Sc., Entomologist on the Staff of the Department, proof copies of which had been distributed. Much appreciation was expressed by Delegates, of the contents and manner of production, of this work, and evidence is to hand already that it will prove eminently useful to agriculturists in the West Indies.

The discussions at the remaining sessions of the Conference will receive attention in the next number of the *Agricultural News*.

DEMERARA SUGAR-CANES IN LOUISIANA.

The sugar planters, field managers and central factory operatives of the Lower Coast have up to the present season enjoyed twelve consecutive years of experience in the cultivation and manufacture into sugar of the Demerara seedling canes numbers 74 and 95, introduced into this State by Professor Stubbs, then Director of the Sugar Experiment Station, some twenty odd years since.

In Plaquemines parish, which produces most of the sugar made on the banks of the Mississippi River below New Orleans, both of these two varieties of seedling canes have proved themselves so very far superior to the former general type of red and striped ribbon canes, that they have largely forced the latter out of cultivation, and this season, on the entire West Bank of Plaquemines parish, the cultivation of the older variety of cane has been virtually abandoned, as no seed has been, or will be, put up this season for its perpetuation.

From the personal observation of the writer of this article, the virtues of these two new varieties of cane are so nearly even that it has been difficult to determine which is the more valuable of the two. The *Louisiana Planter* has editorially described the relative advantages of D.74, at such great length and so often, that it will not be necessary to repeat them here. But on the Lower Coast, D.74 is coming to be regarded as involving too much risk from storm breakage, to form the main proportion of a cane crop. It suffered fearfully in this section in the storm of September 20, 1909. In the blow of short duration of the 12th instant, from the north, with a forty-mile-an-hour velocity, there was again considerable damage done to the tall D.74 plant cane by top and stalk breakage, in some fields such damage being at least a loss of 10 per cent.

With the above-repeated lesson, this greatest disadvantage will probably lead ultimately to a complete discontinuance of the cultivation of D.74 on the Lower Coast, much to the regret of those who have noted its numerous superiorities in other respects.

But the weight of planting and manufacturing opinion in this special district is that the D.95 will more profitably replace the diminishing D.74; and the probability is that D.95 will in a few years be the exclusive cane in that part of the sugar belt, unless some superior seedling be soon imported.

The D.95 requires the same intensive tilth as D.74, and under similar conditions, with an average rainfall, will produce, or has produced, a heavier tonnage than ever obtained from D.74, or any other kind of cane grown on the Lower Coast. Forty-five tons to the acre has been the product of a field of 60 acres.

As seed it does not keep as well as the D.74, but from good seed makes as good a stand of plant cane, and very far better stands of stubble [ratoons].

In storms it is never broken, and rarely blown prostrate, bowing before the wind to an angle of almost 45 degrees, and keeping its joints well clear of the ground.

To cane borers, compared to the D.74, it is almost immune.

As a cold resister it is far superior to the striped cane and about equal to D.74. In the blizzard of November 13, as far up as Belle Alliance, near the head of Bayou Lafourche, where the minimum temperature was 24 degrees, much D.95 cane was so little injured as not to be hurt for seed, as none of the eyes were killed.

The *Louisiana Planter* has already published several articles concerning the adaptability of the D.95 cane to the rank reclaimed marsh and swamp lands of the Lower Coast, where in the first season's planting such cane has yielded more than 180 lb. of sugar to the ton, while striped cane on such soil would not have given enough sugar the first year of its planting to pay the cost of its cutting and hauling to mill.

While the sucrose percentage of D. 95 is very nearly equal to that of D. 74 under similar conditions and environment in the beginning and middle of the grinding campaigns, it is fully equal in the latter half of the season, and from start to finish much higher than that of the striped cane.

During this season, in at least two of the four central factories of the Lower Coast, the sugar yields have been fairly satisfactory in the three first weeks of the campaign, having attained an average from the start of very nearly 160 lb. of sugar to the ton of cane. The fact of this yield having been well above the general average of the sugar belt is almost certainly due to the almost exclusive handling of the seedling canes, D. 95 forming the greater part of the raw material.

In view of the Lower Coast's justified partiality to the D.95 cane, perhaps it would be well for the planters of the sugar belt generally to pay more attention to that comparatively neglected seedling, and at least give it a fair trial in their lower grounds. (From the *Louisiana Planter*, November 25, 1911.)

FRUITS AND FRUIT TREES.

COCOA-NUT FIBRE.

The increased extent to which cocoa-nut plantations have been made in Madagascar and the French islands of Oceania, and the fact that many of the plantations have commenced to yield the fruit on such a scale that it may be utilized practically, has led the owners to enquire as to the ways in which the cocoa-nut may best be exploited on a commercial scale. In connexion with the matter, *L'Expansion Coloniale*, which is issued by the Colonial Institute of Marseilles, gives an account, in its issue for December 1911, of the method of preparing the fibre (coir) in the part surrounding the kernel, that is employed in Ceylon, as this is described by M. Lan, Acting Director of Agriculture and Commerce in Cochin China.

The article mentions, first of all, the fact that the operations begin by the retting of the outer layer of the fruits in stagnant water, in large vessels having a depth of 4 to 5 feet, a length of about 13 feet, and a breadth equal to the depth; they remain there for about two days, at the end of which time they are taken to the combing machines. They are then split into four or five pieces, by children, and subjected to the action of cylindrical combs, moved by a crank, and formed of strong metal points about 1½ inches long. In this way, most of the foreign matters have been removed, after the pieces have been subjected, on both surfaces, to the action of four such combs.

The next step in the process is to wash the fibres in tubs of water, in order to remove the matter that still adheres to them; and when they are ready, they are dried in the sun, being spread out in thin, regular layers for the purpose. The process of drying requires about a day, unless it rains, when the fibres have to be sheltered from the wet until the sun shines again. Drying is aided by frequently moving the mass, and turning it over.

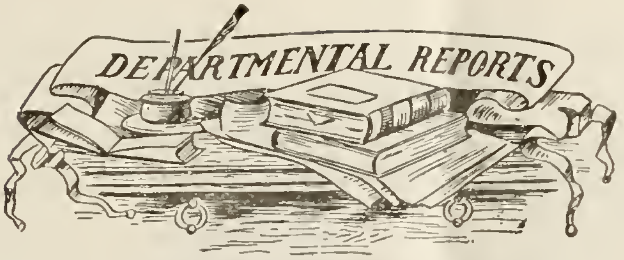
The dry fibres are then subjected to a further combing, by hand, the effect being to separate those which are long from the shorter fibres. The former are used in making brushes; the latter are employed in the manufacture of rope, for stuffing mattresses and in making carpets. This combing is conducted with a contrivance which is fixed to a beam embedded in the soil, and possesses triangular teeth 10 inches long and 1½ inches apart. The two kinds of fibres obtained are sent to Europe, where they are employed for the purposes to which they are suited.

The annual yield of one tree amounts to 5 or 6 lb. of commercial fibre. The average price obtained for this is equivalent to about 12*s.* 4*d.* per cwt.

Attention is drawn by M Lan to the fact that all nuts do not give fibre of the same quality. The best fibre is obtained from those that are not quite ripe, the opposite being the fact in regard to the oil. When the fruit has ripened, the fibres obtained from it are hard and difficult to ret; the fibres from unripe fruits are wanting in strength; they are at their best at the commencement of ripening. A useful practice consists in reserving nuts that contain little oil, for the production of fibre. Nevertheless, the latter, even when it is of inferior quality, is sufficiently valuable to pay for the labour that is required for preparing it.

The article concludes with figures from market reports which indicate that the prices for coir have shown an increasing tendency, and it is considered that they will continue to show it for some time.

International Exchange by the Smithsonian Institution.—The report of the Secretary of the Smithsonian Institution for the year ending June 30, 1911, shows that, in the international exchange of publications conducted by the Institution, the number of packages handled during the year amounted to 228,698, as compared with 221,625 in the previous similar period. For carrying on this work, the amount required was $36,955 The number of packages sent abroad was 187,707, and there were received in return 40,991. The apparent disparity between the number received and that sent out may be partly accounted for by the fact that many returns from other countries are sent by mail, and not through the exchange service. Another reason is found in the circumstance that the term Package often includes a large number of publications. The figures that are given show that nearly three-quarters of the work of the International Exchanges Office of the Smithsonian Institution has been conducted on behalf of United States government establishments.



ANTIGUA: REPORTS ON THE BOTANIC STATION, EXPERIMENT PLOTS AND AGRICULTURAL EDUCATION, 1910-11.

Among the additions made at the Botanic Station, Antigua, during the period under report, has been a seed house for the reception of seeds and tender seedlings. In spite of the untoward conditions that were experienced, the collection of striking species of plants has been maintained, and it has also received several acquisitions.

Further attempts to raise seedling canes were not successful. Of those produced during 1902-3 and 1907-8, nineteen were planted, in the previous year, on one of the sugar estates, and of these again two, designated as A.95 and A.149, were chosen for the purpose of inclusion in the experiments with varieties. During the year under report, twenty-seven varieties raised in Antigua were planted on Cassada Garden estate.

The details concerning plant distribution show that the number of plants sent out, not including sugar-cane and onion plants, which vary considerably in amount from year to year, was the largest recorded. It shows that extensive planting of limes took place during the year, the number despatched from the station being over 16,000. The distribution of cocoa-nuts was smaller; but this does not indicate any diminution of interest in the cocoa-nut industry, for there was a large number of plants ready for distribution, and a larger number of seeds on order. In the experiment plots attached to the Station, there are included cocoa-nuts, lime seedlings, hybrid cotton, various economic plants and three grasses, namely *Andropogon annulatus*, *Paspalum dilatatum* and *Pennisetum cenchroides*. Successful working of the cadet system is reported; this receives attention, it may be mentioned, in the *West Indian Bulletin*, Vol. XII, p. 20.

The area planted in cotton, in Antigua, has continued to decrease, until in 1909-10 it was 252 acres. The export for the season, in the island mentioned, was 67,617 lb. of lint; that of seed-cotton from Barbuda was 126,386 lb., corresponding to an estimated amount of 31,596 lb. of lint. This gives an average return of lint, over the whole area, of 177 lb. per acre. An interesting account is presented, of trials of cotton varieties possessing lint of shorter staple than that of Sea Island, on some of the heavier soils in Antigua. The statistics given concerning the lime industry show that this is in a healthy condition. The onion industry, first taken up about 1896, is now well established, and of some importance in the island. Attention has been drawn already to the fact that interest is being maintained in the cocoa-nut industry. The Report presents notes in connexion with possible new subsidiary industries for Antigua. Short mention is made of the sugar-cane experiments, which receive, as usual, treatment in a special report.

The experiments at Skerretts and Scott's Hill have been continued on the lines of previous years, and included trials with cassava, sweet potatoes, cotton, eddoes and tannias, broom corn, yams, sesame, various green dressings and fodders, Indian corn, castor oil, onions, mangoes, insecticides and hedges. The information concludes with a report on agricultural education at the Grammar School, to which is appended a special report by the Agricultural and Science Master.

TRINIDAD AND TOBAGO: ANNUAL REPORT ON THE DEPARTMENT OF AGRICULTURE, 1910-11.

A general summary of this, by Professor P. Carmody, F.I.C., F.C.S., the Director of Agriculture, placed at the beginning of the report, shows that additional experiments are now being carried on in different parts of the Colony, and that they include 52 acres of bearing cacao and 35 acres of sugar-cane. The Cacao Prize Competition for 1911 received 430 entries, and it is expected that its results will eventually be valuable. Rubber-tapping experiments have been continued, and the investigations in Tobago, in connexion with cacao and rubber, have been resumed actively. In relation to this island, some of the most interesting work is that which is being done in the hybridization of cotton, by Mr. T. Thornton, A.R.C.S.

Note is made of the fact that the export of cacao for the year ending December 31, 1910, was above the record attained in the previous year, being nearly 58,000,000 lb., as compared with 51,575,000 lb. Manurial experiments with cacao are commencing to show that benefit accrues, under the conditions of the trials, by the addition of manure in cacao plantations; although, as is stated, the fact that the investigations have only been carried on for a year makes it unwise to draw any positive conclusions from them. Mention is made of small plot cacao manurial experiments, in their second year, the results of which were not ready for publication. Money has been voted by the Board of Agriculture for the purpose of carrying out manurial experiments with cacao in districts of the island where the conditions differ; this fact has led to the increase in the area of cacao experimentation mentioned at the beginning of this review.

The conditions were unfavourable to the sugar-cane. The work of greatest interest in connexion with this has been carried on in relation to frog-hoppers and *Castnia licus*, seedling canes, and cane farming. The cultivation of cocoa-nuts is extending. With reference to rubber, mention is made of the report made by Mr. H. Smith of Tobago, on his visit to Mexico and Central America, on behalf of the Board of Agriculture; this was reviewed in the *Agricultural News*, Vol. X, p. 91. Other matters of chief interest in connexion with rubber include the representation of the Colony at the recent International Rubber Exhibition, and the tapping of trees on estates, by the Department. The information given concerning cotton relates chiefly to Thornton's hybrid cotton.

The value of the bananas exported from Trinidad during last year was nearly £20,000; at the present time the space required for fortnightly shipments amounts to about 200 tons of cold storage.

In regard to agricultural education, there are included: the Cacao Prize Competition scheme, in connexion with which circulars of instruction are being issued; arrangements in connexion with agricultural inspection and education in Tobago, and the making of an agricultural reference library at the Director's office. The numbers of circulars and bulletins issued were ten and seven respectively.

At the conclusion of the general summary, the information includes the more detailed accounts of the work at the various institutions and places supported in connexion with agriculture, namely, the Botanical Department, the River Estate, the Government Farms, St. Augustine Estate, the Government Laboratory, Manurial Experiments and Rubber Tapping Experiments.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date February 12, 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, from various Islands at 18*d.* to 20*d.* and prices are very firm. A few choice St. Vincent have realized from 22*d.* to 24*d.*

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

The sales for the week were 128 bales, consisting of some crop lots classing Fine to Extra Fine, which were ordered sold on a basis of quotations, also some odd bags of Fine and Fully Fine off in preparation.

The planters' crop lots continue to be held beyond the views of buyers, also about 400 bales of old crop cotton brought over from last year.

There is a limited demand for all the offerings which the Factors are willing to sell at our quotations, the buying being for England, France and the Northern mills.

We quote viz :—

Extra Fine	32c. = 18*d.*, c.i.f., & 5 per cent.
Fine to Fully Fine	26c. to 28c. = 15*d.* to 16*d.* c.i.f. & 5 per cent.
Fine to Extra Fine, off in preparation	18c. to 25c. = 10½*d.* to 14¼*d.* ,, ,, ,,

A Cotton-Picking Machine.—Dr. Fischer has just given the Technical Commission of the German Colonial Agricultural Committee reasons for the conclusion that the Campbell cotton-picking machine has great commercial value. He states that one machine can easily pick 5,000 ℔. of cotton per day, and under favourable conditions as much as 10,000 ℔., whilst the machine only requires a man and a youth to work it. After estimating all working costs, and allowing for depreciation, Dr Fischer estimates that the picking cost is about 1*s.* 5*d.* per cwt. as against 4*s.* 2*d.* per cwt. for hand labour. Dr. Fischer suggests making large-scale experiments with the machine in the German African colonial cotton fields, but he admits that it may not prove so suitable for the class of cotton grown there as in America. The price of the machine, f.o.b. New York, is put at £1,000, whilst the weight is about 4½ tons. The makers are the Price-Campbell Cotton Pickers' Corporation, and they expect to produce 12,000 machines during the next four years. If the machine can really do what is claimed for it, its importance to the cotton industry is demonstrable. (*Journal of the Royal Society of Arts*, December 29, 1911, p. 182.)

LABORATORY MEASUREMENTS FOR VALUING COTTON.

As is pointed out in an article in *L'Agriculture Pratique des Pays Chauds*, for November 1911, the chief commercial qualities of a sample of cotton are four, namely, length, fineness, strength and uniformity; of these the last naturally depends on the others. Further, all these qualities vary in different crops, in different individuals from the same crop, in different bolls from the same plant, in different seeds from the same boll, and in different parts of the same seed. It is, therefore, necessary that the method of sampling must be very definite, and must take account of all the variations that may occur in a normal fashion on one seed, on different seeds on the same boll, and in different bolls on the same plant. In employing such methods, it is of no use to make the observations on commercial samples; it is recognized at the same time that it is possible, after long practice, to carry out a quick examination of such samples, from a commercial point of view, without using measures of any kind. The article mentioned proceeds to give details of the ways in which the various measurements in connexion with cotton fibre may be made, and from these the following information is taken.

MEASUREMENT OF AVERAGE LENGTH OF FIBRE. On a given seed, the fibres at the apex are always longer than those at the base: the length may also vary from one end of the seed to the other. Another matter is that, in a given boll, it is generally the third seed, reckoning from the apex, that possesses the longest fibres, although there are exceptions to this.

In making the measurements, the fibres on the seed selected are combed by means of a mounted needle, in order to extend them radially from the seed. If the cotton on this is regular, two samples are taken by means of forceps, from the apex of the seed and from the side, and one from the base; each sample should consist of about thirty fibres, and all these are measured, and the average length found. If the cotton is irregular in length, samples representing the areas in which it is longest and shortest are taken, and a similar procedure is followed. This entails about 150 measurements of each seed, and as at least three seeds are examined from each boll, and at least three bolls at three different levels on the plant, the total number of measurements in the case of any one plant is a minimum of 4,050. These should be made quickly, and in the interests of accuracy, it is found better to make a large number of measurements to half a millimetre rather than to take the trouble of measuring to a tenth of a millimetre.

In the method of Deschamps, for measuring the length of individual fibres, small pieces of black gummed paper cut into squares of about ⅓-inch are employed; a fibre is detached from the sample by means of a fine pair of forceps, and each end is fixed to a square of the paper by means of a light, wet brush, when on drying, the fibre may be straightened by separating the squares of paper by means of forceps, and its length measured. A variation of the method is to place the fibre on a plate of black glass and to stretch it by drawing a wet brush in a straight line over it.

A further method of determining the average length of the fibres in a small sample pulled from the seed consists in placing them, carefully combed out, on a piece of thick, uniform paper and drawing the outline of the space covered by the straightened fibres; the area of this space depends on the average length of the fibres, and it may be measured by cutting out the piece of paper marked by the outline, weighing it, and comparing its weight with that of a piece of the paper of known area. The extent to which this method may be applied is limited; it is only suited for the comparison of samples of the same origin.

MEASUREMENT OF AVERAGE DIAMETER, OR FINENESS. This requires a smaller number of observations than that needed for estimating the average length. As in the case of the latter quality, the diameter of different fibres varies; most generally, the largest fibres are found on the seeds at the base of the boll, much more rarely on those at the middle: while the finest fibres are found on those at the apex; on the same seed the fineness usually increases progressively from the base to the apex. For comparing the fineness of cottons of different types, it is sufficient to make the measurements from samples taken from the middle of the seed; if, on the other hand, it is required to ascertain the average fineness of a given crop, the observations must be made on three seeds from each capsule, the samples being taken from the base, the middle and the apex of each, and as they must be conducted on three bolls at three different levels on each plant from three plants representative of the crop, the total number of measurements becomes at least 810.

Experience has shown that the largest diameter of the fibres is usually at the lower third: a further matter is that direct measurement of the fibres spread out under the microscope has been found more satisfactory than that of the sections of the fibre cut and mounted in suitable media.

MEASUREMENT OF STRENGTH. Speaking exactly, the strength or tenacity of a cotton fibre is measured by the weight which, suspended at one end of it, is necessary to cause it to break: the elasticity is measured by the extension per unit of length which the fibre undergoes before being broken.

For measuring strength, Henri has invented an apparatus consisting essentially of a marked float having at its upper end a metal stopper, provided with a pair of small forceps; the jaws of the forceps are covered with small flat pieces of cork, in order to prevent the crushing of the fibre which they hold. The float moves vertically in a calibrated glass vessel, funnel shaped at the lower part, and provided with a stop-cock similar to that of a burette. The upper part of the apparatus comprises essentially a second pair of forceps like the first, fixed to a copper rod in such a way as to permit of rotation. This rod is held in a horizontal arm, which may be moved up and down. A piece of blackened wood is placed behind the upper pair of forceps in order to facilitate observation on the fibre that is being examined. For the purpose of determining the elongation of the fibre, a needle pivoted to one of the uprights holding the apparatus is fixed, by its shorter length on one side of the pivot, to the lower pair of forceps.

In conducting an observation, water is poured into the vessel, the fibre is fixed in the forceps, and the proper adjustments made. Water is then allowed to run slowly out of the vessel, in order to cause the float to be partly supported by the fibre, and when this breaks, the position of the mark on the float relative to the graduations on the vessel, as well as the position of the needle, are noted. After this, by suitable calculation, the breaking strain and the elasticity of the fibre are ascertained.

THE EFFECT OF SOLUBLE SALTS ON SOILS.

The following is a summary, given at the end of Bulletin No. 82 of the Bureau of Soils of the United States Department of Agriculture, which deals with investigations of the effect of soluble salts on the physical properties of soils :—

From the foregoing experiments and discussion it is evident that the causes producing a change of structure in the soil are many and complex.

It has been demonstrated, furthermore, that the addition of small amounts of soluble salts affects the physical properties, and therefore the structure of the soil.

Some results obtained are not explained by hitherto known facts and are apparently not in accord with theories regarding the action of salt solutions on solid particles.

From the results no predictions can be made regarding the specific direction or the amount of the action of salts on particular soils, but it can be asserted positively that there is a measurable change in the structure of a soil due to the addition of soluble salts. It is conceivable that there are causes producing changes other than those which are generally considered.

The effect of salts is more pronounced in a soil containing a large percentage of fine soil particles, and this leads to the conclusion that colloid-like clay particles are affected most by soluble salts, and in turn affect most the structure of the soil.

The actual nature of the condition produced in the smallest soil particles is not known beyond the fact that flocculation and deflocculation may be produced.

The photographs of soil layers, in addition to these effects, show an apparent difference in the grouping of the smaller aggregates with reference to the larger soil grains.

The fact that the problems are complex does not detract from the practical conclusion that soluble salts, whether they supply to a soil elements necessary for plant growth or not, may produce in the soil measurable changes in structure which in turn greatly influence plant growth.

Silk Production in Italy.—The Italian cocoon crop of 1910 amounted to 22,658,000 lb., as compared with 21,870,000 lb. in 1909 and 27,933,000 lb. in 1908. The crop of Piedmont in 1910 was a little over 10 million lb., as against 9 million in 1909, and 15 million in 1908. In 1910, as in 1909, Piedmont, instead of producing, as usual, more than one-half of the total Italian crop, produced so small a quantity as greatly to diminish the total crop of Italy. The failure of the Piedmontese crop was due in part to the cold and rainy weather of the spring months which affected the growth of mulberry leaves, and in part to *Diaspis pentagona*, which made its appearance early in the spring and caused considerable damage. The quality of the crop was, however, satisfactory, and was richer in silk than the crop of 1909. (From the *Journal of the Royal Society of Arts*, January 26, 1912, p 292.)

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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NOTES AND COMMENTS.

Contents of Present Issue.

In this issue is presented the second of the editorial articles having relation chiefly to matters that received discussion at the recent Agricultural Conference.

An article on page 68 describes the methods employed for the extracting and preparation of cocoa-nut fibre in Ceylon.

On page 69, there are given reviews of the annual reports for 1910-11 of the Agricultural Departments in Antigua and Trinidad.

An article on pages 70 and 71 describes methods for making laboratory measurements for the purpose of valuing cotton lint. The object of these is to supplement the tests that are made without an apparatus, by those who possess experience in the matter.

In this issue, the Insect Notes present an account of sugar-cane insects of Hawaii, which is given on page 74. It will be seen that several of these pests are of the same kind as those in the West Indies; though there are radical differences in the methods that are adopted for the control of some of them.

An article on page 75 gives an account of the rubber from the West Indies that was exhibited at the Second International Rubber Exhibition held last year in London. It presents a description of the samples, more particularly from a commercial point of view.

The Fungus Notes, on page 78, review an article that appeared recently, describing work in connexion with the red rot disease of the sugar-cane, in Louisiana.

Publications of the Imperial Department of Agriculture.

The first part of Volume XII of the *West Indian Bulletin* is being issued. It commences with accounts entitled: Manurial Experiments with Cotton in the Leeward Islands, The Cotton Industry in the Leeward Islands, and Rubber in the Drier West Indian Islands, with Special Reference to Antigua, by Mr. H. A. Tempany, B.Sc., Superintendent of Agriculture for the Leeward Islands. The interests of rubber receive further attention in a succeeding article entitled Some Notes on Rubber Trees in Dominica, by J. Jones, Curator of the Botanic Station, Dominica. After the Cadet System in Antigua and St. Kitts has been described in a short article, a paper is presented bearing the title An Account of the Return of Vegetation and the Revival of Agriculture in the Area Devastated by the Soufrière of St. Vincent in 1902-3, by W. N. Sands, Agricultural Superintendent, St. Vincent; this is usefully illustrated, and completed by lists of plants collected, during 1907, in the area devastated by the volcanic eruptions. The two articles which follow are entitled Notes on St. Lucia and its Agriculture, and The Lime Industry in St. Lucia, by J. C. Moore, Agricultural Superintendent, St. Lucia.

The next paper consists mainly of compilations by Mr. G. G. Auchinleck, B.Sc., Superintendent of Agriculture, Grenada, and of a note by Mr. H. A Tempany, B.Sc., in connexion with the work of various investigators in the West Indies on the subject of The Estimation of Certain Physical Properties of Soil; the information given relates chiefly to experiments in soil shrinkage and friability. The matter in this issue of the *West Indian Bulletin* is completed by the inclusion of papers entitled The Estimation of Carbonates and of Organic Carbon in Soils, by Dr. Francis Watts, C.M.G., etc., Imperial Commissioner of Agriculture for the West Indies: The Epizootiology of Anthrax, by Mr. Stewart Stockman, M.R.C.V.S., Chief Veterinary Inspector of the Board of Agriculture, England: Grafted Cacao at the Dominica Botanic Station, by Mr. J. Jones; and The Determination of the Water Content of Molasses and The Composition of Antigua and St. Kitts-Nevis Molasses, by Mr. H. A. Tempany, B.Sc., and Mr. V. M. Weil, B.Sc., Assistant Government Analyst, Antigua.

With this issue of the *West Indian Bulletin* are distributed the Index and Title Page of Volume XI.

As regards other publications of the Department, it may be stated that the annual reports on the Botanic Stations in Grenada and Dominica are being issued, Additional interest attaches to these from the fact that they are illustrated.

Candelilla Wax.

With reference to the note on candelilla wax appearing on page 409 of the last volume of the *Agricultural News*, it is useful to state that, in the *Bulletin of the Bureau of Agricultural Intelligence and of Plant Diseases*, for November 1910, p. 117, mention is made of the fact that small lots of this wax are now appearing on the London markets and in other European centres. According to the *Bulletin du Musée Colonial de Haarlem* (July 1910) a company has been formed at Monterey, in Mexico, for the exploitation of *Pedilanthus paronis*, the plant which produces it.

This plant grows wild in North Mexico and in the neighbouring territory of the United States. It is a shrub of from 2 feet 6 inches to 4 feet in height, and every part of it is covered with a thin coating of wax. The yield in the works is from 3½ to 4 per cent.

The cost of a factory capable of producing 226 kilos. of wax per day is about 12,000 francs. The working expenses amount to 370 francs. per ton, and the price of the product is 3,000 francs per ton. This wax is used for candles, varnishes, photographic plates and electrical insulators. It is hard, of a pale colour, with a high melting point. It is superior to Carnauba wax, as it keeps perfectly white.

Electricity and Animal Production.

An experiment in connexion with this subject is described in *Diplomatic and Consular Reports*, No. 4650, issued in May 1911. in which it was indicated that the birth rate of lambs, under the conditions of the trial was more than doubled, and that the yield of wool was greatly increased.

In the experiment, which was conducted in California, 1,000 sheep were placed in a field under the power wires of the Great Western Power Company: the same number of sheep was employed at the same time as a control, without electricity. Where electricity was used, the average production of lambs was a little more than two lambs to each ewe; while under the ordinary condition it was less than one. At the same time the sheep, where electricity was used, yielded one-fifth more wool than those where it was not employed.

A Method for the Determination of Humus in Soils.

The *Iowa Station Bulletin*, No. 124, p. 370, presents an account of a method for the determination of humus in soils, which has been devised with a view to the avoidance of difficulties that arise in regard to filtration, when the ordinary methods are used. In the manipulation described, a centrifugal machine is employed, and an account of the procedure is given as follows: 'After washing free from chlorides, the soil is transferred to a 1-litre shaking bottle with 500 c.c. of a 4 per cent. ammonia solution, using a glass rod to loosen the soil... The flask is then stoppered with a rubber stopper, placed in the shaking apparatus [which is described] and shaken at the rate of 50 revolutions per minute for three hours. At the end of this time the bottles are removed and the contents allowed to settle for ten minutes... About 350 c.c. of the solution is then decanted through a funnel into the centrifuge bowl, the top clamped in place, and the solution whirled for ten minutes. By means of a thumb screw a part of the solution is drawn off through the glass tube while the machine is still at full speed. The first 10 c.c. is discarded and then about 70 c.c. of the solution is collected. This amount is readily caught in a small beaker, which should be covered at once with a cover glass to prevent loss by evaporation.

'Fifty cubic centimetres of the solution, which represents 1 gramme of soil, is drawn off with a pipette, placed in a weighed porcelain dish, and evaporated to dryness on a steam bath. The dish is then dried to constant weight in an oven at 110° C., and the weight recorded. The contents of the dish are then ignited in a muffle furnace, and weighed again after cooling to room temperature. The loss in weight upon ignition represents the weight of the humus, and the increase of the last weighing over the weight of the empty dish represents the weight of the ash.'

The Properties of Calcium Cyanamide.

The interest in this manure, of comparatively recent production, has caused a large amount of investigation to be undertaken concerning its properties. Some of the work done in this way receives attention in the *Experiment Station Record*, for June 1911, p. 623.

In the experiments noted, it was found that only about one-half of the weight of commercial calcium cyanamide consists of the pure compound: the other half is composed of free lime and other impurities. Dicyandiamide and other similar compounds are only present in traces. When subjected to the action of the moisture and carbon dioxide of the air, the commercial product absorbs water (see also *Agricultural News*, Vol. X, p. 313) and finally undergoes a perceptible loss of ammonia. With improved methods of preparation, this loss is much lessened.

The loss of nitrogen from calcium cyanamide was also shown to depend upon the method of storage: when it was placed in thin layers, under dry conditions, the loss was 1·7 to 1·8 per cent. of the total nitrogen, during eight months: under moist conditions, however, the loss was increased to 8 per cent., in the same time. It was found that when the manure is applied to the soil in normal amounts, no loss of ammonia takes place, for any of this compound that may become free is absorbed by the soil and undergoes nitrification.

Storage of calcium cyanamide in a dry place was shown to cause an increase in its content of dicyandiamide. Past results, which indicate that the latter compound is poisonous to plants, were supported by the work of the investigators. Another result that received confirmation was the fact that calcium cyanamide should be mixed with the soil, before sowing takes place, rather than applied as a top dressing. This manner of use prevents loss of ammonia, and causes any dicyandiamide that may be formed to be converted quickly into ammonia, which subsequently undergoes nitrification.

INSECT NOTES.

SUGAR-CANE INSECTS OF HAWAII.

The sugar-cane insects of Hawaii are dealt with in Bulletin 93 of the Bureau of Entomology, United States Department of Agriculture, by Mr. D. L. Van Dine, who was for several years Entomologist of the Hawaiian Agricultural Experiment Station. The information given herewith is abstracted from the bulletin mentioned, and should be of interest to growers of sugar-cane in the West Indies.

The Hawaiian Islands, which form a territory of the United States, lie between latitude 18° 54′ and 22° 15′ North Latitude, about 2,100 miles south-west from San Francisco. The climate is similar to that of the islands of the Lesser Antilles.

The principal sugar-cane pests are four in number: the sugar-cane leaf hopper (*Perkinsiella saccharicida*, Kirk.), the Hawaiian sugar-cane borer (*Sphenophorus obscurus*, Boisd.), the sugar-cane leaf-roller (*Omiodes accepta*, Butl.), and the sugar-cane mealy-bug (*Pseudococcus calceolariae*, Mask.).

The sugar-cane leaf-hopper was introduced into the Hawaiian Islands from Queensland before 1900. The species occurs throughout the sugar-cane areas, both in Australia and in Hawaii, and it has been recorded as occurring in Java. This insect spread rapidly over the sugar-cane districts of the Hawaiian Islands, and early in 1903 became generally abundant throughout the cane fields of the Hawaiian Territory.

The eggs of the leaf-hopper are often deposited beneath the epidermis of the sugar-cane stalk, in the internodes, and it is probably because of this habit that the leaf hopper was introduced into Hawaii, the eggs being concealed in cane cuttings imported for planting.

The adult leaf-hopper is attracted to light, and this characteristic accounts for a considerable amount of spread locally, steamships and railway trains as well as the bright lights of the sugar-cane factories being responsible for dissemination of the insect to a large extent.

During the severe outbreak of leaf-hoppers in Hawaii, in 1903, the adult insects were often observed to migrate in enormous swarms, flying with the prevailing wind. The infected area was probably greatly increased by these migrations.

The eggs of the leaf-hopper are often deposited in slits in the epidermis of the leaves and stalks of the sugar-cane. The time required for them to hatch, in the laboratory, is fourteen days, while the entire life-cycle occupies a period of about forty-eight days. It is recorded also that in one trial with infested cane cuttings, the eggs continued to hatch for a period of thirty-eight days. This will serve to show the danger that exists of introducing the leaf-hopper in cane cuttings imported into any country for planting, since the manner in which the eggs are deposited in the cane, and the length of the period over which the young continue to appear, would make it possible for one shipment to infest an area far remote from the place of export.

The control of the leaf-hopper falls under several heads, such as the burning of the trash, the selection of cane varieties, cultural methods and diversification or rotation of crops. The use of insecticides, stripping off the mature leaves, and the collection of adult insects by means of nets, have all been tried and abandoned. The cutting down and burning of the canes over the centres of infestation resulted in the destruction of the eggs and immature insects, but many adults escaped to adjoining fields, by flight.

The burning of the trash, after the cane is harvested, is the most effective method practised for the control of this and other pests of the sugar-cane in the Hawaiian Islands.

In the selection of canes resistant to attacks of leaf-hopper, the Yellow Caledonian has been found to be the most valuable of all the varieties tried.

The use of other crops in rotation with sugar-cane is strongly recommended. Sugar-cane has been the principal crop in the Hawaiian Islands for many years, and certain areas have been planted continuously in that crop for twenty-five years. Other crops should be grown, either for market or as green dressings, for rotation with sugar-cane. The practice of burning the trash results in the loss of great quantities of organic matter; this can best be replaced by a green dressing crop, and if for this purpose a leguminous crop be used, not only organic matter, but an amount of nitrogenous plant food, will be added to the soil.

It has been estimated that the injury caused by the leaf-hopper to the sugar-cane industry in the Hawaiian Islands during 1903 and 1904 amounted to $3,000,000. It is likely, however, that other pests, and certain fungus diseases, were responsible for a portion of this loss. The leaf-hopper was by far the most important of the pests, and this insect, also, was responsible to a large extent for the severity of the attacks of the rind fungus (*Melanconium sacchari*), since the incisions made by the female leaf-hoppers in egg-laying, and the punctures of these insects of all ages made in feeding, offer the most ready means of access for the fungus to the interior of the cane. Any practice which results in the reduction in the numbers of the leaf-hoppers will have a very beneficial effect in connexion with the occurrence of the rind disease.

Among natural enemies, many predaceous insects, native to the Hawaiian Islands, at the time of the severe outbreak of leaf-hoppers in 1903 and 1904, found in this pest a source of food, and undoubtedly aided in reducing its numbers. Parasitic insects were introduced from America and from Australia. The most important of the introduced species were certain egg parasites from Australia, which is the original home of the leaf-hopper.

The practice of burning the trash results in the destruction of many beneficial insects, and in consequence of this, it is still found necessary to propagate the parasites under artificial conditions, and to distribute them in the fields as the attacks of the leaf-hopper are commencing.

The Hawaiian sugar-cane leaf-hopper does not occur on the continent of North America. The insect is closely related to the corn leaf-hopper, *Dicranotropis* [Delphax] *maidis*, which occurs in the Southern States, and has been recorded from the West Indies.

The West Indian species, *Delphax saccharivora*, is a leaf-hopper attacking sugar-cane; but this insect does not often occur in sufficient numbers to cause any serious loss.

The sugar-cane borer of the Hawaiian Islands is a weevil borer, related to the weevil borer which is of common occurrence in the West Indies. It is the second in importance of the sugar-cane pests in those islands, and in addition to the sugar-cane it attacks several palms, and the papaw (*Carica Papaya*).

The eggs are laid beneath the epidermis of the cane stalk; and the larva lives in the tissue of the cane, often completely destroying the entire interior, even when there is no external evidence of injury to be seen. The life of the borer within the stalk lasts seven weeks. The pupa is formed within a cocoon made from the fibre of the cane in the stalk.

Burning of trash is strongly recommended as a control measure, and the selection of a hard variety of cane such as Yellow Caledonian is also considered to be of value. The selection of uninfested seed cane is of importance, since the adult weevil is able to work its way to the surface even though buried to a considerable depth. If a cane cutting which is used for planting contains a borer, the grub will have every chance to complete its development and escape, while the cutting will be destroyed.

The practice of collecting the weevils in the field and at baits consisting of pieces of sugar cane about 12 inches long, split lengthwise, distributed along the borders of the field, has been found to yield valuable results. These baits also furnish the adult females with opportunities for egg-laying, becoming in consequence heavily infested, and as the canes dry up the young grubs perish.

The Hawaiian sugar-cane borer has long been known as *Sphenophorus obscurus*; it is related to the West Indian species *Sphenophorus sericeus* which attacks sugar-cane, and to other species of the same genus, such as *S. sordidus* which is a pest of bananas and *S. sexguttatus*, which is recorded as attacking sugar-canes in Porto Rico.

The Hawaiian sugar-cane leaf-roller is the caterpillar of a moth which is a native of the Hawaiian Islands. It sometimes occurs over large areas in sufficient numbers to cause a considerable amount of damage to growing sugar-cane. The species, which is primarily a grass feeder, now occurs very generally on sugar-cane throughout the islands, feeding on the leaves, and in the crown of the plant. It is attacked by parasitic and predaceous insects to such an extent that it only occasionally becomes a serious pest.

The very young larvae feed in the crown of the sugar-cane plant, where the young leaves have not yet unrolled. Later on they roll the margin of a leaf over, forming a tube for their 'retreat'. When nearly full-grown they are found in their rolls or tubes, toward the tip of the upper leaves.

No remedial measures are considered necessary, since the degree of control exercised by the natural enemies of the leaf roller is generally sufficient to keep the pest reduced to fairly small numbers.

The sugar-cane mealy-bug is known in Louisiana and the West Indies as well as in the Hawaiian Islands. This insect feeds on the stalk of the canes. It is not generally a serious pest, being held in check by its natural enemies.

The burning of trash and the selection of clean cuttings for planting are strongly advised in Hawaii as means of keeping the mealy-bug from increasing too rapidly.

DEPARTMENT NEWS.

Mr. P. T. Saunders, M.R.C.V.S., Veterinary Officer on the Staff of the Imperial Department of Agriculture, returned to Barbados, from Grenada, by the R.M.S. 'Tagus', on February 23, 1912.

Mr. G. E. Bodkin, Economic Biologist to the Department of Science and Agriculture, British Guiana, after attending the recent Agricultural Conference in Trinidad, paid a visit to Barbados, in order to have an opportunity of making investigations, at the Head Office of the Imperial Department of Agriculture, concerning biological matters of agricultural import in British Guiana and the West Indies. Mr. Bodkin left for Dominica, in pursuance of similar work, by the S.S. 'Parima', on February 29, and will probably return to Barbados on March 16.

WEST INDIAN RUBBER AND THE RECENT RUBBER EXHIBITION.

Messrs. Lewis and Peat, of Mincing Lane, were kind enough to examine critically the various exhibits in the West Indian section of the recent International Rubber Exhibition, and have submitted the following commercial report regarding them.

The West Indies were represented at the International Rubber Exhibition by Trinidad and Tobago, British Guiana, Dominica and Jamaica. About eighteen or twenty different estates sent samples, and the quality and variety of sorts exhibited showed a great improvement on those displayed at the last show at Olympia, three years ago.

HEVEA. Practically all the samples were good, and some compared very favourably with those from Malaya and Ceylon. The quality of the rubber without exception was satisfactory, but a little more experience must be gained, and a little more attention paid to the various stages of the preparation, especially the washing and drying. Many exhibits were spoilt by being insufficiently dry, and others by being too resinous, many showing small particles of dirt and bark. The smoked biscuits from the Trinidad Botanic Gardens deserved special mention.

CASTILLOA. Taken all round, the exhibits of this species were excellent, and the rubber prepared by Mr. H. S. Smith's new machine was as good as any yet produced from this tree. The two best samples shown were from Major Walker's estate, Easterfield, and Mr. Smith's Caledonia estate, Tobago. These sheets showed what can be done with Castilloa latex, and we should think that this rubber would rank very close to Hevea if sent to the market as well prepared as these two exhibits. They were better than anything we have seen, either from Mexico or anywhere else. The Ceara samples were good, but nearly all showed too much resin, but this might be entirely due to the tree being very young, and to the insufficient washing after coagulation and before drying.

The small samples of Landolphia, Funtumia and Ficus, shown by the Trinidad Department of Agriculture, indicated that all three of these species give a very marketable latex; but we doubt whether their cultivation, where Hevea, Castilloa or Ceara will grow with such good results as shown by the other exhibits, is advisable.

Altogether, the collection was most satisfactory, and although the West Indies are perhaps a few years behind the big plantation centres of Ceylon and Malaya, they are certainly coming along very fast, and in a few years will be able to compete. As to Castilloa curing, we think that Mr. H. S. Smith and his colleagues are teaching the rest of the world how to do it, and if they can be sure of a good yield, they will bring the cultivation of this species to a very high position in the rubber-planting world.

Naturally, until the production can be increased so that regular supplies can be relied upon, it is very difficult to obtain fair values, and with such small and irregular parcels, both as regards quantity and quality, prices from time to time are most erratic, and cannot be fairly quoted as the intrinsic value of any one of them against either wild Para or plantation Para, cultivated with success in the Middle West. (*Bulletin of the Department of Agriculture*, Trinidad and Tobago, Vol. X, p. 198.)

GLEANINGS.

The *International Sugar Journal* for January 1912 states that, during the crop season ending August last, Argentina produced 1,485,666 tons of cane; in the previous season the production was 1,175,234. It was expected that the output of sugar would reach 160,000 tons.

The average yield of cotton during the past season in St. Vincent has been somewhat low, prices for the first shipments, as has been shown in the *Agricultural News*, have been about 20*d.* to 21*d.* per lb. The prices for arrowroot have continued firm in both the English and Intercolonial markets.

The annual report of the Porto Rico Experiment Station for 1910 gives the results of trials of chloride of lime, potassium permanganate, tri-cresol and carbon bisulphide, in cases where lilies were being grown in so-called sick soil. The best results were obtained with the cheapest of these substances, namely chloride of lime.

The values of the chief exports from the Federated Malay States during the year 1910 were as follows: tin and tin ore, \$57,154,891 (\$1 = 2*s.* 4*d.*); Para rubber, \$38,441,610; copra, \$1,194,226; sugar, \$679,794; rice, \$655,085; tapioca, \$516,252. There were increases over the amounts for 1909 in all cases except those of sugar and tapioca.

It is expected that, mainly owing to the unfavourable conditions at the commencement of the season, the yield of cotton throughout Nevis will be small; in some districts, however, the returns are good. Trouble has been experienced with cotton stainers and caterpillars, and there is likely to be some increase in the quantity of stained cotton.

It is reported by the Agricultural Superintendent, St. Kitts-Nevis, that, up to January, little progress had been made in regard to the old sugar-cane crop in the Basseterre district; in the northern districts, the prospects of the crop were more promising. The young cane crop was stated to be healthy, and more regular growth than usual was being made.

Information has been received from the Secretary of the British Cotton Growing Association that the sorting of cotton on arrival at Liverpool will be greatly facilitated if planters will in all cases send specifications of their shipments to the Association, when advising that a consignment is being sent forward. The specification note should show the number of bales, together with weights, marks and numbers of each bale, whenever a shipment is being advised.

It is announced that the following reports, presented to the International Congress of Tropical Agriculture in May 1910, have now been published: Report on the Present Position of Cotton Cultivation, by Professor Wyndham R. Dunstan, M.A., L.L.D., F.R.S., price 1*s.*; Papers and Reports on Cotton Cultivation, supplementary to the above, price 5*s.*, post free (abroad) 5*s.* 7*d.* These are to be obtained from the British Section of the International Association of Tropical Agriculture and Colonial Development, Imperial Institute, South Kensington, S. W.

The *Centralblatt für Bakteriologie* for February 4, 1911, contains an account of experiments that have been conducted on the peaty high moors of Sweden, in growing leguminous crops with the aid of such inoculating substances as Azotogen and Nitragin, and with natural soil. Past results had shown that the best effect was obtained by the use of natural soil, and the new experiments formed a confirmation of these. Of the artificial preparations, Azotogen (prepared by Dr. Simon of Dresden) was shown to be superior to Nitragins obtained from Dr. Kühn of Cologne. (See also *Agricultural News*, Vol. X, p. 408.)

In the *Experiment Station Record* for July 1911, p. 17, attention is given to the continuation of experiments that are being conducted in France in order to find if there is any truth in the popular superstition that the moon exercises an influence on the growth of plants. In the latest trials, planting at the time of the new moon gave the greatest yield in twenty-eight cases, planting in the first quarter in twenty-nine, planting at the time of the full moon in twenty-eight, and planting in the last quarter in twenty-seven. This shows that no material difference in the yield could be attributed to the influence of the moon.

The *Nachrichten für Handel und Industrie* (Berlin) of November 29, 1911, states that the Russian Minister of Agriculture has caused experiments in cotton-growing to be carried out in Bessarabia, Kherson, Ekaterinoslav, Taurida, the Black Sea district and North Caucasus. Altogether, about 800 acres were sown with cotton seeds. The results were very satisfactory; the cotton ripened well, and produced a good workable staple. The Moscow Cotton Committee submitted the South Russian cotton to a thorough examination, and declared it to be as good as Turkestan cotton. Experiments with early varieties of cotton will be continued on a larger scale. (*The Board of Trade Journal*, December 14, 1911.)

According to the *Bulletin of the Bureau of Agricultural Intelligence and of Plant Diseases* for June 1911, p. 1209, the Government of Siam has made a commencement of repairing the irrigation and drainage works which had been allowed to fall into ruin, and numerous attempts have been made in jute cultivation, without much result, so far. Agricultural exhibitions were held in 1910 and 1911. In the former of these years, the values of the chief exports, rice and teak, were respectively £7,437,565 and £625,672. The teak industry has brought about a large amount of deforestation, and the effects of this are beginning to be felt, so that the Government has made stringent regulations regarding the removal of timber trees.

STUDENTS' CORNER.

MARCH.

First Period.

Seasonal Notes.

Give a description of the way in which you would select cocoa-nuts for planting, affording special attention to the characteristics that should be possessed most specially by nuts that are used for seed. In this matter, would you have any regard to the kind and condition of the trees from which the nuts came? If so, what special properties should be exhibited by palms that are used to provide cocoa-nuts for planting? In what circumstances of soil and situation do cocoa-nuts thrive best? It is sometimes found that cocoa-nut seedlings develop slowly during the first part of their existence, and then begin to grow quickly, and afterwards to flourish. What reasons may be adduced for this circumstance? Provide a description, with diagrams, of the fruit of the cocoa-nut palm.

State your experience in regard to animal pests of cotton, giving information as to those which usually effect the greatest damage, under conditions with which you are familiar. Which of these pests are most likely to be reduced in numbers by the proper clearing of cotton lands after the crop has been reaped? State what insecticides you would stock at the beginning of the season, and in what quantities you would provide them, for use on 25 acres of cotton. To what extent does the natural control exist, of insect pests attacking cotton?

Experience has shown that the suitability of lands for the growing of cotton depends to some extent on their aspect, in relation to the points of the compass, and to the degree of slope. In some places, lands with a northern slope are found to be much less suitable for the cultivation of cotton than those which slope to the south. In the former situation, there is likely to be a large dropping of bolls during the cooler months, and in addition, those which remain on the plants may not develop in the normal time and manner. Can you account for this circumstance, giving consideration to differences in temperature and rainfall, and to the incidence of the wind, under the different conditions?

Give a description of the operations connected with the harvesting of onions. What precautions should be employed in drying the bulbs? State the reason why onions cannot, as a rule, be stored for any length of time, in the West Indies. How should onions be graded and packed for export? Indicate any improvements in these matters that may have occurred to you.

Questions for Candidates.

Preliminary Questions

(1) Distinguish between complete and incomplete, and perfect and imperfect flowers, giving examples of each.

(2) How may weeds be made useful to the agriculturist?

(3) State the chief ways in which air is caused to enter and leave the soil.

Intermediate Questions.

(1) Give a description of the work, where artificial pollination is necessary for the production of a crop

(2) State the chief uses of weeds to the agriculturist. What kinds of weeds are most likely to benefit the soil in which they grow?

(3) What changes take place in the air in the soil, owing to the presence of the roots of plants?

Final Questions.

(1) Give as many examples as you can of the uses of flowers to mankind.

(2) Provide an account of any cultivated plants, which are now of importance, that are known to have originated as 'weeds'.

(3) In what ways is the atmosphere being exploited for the production of manures which are intended to take the place of supplies of special manures that are rapidly undergoing exhaustion?

TRADE AND AGRICULTURE OF BARBADOS, 1910-11.

The report on the Blue Book of Barbados, 1910-11, has been issued as *Colonial Reports*—Annual, No. 698. In dealing with the trade, agriculture and industries of the Colony, this shows that the value of the imports in 1910 was £1,345,194, as compared with £1,119,343 (though addition of the items makes the latter amount £1,129,343). The sugar and molasses shipments were as follows: muscovado sugar 35,906 hogsheads value £350,084, as compared with 16,968 hogsheads value £144,228 in 1900; dry sugar, 3,993 hogsheads value £45,920, as compared with 827 hogsheads value £8,684 in the previous year; molasses 77,722 puncheons value £310,888, in comparison with 69,036 puncheons value £315,180, in 1909. The increase in the exports of dry sugar (dark crystals) is accounted for by the adoption of modern methods of sugar manufacture, and largely by an apparent change due to the employment of a more accurate system of Customs declaration. The amount of rum distilled in 1910 was 226,169 gallons: in 1909 it was 207,239 gallons.

A computation is given of the total output of sugar for the year that would have been made if there had been no manufacture of fancy molasses; this would have been 59,771 hogsheads, reckoning that 315 gallons of fancy molasses is equivalent to 1 ton of sugar, with its molasses.

The quantity of cotton lint exported during the crop season (October 1 to September 30) of 1910 was 644,279 lb. value £38,549; in 1909 the similar figures were 838,748 lb. value £41,937. The exports for the actual years were respectively, 589,118 lb. value £36,820 and 830,117 lb. value £40,946. The decrease of the area reaped was 1,647 acres, and was due to the low prices and poor yields of 1908. Better prices toward the close of 1909 and during 1910 have led to increased planting of cotton.

During the year ended December 31, 1910, 13,137 bunches of bananas were exported to the United Kingdom.

Returning to a consideration of the imports into Barbados, it is of interest that these came from the chief exporting countries in the following proportions: the United Kingdom, 44 per cent.; United States, 30 per cent.; Canada, 11 per cent.; and the British West Indies, 5 per cent.

FUNGUS NOTES.

THE RED ROT DISEASE OF THE SUGAR-CANE IN LOUISIANA.

A fairly complete account of the red rot disease of sugar-cane, due to *Colletotrichum falcatum*, as it appears in Louisiana, has recently been prepared by C. W. Edgerton, Plant Pathologist at the Louisiana State University, and has been published in the *Modern Sugar Planter* for January 27 and February 3 of this year. As some interesting points have resulted from this work, it is thought that an account of it may be of interest to West Indian readers, particularly as there is most probably a close connexion between it and the rind disease of these islands.

SYMPTOMS. In Louisiana the red rot disease attacks both the leaves and the stems of the sugar-cane. Affected canes frequently show no symptoms of ill health on the outside; but when they are split open, the internal tissues exhibit a bright red discoloration, quite characteristic, and distinct from the reddening produced by other injuries. Very frequently, the centres of the red areas are occupied by white or whitish spots, the strands of vascular tissue are discoloured red, and may be surrounded by a red ground tissue. The attack on the leaves usually commences as a red spot on the upper side of the midrib. This extends in both directions along the axis, and often becomes from 1 to 3 feet in length. The centre of the spot dries, and becomes whitish in colour, and is finally covered with the black fruiting pustules of the fungus. Since the disease does not cause any external symptoms on the stems of the infected canes, the spots on the leaves form a useful means of ascertaining whether or not it is present in a field. Two points of difference between Edgerton's description and that of the rind disease given by Howard are worthy of note (A. Howard, *Annals of Botany*, Vol. XVII, No. LXVI, p. 373). In the first place, the brown discoloration of the rind, followed by shrinkage, which are noticeable on the outside of canes infected by rind disease, does not occur in the Louisiana disease; while Howard also makes no mention of the occurrence of the red spots on the leaves, though he describes the leaf symptoms in some detail.

INOCULATION EXPERIMENTS AND PROGRESS OF THE DISEASE. Edgerton made over 275 inoculations with pure cultures of *Colletotrichum falcatum*, on stems of canes belonging to the varieties D.74, D.95, purple and striped. The inoculations were effected at needle punctures in the lower joints. Only about six of the 275 canes failed to develop the disease, while of the equal number of controls employed about six showed the disease. This was probably due to the difficulty of preventing accidental infection when red rot is abundant in the field. In addition to proving conclusively that the fungus can act as a wound parasite, these experiments showed that D. 74 and D. 95 are more resistant to the disease than the local types; while of the former D.74 appeared to be the more resistant. Further inoculations were made with two species of Colletotrichum which resemble *C. falcatum* so closely as to be indistinguishable under the microscope or in pure cultures. The first of these is *C. lineola* commonly found on broom corn and Johnson grass (*Sorghum halepense*), in the Southern States; the second is *C. cereale*, that attacks wheat and other grasses in the Northern States.

These inoculations did not yield any conclusive results, though in a few cases indications of infection were obtained with *C. lineola*. There is a possibility that the fungus on the sugar cane was originally the same as *C. lineola*, but has become adapted to living on cane. Further work to determine this will be carried out.

The first sign of infection is a reddening of the tissues at the point of inoculation. The discoloration spreads in all directions, but most rapidly along the stalk. The fungus grows very rapidly in the vascular bundles, which it discolours red. It passes up them from the infected internode through the node into the internode above, and may extend, in this way, through two to five joints during the season. Red patches appear here and there in the ground tissue near diseased vascular strands, as the fungus grows out laterally from the bundles into the parenchyma. Several weeks after inoculation, the centres of the red patches dry out and show the white spots characteristic of the advanced condition of the disease. Infected stalks usually show little, if any, decrease in size and cannot be distinguished from healthy stalks by an examination of the exterior. Sometimes, when the stalk is inoculated when very young, the fungus breaks through the rind tissue which becomes dry and sunken, while fructifications of the fungus appear on its surface; at other times the growth of the fungus may be so rapid as to kill young stalks altogether. Apparently, the fungus cannot penetrate the fully developed rind and fructifications do not form at the nodes, as they usually do on canes attacked by *Colletotrichum falcatum*, in the West Indies. In his infection experiments with *C. falcatum*, Howard (loc. cit.) usually obtained the characteristic external symptoms observed in the case of the West Indian rind disease.

INFECTION IN THE FIELD. Carefully conducted field observations showed that there is a possibility that the fungus can enter previously undamaged canes at the node, where the rind tissue is broken by the leaf traces and rootlets. This was not definitely proved, as small wounds due to minute insects may have been present. Howard was able to produce successful inoculations by placing the fungus on the leaf bases and on the broken surfaces produced when the leaves were stripped off. There is also a possibility that, in Louisiana, the fungus penetrates the stem from the leaves, entering along the leaf traces. By far the commonest means of entry is, however, the tunnels made by the moth borer (*Diatraea saccharalis*). Not only do the tunnels afford an easy means of entry to the fungus, but the grubs serve to disseminate the mycelium throughout the cane far more thoroughly than this could be done by its own, unaided, growth. Observations showed that over 50 per cent. of canes attacked by moth borer are probably also infected with red rot. One other point was definitely established, namely that the disease does not spread upwards into the young growing shoots from previously infected cuttings.

LOSSES FROM RED ROT DISEASE. A certain amount of loss is occasioned by the killing out of young shoots, and even more by the injury to the leaves. The disease does not appear to be as serious in its direct effects as is the local rind disease, since shoots are rarely completely destroyed. The two main sources of loss are, however, a bad stand due to the failure to germinate evinced by infected cuttings, as well as to the possibility that the disease can spread in the soil from infected to healthy cuttings; and the loss of sucrose and increase of glucose in the juice caused by the presence of the fungus in the tissues. The fact that no selection of cuttings is practised in Louisiana necessitates the planting of a large number, and often results in a poor stand, partly due to the presence of red rot in the canes cut up for planting. Analyses of the juice of artificially infected canes showed that not only is the juice from the infected internodes deficient in sucrose, but that the deficiency extends to the internodes above, while it is accompanied by an increase in glucose. This is partly due to the fact that the fungus secretes an inverting enzyme. Appropriate comparative experiments also showed that the decrease in sucrose and increase in glucose in the juice of canes attacked by the moth borer are probably mainly due to the presence of the red rot disease in such canes, following the attacks of the insect.

Finally, it may be stated that the remedial measures recommended by Edgerton are very similar to those already employed with success in the West Indies, with the exception that no mention is made of the growing of immune varieties, or of the need for the introduction of new varieties for trial. He apparently considers that adequate preventive measures will do all that is necessary to control the disease.

WEST INDIAN PRODUCTS.

DRUGS AND SPICES ON THE LONDON MARKET.

Mr. J. R. Jackson, A.L.S., has forwarded the following report on the London drug and spice market, for the month of January 1912:—

The first week of January in Mincing Lane is always a period of slack and unsettled business, a condition that is often carried well on into the second week, when, the drug auctions are resumed after the Christmas holidays. The present year has proved no exception to that general rule; the drug sales were not commenced until the 11th, consequently our notes, so far as drugs are concerned, will cover a period of a fortnight only. The general tone of the markets throughout the month has been of a normal character, notwithstanding the continued industrial outbreaks that have occurred in many branches of trade, particularly those affecting the cotton and coal industries, the last named of which has such far reaching effects.

The details referring to West Indian products are as follows —

GINGER.

At the first spice auction, ginger was represented by 290 packages of wormy, washed, rough, Cochin, 89 of which found buyers at 42*s.* per cwt., a week later the offerings had increased to 828 packages, washed rough Cochin was bought in at 50*s.* per cwt.; wormy at 45*s.*, bold selected Calicut at 95*s.* and small cut at 72*s.* 6*d.* Forty bales of Formosa were offered, and found purchasers, at 34*s.* for dark and lean, coarse. On the 17th of the month some 300 bags of wormy washed rough Cochin were brought forward, of which 20 were disposed of at 41*s.* per cwt.; 100 bags of rough brown Formosa were also offered, but found no buyers, being bought in at 35*s.* On the 31st. 161 bags of rough, washed, wormy Cochin were offered, and bought in at from 42*s.* to 45*s.* per cwt., while 168 bags of good limed Japan were sold without reserve at 31*s.* 6*d.* to 32*s.* per cwt.

NUTMEGS, MACE AND PIMENTO.

At the first auction on January 3, West India Nutmegs were in good supply, 231 packages being brought forward, most of which sold at the following prices: 55's. 1*s.* 2*d.* 60's. to 68's, 7*d.* to 9½*d.*; 70's to 80's 5¾*d.* to 6½*d.*; 91's. to 101's. 5½*d.* to 5¾*d.*; 123's to 157's. 5¼*d.* to 5½*d.* A few packages of Eastern were also sold, limed fetching the following prices: 60's to 70's. 7*d.* to 9*d.*; and 80's. to 100's, 6*d.* to 6½*d.* The following prices were realized for 32 packages West Indian brought forward on the 18th, 66's. 7*d.* 68's. to 78's. 5¾*d.* to 6½*d.*; 92's to 102's, 5*d.* to 5¾*d.*; and 118's, 5½*d.* At the fisst spice auction on the 3rd, 39 packages West Indian mace were sold; fine bold fetching 2*s.* 8*d.* ordinary to fair 2*s.* 1*d.* to 2*s.* 4d. and broken 1*s.* 11*d.* to 2*s.* 1*d*; 22 cases of Java were also offered and 11 sold, 2*s.* 4*d.* being paid for pale reddish and 2*s.* 3*d.* to 2*s.* 4*d.* for heavy dark red. A week later a few lots of West Indian were sold at 2*s.* 3*d.* to 2*s* 4*d.*, while broken fetched 2*s.* 2*d.* On the 17th there was a steady demand for West Indian, sales being effected at 2*s.* 7*d.* per lb. for bold pale, 2*s.* 4*d.* for fair, and 2*s.* 2*d.* for red. Three cases of Wild Bombay were sold without reserve at 6⅜*d.* to 6⅝*d.* per lb. Of Pimento there is little or nothing to report. At the beginning of the month none was offered at auction, but privately it was quoted at 2⅝*d.* per lb., the later offerings have all been brought in at about the same price.

ARROWROOT.

This article has been quiet at auction, through the month. On the 3rd 20 cases of Natal were brought forward, as well as 10 half barrels of Bermuda, the former were bought in at 10*d.* per lb. and the latter at 1*s.* 6*d* These consignments were submitted to auction again on the 17th, with similar results, and in addition 20 barrels of fine St. Vincent were also offered and bought in at 3¾*d.* per lb.

SARSAPARILLA.

At the first drug auction of the year, on the 11th, the offerings of sarsaparilla were exceedingly small, consisting of 2 bales of grey Jamaica, 8 of native Jamaica, and 3 of Honduras. For the 2 bales of grey Jamaica, for fair, somewhat coarse, 1*s.* 10*d.* to 1*s.* 11*d.* per lb. was paid; of the native Jamaica, 2 bales only found buyers, fair red selling at 1*s.* 1*d.*, and dull red at 11½*d.* per lb.; red and yellow mixed were held at 1*s.* 1*d.* per lb., while the 3 bales of Honduras fetched 1*s.* 5*d.* per lb. At the auction on the 25th, 19 bales of grey Jamaica, 2 of native Jamaica, and 2 of Mexican were submitted; the whole of the grey Jamaica met with a ready sale, at from 1*s.* 11*d.* to 2*s.* per lb., fair fibrous, partly dark and coarse, fetching 1*s.* 10*d.*: the 2 bales of native Jamaica went for 1*s.* to 1*s.* 1*d.* per lb. for fair red, while the Mexican was held at 1*s.* 1*d.*

KOLA, OIL OF LIME AND TAMARINDS.

At auction on the 10th, 44 packages of kola were brought forward, and 11 sold, fair halves and whole St. Lucia fetching 3¼*d.* to 3½*d.* per lb., and fair Dominica 3½*d.* At the sale on the 24th, 4 barrels of West Indian kola were offered, 2¾*d.* per lb. being paid for ordinary dull mouldy. Two cases of West Indian distilled oil of lime were offered in the early part of the month, and disposed of at from 1*s.* to 1*s.* 3*d.* per lb. At the end of the month, 1*s.* 2*d.* to 1*s.* 3*d.* was the price quoted for fair distilled, and 5*s.* 3*d.* for West Indian hand pressed. There has been a steady demand for lime juice; at the end of the month a barrel of good, raw, brown Jamaica sold at 1*s.* 4*d.* per gallon, and 2 hogsheads from Montserrat fetched 1*s.* 3*d.* per gallon. At auction on the 10th, some 16 packages of fair dry Antigua tamarinds were offered, and sold at 12*s* 6*d.* per cwt., in bond.

It is reported from Portuguese East Africa that large trees of a species of Balanites, producing fruits whose kernels yield freely a fine oil, not unlike olive oil, have been discovered in the Lebombo Mountains and on the Umbeluzi River. The return from each tree at maturity is stated to be as much as 1,200 lb. of the fruits, each containing 60 per cent. of oil.

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR, February 13, 1912; Messrs. E. A. DE PASS & Co., January 19, 1912.

ARROWROOT—3½*d.* to 3¾*d.*
BALATA—Sheet, 2/3½; block, 3/4 per lb.
BEESWAX—£7 10*s.*
CACAO—Trinidad, 58/- to 69/- per cwt.; Grenada, 51/- to 56/-; Jamaica, 49/. to 55/6.
COFFEE—Jamaica, 67/6 to 74/- per cwt.
COPRA—West Indian, £26 per ton.
COTTON—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 18*d.* to 24*d.*
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—49/- to 64/- per cwt.
ISINGLASS—No quotations.
HONEY—No quotation.
LIME JUICE—Raw, 1/3 to 1/6; concentrated, £18 10*s.* to £18 12*s.* 6*d.* to £19; Otto of limes (hand pressed), 5/6.
LOGWOOD—No quotations.
MACE—Firm.
NUTMEGS—Firm.
PIMENTO—Common, $2\frac{9}{16}$*d.*; fair, 2⅝*d.*; good, $2\frac{11}{16}$*d.*; per lb.
RUBBER—Para, fine hard, 4/6½; fine soft, 4/6; Castilloa, 4/6 per lb.
RUM—Jamaica, 1/8 to 5/-.
SUGAR—Crystals, 18/9 to 21/-; Muscovado, 15/- to 17/6; Syrup, 14/6 to 17/6 per cwt.; Molasses, no quotations.

New York.—Messrs. GILLESPIE BROS. & Co., February 9, 1912.

CACAO—Caracas, 11¾c. to 12½c.; Grenada, 11⅛c. to 11⅞c.; Trinidad, 11¾c. to 12¼c. per lb.; Jamaica, 10¼c. to 11⅛c.
COCOA-NUTS—Jamaica, select, \$25·00; culls, \$16·00; Trinidad, select, \$26·00 to \$27·00; culls, \$15·00 to \$16·00 per M.
COFFEE—Jamaica, 14½c. to 16½c. per lb.
GINGER—8c. to 10¼c. per lb.
GOAT SKINS—Jamaica, 53c.; Antigua and Barbados, 48c. to 50c.; St. Thomas and St. Kitts, 45c. to 47c. per lb.
GRAPE-FRUIT—Jamaica, \$2·75 to \$3·50.
LIMES—\$5·00 to \$5·50.
MACE—50c. to 57c. per lb.
NUTMEGS—110's, 13⅝c. to 13⅞c.
ORANGES—Jamaica, \$2·00 to \$2·50 per box.
PIMENTO—2⅝*d.* per lb.
SUGAR—Centrifugals, 96°, 4·48½c. per lb.; Muscovados, 89°, 3·98½c.; Molasses, 89°, 3·73½c. per lb., all duty paid.

Trinidad,—Messrs. GORDON, GRANT & Co., February 19, 1912.

CACAO—Venezuelan, \$12·00 per fanega; Trinidad, \$11·60 to \$11·90.
COCOA-NUT OIL—\$1·08 per Imperial gallon.
COFFEE—Venezuelan, 15½c. per lb.
COPRA—\$4·35 per 100 lb.
DHAL—\$4·20 to \$4·25.
ONIONS—\$3·75 to \$4·25 per 100 lb.
PEAS, SPLIT—\$6·90 to \$7·00 per bag.
POTATOES—English, \$1·60 to \$1·80 per 100 lb.
RICE—Yellow, \$4·60 to \$4·70; White, \$6·25 to \$6·50 per bag.
SUGAR—American crushed, no quotations

Barbados,—Messrs. JAMES A. LYNCH & Co., February 24, 1912; Messrs. T. S. GARRAWAY & Co., February 26, 1912; Messrs. LEACOCK & Co., February 16, 1912.

ARROWROOT—\$6·50 to \$7·00 per 100 lb.
CACAO—\$10·50 to \$12·00 per 100 lb.
COCOA-NUTS—\$16·00.
HAY—\$1·60 to \$1·90 per 100 lb.
MANURES—Nitrate of soda, \$65·00; Cacao manure, \$42·00 to \$48·00; Sulphate of ammonia, \$80·00 per ton.
MOLASSES—No quotations.
ONIONS—\$2·75 to \$8·00 per 100 lb
PEAS, SPLIT—\$7·00 to \$7·10 per bag of 210 lb.; Canada, \$2·75 to \$4·40 per bag of 120 lb.
POTATOES—Nova Scotia, \$1·50 to \$3·00 per 160 lb.
RICE—Ballam, \$4·85 to \$5·25 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
SUGAR—American granulated, \$5·50 per 100 lb.

British Guiana.—Messrs. WIETING & RICHTER, February 20, 1912; Messrs. SANDBACH, PARKER & Co, February 19, 1912.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	——	\$13·00 per 200 lb
BALATA—Venezuela block	No quotation	Prohibited
Demerara sheet	70c. per lb.	70c.
CACAO—Native	18½c. per lb.	18c. per lb.
CASSAVA—	96c.	No quotation
CASSAVA STARCH—	——	No quotation
COCOA-NUTS—	\$12 to \$16 per M	\$10 to \$16 per M., peeled and selected
COFFEE—Creole	18c. per lb.	16c. per lb.
Jamaica and Rio	18c. per lb.	18½c. to 19c. per lb.
Liberian	13c. per lb.	12c. to 13c. per lb.
DHAL—	\$3·75 per bag of 168 lb.	\$3·80 per bag of 168 lb.
Green Dhal	\$4·50	——
EDDOES—	\$1·90	——
MOLASSES—Yellow	None	——
ONIONS—Teneriffe	——	——
Madeira	——	8c.
PEAS—Split	\$7·25 per bag (210 lb.)	\$7·60 per bag (210 lb.)
Marseilles	——	No quotation
PLANTAINS—	20c. to 40c.	——
POTATOES—Nova Scotia	\$2·75 to \$3·00	\$2·75 to \$3·00
Lisbon	——	No quotation
POTATOES-Sweet, B'bados	\$1·20 per bag	——
RICE—Ballam	No quotation	——
Creole	\$5·00 to \$5·25	\$5·00 to \$5·25
TANNIAS—	\$2·16	——
YAMS—White	\$2·16	——
Buck	\$3·00	——
SUGAR—Dark crystals	\$3·30 to \$3·50	\$3·20 to \$3·30
Yellow	\$4·00 to \$4·25	\$4·10 to \$4·25
White	\$4·80 to \$5·00	——
Molasses	\$2·90 to \$3·00	——
TIMBER—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	\$3·75 to \$6·00 per M.	\$4·00 to \$6·00 per M.
,, Cordwood	\$1·80 to \$2·00 per ton	No quotation.

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CONTENTS.

The West Indian Agricultural Conference, 1912.

III.

THE present article forms the third, and last, of a series dealing editorially with the chief matters that received attention in discussion at the recent Agricultural Conference in Trinidad. The subjects of broad import that remain for treatment are concerned with cotton-growing, agricultural education and rubber production.

Great attention was paid to the various characters of the lint that are particularly demanded by spinners of Sea Island cotton. Those who have to deal with this lint can form a fair judgment of its value to them, by ordinary examination: the best test of it, however, is its behaviour in the spinning machines. Among the properties most required in such lint is that of strength—one of the special characteristics of West Indian Sea Island cotton. The possession of strength is a matter of much importance to those who have to use the cotton as the raw material for their manufactures, but the fact that this cotton is very likely to show irregularities often lessens the advantage of the special possession of strength by the lint. The existence of such irregularities has its effect in causing great wastage in spinning, and a consequent reduction of economy in working up the material. In connexion with this irregularity, a character specially shown by cotton from the West Indies is the presence of 'nep', or small clusters of weak cotton among the lint, varying in size.

There was much debate as to the reason why this feature is noticed so frequently in West Indian cotton, and it was decided that its production is due, not to bad ginning of the seed-cotton, but to untoward or varying conditions surrounding the plants during the period of growth. It was concluded that the best means to be employed for the reduction of the percentage of weak fibres in cotton is rigid selection, having particular regard to this property in the product of the plants raised for the purpose, and evidence was adduced from practical experience, showing that such reduction had been attained as the result of experimentation.

In a discussion of the direct causes of irregularity in West Indian cotton, it was concluded that the feature is due mainly to interruption of nutrition, whereby interference takes place with the building up of the fibres during their period of growth. As has been indicated, this irregularity in nutrition may arise from the existence of untoward conditions in regard to weather and insect and fungus pests; it is also brought about by the unequal distribution of the fibres on the seed, whereby the insufficient food-supply of these, where they are most closely crowded together, causes the production of weak fibres. It is a natural circumstance that the control of the conditions under which the plants grow is not entirely in the hands of the agriculturist, although as has been proved, much can be done toward minimizing the evil effects from pests and diseases. The circumstance is quite different as regards the distribution of lint on the seed, for the employment of proper methods of selection will have the effect of bringing about greater uniformity of this; and it may be claimed that much good has resulted already from the simple rejection of clean black seeds from material that is to be used for planting. A last matter for consideration in relation to the effects arising from unequal nutrition is that the possession of too many seeds by the boll will necessarily be a factor in reducing uniformity, and the experimenter and grower are thus faced by a condition that possesses the greatest difficulty in regulation.

The last subjects for special mention in connexion with the discussions on cotton production related to the obtaining of fixed types, to be employed in cultivation, and the increasing necessity for specialization in agriculture. It was brought forward that an important feature relating to the first of these is the making of a collection of material showing the different types of cotton, grown and found wild in the West Indies. The second subject—specialization—received its emphasis in the necessity that increases from day to day, for the assistance of specialists, on the part of agricultural departments.

The discussions at the session during which agricultural education was considered dealt mainly with the extent to which nature study and agricultural teaching should be taken up in elementary schools, as well as with the scope of such subjects in so far as they are suited for treatment in schools of the kind. Emphasis was laid upon the importance of the practical treatment of these matters and of the provision of the efficient training of teachers. Attention was also given to the means for the instruction in agricultural subjects of those who will ultimately hold positions of responsibility as practical agriculturists, and descriptions were afforded of the work that had been done in this direction in different parts of the West Indies and in British Guiana.

In the consideration of the matters brought forward in relation to rubber, a question arose, out of the information presented in the first paper read at the session, as to the kinds of soil that are best suited for Hevea cultivation, when it was stated that this may be successful, even in heavy clay soil, if the rainfall is not very large: more rain was wanted, and could be tolerated, for Hevea on lighter soils. After the elucidation of other interesting kindred subjects, the description of the exploitation of rubber in part of the West Indies and British Guiana served to show that experimentation is done on a large scale and that caution is being exercised in this work of the agricultural departments in order to provide the most accurate knowledge concerning rubber introduction and cultivation, and to guard against any inadvisable extension of the industry.

Much interest was shown in regard to the choice and manner of importation of Hevea seed, and in reference to the latter, evidence was brought forward to show that the best method of packing is that in which charcoal containing about ten per cent. of actual moisture is mixed with the seed in the parcels. The subject of the choice of seeds was discussed in relation to the importance of the possession of an exact knowledge of the nature of the trees that are employed as a source of the seed. In regard to one matter, it is natural that trees which mature earliest should be used to furnish the demand for seed; and it is a question of importance, whether such planting material is likely to yield the plants that are best for rubber production. Some observations have shown it to be probable that the age of the trees furnishing the seed is not of prime importance, as long as they are good producers of latex; though it is naturally safer to employ the older trees for the purpose, as more is known concerning their qualities.

Consideration of the question of the manner of planting Hevea seemed to lead to the conclusion that, at least as far as some experience is concerned, while wide planting is usually advocated in Malaya, close setting of the plants, with subsequent thinning, has been found successful in the West Indies. The opinions expressed as to the utility of Castilloa as a rubber producer in this part of the world differed materially; it seems that the plant may prove itself useful when planted widely in conditions that are particularly suited to it, and evidence based on its behaviour in its own country was brought forward as to the promising nature of the species *Castilloa costaricana*. Attention was given, further, to *Funtumia elastica* as a rubber producer: close planting is best for this species, but even under the most favourable conditions, as far as experience in Trinidad is concerned, the yield of rubber is small and the product poor, quickly becoming tacky.

Finally, in relation to rubber, opinions were expressed as to the future of the industry that may develop in the West Indies, and to the likelihood of the serious competition of the artificial with the natural product. As far as the first is concerned, it is likely that plantations in the West Indies will never have to compete directly with those in the East; the competition will almost certainly be only with the South American production, which suffers under the disadvantages of the existence of export taxes and of scarcity of labour. With regard to synthetic rubber, any large manufacture of this is bound to increase its price by enlarging the demand for the material—turpentine—from which it is made; and while the practicability of the ultimate extensive production of the commodity is not denied, it is likely that many years will elapse before it will be conducted on such a scale as to affect the interests of the grower of rubber.

The business of the succeeding sessions had reference to the consideration of matters that are not concerned purely with agricultural production. This article therefore completes the series, commenced in the last issue but one of the *Agricultural News*, in which it has been intended to present a broad summary of the results of the discussions at the recent Agricultural Conference.

THE FORMATION OF CALCIUM CARBONATE IN THE SOIL

The *Journal of Agricultural Science* for October 1911, contains a paper, bearing this title, which describes work that was carried out at the suggestion of A. D. Hall, for the purpose of ascertaining the nature of the organisms which are concerned with the conversion of calcium oxalate into calcium carbonate, in the soil.

The paper commences by pointing out that some of the processes in the soil tend continually to diminish the amount of calcium carbonate in it; nevertheless, soils remain fertile, when in a normal condition, without additions of calcium carbonate. This suggests that there is a balancing action, by means of which the calcium carbonate withdrawn is supplied from another source, or sources. The first stage in the investigation was a repetition of Hall and Miller's experiments to show that organisms capable of fermenting calcium oxalate to carbonate are present in the soil. A culture solution containing the necessary mineral salts, and including ammonium sulphate, as well as glucose for providing a certain amount of soluble organic matter to assist in the commencement of the growth of the bacteria, was employed. A definite amount of calcium oxalate was added to this, and it was inoculated with soil and placed in an incubator at 25° C. In a period varying from three to five weeks, it could be shown that most of the calcium oxalate had disappeared, and small crystals of calcium carbonate were found, mostly on the bottom and sides of the flasks. The observation was completed by determining by suitable means the amount of calcium oxalate left.

There is reference to the fact that attempts had been made previously, by Mr. A. Amos, B.A., to bring about this change in calcium oxalate, in pure cultures of various bacteria, and that the only one with which he obtained any success was the nitrogen-fixing organism, *Azotobacter chroococcum*.

The authors made further investigations on these lines, but found that, although a large number of bacteria, yeasts and moulds were tested in pure culture, none seemed to be able to effect the decomposition of the calcium oxalate. In the nutrient solution containing ammonium sulphate, there was usually little or no growth, among the species exhibiting the latter characteristic being *Azotobacter chroococcum*. In cases where no growth occurred, a strong culture of the organisms was taken, and after a small quantity of sterilized calcium oxalate had been introduced into it, the flask was kept in an incubator for some time. It was only in cultures of Azotobacter that any conversion to calcium carbonate took place, and this was only after all the soluble organic matter had been exhausted; the observation of Amos was thus confirmed A list is given of the organisms that did not show any power of decomposing the calcium oxalate.

The first attempts that were made for the purpose of isolating from the soil an organism that is responsible for the change were unsuccessful; better results followed the use of a clear water extract of soil in the place of the ammoniacal nutrient solution described above. 'The results were similar whether the extract was prepared from a somewhat stiff loam or from a light sandy soil, the production of carbonate being however more rapid in the case of the sand, which was extremely poor in organic matter. The lack of much soluble organic matter seems to throw the organisms back on the oxalate for their supply of carbon.' The action was shown not to be due to enzymes, by making similar experiments in which toluene or chloroform, as an antiseptic, was added to the solution: when there was no formation of carbonate, even after six weeks.

The solutions in which the change had been brought about were used for making plates in ordinary gelatine or agar nutrient media, and in most instances only one, two or three types of colonies developed. The organisms were obtained pure by sub culturing, and inoculated in fairly large amounts into sterile soil extract containing calcium oxalate in suspension. In the result, six types of bacteria were isolated, which possessed the power of changing calcium oxalate to the carbonate. The rate at which the change took place varied considerably at different times, under similar conditions, and appeared to be affected by the kind of medium on which the organism had been grown previously. An impure culture was found, on the whole, to bring about the change more quickly than any of the pure cultures, and in no case was the carbonate formed unless oxygen was present.

The conclusion is reached that it seems probable that a number of bacteria in the soil are able to oxidize calcium oxalate, if the lack of other food makes it necessary for them to employ it in nutrition.

FRUITS AND FRUIT TREES.

THE PACKING OF JAFFA ORANGES.

The gathering of oranges commences when they are yet green. The fruit is removed from the trees with a piece of stalk by means of sharp long-handled shears, but great care must be taken in cutting that the stalks do not project beyond the circumference of the fruit and that the latter is not injured by the shears, because the least wound will render it unsuitable for exportation. The work of cutting the fruit from the trees begins after the rain or dew has evaporated, and as soon as the orange is cut off it is placed in a canvas-lined basket.

When filled, the basket is carried on a boy's shoulder to the shed or store in the orchard, the floor of which has been covered with mats ready to receive the oranges. The basket is immediately emptied by a workman in the shed, who takes out the oranges two or three at a time by hand, examining them as he does so, and separating any that he may find bruised or wounded, forming with the sound ones a heap 2 to 2½ feet high.

They are left in the store from one to three days, after which they are sorted and placed in cases in the following manner. Sitting down beside the heap the workers take each orange singly, examine it and place it in one or other of four heaps of different qualities. The first quality is for oranges with close, thin, smooth peel and without any stains of scale disease or any trace of wound marks The second quality is for those similar to the first quality, except that the peel has slight stains of scale disease The third quality is made up of the large, rough and thick-skinned oranges. The oranges of these three qualities are, when sorted, wrapped in thin tissue paper and placed in cases in rows sufficiently close that they may not move during the voyage, and are shipped to England and Russia.

The cases used for oranges of the first and second qualities are 68 cm. [27 inches] long, 34 cm. [13½ inches] wide, and 27 to 28 or 30 cm. [11 to 12 inches] high.

The third quality oranges are packed in cases 1 metre [40 inches] long, and 47 cm. [19 inches] wide, and 47 cm. [19 inches] high, and consigned to nearer ports such as Constantinople and Egypt.

The fourth quality oranges, which are those attacked by diseases or bruised, are poured into cases of the same size as those used for the third quality oranges, without being wrapped in paper, and are shipped to neighbouring markets in Egypt and Syria. As soon as a case is filled up, its cover is nailed on. Other cases are sent on camels to merchants to be warehoused until sold (From the *Cyprus Journal*, January 1912, p. 602.)

KOLA TREES AND KOLA NUTS.

There has been published recently a work dealing with this subject, by A. Chevalier and E. Perrot, which forms part of a larger publication entitled *Végétaux Utiles de l'Afrique Occidentale*, by the same authors. The information given in the section under consideration is reviewed in an article that appears in the *Journal d'Agriculture Tropicale* for August 1911, part of which has been utilized in presenting the matter below.

The information published concerning kola plants before the appearance of the work of Chevalier and Perrot is considerable, but the investigations have not formed a means of determining precisely, from a botanical point of view, the real characteristics of the varieties examined, because the material available for the purpose was insufficient. On the contrary, the large number of investigations that A. Chevalier has been able to make in every part of West and Equatorial Africa, where kola plants are found, enabled him to criticise accurately the work of his predecessors. Before his researches were made, the classification of the plants was quite incomplete, and the efforts of different authors had only served to make it more obscure

The two principal causes of error that have made of no avail all past efforts to determine the relationships between different species of Cola have been firstly, that it was believed possible to differentiate the types by means of the colours of the nuts, and secondly, that it was thought that only two species existed, separable by the characteristic of seeds with two cotyledons, and of seeds with more than two cotyledons.

It has been shown by A. Chevalier that the same trees can bear nuts of different colours, and that the separation of the known types into two species, according to the number of cotyledons, does not suffice for complete classification.

It is stated in the article from which this information is derived, that the account of the past observations made for drawing up the classification that was considered until recently to be complete, and the description of the work done in determining the distribution of the different species, together form a large part of the work under review—a part which is provided with very accurate figures and with admirable plates. It is upon the conclusions given that future researches, for the purpose of completing the botanical study of kola plants must be based. It will suffice at present to give a translation of the table in which A. Chevalier has presented a classification of the kola plants discovered by him or known previously. This may be detailed as follows.

(1) *Cola nitida* (Vent.), A Chev. This is the most generally cultivated species, and from it are obtained nearly all the nuts in commerce; its seeds always possess two cotyledons. It comprises numerous varieties that may be grouped in sub-species as follows:—

(a) *Cola rubra*, A. Chev., which yields only large, red nuts;

(b) *Cola alba*, A. Chev., which gives only large, white nuts;

(c) *Cola mixta*, A. Chev., from which may be obtained red nuts, white nuts and sometimes rose-coloured nuts, from the same tree: it is the form that is most widely dispersed in cultivation;

(d) *Cola pallida*, A. Chev, which yields nuts of small size, often rosy in colour.

(2) *Cola acuminata* (Pal.), Beauv. This always gives nuts possessing more than two cotyledons.

(3) *Cola Ballayi*, Cornu. This yields nuts having four or five cotyledons, but it is easily distinguished by its very large leaves, grouped in false whorls.

(4) *Cola verticillata* (Thomm. in Schum.), Stapf. This is easily distinguished by its leaves, in whorls of three or four: it gives red nuts which are mucilaginous and possess more than two cotyledons.

(5) *Cola sphaerocarpa*, A. Chev. This constitutes a species about which little is known at present; the plant yields large, white nuts with more than two cotyledons which are probably not edible.

A chart placed at the end of the volume shows the distribution of these species: *Cola nitida* is found chiefly in West Africa, while those species with more than two cotyledons occur most commonly in Equatorial Africa.

EARLY AGRICULTURE IN THE BAHAMAS.

In the year 1874, the Bahama Islands were visited by Dr. Johann David Schöpf, a German traveller, who among other matters published the book that is regarded as the first work on American geology. The *Travels* of this savant have been translated into English for the first time, from the copy in the Library of Congress, of the United States of America. The information below has been taken from extracts supplied by the translator, and published in Bulletin No. 16 of the Lloyd Library of Botany, Pharmacy and Materia Medica. From a perusal of this, it will be seen that the agricultural conditions of the Bahamas at that time were very different from those which obtain at present, and the contrast may be heightened by reference to an article entitled Agriculture in the Bahamas, 1910-11, published in the last volume of the *Agricultural News*, page 365.

In describing Providence Island, mention is made of deserted plantations and ruined houses, and the reason for the existence of these is found in the fact that the exploitation of the timber in this and other islands was comparatively easy and lucrative, and replaced to a great extent the raising of ordinary crops. As regards the chief agricultural products of the day, coffee is said to have thriven excellently, and it is stated that several large coffee plantations were to be seen in and near Nassau. The sugar-cane also grew well, but the rocky nature of the soil prevented the land from being properly exploited, and only enough sugar for local consumption was made, the product being obtained by merely boiling the cane juice to a thick syrup. Indigo was growing abundantly; no large manufactories had been set up, however, on account of the character and small supply of the available water.

Cotton was grown to a greater extent in the other islands, than in Providence, and was regarded as one of the most certain crops. Yams were raised in large quantities, chiefly for local use, and there was some small export to North America. The dry climate did not permit of the growing of more than one crop of maize in the year, and the production was so insufficient that many cargoes were continually sent from America to supply the deficiency.

The tamarind tree is mentioned as being planted now and then. There was an export of the produce, which was prepared by removing the shells of the pods and placing the seeds, with their acid covering, between layers of brown sugar. Orange and lemon trees are mentioned, as well as what seems to be a shaddock or grape fruit under the name Soursoop. The citrus fruits grown most abundantly were limes, which are stated to have been exported in great quantity, from Providence and other West Indian Islands, to North America, 'where they are preferred greatly for punch, being juicier and sourer than lemons.' There was also an export of lime juice. Pine apples were raised in some large quantity, and exported to America and Europe; they are stated to have been sold in London at 4*s.* to 8*s.* apiece, the purchase price in the Bahamas being 4*s.* to 5*s.* a dozen. In addition to the export of the fresh fruit, there was a trade in the fruit conserved in sugar or brandy.

It is stated that almost all the Bahama Islands, except the Keys, were thickly overgrown with bush; nevertheless, large timber trees existed on some of the larger islands, which could be cut by anyone, at will. Wood cutting was, however, becoming more difficult and less lucrative. Mahogany (not only the product of *Swietenia Mahagoni*, but that of several other trees, including *Cedrela odorata*) was exported to Europe. There was also a considerable output of Braziletto wood (from *Caesalpinia brasiliensis*). Exports of lignum vitae, from *Guaiacum officinale* and *G. sanctum*, took place at times, and there was a commencement of a trade in logwood, employing trees that had been raised from seed brought from Honduras.

Under the names White Cinnamon and Eluthera Bark is mentioned Eleuteria bark (*Croton Eleuteria*), many tons of which were sent to Curaçao and other Dutch colonies for making cinnamon water, and perhaps also cinnamon oil. Cascarilla bark (from *Croton Cascarilla*) was also gathered, on some of the islands. An onion known as Squills, or the Sea Onion, was collected on the sandy shore, dried and sent to North America.

Among the remarkable or useful plants that are stated to have been growing, in addition to the above, there are included the papaw, guavas, the avocado pear, the banana, the common fig, the cashew, various palms, the custard apple and similar fruits, the wild cherry (*Malpighia glabra*), the sapodilla, the hog plum, and the manchineel and the mangrove.

In conclusion, an interesting list is given of the commoner plants flowering in the Bahamas in April and May.

WEST INDIAN COTTON.

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

Since our last report, between four and five hundred bales of West Indian Sea Island cotton have been sold at hardening rates.

The sales comprise Montserrat and Virgin Islands 17*d.* to 18*d.*, St. Kitts 18½*d* to 20*d.*, with some superfine lots 21*d.* to 23*d.*, and St. Vincent 22*d.* to 24*d.*, with a few exceptional bales at 25*d.*

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending February 17, is as follows:—

There has been a moderate demand this week, which resulted in the sale of some lots of old, crop cotton, which the owners consented to sell on a basis of quotations. There is no demand for the Planters' Crop Lots classing Extra Fine, which the Factors are showing more disposition to sell, and would make some concession from present asking prices.

We quote viz :—

Extra Fine	32c. = 18*d.*, c.i.f., & 5 per cent.
Fine to Fully Fine	26c. to 28c. = 15*d.* to 16*d.* c.i.f. & 5 per cent.
Fine to Extra Fine, off in preparation	18c. to 25c. = 10½*d.* to 14¼*d.* ,, ,, ,,

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Insurance of West Indian Cotton.—A new notice concerning the West Indian All Risks Policy for insurance by the British Cotton Growing Association shows that an alteration has been made in the direction of an additional rate of premium, amounting to 2*s.* 6*d.* per cent., on cotton transhipped by a sloop or drogher in the West Indies; this is in addition to the 8*s.* 9*d.* per cent. net for Jamaica, 10*s.* per cent. for Barbados and 12*s.* 6*d.* for the other islands. The amount of the premium will be deducted, as before, from the account sales. The addition has been made because of the buying of cotton in the Grenadines, and its transhipment to St. Vincent in sailing boats, and it is advised by the British Cotton Growing Association, in order to avoid any possible trouble, that planters whose cotton is likely to be shipped or transhipped in this way shall give notice to the Association beforehand, and also supply similar information when the cotton is shipped from the West Indies by the ocean steamer.

THE BRITISH COTTON GROWING ASSOCIATION.

The following account of a recent meeting of the Council of the British Cotton Growing Association has just been received :—

The ninety sixth meeting of the Council of the British Cotton Growing Association was held at the Offices, 15, Cross Street, Manchester, on February 6.

In the absence of the President (the Right Hon. the Earl of Derby, G.C.V.O.), who had been commanded to attend the Thanksgiving Service at St Paul's Cathedral, Mr. John E. Newton occupied the Chair.

WEST AFRICA. Considerable progress has been made by the Government during the past year in the construction of roads in the cotton-growing districts of Lagos, and the Association's Staff is now better able to inspect the farms where the bulk of the cotton is produced.

The latest reports from Lagos are to the effect that the crop will be a late one, but there is every reason to believe that a larger area was planted with cotton than in 1910. As the Harmattan season is not yet over, it is not to be expected that the crop will come through without suffering to some extent, but allowing for this it is expected that the crop will not be less than 7,000 bales.

The purchases of cotton in Lagos for the month of January were 147 bales, as compared with 92 bales for January last year, and 87 bales for 1910.

A cable has been received from Northern Nigeria stating that the purchases for December were 175 bales, and it is estimated that the crop this season will amount to not less than 2,000 bales.

UGANDA. The new crop is now beginning to come forward, and there is every reason to believe that the production will exceed that of last year, when 19,000 bales of cotton were exported from the Protectorate.

RHODESIA. The Association's representative, who has recently made a tour of inspection through the Fort Jameson district of North-east Rhodesia, is quite convinced of the future of this country for cotton, and estimates that, during the present season, there will be 4,000 acres under cotton cultivation. In order that experiments may be made to evolve a suitable type of quick-maturing cotton for the higher altitudes, several varieties of American seed are being obtained, and a number of varieties which have done well in the Nyasaland Uplands. The area of land suitable for cotton is practically unlimited, and the terms on which land can be obtained are most advantageous. Up to quite recently it was necessary to carry the cotton in small bales on the heads of natives for a considerable distance; but a good road has been constructed from Tete, and waggons have been sent out for transport purposes from Fort Jameson to Tete; as a consequence the freight charges on cotton have been reduced considerably.

SUDAN. Mr. Hutton (the Chairman of the Association), who will shortly be returning from his visit to Egypt and the Sudan, reports most favourably on the developments in the Tayiba district, and a shipment of 200 standard bales of cotton is now on its way from Port Sudan.

A statement regarding the present position of the capital of the Association shows that the balance remaining to be raised for the completion of the total authorised capital of £500,000 is £25,589.

RUBBER-YIELDING PLANTS FROM PERU.

The following information concerning rubber-yielding plants recently collected in Peru is taken from the *Kew Bulletin*, 1912, p. 74 :—

Mr. W. Fox, on a recent journey in the territory between the rivers Putumayo and Caquetá, collected five rubber-yielding plants, about which he has furnished the following particulars. *Hevea Foxii*, Huber, is by far the most common and the best rubber-yielding species, and is the source of the Para rubber of commerce from this region. This species bears the vernacular name of Ituri or Iserai, but these names also appear to be applied to another species of Hevea, allied to *H. lutea.* Of the rubber exported from this region 75 per cent. is derived from *Hevea Foxii*, and these trees are the only ones which are properly tapped. All the other rubber plants are cut down for the extraction of their latex.

The Hevea is tapped by incisions made with a machete, and the latex is allowed to run down the tree to the ground, where it coagulates. The rubber is recovered in strips, which are taken to a stream and washed, and it is then rolled into rabos or tails, in which form it arrives in London. This crude method is due to the wide area over which the trees are scattered.

Micrandra minor, Benth., bearing the vernacular names Huemega or Wakati Ewickeri, was found fairly evenly distributed, but was becoming scarce owing to the destructive methods of working. The latex of this tree is mixed with that of the Hevea, and is also used for wrapping the rabos or tails.

A species of Castilloa, probably *C. elastica*, though somewhat different from the type, was also collected, but as leafy specimens only; it bears the name Caucho negro or Efacone. It is only found in quantities near the Caquetá and Putamayo Rivers. The sections where the valuable Castilloa occurs have not yet been much worked, so that its destruction is not so marked as is the case with the other trees.

Another tree yielding rubber is the Minyadotana, a new species of Zschokkea described in the *Kew Bulletin* 1912, p. 38, under the name *Z. Foxii*, Stapf. The tree is not very widely spread, and is becoming scarce owing to the methods of working. The latex is used for mixing with that of the Castilloa and the Hevea.

Lastly, a gutta-yielding plant was found which is probably *Sideroxylon cyrtobotryum*, Mart. This plant, which is known by the native name Arórate, is rare and was met with only at Oriente, near the Igara Parana, and the yield is therefore a negligible quantity

SORE SHINS IN HORSES.

The condition known as sore shins is an inflammation of the periosteum, or sheath, which covers all the bones; it is found on the anterior portion of the metacarpal, or cannon bone, from the knee to the fetlock, particularly in the lower third. It only occurs in the fore legs.

CAUSES. It is dependent on the concussion brought about by fast work, especially if on hard ground, before the bones are able to stand the strain. Hence it is almost confined to race-horses, the legs of which, from the nature of their work, are likely to be affected, and two-year-olds are more liable than three- or four-year olds; while the condition is almost unknown after that age.

The inflammation commences at the epiphyseal cartilages at the end of the bone, extends along the bone, and may affect its whole length in rare cases. If it is very severe, the bone itself is involved, and necrosis, or death, of the bone may result.

SYMPTOMS. Usually, it develops suddenly, generally after hard exertion, and shows itself by severe lameness. The horse rests the affected leg, and 'points' the foot. If both legs are attacked, the animal rests them alternately. The leg is carried forward stiffly, and the length of the step is short. The swelling is confined to the cannon bone, usually in the lower part, and is tense and puffy, later becoming softer and more elastic. It is due to an inflammatory exudate poured out between the periosteum and the bone, which in health are in close apposition. The pain is from the pressure of this exudate on the delicate nerves of the periosteum, and is increased by the inelasticity of that membrane.

In very acute cases, the horse may show constitutional symptoms—fever, with increased pulse and signs of general disturbance.

In a given instance, it may be said that the chances of complete recovery are favourable if the condition is recognized early, the exudate being absorbed, though slowly, leaving no sign. If training is continued, the symptoms return, and are more severe. On the other hand, if the exudate be already large in amount, permanent thickening of the bone results, either in the form of nodules, or in thin layers on the surface of the bone.

TREATMENT. The first signs of lameness should be carefully looked for, and the work of the horse at once stopped. Cold water, with astringents such as the usual salts of lead or zinc, should be applied to the legs, to check the amount of exudate, while, if the pain is excessive, a sedative such as opium may be used. Gentle pressure is also beneficial. Medicinal agents, in the form of laxatives and febrifuges, may be usefully employed, if constitutional symptoms are manifested. After the acute stage is over, iodine and similar agents promote absorption of the exudate, and prevent bone formation. A blister is commonly advised at this stage. In those cases which do not yield to treatment, surgical interference may be resorted to, though experience shows that the results are not always successful.

Recovery is aided by a long rest, and the horse must be brought back into training gradually, or the trouble will recur.

If the horse has not been unduly overworked, and yet the condition arises, it is probable that the animal's legs are not equal to the strain of hard work, and it becomes a question if training as a race-horse may be profitably continued.

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. XI. SATURDAY, MARCH 16, 1912. No. 258.

NOTES AND COMMENTS.

Contents of Present Issue

The editorial in this number constitutes the third and last article dealing chiefly with matters that received discussion at the recent Agricultural Conference.

An article on page 83 describes interesting and important work that has been conducted recently in connexion with the formation of calcium carbonate in soils.

Information available in an old work dealing with travels in America forms the subject of an abstract on page 85, describing early agricultural conditions in the Bahamas.

Attention is drawn to a note, on page 86, concerning certain changes in the terms of insurance of West Indian cotton by the British Cotton Growing Association.

An interesting article, dealing with sore shins in horses, appears on page 87.

The Insect Notes, in this issue, are given on page 90. They have for their subject an account of the sugar-cane beetle that has proved such a menace to the sugar-cane industry of Mauritius, and against which an energetic campaign has been conducted recently. Special interest attaches to this insect, from the fact that it is found in parts of the West Indies, where it is apparently controlled by natural enemies.

The Fungus Notes, on page 94, comprise the former of two articles dealing with the bud rot of the cocoa-nut palm.

Information Regarding the Mango.

A list of some of the authorities that may be consulted for information concerning the mango is given in the *Pomona College Journal of Economic Botany* for December 1911, and is reproduced here for information, as follows.

Woodrow, The Mango: Its Culture and Varieties, Paisley, 1904; Collins, The Mango in Porto Rico (Bureau of Plant Industry, Bulletin No. 28), Washington, 1906; Higgins, The Mango in Hawaii (Hawaii Agricultural Experiment Station Bulletin No. 12), Washington 1906; McMillan, A Handbook of Tropical Gardening and Planting, Colombo, 1910; Jumelle, Les Cultures Coloniales, Paris, 1901; Hartless, A Tabular List of Mangos Grown at the Government Botanic Gardens, Saharanpur, U.P., India; Yearbooks of the United States Department of Agriculture for 1901, 1907, 1908 and 1910; Catalogue of Government Botanical Gardens, Saharanpur India, 1907; Catalogue of Tropical Fruit Trees, William Bros., Heneratgoda, Ceylon, 1907; Catalogue of Royal Palm Nurseries, Oneco, Florida, for 1911-12; Inventories of Bureau of Plant Industry, United States Department of Agriculture.

The Rainfall of Dominica, 1911.

The rainfall returns of Dominica for 1911 show that the greatest precipitation was received at Gleau Manioc, Saltoun, Long Ditton and Corlet, with 270·47, 249·45, 230·76 and 219·59 inches, respectively; at no station other than these was more than 200 inches registered. Gleau Manioc has received the highest rainfall of all stations, during the last four years, the figures for the first three being: 1908 236·18, 1909 258·82, and 1910 302·56 inches.

As in the past three years, Batalie has received the smallest precipitation, in this instance 62·41 inches. It is followed by Macoucherie with 66·36, Wall House with 81·33, and Picard with 82·59 inches. The increase in the rainfall, even at those stations where it is usually low, which took place in 1909, has not been maintained to the same extent as it was during 1910.

As was mentioned in the last volume of the *Agricultural News*, p. 137, the average precipitation for the years since 1907 and 1908 had been about 30 inches higher than it was in those years. This increase has been maintained in 1911, but not to the same extent as was the case in 1909 and 1910, in which the mean for thirty-four stations was 137·36 and 136·59 inches, as compared with the mean for thirty-six stations in 1911, which was 132·69 inches; the basis of this comparison is not strictly correct, owing to the fact that, in the last-mentioned year the average was cast from a larger number of stations.

In regard to the distribution of the rainfall, the averages in the different districts were as follows: fourteen Leeward Coast stations 94·66, three Windward Coast stations 133·64, twelve Inland stations 190·85, and six La Soye Coast stations 108·53 inches.

Agricultural Teaching and Hygiene in Grenada Elementary Schools.

The Report on the Primary Schools, Grenada, for 1910-11, published in the *Government Gazette* for January 15, 1912, states that good results were obtained in many schools in the theoretical teaching of subjects connected with agriculture. Little use is made, however, of school gardens, in connexion with this work, but it is expected that the fact that in a few cases bonuses were given for school plots, as a result of the examinations of 1911, will stimulate teachers and managers in the re-establishment of the gardens. It is evident that teaching of this kind cannot possess useful results unless it is accompanied by proper demonstrations, and practical work with plants on the part of the pupils.

A favourable report is given on the teaching in sanitation and hygiene, and good results have been obtained in the subjects, even by lower division schools, although it forms no part in their curriculum.

The St. Vincent Arrowroot Growers' and Exporters' Association.

The report of this Association for the period ending December 31, 1911, was presented at its first annual general meeting, held in Kingstown on January 24, 1912. The formation and objects of this Association have been dealt with already in the *Agricultural News*, Vols. IX, p. 285: X, pp. 9 and 220.

In regard to advertising, it had been decided that, as funds to be collected under the Arrowroot (New Market Fund) Ordinance would not be available until December 1910, this should commence in January 1911, and meanwhile information was to be collected in connexion with the matter. His Honour the Administrator placed at the disposal of the Committee useful information in regard to the exploitation of arrowroot in Canada; the assistance was also obtained of Mr. A. E. Aspinall, Secretary of the West India Committee, and of Mr. A. S. Durrant, of New York. By this means, the Association has been placed in communication with several countries, and samples of arrowroot, together with advertising matter, including the Guide Book to St. Vincent, written by the Hon. Mrs. Murray, have been distributed in Europe and the United States. Efforts have also been made for the expansion of trade in the West Indies, and in addition to the work done through commercial firms in Canada, there was the placing of advertisements in journals and handbooks circulating in that country, one of these being *The West Indies in Canada*, published by this Department. Another more detailed effort consisted in the provision of an exhibit, with accompanying copies of illustrated booklets, at the National Exhibition in Toronto. In the report, a list of firms in Canada and the United States, who may be interested in arrowroot, is inserted provisionally.

Among general matters, it is shown that there is at present no tendency to over-production of St. Vincent arrowroot. The success gained already has caused the Association to urge strongly that the Ordinance mentioned above be renewed for two years, reckoning from December 1, 1912. Finally, grateful appreciation is expressed of the interest that the Administrator, the Hon. C. Gideon Murray, has shown in the formation of the Association, as well as of the assistance that has been afforded by His Honour.

A New So-called Ground Nut.

The *Agricultural News*, Vol. IX, p 340, contained an account of the Bambarra ground nut, which is known botanically as *Voandzeia subterranea*. It is announced by the *Bulletin of the Imperial Institute*, from information given in *Der Tropenpflanzer* 1911, p. 273, that another plant has been discovered, in Togoland, which is similar to this plant and to the ground nut, in that it ripens its fruits below ground. It occurs in three forms yielding seeds of different colours, and is called by the natives in Togoland Kandela, and by those in Dahomey Doi. It has been named *Kerstingiella geocarpa*, and has been already described from Dahomey under the name *Voandzeia Poissoni*. The seeds are about ⅜-inch long and nearly ¼-inch broad, and are stated to possess a pleasant flavour. So far, the plant has only been seen in cultivation.

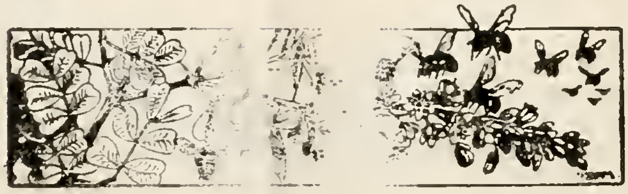
Legislation Against Noxious Weeds in Grenada.

The Grenada *Government Gazette* for January 3, 1912, publishes the draft of a Bill for an Ordinance that may be cited as the Noxious Weeds Ordinance, 1912.

Under the regulations of this Ordinance, noxious weeds on land have to be removed by the persons responsible in respect of the land, and further, such persons are bound to report the occurrence of noxious weeds to a Justice of the Peace, Magistrate or Inspector under the Ordinance, or at the nearest Police Station, or direct to the Superintendent of Agriculture.

The Ordinance gives power to inspectors to enter upon any land, whether it is enclosed or not, for the purpose of ascertaining if any noxious weeds exist thereon. If such plants are found, notice is given to the person responsible, requiring him to clear the land within a time specified in the notice. The Ordinance, further, provides for penalties for disobedience and for the removal by inspectors of neglected weeds, at the expense of the delinquents.

For the interpretation of the Ordinance, the term Noxious Weeds is intended to include any plant which the Governor may, from time to time, with the consent of the Legislative Council, signified by resolution to that effect, declare by Order published in the Gazette to be a noxious weed, either throughout the whole colony or in one or more districts or portions of districts thereof.



INSECT NOTES.

THE SUGAR-CANE BEETLE IN MAURITIUS.

In a recent number of the *Agricultural News* (see Vol. X, p. 314) a short note appeared on the subject of a new sugar-cane pest in Mauritius. This pest was the larva of a hardback beetle which had made its appearance in that island, and had caused a considerable amount of loss by the injuries inflicted on the growing cane.

Since the time that this beetle was first reported, it has attracted attention from all parts of the sugar-growing world, on account of the very serious nature of the damage done by it, and also because of the fact that it is seemingly a new form, certainly new to Mauritius, and, up to the present time, apparently not identified in any published account of the insect.

The enormous numbers in which these insects have occurred are shown in two letters which have been received by the Imperial Commissioner of Agriculture from a correspondent in Mauritius. In one of these, dated December 15, 1911, it was stated that the adult beetles were being captured in large numbers, over 390,000 having been taken in a single night; a postscript added on the 19th of the month gives the record of 1,372,000 beetles taken in one night.

The method adopted for the capture of the beetles is ingenious. This work is done by East Indians—men, women and children—who stick small branches of trees into the ground, in fields where the insects are known to abound. The branches, having the appearance of small shrubs, are placed irregularly, at no fixed distance apart; this may vary from 15 to 50 feet. At dusk, the insects come out of the ground and settle on the branches from which they are collected by the Indians, who are provided with small hand lamps. The insects are taken to the officer in charge of the work, and are paid for at a given price per thousand.

In another letter from the same correspondent, under date of December 28, 1911, the Imperial Commissioner was informed that the record capture for the season amounted to nearly 3,000,000 of the beetles in one night, while the total number for the months of November and December exceeded 25,000,000. During the latter part of December, however, there was a decided falling off in the number of insects taken, the last figures received being 275,000, for one night near the end of the month.

It would appear from the information received that the collecting of the adults, especially towards the end of the year, was the control method on which the greatest dependence was placed; although it is possible that experiments with other methods may have been under progress, and will be reported upon later.

A question of very great interest in connexion with the outbreak of the beetle in Mauritius is that of its identity, relationship and original home. There seems to be no doubt that it is a recently introduced form in Mauritius, and the fact that it occurs in the vicinity of the Gardens at Pamplemousses, gives rise to the surmise that it may have been introduced among plants imported for the gardens.

A letter in the *West India Committee Circular* for December 5 last suggests a relationship between the Mauritius beetle, and the Lachnosterna beetle in Porto Rico and Cuba.

In the *Agricultural News* for February 17, 1912 (Vol. XI, p. 58) there appeared an article on The New Zealand Grass Grub, in which mention was made of several root-eating grubs, and of the general relationships between them. In the first of the letters quoted above the correspondent refers to the article in the *Agricultural News* (Vol IX, p. 186) entitled The Hardback Beetle, stating that the brown hardback which is mentioned there seems to be very similar to, if not the same as, the beetle causing so much injury in Mauritius. This is the brown hardback which has often been referred to in publications of the Imperial Department of Agriculture as *Cyclocephala* sp.

At the West Indian Agricultural Conference in Trinidad, one of the delegates was Mr. Guy A. K. Marshall, Scientific Secretary to the African Entomological Research Committee. Mr. Marshall, who has made a special study of Coleoptera, brought with him to the West Indies specimens of the Mauritius beetle which he had received from the island. These specimens were compared with hardbacks in the collection of the Imperial Department of Agriculture, when it was found that the sugar-cane pest of Mauritius is the same as the common brown hardback in Barbados, but the examination showed that the brown hardbacks from other islands belong to the genus Cyclocephala, while the Barbados species is distinct.

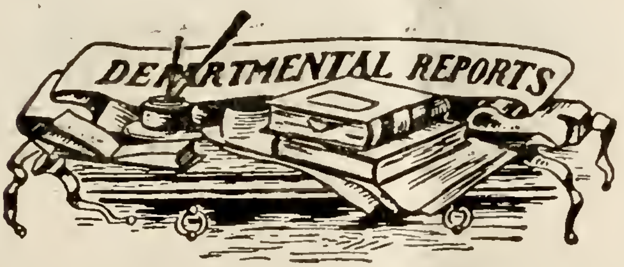
Mr. Marshall was able to state that the sugar-cane pest of Mauritius has been described under the name of *Phytalus smithi*, Arrow, and that the Barbados brown hardback is the same species. The published description in which this name is used has not yet been received, although it may have appeared before this time.

It is naturally of considerable interest that, while the brown hardback in Barbados is not recognized as being of any importance as a pest in that island, in another part of the world the same species should develop to such enormous numbers and should become a pest of such great economic importance.

It is well known that insects are much more serious pests when introduced into a new locality than in their native homes, and this is generally attributed to the fact that in the former of these situations they are not checked by the activities of their natural enemies, which occur in their native habitat.

If Barbados, or another West Indian island, is the native home of this pest, it would seem probable that there must be some very efficient natural enemy, which is able to control it. Careful and systematic observations of the natural enemies of the hardback beetles throughout the West Indies might result in the discovery of the natural enemies which are responsible for keeping these insects reduced to comparatively insignificant numbers.

In regard to the occurrence of the leaf-blister mite (*Eriophyes gossypii*) as a pest of cotton in the West Indies, Barbados has, so far, been regarded as free from the presence of this enemy of the cotton planter. It has, however, been found quite recently in several cotton fields in that island.



ST. KITTS-NEVIS: REPORTS ON THE BOTANIC STATION, ECONOMIC EXPERIMENTS AND AGRICULTURAL INSTRUCTION; ALSO ON AGRICULTURAL EDUCATION, 1910-11.

It is shown, among the first matters dealt with in this report, that the condition of the Botanic Garden in St Kitts has been maintained, and that efforts have been made for its improvement. Hedges of bread-and-cheese (*Pithecolobium Unguis-cati*) have made good progress, except where they have suffered from attacks of what is apparently a root disease. The letting of the lawn for recreation and games continues to be appreciated. In regard to economic plants, success has been obtained with onions; but the want of an external market prevents an onion-growing industry from extending. There has been no increase in cacao-growing during the year, though success has been obtained on experimental estate areas, in the island of St. Kitts. The area in rubber cultivation remains the same as it was in the previous year; it is occupied by *Castilloa elastica*, *Funtumia elastica* and *Hevea brasiliensis*. The lime industry has been retarded by attacks of scale insects, particularly by the purple scale (*Lepidosaphes beckii*), and material bearing fungus parasites has been introduced from Dominica; no definite results as to the effects of the introduction are yet apparent, but these are awaited with interest. A succeeding section of the report gives information concerning the agricultural show held during the year under review, and regarding the work of the Permanent Exhibition Committee, chiefly in connexion with the Canadian Exhibitions.

The experiments of an economic nature deal mainly with food plants, green dressings, tobacco, cotton, limes and sugar-cane, and the work of this kind is closely connected with the distribution of planting material, of which a fairly large and varied quantity was sent out. Trials with yams gave, among other matters, inconclusive results as to the effects of staking. With cassava, a test of the variety Black Stick did not support its reputation as a heavy producer. No definite results were obtained as to the value of liming lands for growing ground nuts; among the exotic varieties of ground nuts, the Spanish is mostly in demand, on account of its small marketable size, early maturity and easy and cheap harvesting. A trial was made of the Bambarra ground nut (*Voandzeia subterranea*), and this work will be continued.

On the averages of eight years' experiments, Caroline Lee, Spooner, White Gilkes and Red Bourbon have shown themselves the four best varieties of sweet potatoes, as regards return. Mazzagua Guinea corn was tried, and its prolificness has caused it to receive much attention from growers. Among other plants in relation to which the chief interest exists are pine-apples, onions, tobacco and *Tephrosia candida*.

Manurial experiments with cotton have continued to show the value of good cultivation, with small applications of farmyard manure. Lint from selected plants was sent to Mr. A. H. Dixon, of the Fine Spinners' and Doublers' Association, Limited, who kindly made a report on it, which is reproduced. The usual cotton selection work has been continued, and hybrids have been made between Sea Island and native St. Eustatius. The estimated area of cotton in the Presidency, during the season under report, was 3,800 acres, made up as follows: St. Kitts 1,500 acres, Nevis 1,300, Anguilla 1,000 acres; the return of lint, as far as could be ascertained at the time of the writing of the report, was: St. Kitts 323,894 lb., Nevis 331,757 lb., Anguilla 123,695 lb., making a total of 779,346 lb. Finally, with respect to St. Kitts, as regards sugar-cane experiments, the total number of plots reaped during the season was 530; 290 of these were concerned with varieties, plants and ratoons, and 240 with manurial experiments with ratoons.

A list of the plant distribution, at the Experiment Station in Nevis, shows that this has comprised a large part of its work. The experiments were chiefly concerned with food crops, cotton, limes, broom corn and green dressings. As regards economic plants, comparatively new to Nevis in any quantity, the chief success is expected with limes and onions; the results with cacao are, up to the present, somewhat disappointing. A scheme of experiments with sugar-cane, similar to that in Antigua and St. Kitts, is being followed, on a smaller scale, in Nevis. The cotton selection carried out for providing peasant growers with good seed, has been successful, particularly in that the returns of cotton raised by small cultivators compare favourably with those from estates.

The report on agricultural teaching at the Grammar School, St. Kitts, shows that the work has been carried on according to the usual scheme, except that an alteration has been made in the time-table whereby all the pupils in the school study botany as well as chemistry. The information concerning this work is amplified by the inclusion of a special section describing, in more detail than is usual, the science instruction at the St. Kitts-Nevis Grammar School.

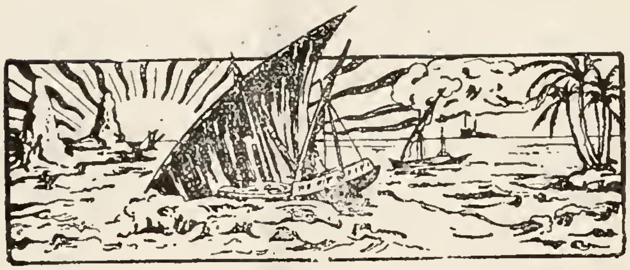
VITALITY OF PARA RUBBER SEEDS.

An account of observations on the duration of the vitality of Para rubber seeds is given, as follows, in the *Agricultural Bulletin of the Straits and Federated Malay States* for December 1911:—

On January 31, a box of 600 Para rubber seeds was packed for a German planter to go to German New Guinea. The seeds were packed as usual in a tin box 12 inches long, 8 inches wide and 5 inches deep, in layers of burnt rice husk, and the box was covered with canvas stitched over it. The planter, however, omitted to leave any address or instructions for shipping the box, as he intended to do. The parcel remained unopened until July 13 (a period of five months and thirteen days), when the lid was taken off and the box left open by a window. By the end of the month fifty-three of the seeds had germinated and thrown up strong stems.

A hundred of the others were removed and put in a pan and of these, three germinated.

No particular care was taken of these seeds and it is probable that if they had been carefully treated more would have germinated. The duration of the vitality of these seeds for nearly six months, enclosed in a box, shows that the Para rubber seed has greater lasting powers if properly packed than would be expected. I believe this is the longest record of duration for this seed.



GLEANINGS.

The distribution from the St. Lucia Botanic Gardens during January comprised 4,760 plants, including 4,050 lime plants and 150 cacao plants. In addition to these, 163 packets of seeds were sent out.

The chief exports from St. Vincent during November last comprised: arrowroot 162,254 lb., Sea Island cotton 17,283 lb. (48 bales), cotton seed 78,339 lb., muscovado sugar 53,450 lb., molasses 2,025 gallons, cacao 34,425 lb.

During last month, the number of plants distributed from the Dominica Botanic Station was 3,468. These included: limes 1,600, Para rubber 1,300, cacao 200, shade trees 200, Eucalyptus 86, grafted mangoes 11, miscellaneous 71.

In a notice by the St. Lucia Agricultural Department, it is intimated, for the information of planters in the island, that preparations are being made by the Department for raising a large number of plants of Para rubber for local distribution during this year.

The *Experiment Station Record* for August 1911, p. 109, gives a note on a method for the estimation of citric acid in citrates and lemon juices. In this, the citric acid is precipitated as calcium citrate, which is heated with sulphuric acid, and the amount of carbon dioxide that is driven off measured. This amount depends directly on the quantity of citric acid that was present.

Returns received from the Superintendent of Agriculture, Barbados, show that the area of cotton grown in the island during the period January to December 1911 was 4,670 acres. Of this 4,401 acres comprised cotton planted in that season, while 269 acres consisted of so-called ratoon cotton, that is cotton which had been allowed to spring again from the last season's plants.

An account is contained in the *Bulletin of the Bureau of Agricultural Intelligence and of Plant Diseases* for March 1911, p. 629, of a plant named *Atractylis gummifera*, belonging to the Compositae, which is found almost throughout the Mediterranean region, and is very common in Sicily, in open, rocky, dry, situations. Analyses have shown that the plant produces a latex containing about 23 to 36 per cent. of rubber which, it is stated, might be used industrially. The means of propagation are apparently by cuttings or from seed.

Among the matters of recent interest in connexion with the Antigua Botanic Station has been the importation of twenty-nine new species of Eucalyptus. The plants distributed from this station during February last included 15,500 cane cuttings and fifty cocoa-nut plants. During that month, a cane mill and oil engine were imported in connexion with the experimental work that is conducted with sugar-canes.

A method for protecting seeds from rats, mice or birds is suggested in the *Garden and Field* for January 1912. This consists in adding water or kerosene to the seeds in sufficient amount just to moisten them, stirring them well, and then adding a small quantity of red lead and stirring again until each seed is given a coating of this substance. It is claimed that even if seeds so treated are attacked by vermin, these will not return once they have experienced the results.

Some of the sections of the meeting of the British Association for the Advancement of Science, to be commenced in Dundee on September 4 of this year, under the presidency of Professor A. E. Schäfer, F.R.S., will be held with the following as Presidents: Chemistry, Professor A. Senier; Botany, Professor F. Keeble; Agriculture, Mr. T. H. Middleton. It will be noticed that this is the first meeting of the British Association at which Agriculture has comprised a complete section.

The *Annual Report of the Ontario Agricultural College and Experiment Farm* for 1910, p. 100, contains an account of work that has been done in order to find the effect of adding various substances to lime sulphur wash for spraying. It was shown that, although a certain amount of alteration results from the addition of lime, this is not sufficient to render inadvisable such addition; the same was the case with lead arsenate and calcium arsenite, but the employment of Paris green in the same way was found to reduce the strength of the wash by almost one half.

In the *Bulletin of the Imperial Institute* for 1911, p. 346, it is recorded that Para rubber from Seychelles, submitted to brokers, was valued at about 7*s.* per lb. for light biscuits, and 6*s.* 11*d.* per lb. for dark biscuts, in London, with fine hard Para quoted at 6*s.* 11*d.* per lb. and fine plantation Para at 6*s.* 11*d.* to 7*s.* 10*d.* per lb. The physical properties of the samples examined are stated to have shown a considerable improvement on those of the previous specimens from Seychelles, and the opinion is given that there is little doubt that Hevea in Seychelles, when mature, will yield rubber of excellent quality.

The United States Department of Commerce and Labour has issued a bulletin which shows that the quantity of cotton exported from that country during the twelve months ended August 1911, was 4,007,880,368 lb., having a value of £120,327,264. In a like period for 1909-10, the similar figures were 3,241,391,972 lb. and £95,852,770, and in 1908-9, 4,440,883,763 lb. and £87,361,887. The export price per lb. of cotton lint varied from 7·2*d.* to 7·1*d.* and 4·7*d.*, for the above years in the order given. It should be stated that these export figures refer to shipments from the chief cotton ports, and are actually within about 1 per cent. of the total cotton shipments.

STUDENTS' CORNER.

MARCH.

SECOND PERIOD.

Seasonal Notes.

What matter in connexion with the life of the sugar-cane is indicated by the circumstance of arrowing? State what you know of the way in which the arrows of the sugar-cane are formed, and describe the flowers which they bear. What is the chief importance of the flowering of the sugar-cane, in regard to experimentation with the plant, and to the sugar industry. Mention any varieties of sugar canes with which you are acquainted that arrow freely; state the reason why arrowing takes place to a greater extent in some years than in others. What precautions should be employed in using sugar-cane arrows in the production of seedlings? Give a general account of the work that is done in obtaining a supply of sugar-cane seedlings.

The completion of the harvesting of limes will allow attention to be given to the cultivation of the fields. What observations and records do you make in order to obtain information as to which fields require pen manure, and which are needing artificial manures? State if you consider that all fields should be given a dressing of pen manure at definite intervals, providing reasons for your answer. What are the chief effects of applications of pen manure, in relation to the soil? What are the reasons why the land is likely to suffer through the continual use of artificial manures without pen manure? The ordering and employment of artificial manures require care, not only in the matter of obtaining the kinds best suited to the plants to be treated, but also with respect to the choice to be made where more than one kind may be used for the provision of a given element of plant food. In relation to this matter, sulphate of ammonia is dearer than nitrate of soda; what compensating circumstance is, however, possessed by the latter, and how would you compare the two manures in this respect? The manuring of lime cultivations does not usually take place during the present part of the year. Give reasons for this. What is the proper time for carrying out the mulching of lime plantations, and what is the purpose of the operation?

Observations conducted in lime fields during the wet season will have given indications as to the places where draining is required. The present time is suitable for taking advantage of these observations, in the direction of increasing the number of drains, or of deepening those that exist already. Give an account of the kinds of drainage that are needed in lime cultivation, under different conditions. Speaking generally, drains should be 3 or 4 feet deep, with the exception of contour drains that have been made only for the purpose of preventing the washing away of the soil.

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) How can plants be grown without soil, and what use has been made of the methods that are known?

(2) State broadly what beneficial kinds of work are done by bacteria in the soil.

(3) Explain what is meant by grafting, and give an account of its uses.

INTERMEDIATE QUESTIONS.

(1) Describe the way in which information is obtained as to the elements that must be provided for green plants, through the roots, in order that they may grow normally.

(2) In what ways do bacteria affect the nitrogen of the soil in regard to (a) the forms in which it is found, (b) the quantity that is present?

(3) Describe the process of grafting, in the case of any plant of commercial importance with which you are familiar.

FINAL QUESTIONS.

(1) How has it been shown that the supply of a certain amount of iron is necessary for the proper development of green plants, and what are the more obvious signs of a lack of this element?

(2) State what methods are employed, or suggested to be employed, for increasing the beneficial action of micro-organisms in the soil.

(3) Describe what occurs in the stems of two plants, or parts of plants, that have been grafted successfully the one on the other.

CAMPHOR IN GERMAN EAST AFRICA.

Notes given in the *Agricultural News* from time to time (Vols. VIII, p. 328, IX, p. 233 and X, p. 56) have summarized the results of experiments that have gone to show that the greatest yield of camphor, in proportion to the raw material, is obtained from the leaves and twigs. In relation to the same subject an article in the *Journal d'Agriculture Tropicale* for April 1911 draws attention to information contained in *Der Pflanzer* for November 18, 1907, to the effect that 300 lb. of camphor seeds were imported into that colony from Japan, in 1905; most of these were sown at Wilhelmstal, from which place young plants were sent out to nurseries at different stations, as well as to planters. The article proceeds to give attention to results with plants obtained from this source, which were planted at the station at Amani; these results were presented in the last volume of the *Agricultural News*, p. 56.

It is further stated that interest has been revived in the matter on account of the similar results that have been obtained in such diverse places as Ceylon, Italy (using old trees), the Federated Malay States (Batu-Tiga), and in Jamaica. Attention is drawn, however, to the suggestion that camphor trees thus exploited may not be able to withstand the annual removal of the leaves. In regard to this matter, the statement is made that the most detailed experiments, at Batu-Tiga and Amani (those in Italy are omitted from consideration, on account of the age of the trees), on trees three and a half to five years old are explicit on the point that, on condition that the leaves are removed to a reasonable extent, the trees do not suffer any harm. The experiments at Amani are precise on this point, and it has been shown that one-third of the foliage should be cut away; when after the following rainy season, the trees are ready for a repetition of the treatment. The practical advice based on this is that planters of camphor trees should treat these in such a way as to cause the greatest production of leaves.

The article discusses briefly the question as to the bringing about of a revolution in the camphor industry, owing to the fact that the drug may be obtained so easily and economically from the leaves, and points out the importance of the suitability of German East Africa to the camphor tree, in relation to the matter.

FUNGUS NOTES.

BUD ROT OF THE COCOA-NUT PALM.

PART I.

The bud rot disease of cocoa-nut palms has been known in the West Indies for many years, and has caused serious losses in some cases, particularly in Cuba: but although this is so, and though many workers have devoted time and attention to its investigation, its true cause has only very recently been determined, and there are still many misconceptions of its origin, and of the efficacy of the different methods of treatment that have been suggested. The account of an extensive and careful investigation, which has led to a clear understanding of the symptoms and causes of the disease, has recently been published as Bulletin No. 228 of the Bureau of Plant Industry of the United States Department of Agriculture. The work has been carried out by J. R. Johnston, late Assistant Pathologist in the Laboratory of Plant Pathology, now Pathologist to the Estacion Experimental de la Associacion de Productores de Azucar de Puerto Rico, who investigated the disease in Cuba, and also visited Jamaica, Trinidad and British Guiana, for the purpose of comparing the forms of disease reported from those localities with that found in Cuba. The results of this work are given below.

SYMPTOMS OF THE DISEASE. The account of these, in Mr. Johnston's own words, is as follows: 'The common name of the disease, bud-rot, well describes its nature, for in its acute or advanced stages the bud of the tree, i.e., the growing point in the centre of the crown, is affected by a vile-smelling soft rot which destroys all the younger tissues. At this stage most of the nuts have fallen, the lower leaves are turning yellow, and the middle folded and undeveloped leaves are dead and hang down between the still green surrounding leaves. Signs of the disease in its incipiency are (1) the falling of immature nuts; (2) a staining of the open flower spikes, partly or wholly, to a rich chocolate brown; and (3) the dying and bending over of the middle undeveloped leaves. When the nuts are being shed, investigation reveals at the base of the affected spikes a dark-coloured wet rot which spreads around the leaf sheaths, or strainers, as they are locally known. This rot appears as water-soaked areas which may reach a length of 15 or 20 cm. on both the upper and lower surfaces of the bases of the leaves. This condition often penetrates the leaf bases to a depth of 2 cm. or more, and the tissues involved in it swarm with bacteria. As the white tissues at the base of the leaf become old and green the water-soaked spots harden, and they may often be found in this condition on otherwise perfectly healthy trees.

'The rot gradually spreads from the base of one spike to another through the wet strainer. It is probable that insects carry the disease from one part to another, since there may be one or more points of infection. Gradually all the spikes become affected and shed their nuts, and the leaf stalks become so rotted at their bases that they are not able to maintain their natural position, but are pendent, often for a long time, or else fall off.

'If the infection starts in the central leaves the disease is apt to progress rapidly downward into the younger tissues, which it is very active in disintegrating, the vascular bundles being so soft as to allow the tissues to go entirely to pieces. In the centre it may progress into the trunk for a short distance and rot out the fundamental tissue, leaving only the fibres which are too hard to be disintegrated. This rot has been found, exceptionally, as far as 1·5 metres under the heart of the bud, a hard outer shell being left around the central rotted portion. Usually the decay extends in the trunk under the bud for a distance of only 0·2 to 0·5 metre and never throughout its length.

'Spots which are merely fungus infections often occur on the middle leaves. These spots spread and coalesce, leaving blackened, wet, and later, dry and dead tissues. Insects and small animals are often found in the decaying tissues, but the advancing margin of the soft rot appears to be occupied exclusively by bacteria.'

DISTRIBUTION. Johnston's principal investigations were conducted in Cuba, but he also found a bud rot with exactly similar symptoms in Jamaica, Trinidad and British Guiana. Its spread and general effect are most serious in Cuba; in Jamaica where it used to be prevalent, the destruction of diseased trees, and general sanitary measures, have reduced it very greatly, so that Johnston estimates that probably only about fifty cases existed there at the time of his visit; while in Trinidad he found it to be fairly prevalent and responsible for considerable damage. Since then, however, an active campaign for the destruction of diseased trees has been instituted by the Board of Agriculture, in the latter island, and the majority of them have been destroyed, so that only a few cases can now be found. In British Guiana the disease is present though not very virulent in form.

Diseases with very similar symptoms have been reported by other observers from the Cayman Islands and from British Honduras. Although full accounts of these are not available in all cases, and though careful comparative investigations have not been made, there is not much doubt that these diseases are the same as bud rot It may here be noted that one or two instances of a disease strongly suspected of being the same as that under consideration have been reported from certain of the smaller islands of the Lesser Antilles. Old traditions of the wholesale destruction of cocoa nut plantations still linger in some of them, and lead to the surmise that possibly at one time or another bud rot has been present in the majority.

It is interesting to note that, although there have been reports of the existence of bud rot in Porto Rico, Johnston did not find it there; neither did he observe it in New Providence Island, in the Bahamas, nor in certain small groves along the Coast of Colombia and Venezuela; while according to Professor Rolfs and Dr. Bessey, it is also absent from Southern Florida.

Diseases with similar symptoms, also attributed to bacteria, have been reported from the Philippines and Ceylon, and these are very probably the same as the West Indian disease. From German East Africa, Portuguese East Africa and Tahiti, there are reports of a similar disease which cause it to be very desirable that comparisons should be made with the local disorder. In India, a similar disease of certain palms in Travancore has been attributed by Butler to a fungus, *Pythium palmivorum*, while Coleman has found another fungus, *Phytophthora omnivora*, var. *Arecae* on the Areca palm in Mysore. (See *Agricultural News*, Vol. IX, p. 254 and Vol. X, pp. 14, 30 and 206.)

CAUSE. The disease has been attributed to very many different causes by various observers, and its infectiousness has been doubted or ignored by some. In connexion with the agents to which the disease has been ascribed, Johnston writes as follows: 'By many it has been thought due to something in the soil or to the climatic conditions, and various applications have been made to the base of the tree in the hope of curing it. Insects eating the roots and working in the trunk or in the crown have also been considered as causes. It has likewise been claimed that a mechanical injury, such as a bullet piercing the tender heart tissues, would produce a rot of the crown. It is safe to say that most of the reasons given as to the causes were based on inaccurate or incomplete observations, together with a lack of any experiments to substantiate them. The rapid spread of the disease in itself seems good evidence of its infectious nature, for it does not stop in one valley or one grove, but frequently spreads over a hillside and into the next valley, always beginning in a small way and from that spreading sporadically over the entire grove. If the disease were due to soil or to climatic changes, many or all of the trees would show signs of the rot about the same time. It could hardly be supposed that this might be accounted for by variation in individual resistance, since in the end most or all of the trees contract the disease.'

Johnston isolated strains of bacteria from diseased trees in Cuba which, when inoculated into healthy trees, produced the disease. The same bacteria were recovered from the inoculated trees, re-inoculated again, and again recovered; this proves as conclusively as possible that the organisms were the cause of the disease, which must therefore be regarded as infectious. The inoculations were made by boring a hole into the heart tissues and then injecting the fluid containing the bacteria. At the same time, control experiments were made by boring the hole without injecting the bacteria. In no case did the controls show any sign of a soft rot, so that they indicated clearly that mere mechanical injury of the heart tissues will not cause the disease.

By means of a long series of comparative culture experiments, Johnston showed that the bacteria from cocoa-nut trees infected with bud rot were indistinguishable from *Bacillus coli*—an organism found in the human colon. Moreover, pure cultures of *B. coli* caused a rot of cocoa nuts practically identical with bud rot. Thus the cocoa-nut organisms must be regarded as strains of *B. coli*. This is a most important conclusion, as it is the first instance in which a bacterium infesting animals has been found to produce a plant disease. Some further results of Johnston's work will be referred to in the next number of the *Agricultural News*.

BACTERIOLOGICAL WORK IN JAMAICA.

A supplement to the Jamaica *Gazette* dated Thursday, November 16, 1911, contains the report of Dr. H. H. Scott, M.D., M.R.C.S., L.R.C.P., Government Bacteriologist, on the work done by that officer between his arrival in Jamaica, on January 6, and the end of the official year, March 31, 1911. The work has been arranged so that part of the day is employed at the Hope Laboratory in carrying out investigations connected with the Agricultural Department, and part is devoted to consultations and pathological work at the Hospital. In the report, the work is described under the following heads: (1) bacteriological examination of samples of water-supplies; (2) veterinary pathology in connexion with the Government Farm; (3) maintenance of the culture of rat virus; (4) work in connexion with fermentation.

As regards the first of these, bacteriological examinations of the main supplies of water to Kingston are carried out every month, for the Kingston General Commissioners. The scheme according to which the samples of water are taken for examination is described, and it appears that, during the time under report, twenty-six such samples have been examined for their bacterial characteristics.

In the work connected with veterinary pathology, by far the largest number of specimens examined consisted of blood smears from cattle suspected of suffering from Texas fever, at the Government Farm; evidence was found in several cases of the presence of the typical *Pirosoma* [Piroplasma] *bigeminum*, conveyed by the bite of ticks. A matter of some general interest is that material from a horse with symptoms of lymphangitis, strongly simulating farcy, gave good specimens of *Saccharomyces farciminosus*, which is the organism of epizootic lymphangitis (see *West Indian Bulletin*, Vol. XI, p. 31).

It is stated that the results with rat virus have not, so far, been very encouraging, and reference is made in this connexion to work in Madras, Calcutta and Burma which has not succeeded in showing that the disease produced by the virus is transmissible from rat to rat. There had been no demand, recently, for the virus, in Jamaica; but the cultures were being maintained at the proper strength, in case such a demand may arise.

The work in connexion with fermentation is largely concerned with the provision of pure yeast cultures for rum manufacture. The preparation of these takes about three weeks for completion, and during the whole of this time there must exist the greatest care in order that contamination may be prevented. A matter that evidences the importance of care in the work is that a small amount of contamination at any stage of the preparation of a culture would quickly cause disastrous results, on its introduction into a distillery. This work is not merely routine in nature, as it includes a large amount of technical labour which exhausts time, but does not exhibit its existence in a large way when results are presented.

A detailed report of the work for the Medical Department shows that part of this is done on behalf of the Typhoid Investigation Committee, appointed to inquire into the prevalence of typhoid fever in Kingston and its suburbs. A disease known in the island as vomiting sickness is receiving special attention by Captain Potter, R.A.M.C., and permission has been obtained from this investigator to announce that work in collaboration, by the writer of the report, has succeeded in showing the existence, in cases of this disease, of an elongated, protozoal-looking body, in many of the red corpuscles which did not stain as a rule, but, in some few instances, gave a spot of stained substance at one end. The possibility is expressed that bodies of the kind constitute one stage of the disease, only met with at some definite period of the illness.

Considerable attention is given in this part of the report to vaccines and their employment in disease. With relation to this matter, much ignorance still appears to exist in regard to the mode of use of these bodies, and to the way in which they produce a curative condition. The fact should be properly realized that vaccines do not cure, of themselves; but that their administration causes a reaction to take place in the tissues, which brings about the removal of the disturbing influence. The conclusion from this fact may be quoted from the report as follows: 'When this idea is grasped, vaccine therapy will no longer be regarded as a "dernier ressort" to which appeal is made after everything else has been tried. Such a procedure is unfair from the points of view of both the patient and the bacteriologist. For when vaccines are tried at a late stage, after all recuperative power is lost or when it is at such a low ebb that no reaction is possible, not only has the time gone by when any treatment is availing, but the vaccine therapy in consequence falls into disrepute.'

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR, February 27, 1912; Messrs. E. A. DE PASS & Co., February 2, 1912.

ARROWROOT—3½*d.* to 4¾*d.*
BALATA—Sheet, 3/6; block, 2/6 per lb.
BEESWAX—£7 7*s.* 6*d.* to £7 10*s.*
CACAO—Trinidad, 57/- to 68/- per cwt.; Grenada, 50/- to 55/-; Jamaica, 50/. to 56/-.
COFFEE—Jamaica, 68/- to 82/- per cwt.
COPRA—West Indian, £26 per ton.
COTTON—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 17*d.* to 24*d.*
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—49/- to 64/- per cwt.
ISINGLASS—No quotations.
HONEY—No quotation.
LIME JUICE—Raw, 1/3 to 1/6; concentrated, £18 10*s.* to £19; Otto of limes (hand pressed), 5/6.
LOGWOOD—No quotations.
MACE—Firm.
NUTMEGS—Firm.
PIMENTO—Common, $2\frac{9}{16}$*d.*; fair, 2⅝*d.*; good, $2\frac{11}{16}$*d.*; per lb.
RUBBER—Para, fine hard, 4/7: fine soft, 4/6¾; Castilloa, 4/8 per lb.
RUM—Jamaica, 1/8 to 5/-.
SUGAR—Crystals, 19/6 to 22/6; Muscovado, 16/- to 19/-; Syrup, 14/9 to 18/- per cwt.; Molasses, no quotations.

New York.—Messrs. GILLESPIE BROS. & Co., February 23, 1912.

CACAO—Caracas, 11¾c. to 12c.; Grenada, 11⅜c. to 11⅝c.; Trinidad, 11¾c. to 12¼c. per lb.; Jamaica, 10c. to 11⅛c.
COCOA-NUTS—Jamaica, select, \$25·00 to \$26·00; culls, \$16·00; Trinidad, select, \$26·00 to \$27·00; culls, \$16·00 per M.
COFFEE—Jamaica, 14¾c. to 17c. per lb.
GINGER—8c. to 10½c. per lb.
GOAT SKINS—Jamaica, 53c.; Antigua and Barbados, 48c. to 50c.; St. Thomas and St. Kitts, 45c. to 47c. per lb.
GRAPE-FRUIT—Jamaica, \$3·25 to \$4·00.
LIMES—\$5·00 to \$5·50.
MACE—50c. to 57c. per lb.
NUTMEGS—110's, 13½c.
ORANGES—Jamaica, \$1·75 to \$2 25 per box.
PIMENTO—2⅝*d.* per lb.
SUGAR—Centrifugals, 96°, 4·80c. per lb.; Muscovados, 89°, 4·30c.; Molasses, 89°, 4·05c. per lb., all duty paid.

Trinidad,—Messrs. GORDON, GRANT & Co., March 4, 1912.

CACAO—Venezuelan, \$11·80 to \$12 00 per fanega; Trinidad, \$11·40 to \$11·75.
COCOA-NUT OIL—\$1·06 per Imperial gallon.
COFFEE—Venezuelan, 15½c. per lb.
COPRA—\$4·50 per 100 lb.
DHAL—\$4·20 to \$4·25.
ONIONS—\$4·25 to \$5·00 per 100 lb.
PEAS, SPLIT—\$6·90 to \$7·00 per bag.
POTATOES—English, \$1·90 to \$2·10 per 100 lb.
RICE—Yellow, \$4·60 to \$4·70; White, \$6·25 to \$6·50 per bag.
SUGAR—American crushed, no quotations

Barbados,—Messrs. JAMES A. LYNCH & Co., March 9, 1912; Messrs. T. S. GARRAWAY & Co., March 11, 1912; Messrs. LEACOCK & Co., March 1, 1912.

ARROWROOT—\$6·50 to \$7·00 per 100 lb.
CACAO—\$10·50 per 100 lb.
COCOA-NUTS—\$16·00.
HAY—\$1·60 to \$1·90 per 100 lb.
MANURES—Nitrate of soda, \$65 00; Cacao manure, \$42·00 to \$48·00; Sulphate of ammonia, \$80 00 per ton.
MOLASSES—No quotations.
ONIONS—\$2·25 to \$6·00 per 100 lb
PEAS, SPLIT—\$7·00 to \$7·10 per bag of 210 lb.; Canada, \$2·75 to \$4·40 per bag of 120 lb.
POTATOES—Nova Scotia, \$1·50 to \$2·25 per 160 lb.
RICE—Ballam, \$4·85 to \$5·25 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
SUGAR—American granulated, \$5·50 per 100 lb.

British Guiana.—Messrs. WIETING & RICHTER, March 4, 1912; Messrs. SANDBACH, PARKER & Co, March 2, 1912.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	—	—
BALATA—Venezuela block	No quotation	Prohibited
Demerara sheet	70c. per lb.	70c.
CACAO—Native	19c. to 20c. per lb.	18c. per lb.
CASSAVA—	96c.	No quotation
CASSAVA STARCH—	\$8·00	No quotation
COCOA-NUTS—	\$12 to \$16 per M	\$10 to \$16 per M., peeled and selected
COFFEE—Creole	18c. per lb.	16c. per lb.
Jamaica and Rio	18c. per lb.	18½c. to 19c. per lb.
Liberian	13c. per lb.	12c. per lb.
DHAL—	\$3·75 per bag of 168 lb.	\$3·75 per bag of 168 lb.
Green Dhal	\$4·50	—
EDDOES—	\$1·08	—
MOLASSES—Yellow	None	—
ONIONS—Teneriffe	—	—
Madeira	—	8c.
PEAS—Split	\$7·00 per bag (210 lb.)	\$7·60 per bag (210 lb.)
Marseilles	—	No quotation
PLANTAINS—	16c. to 40c.	—
POTATOES—Nova Scotia	\$3·10 to \$3·50	\$3·25 to \$3·50
Lisbon	—	No quotation
POTATOES—Sweet, B'bados	\$1·44 per bag	—
RICE—Ballam	No quotation	—
Creole	\$5·00 to \$5·25	\$5·25 to \$5·50
TANNIAS—	\$1·68	—
YAMS—White	\$2·40	—
Buck	\$3·00	—
SUGAR—Dark crystals	\$3·30 to \$3·50	\$3 40 to \$3·50
Yellow	\$4·00 to \$4·25	\$4·25
White	—	—
Molasses	\$2·90 to \$3·00	—
TIMBER—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	\$3·75 to \$6·00 per M.	\$4·00 to \$6·00 per M.
,, Cordwood	\$1·80 to \$2·00 per ton	No quotation.

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AGRICULTURAL NEWS.

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

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CONTENTS.

Amount and Effect of Sterility and of Cross-Fertilization in Cotton.

In experimentation having for its object the production of good types of cotton for cultivation, two of the most important matters that require consideration in regard to their results with respect to the nature of the product obtained are the degree of sterility that may be produced in plants subjected to artificial self-fertilization for a series of successive generations, and the extent to which cross-fertilization takes place under normal field conditions. These subjects receive attention, from the point of view of work with cotton in India, in a publication* issued recently by the Imperial Department of Agriculture in India. The subject-matter of this has formed the basis of what follows in the article below.

In the first stage of experimentation, a number of individual plants has to be protected artificially, in order to prevent access to the flowers of foreign pollen of unknown origin. In the next stage, the number of plants in the experiment has become too great for such artificial protection. It results that in the first stage, the most important matter is the extent to which sterility may arise through continuous self-fertilization: and in the second, the extent of cross-pollination that may take place is the circumstance that requires the most careful consideration. In regard to this, it is hardly to be expected that it is possible to determine exactly the amount of cross-fertilization that is taking place under certain conditions. It is for this reason that the matters that are being reviewed have not arisen as the outcome of a carefully planned series of experiments, but rather of the collection of observations made during investigations with another definite purpose. As has been indicated, the subjects comprise the occurrence of sterility, chiefly through repeated self-fertilization, and the frequency with which crossing takes place in cultivation—two phenomena that need separate treatment.

The study of the cotton flower does not lead to any specific indications that it is normally either cross- or

*Memoirs of the Department of Agriculture in India, Botanical Series, Vol. IV, No. 3.

self-fertilized. Further, in regard to self-fertilization, the effect may be the failure to set fruit or the partial development, only, of bolls; or seed may be produced that gives rise to plants that are completely or partly sterile, or show a lack of vegetative vigour. Actual observations relating to these matters are given, which show that all conditions may obtain; though even with the same type of cotton, indications may appear of the existence of an individual difference in the degree of sterility induced by self-fertilization. It is pointed out that a definite series of experiments is required to determine the extent to which self-sterility in the cottons is a function of the individual.

The above considerations in regard to sterility only take account of the phenomena shown by pure types; the case remains of the similar circumstance with respect to the offspring of a cross. Here, the difficulty is increased; for the particular characters shown may not only arise from the matters concerning sterility dealt with above, but there may also exist sterility resulting from specific or racial diversity. There are not many observations available in regard to the latter form of sterility; they go far enough to show that the Indian forms of cotton are members of a fairly definite group, and that these members exhibit complete sterility when crossed with other forms; there is, however, considerable divergence in the extent of fertility when they are crossed among themselves. The complexity of the subject increases when attention is given to the determination of the degree of sterility that may be produced by such crosses; large and inexplicable divergences of behaviour occur among individual plants of similar parentage.

In dealing with the second part of the subject, that is the frequency of cross-fertilization in the field, the first matter to be considered is the mode of transference of pollen from one flower to another. As is well known the agencies most usually concerned in this transference are the wind and insects, and flowers often show adaptations by which they may most readily take advantage of one or the other of these agencies. When it is considered in this way, the cotton flower shows little adaptation; and that, if anything, to cross-pollination by insects. Further, the time which elapses between the opening of the flower and the advent of the best chances for self-pollination is so short that it leads to the suggestion that cross-fertilization will not be as common as would appear to be indicated by a study of some of the characteristics of the flower. Observations on the great mixing of types occurring in cottons growing in the field constitute, however, a strong argument for the frequent occurrence of cross-fertilization, and this is supported by the significant fact that the only types grown pure, in India under ordinary conditions of cultivation, are those whose natural habit helps to prevent the occurrence of cross-pollination. Mention is made of the very divergent views that have been held by various investigators as to the extent to which cross-pollination takes place in the field; the results of the earlier observations on the subject are contained in Sir George Watt's article on Gossypium.* From a consideration of these and from the results of much personal observation, this investigator concludes that hybridization has played a large part in the history of the cotton plants of India, and he still holds this view in a more recent work.† The results of experiments by other investigators are noticed in the Memoir that is under present consideration, and attention is drawn to the fact that Balls considers that in Egypt at least 5 per cent. of cross-fertilization takes place yearly: there is also mention of work conducted recently in the United States, from which it has been concluded that, in North Georgia, the percentage of cross-pollination is at least twenty, with strong probabilities of forty per cent. of cross-pollination.‡

Details of experiments relating to the subject are presented in the Memoir, which show, in their broad results, that several forms of Indian cotton have arisen through natural cross-pollination. Consideration is then given to the distance at which cross-pollination may occur in the field—a matter of much importance in cotton-breeding, and in the maintenance of definite types in cultivation. Webber¶ considered that absolute isolation would require separation of five to ten miles, but that practical isolation needs a distance of a quarter to half a mile. As far as has been possible to draw any conclusions from experiments and observations in India, it appears that such distances are unnecessary. The particular conclusions reached are expressed as follows: 'for practical purposes, there is no objection to cultivating different races in adjoining plots, provided the two lines bordering the second race are discarded for the purposes of seed supply. Additional security, and one which might render even this precaution unnecessary, may perhaps be obtained by the separation of two kinds with one or two lines of a crop which flowers freely during the cotton season, and will grow under

* Dictionary of the Economic Products of India, pp. 39-42.

† The Wild and Cultivated Cottons of the World, 1907, p. 90.

‡See *Agricultural News*, Vol. X, p. 102.

¶ Yearbook of the United States Department of Agriculture, 1902, p. 370.

the same conditions as cotton. For this purpose the Indian sann (*Hibiscus cannabinus*) [sunn hemp] or *H. Subdariffa* [sorrel] naturally suggest themselves.'

The latter part of the Memoir gives attention to several other matters of interest that are bound up with the subject under discussion. It will be sufficient here, however, to present the main conclusions that are reached: 'Firstly, that a considerable degree of sterility results from self-fertilization repeated through a number of successive generations; and, secondly, that cross-fertilization takes place to a considerable extent, though the greater portion of this is limited to neighbouring plants.'

SUGAR INDUSTRY.

OPENING OF THE ST. KITTS (BASSETERRE) SUGAR FACTORY.

The following account of the opening of the St. Kitts Sugar Factory has been received from Mr. H. A. Tempany, B.Sc., Superintendent of Agriculture for the Leeward Islands:—

The new central sugar factory in St. Kitts was formally opened on Tuesday, February 20, 1912. The undertaking is the work of a company which owes its origin to Messrs. Henckell du Buisson & Co., of 18, Laurence Pountney Lane, E.C., who are largely interested in it, and to whom the origination of the central factory at Gunthorpes, Antigua, was also due. The latter is the pioneer sugar central factory of the smaller British West Indian islands. The St. Kitts factory has originated as the result of its uninterrupted career of successful operation.

This is situated in the Basseterre valley, about 1 mile from the town, and its cane-supply is at present derived from the estates situated in the valley adjoining it, and on the leeward coast of the island. It is contemplated that during coming years the operations of the factory will be extended to include a considerable number of the estates on the windward side of the island. The plant is of modern design, Messrs. Mirrlees, Watson & Co., Ltd., of Glasgow, being responsible for its construction.

The mill is of the fourteen-roller pattern, comprising a Krajewski crusher and a train of four three-roller mills. It is estimated that the factory is at present capable of producing 8,000 tons of grey crystal sugar, but provision is made for further extension to 10,000 to 12,000 tons, as its maximum output.

The constructional work has been in progress during the past eight months, and has been carried out with remarkable expedition and success. The engineer in charge has been Mr. A. Love, from Messrs. Mirrlees, Watson & Co.

At the opening ceremony a large number of guests was present, upward of 220 invitations having been issued by the factory authorities. Among those present were His Honour T. L. Roxburgh, C.M.G., Administrator of St. Kitts, the Honourable Dr. F. Watts, C.M.G., Imperial Commissioner of Agriculture, Mr. G. Moody Stuart, a director of the factory, and the Hon. E. du Boulay (St. Lucia).

His Excellency Sir E. B. Sweet-Escott, K.C.M.G., Governor of the Colony, was unavoidably absent on the occasion, on account of his impending early departure to administer the Government of Fiji.

At 12 o'clock, the mills were set in motion by Mrs. Moody Stuart, and the first canes ground, amid loud applause. Subsequently the guests inspected the factory and were afterwards entertained at luncheon by the factory authorities.

During the proceedings, Mr. Moody Stuart, on behalf of the constructing company, gave an account of the undertaking. In the course of his remarks, Mr. Stuart, after welcoming those present, briefly reviewed the events which led to the erection of the factory, and in passing paid a tribute to the memory of the late Mr. P. A. Wade, one of the planters most largely interested in the scheme, and from whom originated the proposals which had resulted in the erection of the factory.

Mr. Stuart then enunciated the principle on which the factory was founded, which was co-operation between grower and manufacturer. He pointed out that it was not by decreasing the cost of production but by increasing the output of sugar that central factories were able to effect economies. He gave an account of the benefits which had resulted from the introduction of the central factory system into Antigua; similar benefits should now ensue in St. Kitts. Finally, he referred to the question of labour-supply, pointing out that there was likely to be no reduction in the amount of labour required in consequence of the introduction of the factory system; what was looked for, rather, was more productive work as the result of the introduction of labour-saving appliances.

In conclusion, he paid a tribute to the work of the staff which had so efficiently carried out the labour of construction.

Subsequently, numerous toasts were drunk, among the speakers being His Honour T. L. Roxburgh, Mr. Moody Stuart, the Hon. Dr. F. Watts, the Hon. E. du Boulay, the Hon. J. T. Manchester, Messrs. Dobridge, Hardtman, Love, and M. Moody Stuart.

Afterwards, a considerable number of the guests proceeded on special cars for a short trip on the railway system attached to the factory.

The event must rank as one of the first importance in the history of the Leeward Islands Colony, marking as it does a further step in the transition from old-fashioned methods of sugar manufacture to those that are modern and economical. The new regime, inaugurated by the Gunthorpes Factory, Antigua, in 1904, has now made a further step forward, and one which undoubtedly must result in increased prosperity to the Presidency of St. Kitts-Nevis, and to the Colony of the Leeward Islands as a whole. There appears no reason to doubt that the present occasion will constitute the forerunner of further important developments in the same direction, in the future.

A note in the *International Sugar Journal* for February 1912 gives attention to a claim that has been made by an investigator that he has devised a method of determining the quantity of sucrose in sugar factory products by observations on the amount of carbon dioxide evolved when the sucrose is oxidized with chromic and sulphuric acids. As basic lead acetate cannot be used for defecation, in the process, lead nitrate (Herles's reagent) is employed instead. It is said that the results obtained are equal in accuracy to those found by direct polarization.

FRUITS AND FRUIT TREES.

PRIZE-HOLDINGS COMPETITION, ST. LUCIA, 1911-12.

A report by the Assistant Agricultural Superintendent, Mr. A. J. Brooks, on the year's working of the Cacao Prize-holdings Scheme in the Soufrière district, St. Lucia, has been received through Mr. J. C. Moore, the Agricultural Superintendent.

The holdings judged for the competition are divided into three classes: those of 3 to 5 acres, those of 2 to 3 acres, and those less than 2 acres in area. There was an increase in the number of entries in the competition, on account of the confidence engendered by the awarding of prizes on the first occasion in 1910-11, the number of peasants entering being twenty-seven each in Classes I and II, and six in Class III. A description is given in the report, of the original state of the holdings, which shows that almost every omission was made of the operations and attention incidental to good cacao cultivation, and that the trees were mostly planted too closely; nevertheless, the plantings were remarkably free from disease, mostly on account of the hardiness and disease-resisting powers of the varieties grown. These varieties are Forastero and Calabacillo and hybrids between them, and in view of the way in which they thrive, it is recommended that, in peasant cultivation, no attempts should be made to improve the variety of cacao grown, by introducing such delicate kinds as Criollo and Alligator, as these would almost certainly succumb eventually to canker or other diseases. It is suggested that any desired improvement might be brought about by careful selection and grafting on hardy stocks, such as the Calabacillo or Amelonado, the best and proved varieties now found in the district.

In pruning, mistakes seem to be made as much from over-attention to the matter as from neglect. Interplanting with the cacao of other trees such as the bread-fruit, cinnamon, avocado pear and nutmeg has taken place, in many cases, and their contribution to the revenue from the plots renders it difficult to advise their removal. The use of the Nicaragua shade tree (*Gliricidia maculata*) or immortel (*Erythrina* sp.) is recommended where shade is required. Wind-belts have been employed, the chief trees used being pois-doux (*Inga laurina*), bois d'Inde (*Pimenta acris*), immortel, galba (*Calophyllum Calaba*), and other native trees.

All the holdings were visited by the Assistant Agricultural Superintendent at least four times in the year; this officer received valuable assistance from the local instructor, Mr. Acti Clement, who had been awarded the first prize in Class I, in the previous year. The judging was conducted on March 6 to 8, after due notice had been given. Ten of the twenty competitors have carried out the instructions given them, 'in a most praiseworthy manner, and without the least hesitation.' One competitor cut down several bearing trees for the purpose of thinning, while another sacrificed a small crop in order to free his trees from moss. Work such as draining, pruning, the burying of pods, and general care in management of the crop, had been mostly carried out very efficiently. One of the most important results of the scheme has been the arousing of a very keen spirit of competition between the entrants. Some disappointment has resulted from the non-success of those who had won small prizes in the previous competition; the reason for their failure to figure in the prize list was the advent of better competitors in the second year. It is recommended that, if another competition is held, the winners of first prizes in this and last year should not be allowed to compete. In concluding his report, the Assistant Agricultural Superintendent states that the thanks of the Government, and particularly of the Imperial Department of Agriculture, are due to the Rev. Father Viollet and Mr. Palmer for their kind and practical assistance in carrying out the details of the scheme.

The list of prize winners is as follows:—

		£	s.	d.
Class I.				
Bruno Mitchell	1st prize	4	0	0
Bazil Etienne	2nd ,,	3	0	0
Benjamin Blades	3rd ,,	2	0	0
Class II.				
Marcelius Melcher	1st prize	3	0	0
Fervier Fevrier	2nd ,,	2	0	0
Jean Langellier	3rd ,,	1	10	0
Class III.				
Jules Charlemagne	1st prize	3	0	0
(Not awarded	2nd ,,	—	—	—)
James Cenac	3rd ,,	1	0	0
Charles Martineau	4th ,,		10	0
	Total	20	0	0

The prizes were distributed by His Honour the Administrator at a public meeting, held in the Court House, Soufrière, on the 9th instant, when His Honour took the opportunity to encourage the holders to persevere with the good work that they had begun. The Imperial Commissioner of Agriculture also addressed the meeting, explaining the objects of the scheme and pointing out how the continued practice of the improved work, under the direction of the local Agricultural Officers, would bring about the permanent betterment of their holdings and increased profit to the growers. The meeting was very successful, and on the announcement that the scheme would be continued during 1912-13, nine names were entered for the forthcoming, and third, competition in that district.

CULTIVATION AND USES OF SESAMUM SEED.

Sesamum seed, the product of an annual plant, *Sesamum indicum*, is known by a number of names in commerce, among these being Sesame, Sim sim or Sem sem, Til or Teel, Gingelly or Jinjilli, and Benne or Benni. These names are mentioned in an article in the *Bulletin of the Imperial Institute*, 1911, p. 260, from which the following information is taken.

The oil from the seed is largely used in the countries of production as a food; in this case it is prepared in crude pestle mills or wedge presses, and is employed in cooking and for adulterating ghi (clarified butter fat); it is also used for preparing perfumed oil for burning, while the residual cake is fed to cattle, or even eaten by human beings in times of scarcity. The seed is also employed as a food, chiefly in the form of sweetmeats. In European countries the oil is largely employed in soap-making, and the preparation of edible oils and fats. The most important market in Europe for sesamum seed is Marseilles.

The plant grows well in the tropics and in sub-tropical regions. It does not require a large rainfall, as it occupies the ground for only a short time; in India, if it is sown in September, it may be harvested in January. The article mentioned advises the growing of sesamum, in view of the increasing demand for edible oils of the kind yielded by the seed, suggesting that it might easily be raised as a catch crop, 'as the returns are quick, and the cultural requirements simple.'

In India, sesamum is grown alone, or mixed with corn or millet. In the preparation of the land, deep tillage is not essential; all that is required is a fine surface tilth, on account of the smallness of the seed. For sowing, the latter is mixed with sand or ashes, to enable it to be distributed thinly and evenly on the land; the sowing takes place either broadcast or in drills 1 foot to 1 foot 6 inches apart, according to the nature of the soil. Where it is grown alone, 12 lb. to 25 lb. of seed is needed for sowing 1 acre. The seedlings are thinned out when about 6 inches high; at this stage of growth they are delicate, and likely to be damaged by heavy rains.

The time to harvest the crop is indicated by the fact that the leaves begin to turn yellow and the fruit capsules become mottled. At this stage, the plants should not be allowed to remain long in the field, or the capsules are likely to open and cause loss of seed. In harvesting, the plants are cut down close to the ground, or uprooted, tied in bundles and placed upright on a floor or a prepared piece of ground; they do not require any cover, as they are not harmed by rain. This stacking of the plants permits the capsules to ripen, and as these are produced at different periods of growth they are not all equally ripe when the plants are taken from the field. Under ordinary conditions, the first-formed fruits mature in seven days, and the seeds are shaken from these on to a cloth spread on the floor. After this has been done, the bundles of plants are laid out in the sun for two or three days, and again stacked; after this time they are again shaken, and the alternate operations of drying, stacking and shaking are repeated until all the seed has been obtained. In the case of particular varieties, the stems are sometimes beaten with a flail, to make the fruits open, but this is not ordinarily necessary The dried stems that are left cannot be utilized as fodder, but may be burned on the land and the ashes ploughed into the soil.

The above description is that of the harvesting operations as they are carried out in India. In that country, the yield of a good average crop from black soil is about 450 lb. per acre; under the different conditions of growing the plant alone and mixed, however, yields have been obtained as high as 1,230 lb. and as low as 50 to 150 lb. per acre.

The seeds of sesamum vary greatly in colour, and may be white, grey, reddish-brown, dark brown or black, according to the variety. This circumstance makes some difference to their value in commerce, for according to trade regulations, consignments must contain less than 25 per cent. of dark seed in order to be classed as 'white' seed; while allowances have to be made if more than 15 per cent. of dark seed is present. Mixtures of dark and white seed are classed as 'bigarré'; this must contain at least 35 per cent. of the latter. There are also certain regulations and allowances applicable to mixtures of large and small seed. The prices at Marseilles are about £14 per ton for 'black mixed' to £16 13s. per ton for Bombay 'large seeds'. In the United Kingdom, sesamum seed is not a source of oil; the small quantities imported are generally used in making compound feeding cakes, for the purpose of bringing the percentage of oil up to the standard. European methods for extracting sesame oil from the seed are very similar to those employed for obtaining ground nut oil.

The cake left after the expression of the oil still contains 8 to 10 per cent. of this, and is much used as a cattle food. Experiments conducted at the South Eastern Agricultural College, Wye, showed that the cake constitutes an excellent fodder which is agreeable to stock; cows could be given 7 to 8 lb. a day, with no ill effects, and the butter obtained from the milk was soft and white, while it did not contain any trace of seasmum oil. The cake made from unsound or damaged seed is not used as a cattle food, but for manure after all the oil has been removed by means of such solvents as petroleum and carbon bisulphide. At Marseilles, the price of the cake varies from £5 15s. per ton, for that from black Indian seed to about £6 5s. per ton for that from white Levant or Indian seed.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture returned to Barbados by the S.S. 'Guiana', on Saturday, March 16, 1912, from a visit to St. Vincent, the Northern Islands and St. Lucia, in connexion with the agricultural interests of those colonies.

Mr. G. E. Bodkin, Economic Biologist, British Guiana, returned at the same time from Dominica, and left Barbados for Demerara by the S.S. 'Coppename', on Tuesday, March 19, 1912.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date March 12, 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, chiefly from the Leeward Islands from 18*d.* to 19*d.*, with a few at 20*d.*; Barbados 18*d.* to 20*d.* and St. Vincent 20*d.* to 23*d.* The market continues firm.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending March 9, is as follows:—

The market has been very quiet throughout the week, and no sales are reported, but the crop 22 bales Stono has been sold on private terms, we think for France. The offering stock consists principally of Planters' Crop Lots, and about 350 bales to 400 bales of old crop cotton which is firmly held.

We quote viz :—

Extra Fine	32c. = 18*d.*, c.i.f., & 5 per cent.
Fine to Fully Fine	26c. to 28c. = 15*d.* to 16*d.* c.i.f. & 5 per cent.
Fine to Extra Fine, off in preparation	18c. to 25c. = 10½*d.* to 14¼*d.* ,, ,, ,,

COTTON EXPORTS FROM THE WEST INDIES IN 1911.

The following table gives the exports of cotton from the West Indian Colonies mentioned, during the civil year 1911:—

Colony.	Weight in lb.	Estimated value. £	s.	d.
Barbados	740,269	42,400	15	8
St. Vincent	511,947	40,529	3	4
Montserrat	544,607	38,692	8	0
Nevis	348,908	24,813	8	0
St. Kitts	306,590	21,311	11	3
Antigua	193,984	13,590	0	0
Anguilla	127,495	8,888	8	0
Virgin Islands	43,410	3,096	13	6
Trinidad and Tobago	6,056	456	0	0
Grenada and Carriacou*	274,224	10,205	5	0
Total	3,097,490	203,983	12	9

*This Colony shipped only 8,643 lb. of Sea Island cotton lint, valued at £566, the rest being Marie Galante.

COTTON IN NORTHERN NIGERIA.

The following is taken from the letter of the late Governor of Northern Nigeria, Sir H. Hesketh Bell, K.C.M.G., transmitting to the Secretary of State for the Colonies *Colonial Reports*—Annual, No. 704, dealing with Northern Nigeria:—

Strenuous efforts are being made to encourage the natives to grow cotton on a large scale. Experimental plots were established in various centres and the relative merits of three different varieties of cotton were tested. An excessive period of drought militated not only against the success of those experiments but also against the whole normal output of cotton, and the crops almost everywhere were below the average. Buying depôts are now being opened by the British Cotton Growing Association in the chief cotton-growing centres, and a ginnery on a very large scale is in course of construction at Zaria.

As soon as the natives begin to realize that cotton is a crop which is not affected by the local supply and demand and for which there is always a ready sale to an unlimited extent, they will embark largely in its cultivation. Although I cannot share the extremely roseate views that have been expressed in the past concerning the rapid development of an immense output of cotton from this Protectorate, I believe that, under proper guidance and encouragement, there will be a steady and continuous increase of production and that the industry will have a marked effect on the prosperity of the territory. The people have for centuries been accustomed to the growing of cotton, and have little to learn as regards methods of cultivation. The success of the problem lies in the improvement of the local varieties of cotton and in the discovery of means by which the productiveness of the plants can be enhanced. I am of opinion that though the outlook in the Hausa States is distinctly hopeful, the prospects of cotton-growing on a very large scale are much more promising in the fertile lands of the provinces bordering on the Niger and Benue.

Curing of Tobacco.—It has long been known that this process could be materially altered and controlled by external means. It has been recently stated that a process has been perfected in Germany whereby the wild ferments are first destroyed by electrical sterilization and then the required mould is introduced.

In this way superior results are claimed, and the aroma and flavour improved. It is possible that this may be so, as the process as it stands may be compared with that used in the control production of butter. On previous occasions, the preliminary sterilization of the tobacco has been absent. (The *Chemical World*, January 1912.)

BAMBOO LEAVES AS FODDER AND LITTER.

An article giving consideration to the employment of the leaves of species of bamboo for forage and litter for animals, written by the Director of the Jardin d'Essai, Algiers, appears in the *Journal d'Agriculture Tropicale* for November 30, 1911. In this, it is pointed out that the large kinds of bamboo, or true bamboo, as they are called, give the greatest quantity of leaves, and these are relatively long and broad. The collection of the leaves from the plant is, of course, not thought of, on account of the great height of the latter, and the unapproachable nature of the branches which bear them. One must therefore be content to gather the leaves which fall, and these are often found in large quantities, but have naturally become dry. Such fallen leaves are most acceptable to animals, after the removal of the dust and earthy matters that they have collected from the soil, and when they have not yet acquired the mouldy smell and taste which they are likely to develop through resting on the earth for a long time.

The large true bamboo, and not the species of Phyllostachys, bear leaves in the greatest quantity. The best known type is that usually described as *Bambusa arundinacea*—an erroneous name under which the large species *Bambusa macroculmis*, A. Riv., is known: for *B. arundinacea* is only a synonym of *B. spinosa*, so well characterized by its strong spines.

Even at the limit of the area in which it grows, *B. macroculmis*, which appears to be the most resistant among the large species, flourishes with vigour, and the fall of its leaves is almost constant. It has been remarked, however, that, on the coast of Northern Africa, for example, the fall is most sudden and most abundant at the commencement of summer, especially at the time of the sirocco. The advance of the hot weather causes the branches to form leaves, so that those which are older lose the leaves near their base, while the branches themselves are actually lengthening. This fall of the leaves is sometimes considerable, and an example is afforded by experience at the Jardin d'Essai, Algiers, where species of *B. macroculmis*, over 45 feet in height, shed their leaves at such a rate that these have to be taken away in carts several times a week.

It is suggested that some attention should be given to the utilization of the large amount of organic matter supplied in this way, especially as analyses conducted at the Jardin d'Essai have shown that the nutritive value of the dry leaves is at least double that of wheat straw. In ordinary cases, animals to which bamboo leaves are fed have to be gradually accustomed to their inclusion in the food. Animals raised under harder conditions, however, and without any great choice of food, will eat the leaves readily, notwithstanding their comparatively small digestibility in the dry state.

The leaves of the large bamboo are usefully employed as litter, but the best plan is to mix them with other materials, such as straw or leaves of different kinds, because they possess a tendency to stick together and produce layers. Nevertheless, they show an absorptive power which makes them go to form good manure, particularly on account of the relatively large amounts of potash and phosphoric acid that they contain. There is the circumstance, however, that a manure made in this way decomposes slowly, because of the fibrous and siliceous structure of the leaves; this is not a disadvantage when they are required to help to cover the ground for certain crops, or when they are employed to protect the soil from the rays of the sun. At the Jardin d'Essai of Algiers, the leaves have been used specially for the purpose of making manures which were not required to decompose quickly; in such cases a good compost has always been obtained.

In another connexion, even if the leaves of such bamboos do not possess the size and elasticity of maize husks, they none the less constitute useful material for making mattresses and couches, under conditions of urgency, such as the influx of a large number of agricultural labourers, when lodging for these has to be found.

The question still remains if all these advantages, possessed by the material from the bamboo in countries where it grows spontaneously, would still obtain in conditions where it would have to be grown specially, and where labour is not very cheap. As is stated in the article, further observations and enquiries are needed, before definite information concerning the matter can be obtained.

METHODS OF PLANTING TREES.

An account of experiments conducted at the Woburn Experimental Farm, on methods of planting trees, was given in the *Agricultural News*, Vols. VIII, p. 101, and IX p. 261 : a record of experience in India in regard to the methods is also given in the same journal in Vol. IX, p 180. Since this time, experiments similar to those at Woburn have been conducted at several of the Botanic Stations in the Lesser Antilles, and accounts of these have been presented in the *West Indian Bulletin*, Vol. XI, p. 50, and in Annual Reports on the Botanic Stations issued during the past two years. In continuation of the same subject, the *Journal of the Board of Agriculture* for February 1912, p. 951, gives the following abstract of a paper dealing with the matter, which appears in Scientific Bulletin No. 2, 1910, of the Royal Agricultural College, Cirencester :—

An experiment was made to ascertain whether the results obtained at the Woburn Experimental Fruit Farm in the planting of fruit trees would be borne out in the case of forest trees. The land used was old pasture, with a deep and somewhat heavy soil. Twenty four-year-old trees were planted of each of the following kinds: oak, ash, beech, spruce, Corsican pine, and Scots pine, and the planting was carried out as follows: ten trees of each kind were planted in pits, every care being taken to give the roots enough room; the finer soil was placed round the roots, and the whole carefully and firmly trodden down. The other ten trees were planted in very shallow pits, into which the roots were merely pushed anyhow, the soil placed on the top in thin layers, and well rammed with a heavy iron rammer. No care was taken not to injure the roots. The trees were lifted and weighed after two years, but the number was too small to give reliable averages. It is noted, however, that no more of the rammed and carelessly planted trees died than of the others, and in general appearance the two sets could not be distinguished. An examination of the roots confirmed Mr. Pickering's former conclusions that great care in digging holes and carefully spreading out the roots is not of much importance, as in many cases the old roots do not throw out new roots to any extent, while it is important to see that trees are put quite firm in the ground, although ramming would be too expensive for ordinary planting.

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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NOTES AND COMMENTS.

Contents of Present Issue.

In this number, the editorial gives attention to the subject of the Amount and Effect of Sterility and of Cross-fertilization in Cotton. It reviews the results of interesting and important work that has been carried out recently in regard to the matter, in India.

An account is given, on page 99, of the proceedings that took place at the opening of the St. Kitts (Basseterre) Sugar Factory.

Page 101 may be consulted for an interesting article dealing with the cultivation and uses of sesamum seed.

An article of some interest in countries where the bamboo grows plentifully is given on page 103, and contains suggestive facts in regard to the useful employment of bamboo leaves.

The Insect Notes, on page 106 of this issue, are of particular interest on account of the circumstance that they contain information as to the outbreak of the cotton leaf-blister mite in Barbados, in view of the fact that this pest is, as far as is known, new to that island. The same page also contains an article on pests of the mango that are found in the Philippines.

A description and some details of the recent St. Kitts Agricultural and Industrial Show are presented on page 107.

On page 110, the Fungus Notes contain a second, and concluding, article on the bud rot of the cocoa-nut palm.

The Rainfall of Antigua, 1911.

An account of this is published in the *Leeward Islands Gazette* for March 14 1912, the information being furnished by Mr. H. A. Tempany, B.Sc., Superintendent of Agriculture for the Leeward Islands.

The first of the tables given deals with the average monthly rainfall at the stations during the year, and shows that the wettest months were September and October, with 5·34 and 5·18 inches, respectively, and that the driest months were March, April and June, during which the fall was 0·76, 1·85 and 0·98 inches, respectively.

The total of the monthly averages is 36·47 inches, and, as is pointed out by Mr. Tempany, this, like the precipitation in the previous year, is very deficient; it is 8·33 inches below the average for the thirty-eight years 1834-1911. The dry period from March until the end of August caused the outlook for the crops and water-supply in the island to be very serious, but the conditions were improved by the receipt of well distributed rains in the last four months of the year. The fact, however, that two years of drought have been experienced is a matter for some consideration. This is particularly true in view of the circumstance that, as is shown by the returns, the average annual rainfall for the last ten years has been considerably lower than for the corresponding previous periods during the past thirty-eight years.

Influence of Manures on the Constituents of Seeds.

Experiments have been conducted recently, at the Agricultural Experiment Station at Rome, with haricot beans of different varieties (*Phaseolus vulgaris*), in order to determine the effect of various systems of manuring on the constitution of the seeds. These are given attention in the *Bulletin of the Bureau of Agricultural Intelligence and of Plant Diseases* for July 1911, p. 1619, and the following results are stated to have been obtained.

Where the smallest amounts of manure were used, haricot beans were obtained that were richest in nitrogenous matter of a non-proteid nature. On the other hand, these constituents were lowered in amount by superphosphates, and even to a greater extent by nitrogenous manures, the quantity being, in this case, about one-third of the proportion obtained in unmanured soil.

These facts seem to show that the reduction in quantity of nitrogenous substances of a non-proteid nature was due to the presence of nitric nitrogen, which favours the formation of proteid substances. It must be concluded in any case, that the nitrogen in manures exercises a specific effect on the composition of seeds.

The facts adduced also afford an explanation as to why, in the cultivation of medicinal plants, nitrogenous manures give products less rich in alkaloids, for the latter are, of course, of a non-proteid nature. In this connexion, it is of interest to compare the information given in articles which appear in this volume of the *Agricultural News*, on pages 21 and 63.

Cacao in Ecuador, in 1910.

During the year mentioned a record crop of cacao was made in Ecuador: it was 752,761 Spanish lb. (1 Spanish lb. = 1·014 lb.), as compared with 631,958 Spanish lb. in 1908, the year of the previous largest output. This does not include the production in two of the cacao-growing districts. In any case, the output may be considered to have increased by about 20 per cent. The average market price was 4 to 5 per cent. above the average price in 1909.

Uses of Erythrina Indica.

Erythrina indica is related to the bois immortel (*E. umbrosa*) used as a shade tree for cacao. Information concerning the various uses to which it is put, in Indo-China, appears in *L'Agriculture Pratique des Pays Chauds* for January 1911, p. 63.

In Annam and in Tonkin the leaves are employed as food while they are still young; they are eaten raw, wrapped round meat. Owing to their being attacked by birds, and caterpillars and other forms of insect life, the seeds rarely attain maturity; when they are fresh their outer skin is of a beautiful violet colour which changes to a deep brown as they become dry. On account of their rarity and the virtues which are attributed to them, they are much prized by the natives of Annam, who regard them as a valuable remedy for snake bites. When they are used in this way, they are first grated, then crushed and formed into a large pill: they are then boiled in a little water, in order to form a paste from which a plaster is made and applied to the place where the fangs of the reptile have penetrated. The superstitious nature of the people causes them to consider this a sovereign remedy, but there has been no opportunity to test the correctness of their views, because it has not been found possible to obtain sufficient of the seeds in order to find out by chemical analysis if they include any curative substance in their composition.

It is the wood of the tree in which the greatest interest is taken. This is open in texture and not suited for the purposes of cabinet-making. In Cochin China, it is sometimes made into trays. Its great lightness causes it to be employed in Annam for making the native shoes, for which purpose it is preferred to anything else. These shoes are really a kind of sabot, and each consists simply of a flat piece of wood, roughly squared, and fitted with a band of copper for holding it on to the foot. The wood is not employed in this way in Tonkin, but it is made to figure in funeral ceremonies. It is a branch of this tree, and of this tree alone, which the mother of a deceased person uses to assist her in walking behind the coffin, while the father aids his own steps with a stump of bamboo.

The Nature of Graft Hybrids.

A note on work of this kind which was being carried out with a graft hybrid between the cultivated tomato and the black nightshade was given in the *Experiment Station Record*, Vol. XXI, p. 320. In this, the graft hybrid produced was called *Solanum tubingense*, and there were also descriptions of additional graft hybrids, designated as *S. proteus*, *S. darwinianum*, *S. koelreuterianum* and *S. gaertnerianum*.

A subsequent study of these is noticed in the number of the same journal issued in June 1911, page 632. This has shown that, of those mentioned, only *S. darwinianum* appears to be a hybrid in the strict sense of the word. Propagation of the so-called hybrids by cuttings gave plants, except in the case of *S. koelreuterianum*, which produced ripe fruit intermediate in character between that of the nightshade and that of the tomato. There were a number of instances of spontaneous reversion, and all the seedlings derived from the hybrids reverted in the second generation to the parent form most nearly resembled by the hybrid.

As has been stated, the only true hybrid was *S. darwinianum* and support of this view of the form was obtained by observing that, preliminary to the formation of seed, there is actual fusion of cells, including the nuclei derived from the parent forms.

A note on this matter appeared in the *Agricultural News* for January 20.

A Machine for Extracting Rubber from Bark.

In the *Journal d'Agriculture Tropicale* for November 1911, p. 349, an account is given of experiments with an apparatus designed for the purpose of obtaining rubber from Landolphia. It consists of two parts, one of which is a portable machine, moved by two men, which is brought into the neighbourhood of the plants to be treated; this effects the separation of the wood from the latex-bearing bark. The other part comprises a grinding apparatus, worked by means of a steam engine. This separates the rubber from the fragments of bark, makes it into lumps, and after this process, conveys the mixture on to a polygonal sieve, where a strong current of water carries away the fragments of bark and the impurities, leaving the well-washed rubber behind.

After suggesting certain improvements in the machinery, the article describes the grinding apparatus as consisting of two sets of cylinders, placed one above the other, in which the mass of material proceeds from the upper to the lower set. A certain amount of water is forced into the cylinders, in order to facilitate the work of grinding. According to information given by the inventor, the machine shown is capable of dealing with nearly 2,000 lb. of bark in ten hours, the quantity of water required for the treatment of this amount being over 500 gallons. The steam engine employed is one of 15 h.p.

The opinion is expressed that experiments in the employment of the apparatus for the extraction of Funtumia rubber would be of interest; particularly in view of the circumstance that the economic importance of lianes as rubber producers is likely to decrease, so that it is not probable that an expensive machine of the kind would be often employed for exploiting such plants.

INSECT NOTES.

THE COTTON LEAF-BLISTER MITE IN BARBADOS.

With further reference to the occurrence of leaf-blister mite on cotton in Barbados, which was briefly mentioned in the last number of the *Agricultural News* (see Vol. XI, p. 90), the following note may be of interest.

The existence of the leaf-blister mite in Barbados was first discovered by the Entomologist on the Staff of the Imperial Department of Agriculture, on February 27, 1912, and reported to the Colonial Secretary on the same day. The matter was referred to the Local Department of Agriculture which has since been investigating the extent of the attack, and advising cotton growers to pull up and destroy the cotton in all infested fields.

The field in which the pest was first found is part of an estate adjoining Bridgetown, on the south. This estate formerly produced a considerable amount of cotton, sugar and other products; but in recent years has been more and more given up to tenantry. The field in question is in close proximity to a large number of small houses, each with its own plot of ground.

Investigation by the Officers of the Local Department of Agriculture has so far shown the infested area to include a strip some two or three miles wide, along the westward coast for a distance of 18 miles, the southern limit apparently being about 4 miles south-east of Bridgetown.

It will be seen that by far the greatest amount of infestation occurs to the north of Bridgetown, where the frequency of the occurrence of the pest and the severity of the attacks indicate that fields in this section have been infested for a longer time than the field where it was first discovered.

The Governor of Barbados has appointed a Committee in connexion with the occurrence of leaf-blister mite, which is asked to consider and report upon the following points:—

(a) what steps should be taken to stamp out the existing disease,
(b) whether legislation is needed,
(c) the area infected.

This Committee, which consists of ten members of the Agricultural Society, together with the Superintendent of Agriculture of Barbados and the Entomologist on the Staff of the Imperial Department, held a meeting on March 26. As has been stated already, however, the Officers of the Local Department had investigated the extent of the infestation, and were recommending that infested cotton should be pulled up and burned.

Notice of a bill was given in the House of Assembly on Tuesday, March 26, providing for compulsory destruction of cotton infested with leaf-blister mite; for, although owners and managers, generally, have readily complied when requested to destroy infested cotton, it has happened occasionally that this request has been refused.

The life-history of the cotton leaf-blister mite is not known, nor have any food plants of this pest ever been discovered except cotton, both wild and cultivated.

In those islands of the West Indies where the leaf-blister mite has been a pest for several years, it has been found necessary to develop a strain of cotton which will yield its crop in one picking, whereas in Barbados it is the custom to get a second or even a third picking, allowing the cotton to occupy the fields for twelve months, or more. It will probably be necessary in Barbados to adopt a course similar to that followed in the other islands, if the leaf-blister mite becomes established and assumes serious proportions.

The control of the leaf-blister mite depends upon the destruction of all old cotton as soon as the crop is finished. If an interval of several weeks ensues between this and the planting of the new, and attention is paid to the destruction of all infested leaves as they first appear on the cotton plants, the attacks of leaf-blister mite seldom seriously affect the yield of cotton.

The fact that in Barbados there is very little wild land and bush, and that the cultivated fields are very carefully weeded and tilled, would indicate that in that island the difficulties of control would be less than in those where cultivation is not maintained at such a high point and where there is a greater abundance of uncultivated and bush-covered land.

MANGO PESTS IN THE PHILIPPINES.

A short article in the *Philippine Agricultural Review* for June 1911 (Vol. IV, No. 6) gives an account of the occurrence of insect pests on mangoes, which had appeared in the Philippine Islands in such numbers as to cause a considerable amount of loss.

One of these pests was a small insect, with sucking mouth parts, belonging to the Hemiptera Homoptera, and related to such insects as cane flies and leaf-hoppers. Attention was attracted to this pest through the failure of mango trees in several localities to set their fruit. Investigations showed that the trees which failed to set fruit were generally covered with a black blight, and it was found that the larvae of these sucking insects were injuring the buds and tender stems to such an extent as to cause the flowers to drop, and thus prevent the development of fruit.

It was considered by Mr. P. J. Wester, Horticulturist of the Board of Agriculture, that the insect was identical with the so-called mango fly in India, under which common name, by the way, are included three species of homopterous insects (*Idiocerus niveosparsus*, Leth., *I. atkinsonii*, Leth., and *I. clypealis*, Leth.), which in certain years has been reported to reduce the mango crop in that country to one-third of its normal amount. Two of these species have been identified at Washington, D.C., from specimens captured in the Philippines. These are *Idiocerus clypealis*, Leth., and *I. niveosparsus*, Leth.

Another pest mentioned as being quite destructive to mango bloom in the Philippines is the: 'caterpillar that enters the central stem of the flower panicle and hollows it out, causing it to shrivel up and die.'

In the December number of the same journal Mr. Wester reports the occurrence of another mango pest. This is one of the fruit flies, which is said to be either identical with, or very nearly related to, *Dacus ferrugineus*, which is destructive to mangoes in Java and parts of Malaysia; it is thus also related to *Trypeta ludens*, which is a serious pest in Mexico, attacking mango, orange and guava.

These pests have not been recorded from the West Indies, but it may be well for the planters in these islands to realize that serious pests occur in other localities.

The harmful nature of the mango weevil (*Agricultural News*, Vol. X, p. 282), of fruit flies (*Agricultural News*, Vol. VIII, p. 93), and of other pests has been recorded, as is shown, in previous numbers of this journal, and attention is directed to these newly discovered pests in order that West Indian planters may take all reasonable precautions to prevent the introduction of any of them.

ST. KITTS AGRICULTURAL AND INDUSTRIAL SHOW, 1912.

The sixth of these shows was held under the auspices of the Imperial Department of Agriculture and the Agricultural and Commercial Society, at the Grammar School on February 23, 1912. After a private view had been made of the exhibits, His Honour the Administrator, having been introduced by the Hon. S L. Horsford, President of the St. Kitts Agricultural and Commercial Society, formally opened the show at 12 noon. His Honour was accompanied by Dr. Francis Watts, C.M.G., the Imperial Commissioner of Agriculture. In his speech, Mr. Horsford regretted the absence on this occasion of His Excellency the Governor of the Leeward Islands, explaining that this was due to additional work in connexion with His Excellency's forthcoming departure from the Colony; he also read a letter from the Governor, expressing his great regret at not being present, and wishing the Show every success. Mr. Horsford further referred to the presence of Dr. Watts and to the important event that had just taken place in the opening of the Basseterre Central Sugar Factory. He extended a welcome to the visitors from Nevis, and to Mr. H. A. Tempany, B.Sc., Superintendent of Agriculture for the Leeward Islands. He also congratulated the Secretary of the Society, Mr. F. R. Shepherd, on the successful arrangements for the show, and thanked Mr. W. H. Mitchell, M.A., Head Master of the St Kitts Grammar school, and his staff, for the assistance that they had given. In reply, the Administrator thanked Mr. Horsford for his kind remarks and the Agricultural Society for its kind welcome, regretting at the same time the absence of the Governor. In doing this, His Honour took the opportunity to make several comments on the exhibits at the Show, and then formally declared it opened. Dr. Watts expressed his pleasure at being in St. Kitts at such a time of awakening agricultural prosperity, influenced by the possession of a central sugar factory. He also reviewed some of the objects of agricultural shows, giving special attention to their effect in assisting the diversification of agriculture; their usefulness toward finding new markets for the produce which they gave an opportunity to be brought forward; and their effect toward the improvement of stock.

The number of exhibits was 620, as compared with 736 in 1911, the smaller number being partly due to a lessened amount of the exhibits from Nevis, probably because of the drought. The exhibits in the different classes were as follows: horsekind and cattle, 73; smaller stock, 12; poultry, pigeons and rabbits, 19; sugar-cane and its products, 49; fruit, 30; vegetables, 133; local industries, 35; preserves, 58; meals and starches, 50; fancy work, 47; miscellaneous, 69; plants and flowers, 29; school exhibits, 3; trade exhibits 5, exhibits not for competition, 8.

Good exhibits were seen in the riding and driving competition, and in the cattle class the number of teams of steers that was brought to compete was in strong contrast, by its increase, to those in former years. Good native cows were shown, as well as imported mules; a first prize was awarded for a fine specimen of a he-goat bred from Rajah. There were also good exhibits among the poultry.

The sugar-canes shown were numerous and of a high quality; this was the case also with the vegetables, among which there were fair exhibits of ground provisions, notwithstanding the unfavourable conditions that had been experienced through drought. Meals and starches were all represented, and gave rise to keen competition. The same is true of the fancy work, while an improvement was to be noticed in the laundry work. The miscellaneous exhibits included a show of lint and seed-cotton, in both of which fine samples were to be seen. Some of the greatest interest was evinced in the trade exhibits, to which considerable expense and care had been devoted by the competing merchants.

In the classes where the quality and quantity of the exhibits, either, or both, were disappointing, were included horses, fruits, preserves, local industries, plants and flowers, and school exhibits.

Eleven diplomas of merit, awarded by the Imperial Department of Agriculture, were distributed by His Honour the Administrator at a special general meeting of the Agricultural and Commercial Society held on March 12. The exhibits for which the diplomas were given comprised: native cow, steer over three years, team of native mules, driving and riding, 1 stool of plant canes of B.1753, 4 varieties of cut canes, 12 cut canes, dry goods and groceries, hardware and groceries (2 exhibits).

The report from which this information has been taken, furnished by Mr. F. R. Shepherd, Agricultural Superintendent, St. Kitts, who as has been indicated, is Honorary Secretary of the St. Kitts Agricultural and Commercial Society, states that the attendance of the general public at the show was as good as in past years—a fact which indicates that the interest of the general public in St. Kitts, in such affairs, is being maintained.

THE SILK INDUSTRY IN FRANCE AND BRAZIL.

Interest in the production of silk has been increased recently by a lecture by Mr. H. Maxwell-Lefroy, M.A., Imperial Entomologist to the Government of India, in which he suggests that the rearing of silkworms might be taken up on an industrial scale in the West Indies. In regard to the matter generally, the following information is of some direct concern.

In the *Journal Officiel* for January 27, a table is published, giving particulars of the silk cocoon production in France during the past three years; from this the following figures have been prepared :—

Year.	Number of producers.	Seed used, lb.	Fresh cocoons produced, lb.	Fresh cocoons from 1 lb. seed, lb.
1909	119,067	10,076	18,802,357	1,866
1910	114,283	9,830	9,393,360	966
1911	102,605	7,795	11,240,737	1,442

In regard, again, to the silk industry of France, it is of interest that the issue of the journal just mentioned, for February 2, 1912, publishes a decree extending to producers in Algeria the provisions of a law by which those engaged in the production of cocoons in France are granted a premium amounting to about $2\frac{3}{4}d.$ per lb. for fresh cocoons.

The particulars of the Brazilian Budget for 1912 are published in the *Diario Official* for January 5. They show, among other matters, that it is intended to spend 10,000 milreis currency (£1,125) on premiums to producers of silk cocoons. The grant will be at the rate of about $7\frac{1}{4}d.$ per lb. Another form of grant will be that of premiums to producers who can prove that they have employed at least 2,000 mulberry trees for silk culture; the total amount to be distributed in this way is 5,000 milreis (£563).

A note on the silk industry of Italy appeared in the *Agricultural News* for March 2, 1912, p. 71.

GLEANINGS.

The cabled particulars, subject to correction, issued by the Colonial Secretary of the Gold Coast Colony show that the exports of cacao during 1911 were 89,615,244 lb., valued at £1,622,424. The similar figures for 1910 were 51,691,810 lb. and £875,352.

The shipments of cacao from Trinidad during the month of January 1912 are given in the *Proceedings of the Agricultural Society of Trinidad and Tobago* for January and February 1912, as 10,757,066 lb. The output for the same period of last year was 5,848,611 lb.

The plants distributed from the St. Lucia Botanic Station during last month amounted to 1,713, and included limes 1,000, cacao 613, and nutmegs 50 There were also sent out 1,500 Liberian coffee berries, 102 packets of seed and 2 bushels of horse beans.

The *Experiment Station Record*, Vol. XXV, p. 577, gives attention to a paper in which the results are described of a chemical and physical analysis of the butter, body fat, and lard obtained from animals that have been fed on cotton seed products. The investigations showed that cotton seed oil was present in practically all of these.

The *Government Gazette* of the Federated Malay States for January 19, 1912, shows that the exports of cultivated rubber from those States during 1911 amounted to 19,695,330 lb.; during the previous year they were 12,212,526 lb. The shipments for December 1911 were 2,147,859 lb., as compared with 1,234,669 lb. for December 1910.

Reports from the Virgin Islands show that the cotton crop of this season is very late, the reason being the conditions of drought that existed during last year: cotton was still coming freely to the ginnery during last month. The condition of the sugar canes is mostly poor. A fair crop of limes was being reaped in the month mentioned, and the trees had improved.

A final forecast of the sugar-cane crop of Eastern Bengal and Assam for 1911-12 shows that the total estimate for the province is 179,300 acres, as against 181,300 acres in the previous season. The area in this district represents some 8·1 per cent. of the total area under sugar-cane in British India. As regards outturn, the estimates average 89 per cent. of a normal yield, but in several cases they are too low.

It is estimated by the Government Statistician of Queensland that the area of sugar-cane cut by 1912 will be 96,396 acres, yielding 1,564,993 tons of cane. The quantity of sugar is expected to be 176,076 tons: this, as is pointed out in the *Australian Sugar Journal* for January 11, 1912, has been exceeded on three previous occasions, namely in 1906 with 184,377 tons, 1907 with 188,307 tons, and 1910 with 210,756 tons.

In a short note on the United States census statistics for 1909, the *Modern Sugar Planter* for February 10, 1912, states that, notwithstanding the great losses from storms during that season, the amount of sugar produced on plantations in Louisiana was 325,497 tons. In the same year the molasses manufactured amounted to 942,997 gallons, the total sugar products, including refined sugar, being valued at $63,775,000.

Cotton cultivation has been newly introduced into the republic of San Domingo, and according to the *Journal of the Royal Society of Arts* for February 23, 1912, the success that has accompanied the introduction has led many of the more important agriculturists to take it up in the place of less remunerative crops, and this movement has been aided by failure in the tobacco crop. The variety of cotton grown is said to be Sea Island mixed with an indigenous kind.

The account of seeds and plants imported into the United States, contained in Bulletin No. 233 of the Bureau of Plant Industry of that country, which deals with the period January 1 to March 31, 1911, and was issued on February 20, 1912, gives a short description of a variety of date received from Tunis, and known as Menakher. This is stated to be a large fruit of good quality and excellent flavour, known only from the Jerid Oases in Tunis, where it has become extremely rare. It is intended to propagate the variety in the South West of the United States.

The *Gardener's Chronicle* for February 24, 1912 mentions experiments described in *Le Jardin*, in which potatoes were found to be superior, for use in the grafting of the grape vine, to any form of grafting clay wax. In actual practice, after the surfaces of the stock and scion, which should be of about the same diameter, have been prepared for grafting, a hole of the proper size is cut in the potato and this is slipped over the stock, the scion being then placed in position and the potato drawn up and secured in such a way as to surround the graft. The method is said to have been particularly successful during hot and dry weather.

At a recent special meeting of the Rubber Growers' Association, held at the London Chamber of Commerce, it was decided to present to the forthcoming International Rubber Exposition a series of gold, silver and bronze medals for free competition among all rubber exhibitors at the exhibition. The samples submitted must be of a commmercial nature, weighing at least 1 cwt., and any one exhibitor may enter more than one sample for exhibition. The latest time for entries is August 1, and these must be made to Mr. A. Staines Manders, Grand Central Palace, 46th to 47th Streets, Lexington Avenue, New York.

STUDENTS' CORNER.

APRIL.

First Period.

Seasonal Notes.

Distinguish between artificial and natural manures, stating why manures are required for soils on which crops are grown. What is likely to happen, especially in the tropics, from the use of artificial manures, with the employment of little or no natural manure? Discuss the use of artificial manures from the point of view of economy, particularly in relation to the fact that, in most cases, many by-products of the estate are available for manurial purposes. Proper consideration of these subjects will lead to the conclusion that the main use of artificial manures should be to supplement natural manures such as pen manure and green dressings. What are the constituents for which artificial manures are most generally valuable, and which of these constituents of the manure costs the most? Taking the analysis of an artificial manure of which you have had experience, calculate the cost of each constituent in one ton of the manure, and compare the cost of the manure itself with that of others which do not contain the same proportions of the different constituents. It is to be remembered that one of the chief objections to the purchase of cheap, low-grade manures is that they contain a certain amount of matter that is of little or no manurial value, usually called 'filler', the presence of which actually entails greater expenditure in freight, and in applying the manure to the purpose for which it has been bought.

What do you understand by water soluble, citric acid soluble and insoluble phosphate? How is the so-called insoluble phosphate treated in order to make it more quickly available to plants, and what changes that are taking place in the soil assist in its becoming soluble? How is the phosphatic manure known as bone meal treated to make it soluble, and under what name is it known after this treatment? State what you understand by the manures that are called acid phosphates or superphosphates. What is basic, or Thomas, slag?

What occurs to organic matter in the soil which, causes it gradually to disappear? State what products are available, under conditions with which you are familiar, for use for the purpose of restoring the proportion of such matter in the soil. It should be remembered that this question is of larger importance in the tropics than in temperate countries, because of the greater rate at which the destruction of such matter takes place in the soil. Explain the employment of green manuring in this connexion, and state what plants your experience would lead you to consider best to be employed for the purpose. Distinguish carefully the effects of manuring with ordinary plants, as compared with those from turning leguminous plants into the soil. Care is required in using stable manure and green dressings, lest this should lead to the introduction into the soil of seeds of harmful or useless plants, which may interfere with the growth of the crop for which the manure or dressing has been applied.

It sometimes happens that the plants of a leguminous crop, particularly in the case of one that has been introduced for the first time, do not thrive. This condition may be a result of the fact that the soil does not contain the actual strain of bacteria that live in symbiosis with the plant, in the nodules that should form on the roots. In such cases, efforts may be made to introduce the required bacterium, and this is done: (1) by applying soil from an area where the same plant, or one closely related, has been grown recently; (2) by using artificial cultures of the required bacteria, the culture being placed in a large quantity of water containing salts for the nutrition of the bacteria, and the seed of the plant being soaked in the water a few hours after the introduction of the culture; or even (3) such soil as is mentioned in the first of these methods has been soaked in water, and the water poured off and used for moistening the seeds to be planted. Of the ways described, the first has been found most successful. In regard to the second, mention the names of any bacterial preparations that have been prepared for use in connexion with this purpose, on a large scale. In such work, it cannot be expected that any improved results will follow the addition of the bacteria where these are present already in sufficient amount; the lack of recognition of this matter has led to a deal of confusion in the interpretation of the results of experiments performed in connexion with the matter under consideration.

Questions for Candidates.

Preliminary Questions.

(1) Give a list of the operations required in raising sugar-canes from cuttings, under conditions in which you have had experience.

(2) State carefully how Bordeaux mixture is usually made.

(3) What is the importance of sunlight to green plants?

Intermediate Questions.

(1) Give an estimate of the cost of raising an acre of sugar-cane, under conditions with which you are familiar.

(2) What are the chief precautions to be followed in making and applying Bordeaux mixture?

(3) How would you show by means of a simple experiment the effect of sunlight on the rate of transpiration in plants?

Final Questions.

(1) Provide statements showing the approximate cost of raising an acre of canes: (1) when implemental cultivation is employed, (2) when hand labour is the sole resource.

(2) Give an account of any means that has been employed for the speedy making and use of Bordeaux mixture on a large scale.

(3) What is the effect of sunlight in relation to the changes that take place in the soil?

Experiments described in the *Comptes Rendus de l'Académie des Sciences* for May 1, 1911, p. 1884, have shown that when fresh vanilla pods, even those that are completely green, are subjected to the ultra-violet rays an exhalation of perfume is caused. This action is brought about more quickly, and the exhalation is stronger, if the stalk of the fresh fruit is placed in a solution containing manganese chloride at a strength of one part of the salt in 1,000 parts of water.

FUNGUS NOTES.

BUD ROT OF THE COCOA-NUT PALM.

PART II.

In the last number of the *Agricultural News*, some information was given as to the symptoms, distribution and cause of cocoa-nut bud rot, as recently described by J. R. Johnston in Bulletin No. 228 of the Bureau of Plant Industry of the United States Department of Agriculture. In the present article, a further account, dealing with the method of spread and treatment of the disease, is given, the subject-matter being taken from the same source.

SPREAD OF INFECTION. The actual means by which the infection is spread from tree to tree is as yet not determined with absolute certainty. Two agencies have been suggested, namely wind and insects. There are two important arguments against the theory of wind distribution. The first is the sporadic nature of the attacks in any locality, combined with the fact that the disease appears to spread against or across the direction of the prevailing wind, as frequently as it spreads with it. The second depends on the nature of the disease itself. Since the infected tissues are deep-seated in the crown of the tree, and are enfolded by the firm leaf bases, it is difficult to see how pieces of this moist tissue could be distributed by the wind. In another way, the nature of the causative bacteria is such as to render it unlikely that they can survive such desiccation as would be necessary if they are distributed by the wind as a light dust.

On the other hand, nearly all observers have recorded the presence of numerous insects in the decaying tissues of the bud. In the tops of the trees a great variety of forms may be found, while in the diseased tissues those predominating are the larvae of flies, often scavengers, and of earwigs. These insects might spread the infection, either by means of small portions of decaying tissue adhering to their bodies, or through their excreta, in which living individuals of the causative bacteria might be contained. Johnston was able to obtain certain bacteria which gave reactions typical of *Bacillus coli*, from the intestines of earwigs found in diseased trees in Cuba.

Another animal that may be responsible for spreading infection is the turkey buzzard, which may be commonly seen in diseased trees, and is stated to be found in all tropical countries where the bud rot occurs. The diseased tissues, as is well known, have a very unpleasant odour, and it is likely that the birds are attracted by it; in connexion with this, Johnston notes a statement of Dr. Smith: 'that twice, at Baraçoa, buzzards swooped down on the rotted hearts of palms he had laid aside for study, and would have carried the material off, if he had not made a frantic rush to protect it.' Although the fact that these birds feed on the diseased tissue has not been definitely proved, yet Johnston was able to obtain from their excreta a few colonies of bacteria giving reactions very similar to those of the bud rot organism. He also notes that, in Porto Rico, where the disease probably does not exist, turkey buzzards are either very rare or absent. Although the actual carrier, or carriers, of the disease has not been definitely ascertained yet there is considerable evidence that certain animal agencies are responsible, particularly insects and turkey buzzards, while the evidence in the case of other causes is of a negative character.

TREATMENT. Johnston thought at first that bud rot almost always commences in the central leaves, but careful investigation showed that in many cases trees could be found with healthy central leaves, while the spikes, or more commonly the swords just opening, revealed brown water-soaked discoloured areas; in some cases also the bases of the lower leaves were diseased in the same way. Trees showing these discolorations almost always developed a soft rot of the terminal bud, at a later date. It was, however, hoped that careful removal of the infected leaves, flower spikes and swords would result in the recovery of the tree, at any rate if sufficient of the suspected parts was pruned. Twenty-one trees were treated in this way, but though they remained undiseased at the centre for three months, they all eventually succumbed.

As there has been a belief that certain disinfectants are capable of checking the disease, applications of salt, copper sulphate and Paris green were made to trees infected as above in which the central leaves were quite healthy. In every case, it was found that the treatment was without effect and that the disease progressed at about the same rate and killed the trees in about the same time as it did in the case of untreated trees in the neighbourhood.

Another remedial measure from which successful results have been anticipated is flaming. Johnston considered that it was unlikely to have any practical value owing to the arrangement of the leaves and also to the failure of other methods of external treatment; consequently he did not experiment with it himself, but an examination of trials conducted by others fully confirmed his opinion of its ineffectiveness. He sums up the whole position with regard to flaming as follows:—

'From the arrangement of the crown it is impossible for the heat to penetrate into the inner tissues in sufficient degree to dry out the diseased portion without seriously affecting the growing part of the crown. Any flaming whatever will destroy the lower leaves and all the nuts, so that even if the tree is not killed, at least a year's crop is destroyed. The scorching of the leaves and the charring of the trunk so kill the superficial tissues as to permit the rain to soak in and a subsequent rot to take place. It has been contended by some people applying this treatment to their trees that there was subsequent recovery from the disease, at least to the extent of flower spikes opening out and setting nuts. It should be noted, however, that the tree, while retaining the disease, may send forth new flower spikes and nuts for a period of at least a year after infection has taken place without any treatment having been applied. The writer possesses records of individual trees which show this. In many trees flamed the disease progressed subsequently so that it presented to the writer no evidence of the value of this treatment. As a diseased tree is certain to die if not treated, there can be no error in flaming it; but to try this method with healthy trees in the expectation of warding off infection is not advisable, because (1) there is no evidence that the treatment would succeed, and (2) there is the certainty that the tree would be seriously injured in a way that would make it more susceptible to infection.'

Although none of the remedial measures tried have proved effective in preventing the progress of the disease in infected trees, yet adequate preventive measures will check its general spread and reduce to a minimum the number of annual cases. The first step is to destroy all the sources of infection; the second to destroy or reduce in numbers its means of transmission; and the third to do away with conditions favourable to its development. In regard to the first step, the tops of all infected trees must be cut off and destroyed. Johnston recommends that when only a few trees have to be destroyed the best plan is to cut off their tops and burn them, allowing the bare trunks to stand. This leaves the ground free from obstacles and prevents the trunks from forming breeding places as acceptable to insects as they would do if the trees were cut down and the trunks left lying on the ground. 'If the rot extends below the crown, it would be advisable to pour over its surface a pint or so of coal oil and then set fire to it.' When a large number of trees have to be destroyed they should be felled, their tops romoved and burned, and their trunks piled up together and heaped over with earth. According to Johnston, it would probably pay to girdle the trunks about 4 feet from the ground, after cutting off the tops and destroying them. to allow the trunks to dry out and then to use them for timber on the estate.

Since it is probable that insects carry the disease, Johnston suggests that the following measures may prove effective. The spread of infection might be prevented by placing bands of cloth soaked in coal tar, and about 6 inches wide, on the ground round the base at about 5 feet from the tree. This would prevent the access of crawling insects. When rats or larger animals are present, a band of galvanized iron about 8 inches wide might be fixed round the trunk at a height of 5 feet. Turkey buzzards might advantageously be destroyed. It is uncertain, however, if spraying the tops of the trees with insecticides has any very marked effect in reducing the number of flying insects in the crown, while it is a somewhat difficult operation to perform. Lastly, the cultivation should be kept free from bush, so that as little shelter as possible is provided for insects. The soil should be manured and well drained in order that the trees may be given the best conditions for their growth. There can be no doubt that destruction of diseased trees and careful attention to general sanitation and cultivation have materially reduced the prevalence of the disease in Jamaica, and that these measures would give beneficial results in practically all cases.

WEST INDIAN PRODUCTS.

DRUGS AND SPICES ON THE LONDON MARKET.

Mr. J. R. Jackson. A.L.S., has forwarded the following report on the London drug and spice market, for the month of February 1912:—

The position of the markets during February has shown but very little change since our last report. Though business has been by no means brisk, there has, however, been a steady demand for most of the well-known drugs The close of the month has, unfortunately, suffered considerable depression in all trade circles, by the realization of the long threatened coal strike, resulting, as it has already done at the time of writing, in the closing of many large factories, and the suspension of much of the passenger and goods traffic on the railways. In West Indian produce there is but very little to report upon, as the sales have been only of a normal character.

GINGER.

At the first spice auction on the 7th, ginger was represented by 168 packages of Cochin, which were sold without reserve at from 28*s.* to 30*s.* per cwt. At the last auction on the 28th, as many as 1,400 bags of Cochin and Calicut were brought forward, 170 only were sold, at the following rates: small, rough, wormy Cochin, 38*s.* to 38*s.* 6*d.*; good bright cuttings, 55*s.*; fine, bright, rough Calicut, and washed rough Cochin were bought in, the former at 53*s.*, and the latter at 44*s.* to 47*s.* per cwt.

NUTMEGS, MACE AND PIMENTO.

On the 7th of the month, nutmegs were represented by 113 packages of West Indian and 82 packages of Eastern. The former sold at the following rates: 83's, $5\frac{3}{4}d.$ to 6*d.*; 92's to 101's, 5*d.* to $5\frac{1}{2}d.$; 103's to 110's, $5\frac{1}{2}d.$ to $5\frac{3}{4}d.$ Only a part of those from the East found buyers, 56's fetching 1*s.* 1*d.*; 65's, garbled and slightly defective, $10\frac{1}{4}d.$; 85's, $5\frac{1}{4}d.$; and 120's, $4\frac{3}{4}d.$ On the 14th, 20 packages of West Indian were brought forward and sold, 87's fetching $5\frac{3}{4}d.$, and 94's to 103's $5\frac{1}{2}d.$ to $5\frac{3}{4}d.$ per lb. A week later, as many as 300 packages of West Indian were brought forward, and sold at full rates, 63's to 72's fetching $6\frac{1}{2}d.$ to $8\frac{1}{2}d.$, 91's to 106's 5*d.* to 6*d.*, and 110's to 130's $5\frac{1}{2}d.$ to 6*d.* At the last auction on the 28th, 16 packages of West Indian were offered, and sold at similar rates. Of mace, at auction on the 7th, 22 packages of West Indian were sold at 2*s.* 3*d.* to 2*s.* 6*d*, and broken at 2*s.* 2*d.* to 2*s.* 3*d.* per lb. A fortnight later 61 packages of West Indian were brought forward, and sold at slightly increased rates, which were maintained at the last sale on the 28th. Pimento is reported firm, but little has been done with it at the sales.

SARSAPARILLA.

The continued scarcity of grey Jamaica and the demand for it, ensures the ready sale of all that is brought forward at every auction; at the first drug auction on the 8th, the supplies were small, consisting of only 6 bales of grey Jamaica and 8 bales of native Jamaica, the former were all disposed of at an advance of about 2*d.* per lb. over previous rates. Fair fibrous fetched 2*s.* 1*d.* to 2*s.* 2*d.* per lb., and sea-damaged 1*s.* 6*d.* per lb. Of the native Jamaica, 4 bales only found purchasers, 2 bales of good red fetching 1*s* 2*d.* per lb. and 2 bales of ordinary dull red 10*d.* per lb. A fortnight later the offerings of grey Jamaica had increased to 14 bales, which were all sold at a further advance of 1*d.* per lb, fair grey fetching 2*s.* 3*d.* and part slightly rough 2*s.* 2*d.* per lb., while 11 bales of Lima Jamaica, all that was offered, sold at 1*s.* 4*d.* to 1*s.* 6*d.* for fair, part slightly country damaged, and 1*s.* 3*d.* was paid for rough and chumpy.

KOLA, LIME JUICE, LIME OIL, CASSIA FISTULA, TAMARINDS AND CASHEW NUTS.

At the first auction in the month 11 bags of fair bright Jamaica kola in halves, were sold at $3\frac{1}{2}d.$ per lb. and again on the 21st, 10 bags of good clean dried Jamaica halves were brought forward and all disposed of privately, it was stated, at $3\frac{1}{4}d.$ per lb.; and quite at the end of the month it was reported that $4\frac{1}{2}d.$ had been paid for good West Indian halves Lime juice has been scarce throughout the month. At the first auction 14 hogsheads of Antigua were sold, realizing from 1*s.* 3*d.* to 1*s.* 4*d.* for fair brownish, and for 11 puncheons of fair palish Jamaica, 1*s.* 5*d.* was paid. A week later, it was reported that 1*s.* $9\frac{1}{2}d.$ had been paid for some very fine pale juice West Indian distilled lime oil, at the beginning of the month, sold at 1*s.* 2*d.* per lb. The new crop of Cassia Fistula was referred to at the end of the month as arriving freely on the Hamburg market, 23*s.* per cwt. being the price quoted. Tamarinds were represented on the 21st by 8 barrels of West Indian, common dry stony, 10*s.* 6*d.* per cwt. in bond being paid for them. A large quantity of cashew nuts from Bombay were brought forward at the beginning of the month, and part sold at 24*s.* per cwt. for husky, 60*s.* being the price wanted for clean pale.

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR, March 12, 1912; Messrs. E. A. DE PASS & Co., March 1, 1912.

ARROWROOT—$3\frac{1}{2}d.$ to $4\frac{3}{4}d.$
BALATA—Sheet, 3/7; block, 2/6½ per lb.
BEESWAX—£7 2s. 6d. to £7 10s.
CACAO—Trinidad, 55/- to 75/- per cwt.; Grenada, 49/- to 54/6; Jamaica, 49/. to 55/6.
COFFEE—Jamaica, 70/- to 77/- per cwt.
COPRA—West Indian, £26 per ton.
COTTON—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 18d. to 23d.
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—48/- to 65/- per cwt.
ISINGLASS—No quotations.
HONEY—No quotation.
LIME JUICE—Raw, 1/3 to 1/9; concentrated, £18 10s. to £19; Otto of limes (hand pressed), 6/9 to 6 11.
LOGWOOD—No quotations.
MACE—Firm.
NUTMEGS—Firm.
PIMENTO—Common, $2\frac{5}{8}d.$; fair, $2\frac{11}{16}d.$; good, $2\frac{3}{4}d.$; per lb.
RUBBER—Para, fine hard, 4/8½; fine soft, 4/7¼; Castilloa, 4/10 per lb.
RUM—Jamaica, 1/8 to 5/-.
SUGAR—Crystals, 20/- to 23/-; Muscovado, 16/6 to 19/-; Syrup, 14/9 to 15/6 per cwt.; Molasses, no quotations.

New York.—Messrs. GILLESPIE BROS. & Co., March 8, 1912.

CACAO—Caracas, 11¾c. to 12¼c.; Grenada, 11½c. to 11⅝c.; Trinidad, 11¾c. to 12c. per lb.; Jamaica, 10¼c. to 11¼c.
COCOA-NUTS—Jamaica, select, $24·00 to $25·00; culls, $15·00 to $16·00; Trinidad, select, $25·00 to $26·00; culls, $16·00 to $17·00 per M.
COFFEE—Jamaica, 14⅝c. to 16c. per lb.
GINGER—8c. to 10½c. per lb.
GOAT SKINS—Jamaica, 53c.; Antigua and Barbados, 48c. to 50c.; St. Thomas and St. Kitts, 45c. to 47c. per lb.
GRAPE-FRUIT—Jamaica, $3·50 to $4·00.
LIMES—$5·00 to $5·50.
MACE—55c. to 57c. per lb.
NUTMEGS—110's, 12½c.
ORANGES—Jamaica, $1·75 to $2·00 per box.
PIMENTO—3½d. per lb.
SUGAR—Centrifugals, 96°, 4·52c. per lb.; Muscovados, 89°, 4·02c.; Molasses, 89°, 3·70c. per lb., all duty paid.

Trinidad,—Messrs. GORDON, GRANT & Co., March 18, 1912.

CACAO—Venezuelan, $11·90 to $12·10 per fanega; Trinidad, $11·60 to $11·85.
COCOA-NUT OIL—$1·07 per Imperial gallon.
COFFEE—Venezuelan, 15½c. per lb.
COPRA—$4·50 per 100 lb.
DHAL—$4·00.
ONIONS—$5·00 to $5·25 per 100 lb.
PEAS, SPLIT—$7·00 to $7·25 per bag.
POTATOES—English, $2·10 to $2·25 per 100 lb.
RICE—Yellow, $4·75 to $4·80; White, $6·50 to $6·75 per bag.
SUGAR—American crushed, no quotations

Barbados,—Messrs. JAMES A. LYNCH & Co., March 23, 1912; Messrs. T. S. GARRAWAY & Co., March 25, 1912; Messrs. LEACOCK & Co., March 15, 1912.

ARROWROOT—$6·50 to $7·00 per 100 lb.
CACAO—$10·50 to $11·00 per 100 lb.
COCOA-NUTS—$16·00.
HAY—$1·60 to $1·90 per 100 lb.
MANURES—Nitrate of soda, $65·00; Cacao manure, $42·00 to $48·00; Sulphate of ammonia, $80·00 per ton.
MOLASSES—No quotations.
ONIONS—$3·00 to $5·50 per 100 lb
PEAS, SPLIT—$7·10 to $7·25 per bag of 210 lb.; Canada, $3·00 to $4·40 per bag of 120 lb.
POTATOES—Nova Scotia, $1·50 to $3·25 per 160 lb.
RICE—Ballam, $4·85 to $5·10 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
SUGAR—American granulated, $5·50 per 100 lb.

British Guiana.—Messrs. WIETING & RICHTER, March 16, 1912; Messrs. SANDBACH, PARKER & Co., March 15, 1912.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	——	——
BALATA—Venezuela block	No quotation	Prohibited
Demerara sheet	70c. per lb.	——
CACAO—Native	19c. to 20c. per lb.	20c. per lb.
CASSAVA—	96c.	No quotation
CASSAVA STARCH—	$7·00	No quotation
COCOA-NUTS—	$12 to $16 per M	$10 to $16 per M., peeled and selected
COFFEE—Creole	18c. per lb.	16c. per lb.
Jamaica and Rio	18c. per lb.	19c. per lb.
Liberian	13c. per lb.	12c. per lb.
DHAL—	$3·75 per bag of 168 lb.	$3·75 per bag of 168 lb.
Green Dhal	$4·50	——
EDDOES—	96c.	——
MOLASSES—Yellow	None	——
ONIONS—Teneriffe	——	——
Madeira	——	8c.
PEAS—Split	$7·00 per bag (210 lb.)	$7·60 per bag (210 lb.)
Marseilles	——	No quotation
PLANTAINS—	16c. to 40c.	——
POTATOES—Nova Scotia	$3·50	$3·50
Lisbon	——	No quotation
POTATOES-Sweet, B'bados	$1·68 per bag	——
RICE—Ballam	No quotation	——
Creole	$5·00 to $5·25	$5·25 to $5·50
TANNIAS—	$1·80	——
YAMS—White	$2·40	——
Buck	$2·64	——
SUGAR—Dark crystals	$3·30 to $3·40	$3·40
Yellow	$4·25	$4·25
White	——	——
Molasses	$2·90 to $3·00	——
TIMBER—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$3·75 to $6·00 per M.	$4·00 to $6·00 per M.
,, Cordwood	$1·80 to $2·00 per ton	No quotation.

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AGRICULTURAL NEWS.

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OF THE
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CONTENTS.

Recent Work on Bacteria in the Soil.

THE recognition, in recent years, of the large and important part taken by bacteria in those changes occurring in the soil that may be favourable, or detrimental, to the plants growing in it, has led to an increasing amount of work, on the part of investigators, designed for the purpose of determining the conditions under which such bacterial action takes place, and in what ways it may be influenced in the interest of the agriculturist. A review,* published recently, of the chief matters pertaining to such work that have received attention during the past year, affords an opportunity of presenting its chief results, and of indicating the ways in which the results are likely to have application in relation to agricultural practice and investigation in the West Indies.

The chief difficulty that has been encountered in the investigations, so far, has arisen from the fact that, under the artificial conditions of the laboratory, the results obtained concerning the extent of bacterial activity in the soil are not in agreement with those indicated in trials conducted under natural circumstances, on a large scale: in the former case, the amount of this activity is much smaller than that which appears to take place in the soil. In regard to tropical conditions, the difference is likely still to be greater, because of the circumstance that almost all the important investigations are being conducted in laboratories in the Temperate Zone, in relation to the soil constitution and temperature that obtain in those latitudes. The most important requirement at present therefore, is the discovery of a method that will enable experiments, on a small scale, in regard to the activity of micro-organisms in the soil, to be conducted in a way to give results comparable to those obtained in the field; and further, that the work of investigation shall be extended in the direction of affording increased attention to the subject, in its relation to the conditions that exist in the warmer regions of the earth.

The general bacterial activity in the soil has been

*A. D. Hall, on Agricultural Chemistry and Vegetable Physiology, in *Annual Reports on the Progress of Chemistry*, 1911, issued by the Chemical Society.

investigated by some workers with reference to the effect produced by the addition to it of carbohydrates such as starch and sugar (sucrose). Under the conditions of the experiments, this was found to cause injury to growing plants, whereby development was retarded, and the roots killed to a large extent. The reason adduced for this effect is that the presence of so large a proportion of carbohydrates in the soil led to so great an increase in the number of bacteria that, in the competition for the available supply of air, the roots of the plants suffered. This effect was hardly expected, for it was considered that the increased supply of carbohydrates would result in the usual increase in numbers of the chief nitrogen-fixing organism—Azotobacter—with a consequent favouring of the growth of the plants. The apparently abnormal result was shown later, however, to have been produced by the circumstance that the experiments were conducted during the spring of the year, when the temperature of the soil was such that the activity of Azotobacter was at its lowest, while that of other bacteria, notably those of putrefaction, was much greater. On repeating the trials, in autumn, the nitrogen-fixing organism took advantage of the greater supply of the carbohydrate required for providing it with the energy for doing its work, with beneficial results to the succeeding crop. Trials of a similar nature, in the tropics, employing molasses as the source of carbohydrate, and sugar-cane as the crop, have indicated beneficial results in Mauritius and possibly beneficial effects in Antigua; while in British Guiana, it has been demonstrated so far that the application of molasses to sugar-cane lands is not in the nature of a commercial success.

The nitrogen-fixing organism, Azotobacter, as has been indicated, derives the energy needed for this action by the destruction of carbohydrates; that is to say by employing as sources of that energy substances of the nature of starch and the sugars. It has also been stated that the measure of the activity of soil bacteria in laboratory experiments is not on a scale affording comparison with that existing under natural conditions. Thus with Azotobacter, the amount of nitrogen fixed, in relation to the quantity of carbohydrate destroyed, is very small in experiments of the former kind, in comparison with that indicated in trials on a field scale. This condition has led to the making of investigations to find a reason for it, and the result has been to show that while at first the ratio of nitrogen fixed to the carbohydrate used is high, even in the small scale experiments, this decreases quickly, as the time goes on, because, as it is explained, of the accumulation of nitrogenous material under the conditions of the trials, whereby the Azotobacter is caused to use the carbohydrate for purposes other than the fixation of nitrogen. It is natural to conclude that this change in its action on carbohydrates does not occur in the open soil, because the conditions do not ordinarily exist there for the concentration of the nitrogenous material that is effective in causing it to take place.

Another reason for the apparently increased activity of Azotobacter in soils has been found in the fact of the presence of humus, which results in the stimulation of the organism owing to the fact that the humus contains small quantities of silicate of iron, and similar bodies, the effect of compounds of iron being such that this depends largely for its extent on the nature of those compounds. As these are present in basic slag, the circumstance forms an explanation of part of the beneficial effect on nitrification that is known often to follow the application of this manure.

Among the bacteria that have been found to exist normally in soil are a number of heat-loving organisms—that is organisms that can thrive at temperatures sufficiently high to kill the majority of other, similar forms of life, as well as those more highly organized. Experiments have shown that these have the power to fix nitrogen at a temperature as high as 142°F. The matter is suggestive in connexion with the supposition that such organisms may have a larger importance under tropical, than under temperate conditions.

There has been no new work of a striking nature, with respect to the benefit to plants of heating and partially sterilizing the soil, though accounts have been published by several investigators, of the effects produced by antiseptic substances. In the case of these, the improvement of the conditions, as regards plant production, by the application of such substances to the soil, has been attributed to the stimulus that they are thought to give to the beneficial organisms in the soil, rather than to the reason adduced by Russell and Hutchinson,* namely the destruction that they cause of the larger organisms which employ the bacteria as food: and this conclusion is reached notwithstanding the fact that the work of these investigators was, in one of its aspects, conducted for the purpose of showing that the benefit arising in the soil after heating or partial sterilization cannot be attributed to the direct stimulation of bacterial activity.

The circumstance that has just been mentioned, namely, the effect of partly sterilizing the soil by heat

* *Agricultural News*, Vol. IX, p. 33.

or by antiseptics, in relation to the destruction of the larger organisms (protozoa), and the consequent great increase of the smaller forms of life, including the beneficial bacteria, has received attention by an investigator, at Rothamsted, who has devised a means of driving the organisms out of the soil and enumerating them, so that it is no longer necessary to obtain them by culture methods. The work described goes on to produce evidence that these organisms—the protozoa mentioned already, or, at any rate, several kinds among them—exist in the soil in an inert condition (encysted), and are thus unable to cause the decrease in the number of bacteria in the way attributed to them by Russell and Hutchinson. This objection cannot be maintained, however, in regard to all the organisms in the soil that may act in this manner, and it has been met to some extent by the supposition that, under the conditions of the investigation, the bacteria themselves were showing little activity, and that this, as well as the activity of the inert protozoa, would be largely increased under favourable conditions of moisture and temperature.

Other work of interest has shown that Azotobacter and other organisms are capable of increasing the amount of calcium carbonate in the soil by the oxidation of calcium oxalate in plant residues that it contains, the calcium oxalate being attacked only in the absence of organic matter sufficient for the needs of the bacteria. A description of the investigation has been given in a recent issue* of this journal.

The account just presented serves to draw attention to some of the more important results that have been obtained during the past year, in regard to bacteria in the soil. It will be seen that, while these are already of the greatest importance to the agriculturist, the work that is being done, in order to make the labour of investigation possess as close a relation as possible to conditions in nature, will greatly increase the value of those results and render them continually more dependable in their application as a guide in agricultural practice.

SUGAR TRADE OF THE UNITED KINGDOM, 1911.

The following figures giving the imports and exports of sugar, expressed as the nearest ton, into and from the United Kingdom in 1911, are taken from the *International Sugar Journal* for January 1912. For purposes of comparison the quantities for 1910, taken from the same source, are also included:—

* *Agricultural News*, Vol. XI, p. 83.

IMPORTS.

	1911.		1910.	
	Quantity,	Value,	Quantity,	Value,
Unrefined Sugars.	tons.	£.	tons.	£.
Germany	391,912	4,287,246	229,750	2,644,093
Java	173,721	2,815,521	118,275	1,605,161
Austria-Hungary	62,025	756,260	57,520	715,229
British India	64,398	1,093,048	8,871	96,674
Mauritius	58,696	702,934	41,496	589,230
British W. I. Islands, British Guiana & British Honduras	54,346	750,521	78,748	1,147,200
Netherlands	30,916	468,438	20,216	234,063
Hayti and San Domingo	27,277	296,273	76,547	1,078,592
Peru	27,157	293,412	46,232	588,000
Belgium	21,185	282,964	11,165	129,180
Brazil	14,751	138,762	51,469	618,752
Mexico	8,180	103,020	10,686	151,434
Dutch Guiana	6,522	91,963	7,223	105,252
Cuba	3,859	29,611	96,336	1,371,633
Philippine Islands	3,645	34,293	...	...
Russia	1,747	21,686	93	1,190
Straits Settlements	1,226	16,209	792	9,389
France	254	2,620	431	6,260
Other Countries	18,263	213,455	25,198	329,525
Total Raw Sugars	970,080	12,398,236	881,049	11,420,857
Refined Sugars.				
Germany	366,847	5,314,217	334,093	5,080,325
Austria-Hungary	186,137	2,724,065	199,517	3,103,558
Holland	145,068	2,407,165	117,877	1,809,649
Russia	110,051	1,683,815	2,113	26,357
Belgium	60,125	1,022,969	49,148	740,071
France	5,825	93,046	60,708	1,004,381
Other Countries	65,791	1,156,580	80,699	1,369,011
Total Refined Sugars	939,845	14,401,857	844,155	13,133,352
Molasses	158,403	681,455	155,405	700,994
Total Imports	2,068,328	27,481,548	1,880,609	25,255,203

EXPORTS.

	1911.		1910.	
	Quantity,	Value,	Quantity,	Value,
British Refined	tons.	£.	tons.	£.
Canada	8,735	131,871	10,770	170,107
Denmark	4,100	52,504	4,055	56,113
Netherlands	2,957	43,822	3,290	48,418
Italy	1,105	13,344	930	11,658
Portugal, Azores and Madeira	1,100	15,436	1,829	25,998
Other Countries	10,648	183,482	10,489	186,178
	28,645	440,459	31,363	498,472

A summary of the details given concerning the exports of foreign and colonial sugars may be presented as follows. The total of such exports during 1911 was 37,232 tons, value £552,904, as compared with 52,364 tons, value £759,692, in 1910.

FRUITS AND FRUIT TREES.

THE FORCED CURING OF FRUIT.

An account of preliminary work in regard to the forced curing of fruit is contained in Bulletin No. 232 of the Bureau of Plant Industry of the United States Department of Agriculture, just issued. From this, the following conclusions are taken:—

The forced curing or sweating of lemons as at present practised consists in subjecting the green fruit to heat and humidity in closely confined enclosures until the desired yellow colour is produced, the time required ranging from five to fourteen days. Different methods of supplying the heat are used with varying success.

Experiments here described show that heat and humidity are of minor importance in colouring lemons and that the pungent, gaseous combustion products given off by the oil stoves used, produce the desired effect. These gaseous products can be conducted to distant rooms by means of pipes, their effectiveness being thereby unimpaired. This suggests the possibility, in using these gases on a commercial scale, of generating them with the burners in separate structures and distributing them to different rooms containing the fruit. A great reduction of fire risk would result from such an adaptation.

The colouring of lemons is noticeably hastened when confined in spaces constructed of materials of a porous nature. Sweat rooms constructed of earth, brick, or concrete are more effective than those made of wood.

A common result of the sweating process is the loss of the stems from the fruit. This loss is supposed to provide an avenue for the entrance of organisms into the fruit, causing decay—a conclusion not justified by the available evidence. It has been generally held that excessive humidity in the sweat room causes the stems to loosen. Experiments indicate that the gaseous products applied alone will cause the stems to drop and that humidity and heat are less important factors.

It must be understood that the results recorded in this publication are put forth rather as a report of progress than as a finished investigation. It is recognized that further work is required in order to apply the results already obtained to the practical use of the lemon producer, and plans for such further work are already made.

The following note is appended to the summary at the end of the Bulletin:—

Since the manuscript of this bulletin left the hands of the writers, an interesting development from the investigation here reported has been worked out by certain California lemon handlers. Instead of getting the effective combustion products from the rather objectionable oil stoves, these handlers have made use of the exhausted products of gasolene-burning motors. These motors supply the heat needed for the combustion and the energy required for forcing the gases to those parts of the lemon houses in which they are needed. It is probable, however, that this method will prove rather expensive unless the energy developed can be successfully utilized in running washers, graders, or other machinery of the packing house.

NATIVE RICE-GROWING IN JAVA.

This is the title of an abstract, given in the *Bulletin of the Bureau of Agricultural Intelligence and of Plant Diseases* for February 1912, p. 418, of an article in the *Bulletin Agricole du Congo Belge*, Vol. II, p. 744. The abstract is reproduced here:—

Rice is cultivated in Java in three different ways: (1) in flooded fields (sawahs); (2) in wet fields; (3) in dry fields.

CULTIVATION OF RICE IN FLOODED FIELDS. The rice fields form a succession of terraces, arranged without any slope, and surrounded by small banks to keep in the water. The latter is conveyed to the highest terraces, and successively empties on to the lower fields.

Some time before starting work, at the beginning of the rainy season, the rice field is flooded. The soil slowly grows wet. When it is sufficiently softened, ploughing begins: each ploughing is followed by a harrowing, and cultivation continues till the surface is transformed into soft mud.

The nurseries consist of small areas surrounded by banks, which are likewise ploughed several times after flooding. The surface water is then drained off, and on the mud, side by side, whole rice ears are placed. After sowing, the nursery is once more flooded. In eight or ten days the water is drawn off during the night, and irrigation after that only effected by day. This goes on for about two months.

When the young plants are 18 to 24 inches high, they are ready for transplanting to the fields; they are dug up and made into small bunches; these are set out after cutting off the top of the stalk, care being taken to bury the root thoroughly. The distance between each bunch is 4 to 8 inches.

After planting, the rice field is left dry for three to four days. It is then once more flooded. If the rice is yellow in appearance, the field is dried for some time, and, about seventy-five days before the crop, it is left dry for good. The attentions required consist in keeping the banks in good repair and weeding two or three times. It is advisable to clear away plants growing on the bank, to get rid of vermin.

RICE-GROWING IN WET FIELDS. This method is applied where there is not enough water for regular flooding. The field is flooded at the start of the rainy season. When the soil is soaked the water is run off. The soil is then ploughed deeply two or three times and harrowed down. The rice seed is sown in the plough furrows and immediately covered by harrowing. The soil is kept cool by surface cultivation. If the weather is dry and water is at hand, the field is flooded from time to time. During the heavy rains the rice grows very rapidly. By means of well designed banks the water is then kept as long as possible on the field; it is however necessary to provide for a slight current in the water, because in stagnant water rice is largely attacked by a caterpillar which gets inside the stalk and makes the plant wilt.

CULTIVATION OF RICE IN DRY FIELDS. This method is only practical in mountain regions. The soil is tilled with the plough or spade, or sometimes not at all. For sowing, all that is done is to dig holes with a hoe or spade 6 to 8 inches apart, and put down a few grains.

Oryza montana and *O. sativa* are the two species generally grown. The former is used for dry rice fields and the latter for flooded or wet rice fields. The most frequent diseases of rice are caused by *Leptocorisa acuta*, an insect which attacks the young ears and thus prevents the formation of the grain; *Tylenchus oryzae*, a nematode which attaches itself to the roots; the caterpillars of *Nymphula stagnalis*, *Hesperio philiona*, etc., are likewise very frequent; to prevent their metamorphosis, it is recommended to leave the field flooded.

For harvesting the rice, the ears are cut one by one and then tied up in bundles. These bundles are stacked and conveyed to the store-houses. After the crop, the land is very often allowed to lie fallow for six months, or earth-nuts, sweet potatoes and other quick-growing vegetables are cultivated.

Under native cultivation, the average yield per acre is 900 to 1,080 lb. of paddy. With improved methods, yields of 2,700 to 3,600 lb. per acre are obtained, producing about 80 per cent. of dry rice.

Coffee-Growing in Madagascar.—Coffee-growing in Madagascar is beginning to take an important place amongst the agricultural industries of the island. In the Mananjary district there are no fewer than twenty coffee-growing estates, containing at least 700,000 plants, producing at the present time about 120 tons annually. It is estimated that the yield from these plantations will in a few years' time be increased to at least 500 tons. The Liberian variety of coffee is chiefly grown in Madagascar, but many planters are introducing a quality resembling East Indian, with small berries and thin husks. Madagascar coffee is beginning to find a market in France. (The *Journal of the Royal Society of Arts*, March 8, 1912.)

SILK COTTON IN COMMERCE.

Recent references to the product of the silk cotton tree (*Eriodendron anfractuosum*), which is most generally known as kapok, have appeared in the *Agricultural News*, Vols. VIII, pp. 130, 279, 393; IX, pp. 60, 93, 239; and X, p. 308. The following additional information is taken from the *Chamber of Commerce Journal* for February 1912:—

The tree which yields Java kapok is *Eriodendron anfractuosum*, D.C. The kapok exported from India, Cochin China, etc., is derived from *Bombax malabaricum*, and other species of Bombax. In Java, the kapok tree is met with in the fields and by the roadside; it is cultivated only by a few Europeans. The fruit is gathered when ripe and the fibre is separated from the seeds and debris either by hand or by machine. The seeds are pressed for the oil which they contain. The kapok is pressed and packed in jute sacks. For the Australian market these contain 60 to 80 lb.; for America or Europe they are pressed more closely, so that the sacks weigh 99 lb. Owing to the care which is given to the preparation of the kapok in the Netherlands Indies the fibre can be used immediately without further cleaning. The most important markets for kapok are Holland and Australia, but the imports to America, France, Italy, and Spain have increased considerably in recent years. The other European countries are supplied from the Amsterdam market, Germany being the principal customer. England, Russia, Denmark, Sweden and Norway use comparatively little kapok. Horsehair is nowadays being gradually supplanted by kapok which, it is stated, is more hygienic for use in stuffing mattresses. Kapok is also preferred to other vegetable fibres for this purpose. It has the great advantage of being extremely elastic and of retaining this quality for a long period. Mattresses stuffed with kapok, therefore, last longer than those stuffed with horsehair or vegetable fibres. They are also light and easily handled, and, since a smaller quantity of fibre is necessary, they cost less than horsehair mattresses. The statement that kapok mattresses are not cool seems to be unfounded, since the material is used in tropical countries both for this purpose as well as for use in upholstering chairs, etc. Kapok possesses various other advantages. For example, it does not readily absorb moisture and dries rapidly without losing its elasticity. It can also be repeatedly submitted to sterilization by heat without losing its qualities. Kapok is used for surgical dressings on account of its properties mentioned above, and also because it does not become matted. It may be used for making life-belts and life-buoys, since it has great buoyancy and retains this quality after being immersed in water for several days, which is not the case with cork or reindeer hair. Kapok, after immersion in water for thirty days, loses only 10 per cent. of its buoyancy, which it at once regains on being dried. A company has been formed in Germany for spinning yarn from kapok either alone or in admixture with cotton. Kapok is also used by hat makers and in the manufacture of guncotton.

DEPARTMENT NEWS.

Mr. F. W. South, B.A., Mycologist on the Staff of the Imperial Department of Agriculture, left for St. Lucia by the S.S. 'Parima', on April 9, for the purpose of making investigations in connexion with plant diseases in that island.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date March 25, with reference to the sales of West Indian Sea Island cotton :—

Since our last report, about 200 bales of West Indian Sea Island cotton have been sold, chiefly Montserrat, Antigua, Nevis and St. Kitts at prices varying from 18*d.* to 19*d.*, and Barbados 20d., with a few superior bags on private terms.

The market remains very firm, as owing to the poor character of the Carolina cotton this season and the smallness of that crop, most users are purchasing West Indian in replacement.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending March 23, is as follows:—

The market remained very quiet throughout the week, with limited inquiry for a few of the planters' crop lots, which resulted in sale of only 15 bales Jos. T. Dill on private terms, and a few bags of rejections from crops of Extra Fine at 28c.

There is no change to report, except that the Factors seem more disposed to sell and will make concessions to dispose of some of the lots held in stock.

We quote viz :—

Extra Fine	32c. = 18*d.*, c.i.f., & 5 per cent.
Fine to Fully Fine	26c. to 28c. = 15*d.* to 16*d.*, c.i.f. & 5 per cent.
Fine to Extra Fine, off in preparation	18c. to 25c. = 10½*d.* to 14¼*d.* ,, ,, ,,

INJURY TO COTTON FIBRES IN SPINNING.

This interesting subject led to much discussion during the session in which matters relating to cotton were dealt with at the recent Agricultural Conference in Trinidad. Useful information in connexion with it is given in the following article, taken from the *Textile Mercury* for March 2, 1912. It appears to deal with upland cotton, for which the saw gin is used, rather than with the Sea Island variety:—

At a meeting of the Manchester Section of the Society of Dyers and Colourists, a paper was read on this subject by Mr. W. S. Taggart, M.I.M.E. In the course of the paper the author drew attention to the fact that there is a large percentage of poor fibres in all cotton. The ginning operation, being a severe one, has much to do with this, and the fibre, when received in the mill, is thus in a somewhat damaged condition.

The first actual processes capable of doing damage in the spinning mill itself are opening and scutching. Most cotton-spinning machinery dates from an early period, and little has been done to improve matters from what took place many years ago. The beater of the scutcher acts in a brutal way towards the cotton fibre. The damage done to the cotton may be judged from the following figures: The beater revolves 1,000 to 1,200 revolutions per minute. There are two blades on it. Sometimes there are three blades, in which case they are of a smaller diameter and run a little slower, but the general practice is to have two blades. The beater gives the cotton 2,400 blows per minute, at the rate of 1,200 revolutions per minute. During the time that one inch length of cotton emerges there will be about 8,000 blows given to it. It will readily be realized what terrific action must take place.

What happens very often (apart from the damage that may be done to the cotton due to the terrific hammering that the fibres receive) is that the cotton emerging just over the pedal-nose is wedged by the downward moving blade. This wedge action takes place frequently, and causes serious damage.

Another great sinner in respect of injuring cotton is the card, which is also somewhat brutal. The operation acts so that a large number of fibres must be broken or snapped, and also a large number must go through damaged by being cracked. If cracked fibres have any influence at all, they will certainly reduce the strength of the yarn, and they must of necessity reduce the strength of the cloth. What effect they have on dyeing and printing the author could not say.

During the discussion which followed, the opinion was expressed that the hammer wedging action of the opening machine would most likely influence the dyeing, as it had been noticed that when cotton cloth was hammered on a steel plate, the hammered places took up less dyestuff, and it was very likely that the tearing action of the card would have the result of producing darker shades in dyeing.

At a meeting of the Dominica Planters' Association held in January last, it was concluded after some discussion that the shortage of limes and cacao in the past year was partly due to difficulties of transport and the growing scarcity and inefficiency of local labour. The lime crop is also stated to have suffered damage through the indiscriminate picking of green limes during the flowering season. It is further suggested that, for obtaining a proper means of comparison, the crop year for limes should be reckoned from July 1 to June 30 following.

METHODS OF MARKING LABORATORY CRUCIBLES.

These are described in Circular No. 33, just issued, of the Bureau of Chemistry of the United States Department of Agriculture, and are employed for marking porcelain crucibles, accounts of two methods being given, one for marking with platinum and the other for the application of China paints, rubber type being used in both cases:—

THE PLATINUM PROCESS. The crucibles are cleaned by heating for half an hour with nitric acid, one part concentrated acid to one part of water. A sizing is prepared consisting of a hot 5 per cent. solution of gelatine. The parts of the crucibles to be marked are dipped into this sizing and set aside to drain and dry. When the gelatine is dry, the desired number is stamped on with a solution of platinic chloride containing 12 to 15 per cent. of platinum—i.e., about 32 to 40 per cent. of the hydrated crystallized chloroplatinic acid. The pad holding the solution may be made of six or eight folds of smooth linen or muslin, and need not be much larger than the type used. This pad is nearly saturated with a few drops of the platinic-chloride solution. Too much of the solution causes blurring and too little of it or too dilute a solution results in dim numbers. After the numbers are dry the crucibles are gently heated until the platinum is reduced and the gelatine burned off. This is most conveniently accomplished in a muffle. Finally, the numbers are heated for one-half minute in the flame of the blast lamp—i.e., for one-half minute from the time it attains the temperature of the flame.

If the wares are cleaned and fired as directed, the markings adhere well. The figures become more prominent if burnished by use of a china painter's burnishing stone, if available, or of seashore sand, or less advantageously of a silica soap. The deposit is resistant to single acids, but not to alkalis. In some experiments library paste was substituted, with good results, for the gelatine sizing. Gold and mixtures of gold and platinum solutions may be applied similarly, but there is more danger of volatalizing the gold chloride before reduction takes place, and thereby causing a spreading of the deposit. The resulting figures also are less conspicuous than when platinum is used. This method of getting the deposit of platinum or gold may possibly find use also in decorating chinaware. If the solution is applied with a brush, a quill, or a glass stylus, it may be more dilute. The same method applied to silica wares also gives very satisfactory results.

APPLICATION OF CHINA COLOURS. Paints mixed in oil are not satisfactory for use with rubber stamps because the type leaves on the porcelain a rim of thickened paint while the main surface of contact is relatively bare. The method finally adopted is to stamp the wares to be marked with a sizing or varnish similar to that which painters use for applying gold leaf; 'Fat oil'—that is partly oxidized linseed oil, supplied by paint dealers—proved very satisfactory for this purpose. While this sizing is still sticky, the dry pigment is dusted on with a camel-hair brush. After the varnish has set the excess of pigment is wiped off and the crucible is fired at a strong red heat, preferably in a muffle. The fat oil dries slowly. This is an advantage because then some time may be allowed between its application and the dusting on of the pigment for the irregular layer on the porcelain to draw out by surface tension into a smoother one. Standing overnight at room temperature, or for one hour in a drying oven at 100°C., suffices for the varnish to set. The pad used for 'inking' the type may consist of several thicknesses of linen cloth and is nearly saturated with this varnish. Too much varnish on the pad must be avoided, as it results in figures with ragged outlines. This varnish may readily be cleaned from the rubber type before it has set, by the use of a 10-per cent. alcoholic solution of caustic potash applied with a small bristle brush.

THE FORTHCOMING INTERNATIONAL RUBBER EXHIBITION.

The first meeting of the honorary advisory committee of the International Rubber and Allied Trades' Exposition, to be held in New York in September next, was held recently at the London Chamber of Commerce, Oxford Court, E.C. Sir Henry A. Blake, G.C.M.G. (President of the European committee) occupied the Chair.

The Chairman said they were meeting there for the purpose of deciding what course should be taken, especially by the growers of plantation rubber in the Near East, with regard to the great exhibition which had been arranged to take place in New York, under the able management of Mr. Manders. The question for the committee to consider was what benefit was to be derived from this exhibition by the rubber growers of the Near East and possibly by some of the manufacturers in Great Britain. It seemed to him that it would be to the interests of rubber growers to present the plantation rubber in New York as it was presented in London, because, although they did have American buyers over here, the fact remained that in New York they had never yet had placed before the great rubber market, which took half the rubber of the world, the excellent condition of the rubber production in our eastern colonies. He need hardly say that if they appreciated those conditions it could not but be beneficial to the owners of plantations in Ceylon and Malaya. Therefore, in his opinion, it was advisable that rubber growers should make as good a show as possible in New York. He thought that perhaps knowledge of what they were doing in the East might be of advantage in attracting American capital and American orders. They must remember that there was a stupendous market to be opened in future in America for our productions, with excellent remunerative prices, and they must look forward to the day when they required all the markets of the world.

The Organizing Manager (Mr. Manders) submitted a report, in which he stated that since the commencement of the organization on October 1 last year, he had been meeting with most spontaneous support from rubber companies and from the manufacturers and allied trades of America, so that the success of a high class exhibition was already assured. Mr. Manders added that Professor Dunstan (Director of the Imperial Institute, London) was making a magnificent exhibit of known rubbers in British possessions.

Mr. Norman W. Grieve moved that a Committee connected with the Rubber Growers' Association and the Malay States' known agencies should be appointed, with the object of securing subscriptions from home companies or individuals with properties in Malaya, towards the cost of the representation of Malaya at the International Rubber Exhibition.

The resolution was seconded and carried, and similar resolutions were also agreed to with regard to Ceylon, Sumatra, Java and Borneo. (The *India-Rubber Journal*, February 10, 1912.)

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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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial presents a review of some of the chief work that has been done in connexion with bacteria in the soil during the past year. The summary is made to refer to conditions in the tropics, particularly in the West Indies.

A useful table containing statistics with regard to the sugar trade of the United Kingdom is reproduced on page 115.

An article of interest to cotton growers and exporters, entitled Injury to Cotton Fibres in Spinning, appears on page 118. It helps to explain why some of the large wastage, experienced in cotton spinning, takes place.

A short article on page 119 gives information regarding the forthcoming international rubber exhibition, to be held in New York during the present year.

The Insect Notes of this issue appear on page 122. They are concerned with a description of a new method of controlling termites, or white ants as they are usually called.

An article on page 125 gives interesting and useful information concerning the employment of formalin on rubber plantations.

The Fungus Notes, on page 126, comprise the first of two articles giving an account of the work that has been done, and the conclusions that have been reached, concerning the condition known as the Panama disease of bananas.

Rubber Cultivation in Mexico.

As is pointed out in *La Quinzaine Coloniale* for July 10, 1911, the rubber produced in Mexico is mainly of two kinds: Guayule, from *Parthenium argentatum*, and the product of *Castilloa elastica*.

It is stated further that the total export amounts to 5 532 tons valued at over £1,600,000. Of this quantity 407 tons was from Castilloa, 163 tons out of this having been obtained from cultivated trees. It is estimated that the total area of the Castilloa plantations is about 90,000 acres, and in these rubber is being obtained at present from only a small proportion of the trees.

Although about 93 per cent. of the total shipments of rubber was Guayule, the proportion is bound to become greatly lessened on account of the decreasing numbers of the wild plants and the fact that those raised in plantations have not given the yields that were expected from them.

Japanese Isinglass, or Agar-agar.

Japanese isinglass, or agar-agar, is made from six kinds of seaweed, which, according to the *Journal of the Royal Society of Arts* for February 23, 1912, is bought up at the close of summer by wholesale dealers in Osaka, and stored until it is sold to the manufacturers, who deal with it only in the autumn and winter, as in the preparation heat and rain spoil the product.

An account of the process of manufacture, by the United States Consul at Kobe, shows that this is simple, and that the utensils employed are primitive. The first stage is the crushing of each kind of seaweed separately, and then its washing with water in order to clean it, followed by its being dried and bleached in the sun, on mats, the bleaching action being assisted by frost and dew.

When they have been bleached, the six kinds of seaweed are boiled together in certain proportions, for about fourteen hours, until they become soluble. After being strained, the liquid is ladled into shallow trays, where it remains about twelve hours; after which time the solid isinglass formed is cut into strips 3 inches wide and 14 inches long, with a knife and a ruler. These are then pushed through a wire sieve, so that long, fine strips are produced.

The isinglass in this form is placed on a low stand, covered with a clean mat, and dried in the sun during the day and frozen at night, for two or three weeks during January and February, being watered at midnight. The kind of weather that occurs during this time is the circumstance that decides the quality of the isinglass, which is best when the weather is clear and cold. After being bleached sufficiently, the product is compressed and packed in Japanese matting, tied with straw rope.

The very best quality is all exported to China, the so-called No. 1 quality taken by the United States being equal to the No. 2 quality that goes to China. It may be mentioned that one of the uses of agar-agar in the tropics is for making cultures of fungi and bacteria at temperatures at which ordinary gelatine would melt.

A By-product from Funtumia Elastica.

The seeds of *Funtumia elastica* are borne in a follicle, which is a fruit something like a pod, that opens on the lower side the seeds being attached to this side. Each of these seeds is furnished with silky, very light tufts of fibre.

Attention is drawn to this matter in the *Journal d'Agriculture Tropicale* for January 1912, p. 27, where it is stated, after a first examination, that the fleece formed from these tufts would find a use on the market, provided that the price is not too high: that is to say offers would be accepted on the basis of about 4*d.* per lb., landed at Havre. It has been found that the average weight of one fruit, containing 190 to 225 seeds, is nearly 1 oz., and in this there are about 52 per cent. of husks, 36 per cent. of seeds and 12 per cent. of uncleaned tufts of fibre.

It is stated that it would be possible, at the sixth year after planting, to obtain about 88 lb. of the fibre per acre of Funtumia, in open cultivation.

Trade and Agriculture of British Honduras, 1910.

The following details concerning the trade and agriculture of British Honduras during 1910 are taken from *Colonial Reports*—Annual, No. 706, issued at the beginning of this year.

The principal trade was with the United Kingdom and the United States, and to these countries the following chief products were exported in the amounts stated: mahogany 10,069,653 feet, cedar 711,237 feet, logwood 2,006 tons, bananas 441,181 bunches, plantains 3,514,101 fruits, cocoa-nuts 4,871,321 fruits, chicle (for chewing gum) 2,790,890 lb., sarsaparilla 2,967 lb., rubber 16,835 lb., sponges 4,079 lb.; and tortoiseshell 2,703 lb.

This list does not include the comparatively unimportant agricultural export, cacao; of this, the amount shipped in 1910 was 32,023 lb., as compared with 39,868 lb in the previous year.

The sugar produced was practically all taken up for local consumption. For the manufacture of this, forty-six mills were in operation—eleven worked by steam, two by oil engines, and the rest by cattle.

In connexion with the timber trade, two saw mills were in operation during the year.

Sea Island Cotton in Cuba.

A review of a report by the United States Deputy Consul-General for Cuba is given in the *Textile Mercury* for March 9, 1912. This shows that experiments in the cultivation of Sea Island cotton have been carried out during the past three years by the Artemisa Tobacco Company, at Artemisa, Pinar del Rio Province. The chief object of the trials was to find out if cotton can be grown in Cuba, free from attacks of the boll weevil, if certain methods of cultivation are adopted and the seed is planted during the autumn months.

In the first trial, selected Sea Island cotton seed from Florida was planted on a very small scale in September, when a good return was obtained and no boll weevils appeared. After the harvesting of the crop all the remains of the old cotton were burned; and equally good results were obtained on repeating the experiments in exactly the same way, in the second and third years.

It is considered to have been demonstrated that cotton planted in Cuba, in September, will not suffer from the boll weevil, provided that precautions are taken to prevent the insect from being brought into the fields, and that all old plant remains are burned as soon as the crop has been gathered.

It is said that the lint produced is of good quality and of exceptional length. This fact, taken together with the circumstance dealt with above, namely that Sea Island cotton may be grown in Cuba free from the attacks of boll weevil, makes the matter of much importance to the island, as it appears to contain many localities suitable for the raising of long stapled cotton.

Rubber from Dominica.

The Dominica *Official Gazette* for March 22, 1912, contains a report by the Imperial Institute on samples of Para rubber grown in the island and exhibited at the last International Rubber Exhibition, held in London.

The samples consisted of biscuits of Para rubber from the Botanic Gardens. These are described as consisting of light-brown rubber and having a diameter up to 5 inches and a thickness of ⅛-inch; they were clean and well prepared, and the physical properties of the rubber were satisfactory. The loss on washing, which is made up of moisture and impurities, was 0·8 per cent.

The percentage composition of the dry, washed rubber was: caoutchouc 93·9, resin 2·9, proteid 2·8, ash 0·4. The commercial valuation is given as about 4*s.* 10*d.* per lb. in London, with fine hard Para at 4*s.* 4½*d.* per lb, and fair average quality plantation Para biscuit at 4*s.* 10¾*d.* to 4*s.* 11¼*d.* per lb.

In remarking on the samples, the following statements are made:—

'The results of the analysis show that this Para rubber from Dominica is of very good quality, as it contains 94 per cent. of caoutchouc in the dry material, and only small amounts of resin and proteid. It is slightly superior in composition to the previous specimen of Para rubber from Dominica shown at the rubber exhibition held in London in 1908, and subsequently examined at the Imperial Institute (see *Imperial Institute Report* dated February 10, 1909).

'The results of these investigations show that the Para trees in Dominica will furnish rubber of excellent quality which will realize good prices in the market.'

INSECT NOTES.

A NEW METHOD OF CONTROLLING TERMITES.

The following interesting article is reprinted from the *Philippine Agricultural Review* for December 1911, for which it was prepared from notes furnished by D. B. Mackie, Agricultural Inspector:—

The various species of white ants, or termites, constitute one of the most serious insect pests on cultivated estates in the tropics. In some countries only dead wood is attacked, while in others, even living plant tissues are devoured, especially in case of the temporary scarcity of decaying timber; for instance, immediately after the clearing of a forest area. The damage to live plants is usually comparatively insignificant, as compared to the destruction of timber, wooden implements, etc., about estate buildings. Even in places as far north as Washington, D.C., U.S.A., certain species enter houses, and destroy books, furniture, etc.

Attempts along the line of rendering timber used in the construction of buildings, etc., obnoxious or impermeable to termite attacks have been carried on for the last decade or more, but it is only within the last few years that a really scientific method of directly combating the pest itself has been worked out. Of course, timbers can be soaked in tar, creasote, or any number of chemical preparations, thus protecting the material from the pest. Moreover, it is a fairly simple, though not always effective plan, to destroy the queens of the species which construct nests of earth for the rearing of their young; however, since it is almost impossible to destroy an entire colony, even by the use of kerosene, arsenic, or carbon bisulphide, this method has been rather unsatisfactory.

It has long been known that termites are particularly sensitive to arsenic and at the same time are very easily killed or driven away either by arsenical baits, or by white arsenic itself deposited in the galleries of the nest. In order to make the destruction of the colony complete, then, it is only neccessary to carry arsenic, in some form, throughout the nest and all the galleries leading to it. It is now known that the vapour of white arsenic and sulphur burned together in a suitable receptacle and introduced into the nest, or even one of the main galleries leading thereto, will permeate the entire structure of the colony leaving a poisonous deposit throughout the course of the fumes, and at the same time immediately killing nearly all the insects by suffocation. All that is required is a metal box of some sort, which can be readily heated from beneath, connected with a flexible tube which can be inserted into the nest, or main gallery. The lid of the box should, of course, fit tightly, and there must be some sort of a pumping apparatus to force the fumes out of the poison chest through the flexible tube and to the extremity of the smallest gallery, even if it be 20 metres from the central nest. Machines are now on the market at a reasonable price for performing this operation. The principle is the same in all, that is, a charcoal-burning stove carrying a fume chamber on the top forms one piece, and a hand pump which forces air into the fume chamber—thus driving the fumes into the nest—forms the second piece. Rubber tubing connects the pump with the main apparatus, and at the end of the hose leading from the fume chest is a metal point for thrusting into the hard structures of the nest.

About three parts of sulphur to one part of arsenic is the best combination of the fume substances; the heat of the charcoal is sufficient to vaporize both the sulphur and arsenic, and these vapours combine more or less, forming arsenic trisulphide, which is deposited throughout the galleries of the nest, and also upon the individual insects. A nest so treated is probably never again habitable by any colony that might attempt to annex the abandoned structure.

The operation of this fume apparatus is exceedingly simple, there being but few chances for a mistake to be made in its manipulation. It should be remembered, however, that moist clay, or something similar, should be placed around the nozzle of the fume hose at the point of its entrance into the nest, gallery or infested timber; this air-tight packing will prevent the escape of the fumes. In the case of ground infested by termites whose nests are not plainly in evidence, a rod may be used to make an opening into the earth wherein the galleries are suspected to be situated. Except in very heavy soil, these artificial galleries generally break into one or more of the termite tunnels, and thus the fume hose inserted into the hole made by the bar or stick will convey the fumes to the nest and galleries within a reasonable distance therefrom.

Five minutes of pumping is generally sufficient to impregnate the nest and galleries with the fumes. In the case of beams or large timbers in buildings suspected of being infested with termites, a small auger may be used to explore the interior of the wood; when a gallery is located, all that is necessary is to attach the apparatus, pack the point of entrance of the hose nozzle with mud, and pump in the poison.

A heaping teaspoonful of the poison mixture is usually sufficient for treating an ordinary nest. It should be remembered that the insects are not all immediately killed, no matter how thorough the fumigation; but if the operation is well performed, no insect should be in evidence after a period of forty-eight hours. This is explained by the fact that death is caused not entirely by asphyxiation, but probably by the irritant action of the arsenic as well.

The foregoing notes appear to be based on experiment and trial, and are therefore deserving of consideration on the part of those who have to deal with these pests. The question arises, however, as to the effect which arsenic tri-sulphide would exert as an insecticide, since this is an inert and insoluble compound. It would seem that if the sulphur and arsenic were treated in separate compartments, the gases might be mixed in the application with good results, and it may be that the useful effect is due rather to the action of arsenious oxide and sulphur dioxide than to that of arsenic trisulphide.

The application of arsenic in the form of poison bait, or merely placed within the nest or the galleries, is a simple operation which has given good results in some instances. Other methods of control, including the use of cyanide of potassium and the treatment of timbers for building purposes, were mentioned in the *Agricultural News*, Vol. VII. p, 378. Poison baits for termites may be made by mixing arsenic with sawdust, sugar, molasses, sheep manure or horse manure. Any of these mixtures, placed on the ground where the termites are known to occur, will be eaten and will cause the death of many of the insects. Used in this manner, the poison is slowly diffused through the colony, ensuring its destruction in the course of a short time.

TRADE AND AGRICULTURE OF GRENADA, 1910.

The following information concerning the trade and agriculture of Grenada, 1910, is taken from *Colonial Reports*—Annual, No. 701, issued recently:—

The value of the three principal products of the Colony exported in 1909 and 1910 is given hereunder:—

	1909, £.	1910, £.
Cacao	248,398	259,365
Nutmegs and mace	18,135	17,872
Cotton and cotton seed	8,971	8,019

The record cacao crop of the Colony, 73,863 bags, was reaped in the year ended September 30, 1910, being 6,534 bags more than in 1909, which was the largest reaped, at that date. Prices, however, remained pretty much the same as in the previous year, viz: about 51*s.* to 54*s.* 6*d.* per cwt., so that the fullest advantage was not realized from this fine output. The heavy exports of cacao from Guayaquil and Africa affect the market prices considerably nowadays.

The nutmeg crop again fell off this year, only 6,229 barrels and 306 half-barrels being exported in the year ended September 30, as compared with 6,740 barrels and 346 half-barrels in the preceding year; prices also continued unsatisfactory.

The cotton crop of Carriacou was less than in 1909, 2,370 cwt. being exported in the calendar year 1910, as compared with 2,888 cwt., in the preceding year. All of this went to the United Kingdom, but the direction of the cotton seed exported underwent a change in the year under review, £1,440 of the total of £2,221, in value, going to Barbados, where it was purchased by the Cotton Company of that island; the balance went to the United Kingdom.

The dependency of Carriacou continues to flourish under the stimulus applied to it since 1903 by the Land Settlement Scheme, and the concomitant improved administration. Those who visit the place after an interval of years are surprised to notice the immense change for the better which has taken place. In his latest Annual Report the Commissioner of the district writes as follows:—

'In past reports comment has been frequently made on the remarkable transformation which has taken place within a few years in the general tone and prosperity of this interesting dependency. This happy result is so entirely the outcome of the Land Scheme that it may not be out of place my again drawing attention to the fact.'

Of the amount originally advanced from Colonial Funds to finance the scheme, viz. £8,450, all but £1,768 had been repaid at March 31, 1911.

A commencement was made in the island of Grenada with a similar scheme in 1910. An estate called Morne Rouge, in the south of the island, near to the principal town, which had been escheated to the Crown some time ago, was surveyed into lots, and preliminary details settled, but the actual allotment to purchasers was not made until 1911. Beyond mentioning that at the date of this report the lots have all been taken up, and that the scheme is making satisfactory progress, other details must be left to the report for the current year.

The attention of progressive agriculturists in the Colony is being more and more directed to the exploitation of other staple products than those now existing. In Carriacou, as was pointed out in the Annual Report for 1908 (see Report for that year—No. 628) an important lime industry is being established, and in the current year the first shipment of juice has been made. In Grenada, rubber cultivation is extending. At first *Castilloa elastica* was introduced, but of late years Hevea has taken its place; and in the current year a large importation of seeds from Ceylon has been undertaken by the Board of Agriculture.

This Board, which was inaugurated in 1909 (see Report for that year—No. 658), did excellent work in 1910, both of an active nature and as preparatory to further expansion in the future. The local Department of Agriculture, under its control, and in close association with the Imperial Department of Agriculture, gives promise of fulfilling the object for which it was designed. Its affiliation with the Imperial Department is proving to be of the greatest assistance in its practical work, and the ready and courteous co-operation of the present head of that Department is an asset of much value to its existence and usefulness.

Forty-one thousand four hundred and eighteen gallons of rum were manufactured in 1910, being 745 gallons more than in 1909.

THE JAMAICA CANDLE-WOOD TREE.

Interesting information concerning this plant is given in the *Journal of the New York Botanical Garden* for February 1912:—

Among some of the rare and little-known species brought from the West Indies by the various expeditions of the Garden, and installed in the living plant collections are a number of specimens of the Jamaica candle-wood (*Peltostigma pteleoides*), one of which flowered at the Conservatory Range 2, on January 6, 1912. This plant, a member of the Rue family, was discovered on the Santa Cruz Mountains, Jamaica, by William Purdie in 1844, who was making a botanical collection for the Royal Gardens at Kew, and plants grown from seed collected by him flowered there in February 1849. In his *Icones Plantarum*, Sir William Hooker described and figured this new plant under the name of *Pachystigma pteleoides.* As the name Pachystigma had been used for a South African genus in the Madder family, Hooker's plant was renamed two years later by Walpers as *Peltostigma pteleoides.* Subsequent collectors in Jamaica failed to find this species until its rediscovery, after a long search, by Dr. N. L. Britton and Mr. William Harris in September 1907, on a wooded hill at Potsdam, on the Santa Cruz Mountains, probably the original locality, at about 2,600 feet elevation. The trees were in young fruit at the time of their visit, and numerous seedlings were obtained from which the specimens at the garden were grown.

The Jamaica candle-wood, or ptelea-leaved Peltostigma is a slender tree, sometimes attaining a height of 8 metres. The leaves are alternate, the dark-green leaflets usually three, and closely resemble those of the hop-tree, *Ptelea trifoliata*, a native of the United States, sometimes grown in our parks. The flowers are an inch or more in diameter and sweet-scented, with the petals of a creamy white and nearly equal, and the sepals deciduous and unequal, the interior ones large and somewhat petal-like, the outer smaller. The stamens are numerous and inserted on a thick, fleshy disc, and the ovary is covered with short hairs giving it a velvety appearance. This species appears from the history of the living material at Kew and here to flower when at the age of five years.

Herbarium specimens from Southern Mexico and Guatemala from altitudes up to 5,500 feet appear identical with the Jamaica plant.

GLEANINGS.

Reports received recently from England, on cotton from Montserrat, indicate that the lint is being more carefully prepared than in the past, for there is little mention of the presence of leaf. There is, however, frequent allusion to irregularity of staple.

Information has been received from the Governor of the Gold Coast to the effect that the cacao crop of the Colony for last year amounted to 89,482,226 ℔., valued at £1,613,458, as compared with 50,609,950 ℔. in 1910, 45,277,606 ℔. in 1909, and 28,545,910 ℔. in 1908. (*The Board of Trade Journal*, February 22, 1912.)

Food Inspection Decision No. 139 of the United States Department of Agriculture, issued February 23, 1912, holds that any oil other than olive oil is misbranded when it is sold under the name Sweet Oil. This makes it incorrect in the United States to label cotton seed oil, or mixtures of this oil and olive oil, with the words Sweet Oil.

Latest reports indicate that the sugar crop of the Philippines this year will break all previous records, exceeding that of last year by 35,000 tons. The total crop of this year is estimated by experts at 240,000 tons. Of this quantity about 8,000 tons will enter into home consumption, leaving 232,000 tons for export. (*American Sugar Industry*, March 1912.)

According to the *Modern Sugar Planter* for March 2, 1912, sugar-cane planting is backward in parts of Louisiana, and seed cane of the home variety has proved to be bad in several instances. The Demerara seedlings 74 and 95, are stated, however, to be giving very good planting material, there being very little difference between them in this respect.

The Uganda *Official Gazette* for January 31, 1912, shows that the cotton exported during the period April 1 to September 30, 1911 was as follows: ginned cotton, 1,421 tons value £104,318; unginned cotton, 1,123 tons value £26,935. The similar quantities and values for the same period in 1910 were 706 tons value £51,322, and 1,110 tons tons value £19,600. The percentage of lint on seed-cotton may be calculated at 33·3.

The State of Ohio, United States of America, has passed a law, which comes into force in May, requiring all orchards in which there are ten or more trees to be sprayed at least once between November 1 and April 30. The preparation used must be such as will destroy the San José, oyster shell, and scurfy scales. A fine of $25 to $100 is to be imposed for each year that spraying is not performed. (The *Gardeners' Chronicle*, March 2, 1912.)

Speaking in the House of Commons on Monday, February 26, the Minister of Agriculture said it is proposed to place at the disposal of Rothamsted a sum of about £2,000 annually, to help the extension of new work on special lines of research. Arrangements are being made to send several scientific experts to India to prosecute enquiries relating to foot-and-mouth disease, in connexion with the Commission recently appointed upon the subject. It is anticipated that the cost of this Commission will run into some thousands of pounds. (*Nature*, February 29, 1912.)

In the *Bulletin of the Bureau of Agricultural Intelligence and of Plant Diseases* for June 1911, page 1262, a note is given reviewing recent work in regard to the possible action of gypsum with respect to nitrifying bacteria. The investigation has shown that there is no such action, neither was there any effect when lime and magnesia were used. Experiments with artificial soil and with natural soil of the clay type have supported the hypothesis that the beneficial action of gypsum in clay soils is due to a chemical and physical modification of the soils.

A publication issued by the Institut Colonial Marseillais, called *Le Commerce des Colonies Françaises en 1910*, states in regard to Martinique that this colony is recovering from the catastrophe of 1902, and that the trade figures which in 1904 showed imports of £593,267 and exports of £500,556, giving a total of £1,093,823, had reached, in 1910 : imports £774,363, exports £1,076,161; total £1,850,524. The continued increase of exports since 1907 is regarded as an indication that the ancient prosperity of this colony has been regained, for it is necessary to go back as far as the year 1884 in order to find similar figures.

Information received from Mr. W. H. Mitchell, M.A., Head Master of the St. Kitts Grammar School shows that in the Cambridge Local Examination held in December last, as far as the science subjects are concerned, eleven boys were entered from the school as candidates, ten of whom were successful, eight of the latter being holders of agricultural scholarships. In the individual science subjects taken, the results were as follows: agricultural science—1 entered, 1 passed (with the mark good); chemistry—8 entered, 8 passed (2 with the mark good); botany—9 entered, 7 passed (1 with the mark good). The less favourable results in botany are partly due to the fact that this is a new subject in the school.

Articles having reference to the extraction of wax from the sugar cane have appeared in the *Agricultural News*, Vols. VIII, p. 360, and X, p. 51. The *International Sugar Journal* for February 1912 has a note dealing with the same subject, which states that a large sample of the wax was forwarded from Hawaii to Europe, as much as two years ago, for an opinion on it, when it was condemned, and nothing further was done in Hawaii. It is stated, on the other hand, that several firms in Java ventured to recover large quantities of the wax before they took steps to ascertain the possibilities of the market, and, as a result, sustained a heavy loss. The opinion is given, however, that more will be heard of the extraction of wax from sugar-cane, as fresh patents for the process have been taken out from time to time.

STUDENTS' CORNER.

APRIL.

SECOND PERIOD.

Seasonal Notes.

Explain what is meant by a bud, and state how you would show of what the different parts of a bud consist. What are the uses of leaf buds to plants? State any changes that you have observed in leaf buds, between the time that they become visible and the period at which they expand and eventually form shoots. Where are leaf buds usually found? What is meant by a terminal bud, and what is likely to follow the destruction of such a bud? In regard to dormant buds, how may the presence of these be demonstrated, and how is it sometimes shown that they have existed in a stem? Distinguish between dormant buds and adventitious buds, stating for what reasons the latter may be formed. Adventitious buds sometimes develop on roots; give an example where this occurs, and state what advantage may be taken of the circumstance. In what part of the stem do buds originate, and how may this be shown in a general way?

How are flower buds distinguished from leaf buds? State, in the case of several plants which you have examined, where the flower buds are generally borne; that is in relation to the age of the wood on which they are found. Give several examples of the use that is made in agriculture of the fact that certain parts of plants possess buds. What is bud variation, and how may it be demonstrated to exist, in the case of any plant with which you are acquainted?

Under what conditions are flower buds most usually formed? It is sometimes desired to increase the amount of formation of such buds, or to hasten it. In what ways may this be done? It often happens that a plant produces a large number of buds and flowers while it is still young; what may be the reason for this?

What signs are shown by plants when the amount of nitrogenous food that they are receiving is in excess? It should be remembered, in regard to the nutrition of plants, that one essential element of food cannot be used instead of another element; if the supply is insufficient in any respect, the plant is dwarfed in all its parts. It may, however, be reduced in size, while there may not be a corresponding lessening in amount of the seed products. This is why plants that are grown for seed or fruit are less likely to show a decrease in yield than those raised for their vegetative parts such as leaves, stems or roots; for instance, it may have been observed often that cotton plants of small size will give a fair yield of seed and lint. It must be remembered, however, that a limit exists in regard to the matter, and that the food-supply may be easily restricted to such an extent as to interfere seriously with the development of all parts of the plant.

All the above matters should be considered by the student in particular regard to crops of which he has practical knowledge, and with reference to instances that have come, or may come, under his notice.

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) State broadly how roots take up plant food from the soil. In what condition must this plant food be, in order that the roots of a plant may make use of it in this way?

(2) State the chief ways in which farmyard manure differs from artificial manure.

(3) Give a description of any stems that you have examined.

INTERMEDIATE QUESTIONS.

(1) Describe the way in which plant food travels from one part of a soil to another.

(2) Supply an account of the manner in which any artificial manure, that you have seen, is obtained.

(3) State the chief differences between the stems of monocotyledons and of dicotyledons, and say what import these differences possess as regards the agriculturist.

FINAL QUESTIONS.

(1) State what is meant by Osmosis, and how you would demonstrate its existence in a simple way.

(2) Write an account of any substance that has been suggested recently to be used as a manurial source of potash.

(3) Mention as many agricultural products as you can, that are obtained from stems.

THE USE OF FORMALIN ON RUBBER PLANTATIONS.

An article in the *Journal d'Agriculture Tropicale*, for January 1912, p. 15, by V. Cayla, refers to a warning that has been given already by that journal against the belief by planters that formalin is an anti-coagulant. Formalin actually prevents coagulation only in an indirect manner; it acts as an antiseptic. Through its interference with bacterial activity which would cause acidification of the latex, it indirectly prevents the coagulation of Hevea latex, which is produced in an acid medium. The explanation is necessary, because it may be alleged that the formalin itself prevents the coagulation of the latex. It is actually a coagulant. At a strength of 1-per cent. in water it is inactive as a coagulant, and in this proportion it is, if not antiseptic, at least capable of inhibiting bacterial life.

There is, however, a more complex question concerning formalin which, it is believed, has not so far been considered. The formalin (or formol) of commerce is theoretically a solution of formaldehyde at a strength of 40 per cent. When it leaves the manufacturer, it probably answers to this description; but the numerous changes that formaldehyde may undergo when it is kept for some time in solution are unknown, and the result is that when the formalin of commerce is being used, one hardly knows the real nature of the substance. It is possible that certain commercial kinds of formalin, at the time that they are being used, do not contain any trace of formaldehyde, but only modifications of that compound.

In the opinion of the writer of the article, these circumstances provide the reason for the great discrepancy that exists between the results of different investigators, in experiments in the coagulation of rubber latex by formalin, notably in the work of Chevalier, Christy and Fickendey. Although these experimenters worked under almost the same conditions, the reactions noted by them were different.

To summarize the matter, it is the belief of the writer that three points have to be remembered, concerning formalin, in the special connexion: it is a coagulant; it is an antiseptic; and it is a body of which, at the time of its use, one never knows the actual composition, and consequently there is the accompanying ignorance as to its coagulating value.

FUNGUS NOTES.

THE PANAMA DISEASE OF BANANAS.

Part I.

Certain diseases of the banana, characterized by the progressive destruction of the water-conducting tissue in the roots, bulb and leaf sheaths, have been known to exist in the Western Tropics for some years, while a similar disease has recently been reported from Bengal. These diseases are not only spread over a comparatively large banana-growing area in Central and South America and certain of the West Indian Islands, but in some cases they have been responsible for very serious damage, and have occasioned large financial losses. In order to arrive at a clear understanding of the present position of our knowledge of the subject, the history of these maladies, as it appears in publications that have been issued from time to time, may shortly be summarized. Such a course is advisable, because the position is at present somewhat complicated, and it is not yet clear how many of the different forms of disease reported are attributable to the same organism, and are therefore truly identical with one another. It should be clearly understood that this discussion relates only to those diseases in which the vascular bundles, more especially in the rhizome, are destroyed and discoloured, usually becoming dark-brown or reddish-brown.

In 1903, Earle published in the *Journal of the New York Botanic Garden*, Vol. IV, p. 8, an account of a banana leaf-blight in Jamaica, at Stony Hill. He stated that the vascular bundles of the veins and midrib of the leaves became brown; this was followed by the blackening of the entire leaf blade, and the subsequent decay of the leaf and petiole (leaf stalk). The disease did not appear able to extend from the petiole into the tissues of the stem. The terminal bud was not attacked, but continued to push out new leaves, which were infected in turn, so that only three or four of the younger leaves were healthy. Infected plants were much stunted in growth, and did not bear fruit. Earle attributed this disease to bacteria. It is worthy of note that the damage appeared to be confined to the leaves, and to be incapable of spreading to the stem, while there is no mention of any signs of disease in the rhizome or in the roots.

In April 1910, Rorer published a preliminary account of a bacterial disease attacking the Moko Fig and French varieties of plantain. Infected plants showed a drooping of the leaf blades accompanied by a slightly yellowish tinge of colour. This was followed by the breaking down of the leaves owing to the collapse of the petiole at the base of the leaf blade. The vascular bundles in the rhizome and leaf sheaths were destroyed, and their colour changed to shades varying from yellow to dark-brown or bluish-black The preliminary note appeared in the *Proceedings of the Agricultural Society of Trinidad and Tobago*, Vol. X, pp. 109-13.

In May 1910, McKenny published in *Science*, Vol. XXXI, p. 750, a short account of the banana disease prevalent in Costa Rica and Panama, and occurring by report on the Atlantic side of Nicaragua, Honduras and Guatemala. The symptoms of the disease as described by this writer are as follows:—

'Commonly the first external sign is a rapid yellowing and subsequent browning and wilting of one or more leaves. Sometimes there is a striking curvature and yellowing of the terminal part of the leaf blade while the remainder is still green. Eventually all the leaves die and fall back against the trunk, leaving a crop of suckers which in turn are killed and give place to still weaker shoots. The fruit of diseased shoots rarely matures and even when mature is worthless with blotched, somewhat shrivelled surface and dry, pithy interior. Shoots which develop after one or two suckers have died rarely reach the flowering stage, when they do, however, weak, distorted, worthless bunches are produced.

'On cutting the pseudo-stem across and longitudinally many of the bundles are found to be of a yellow, reddish or reddish-purple colour, the colour deepening towards the root-stock. In the last stages the colour of the bundles may be almost black. While in recently affected plants the vessels of the upper part of the stalk and the leaves may be normal, those of the root stock are always coloured. . . . .

. . . . . . A nauseating odour is often given off when leaf stalks which have been diseased for some time are cut open, though there may be no sign of rottting in the trunk.' McKenny makes no definite statement as to the cause of the disease beyond remarking that it is due to a vegetable parasite, and recording the presence of both bacteria and fungus hyphae embedded in the gummy substance blocking cells and vessels of the xylem.

In the same number of *Science*, Erwin Smith gives an account of a disease of bananas found in Cuba. He received material for study from that island and from it he isolated a species of Fusarium, provisionally named *Fusarium cubense*, which when inoculated into the midrib, leaf stalk and psuedo-trunk gave a typical discoloration of the vascular bundles; while from these the fungus was again isolated. The disease was not given a chance to spread into the root stock as the experiments had to be discontinued. It remained to be shown if inoculations into the root stock would give rise to the symptoms of the disease in uninoculated leaves. This point is certainly of importance because, as will appear later, the disease in Surinam is due to a fungus having a Fusarium stage; and in this case the disease starts in the root and root stock, so that, if the Cuba disease is identical with it, inoculations into the rootstock are more likely to produce the disease in its typical form than are those into the aerial portions of the plant. In his account of the Cuba disease Smith writes as follows:—

'The signs of the disease so far as I have been able to obtain them from Cubans, and as the result of my own examination, correspond quite closely with those described by Dr. McKenny, and also to the banana disease described by Mr. Earle from Jamaica in 1903. A similar, if not identical, disease prevails in Trinidad, according to statements made to me by Mr. James Birch Rorer, from whom I have also received alcoholic material. A similar disease occurs in Dutch Guiana, according to statements received by me from Dr. van Hall, Director of the Experiment Station in Suriname. I am inclined to think that the Central American disease is also the same as this disease, although we are not yet certain, Dr. McKenny and myself having joined forces to settle, if possible, the problems relating to banana diseases in these regions. Possibly there are two banana diseases now confused—one due to bacteria, the other to fungi.

'A microscopic examination of the Cuban material showed bacteria to be present in some of the vessels, but not in quantity sufficient to lead me to suppose them to be the cause of the disease. In passing, I might say that Earle sent me cultures of the bacteria isolated by him from the diseased Jamaican bananas, and that in December of 1904 I inoculated these copiously into the leaf-blades and petioles of bananas at Washington, but without production of any disease.'

In 1910, Levy published, in the *Journal of the Jamaica Agricultural Society*, Vol. XIV, p. 241, an account of the disease as he found it in Costa Rica; he writes as follows:—'The younger plants, say up to four months old, when first attacked present no unusual appearance for a few days, after that, it will be noticed that the stem is splitting starting from the bulb upward, for a distance of 1 to 2 feet, exposing the lower layer of the sucker, in some instances the split extends all the way into the heart, the heart leaves will then grow through the split and form for a time a new sucker, but this in time will also succumb, and at last the whole plant will rot to the ground. With the older plants the first sign of infection is manifested in a different way, a fringe of yellow will appear on the lower leaves of the plant, and this border of yellow is so distinct that it can be noticed from quite a distance in contrast to the green of the other part of the leaf, it is only after a few days of this state that the entire lot of leaves turn yellow, at this stage it is often confounded with suckers suffering from drought or lack of drainage, but in a few days the disease puts on another symptom which is peculiar to it. All the leaves suddenly turn a brown colour and hang quite limply down the side of the sucker. The heart, leaf and bunch if *young* turning black.

'The leaves do not have that crisp feel as do those that are found on dry weather banana or from the natural shedding of the leaves, but a soft damp feel, which continues until all the moisture dries out, it is only a matter of time when the whole tree rots to the ground giving off a very offensive smell.

'At all stages of growth, if the head or "yam" of an infected sucker be split open, the heart will be found quite rotten and composed of a putrid yellow mass, further out the fibres will be found to be firmer, but still in a decomposing state and having a yellowish tinge until the outer part is reached, and here will be found say about 1 inch from the surface, a bright red streak flanked to the outside and inside by a brighter yellow than occurs on the other part of the cut surface, the red streak follows all the passages to the roots and continues all along these to their extremities. All the roots will present a sickly appearance, some quite dead, others partly so, but none quite healthy.

'The smell given off by a diseased banana sucker is offensive and peculiar, and if once experienced cannot be mistaken. It would be quite correct to use the Scotch term "feel the smell" in connexion with it.'

This, then, is a summary of the literature on this subject up to the end of the year 1910. An account of the subsequent work that has appeared to date, with a few conclusions that seem to be indicated by the data so far available, will appear in the next number of the *Agricultural News.*

AGRICULTURE IN JAMAICA, 1910-11.

The following general account of agricultural conditions in Jamaica during 1910-11 is taken from the report on the Blue Book for the financial year ended March 31, 1911, issued as *Colonial Reports*—Annual, No. 703:—

The farm school at Hope estate, which was opened in January 1910, completed its first year with a full complement of students. The demand for admission has been so great, that arrangements for extending the accommodation by one-half have been made.

The stock farm, associated with the school, was operated on a business basis during the year, by means of a working account at the Treasury. The stock was valued on December 31 by two practical stock breeders, and favourably reported on. The balance sheet for the year shows a balance of assets £760, on a capital investment of £950. The Public Hospital and other Government Institutions in Kingston are now supplied with milk from the farm at Hope.

The appointment of a Veterinary Surgeon has enabled a start to be made in the development of a branch devoted to the interests of the animal industry, while an officer is now available for service under the Diseases of Animals Law, when outbreaks of diseases are notified in the Colony.

The results from the use, on the large scale, of the tick wash, introduced by the Department, have been very satisfactory, and it has now been demonstrated that the tick pest can be controlled in Jamaica, by the systematic spraying of cattle with this preparation. The Paranaph compound is made at the Laboratory and sold to the public at cost price.

The Sugar Experiment Station was operated during the year on the residue of the Imperial grant, a small surplus still remaining to the credit of the fund at the close of the year. The Imperial grant has thus enabled the station to be equipped with laboratories and an experimental distillery, and to provide for experimental plants on estates, while the operating expenses of the station have been provided for a period of seven years. This work is now being carried on as a part of the operations of the Agricultural Department.

The first field results with seedling canes raised at the station indicated that some valuable new canes have been secured. The most promising of these were raised by natural cross-fertilization of the White Transparent with some Barbados seedling canes in 1903.

The work of agricultural instruction was extended during the year by a considerable increase in the grant to the Jamaica Agricultural Society, whereby four new instructors were provided. The results of this work are encouraging, and efforts are now being made to operate cacao and rubber nurseries in certain favourable centres, under the care of the local authorities.

The Prize-holdings Scheme is taking a firm hold on the small settlers, and marked improvements in small holdings can be traced to the operation of this competition in several parishes.

Special legislation, dealing with the importation of bees and the infectious diseases of plants, have been effected, to protect the honey industry from the risks of introduced diseases, and to give powers for dealing with such dangerous infectious diseases of staple crops as the bud rot disease of coco-nuts, and the Panama disease of bananas, should the latter ever obtain a footing in the island.

Considerable interest has been taken in the prospects of the rubber industry during the year. The Castilloa rubber, of which three distinct species have been established in the island, has given the most promising results, and there are indications that on favourable soils in seasonable districts the Castilloa rubber tree is capable of giving good returns of rubber in Jamaica.

The erection of a large central sugar factory at Rose Hall, in St. James, has been started, and it is expected that the work will shortly be completed. It will deal with the produce of nine sugar estates.

In three sugar estates in Westmoreland arrangements have been made to erect plants for boiling molasses sugar.

The logwood factory at Lacovia in St. Elizabeth has been acquired by the Trust controlling the West India Chemical Works at Spanish Town, and thus put an end to competition in the purchase of logwood

A new plant of modern design for the manufacture of sugar has been erected at Holland estate in St. Elizabeth.

MARKET REPORTS.

London.—The West India Committee Circular, March 26, 1912; Messrs. E. A. De Pass & Co., March 15, 1912.

Arrowroot—$3\frac{11}{16}d.$ to $4\frac{1}{4}d.$
Balata—Sheet, 3/8; block, 2/8½ per lb.
Beeswax—£7 7*s.* 6*d.* to £7 10*s.*
Cacao—Trinidad, 55/- to 75/- per cwt.; Grenada, 49/- to 54/-; Jamaica, 48/6 to 54/-.
Coffee—Jamaica, 69/- to 86/- per cwt.
Copra—West Indian, £26 5*s.* per ton.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 18*d.* to 19*d.*
Fruit—No quotations.
Fustic—No quotations.
Ginger—48/- to 65/- per cwt.
Isinglass—No quotations.
Honey—No quotation.
Lime Juice—Raw, 1/4 to 1/9; concentrated, £18 10*s.* to £19; Otto of limes (hand pressed), 6/3.
Logwood—No quotations.
Mace—Steady.
Nutmegs—Steady.
Pimento—Common, $2\frac{3}{4}d.$; fair, $2\frac{13}{16}d.$; good, $2\frac{7}{8}d.$; per lb.
Rubber—Para, fine hard, 5/1; fine soft, 4/10; Castilloa, 4/11 per lb.
Rum—Jamaica, 1/8 to 5/-.
Sugar—Crystals, 20/- to 23/-; Muscovado, 16/6 to 19/-; Syrup, 12/6 to 18/- per cwt.; Molasses, no quotations.

New York.—Messrs. Gillespie Bros. & Co., March 22, 1912.

Cacao—Caracas, $11\frac{3}{4}$c. to $12\frac{1}{4}$c.; Grenada, $11\frac{1}{4}$c. to $11\frac{3}{8}$c.; Trinidad, $11\frac{3}{4}$c. to $12\frac{1}{4}$c. per lb.; Jamaica, $10\frac{1}{4}$c. to $11\frac{1}{4}$c.
Cocoa-nuts—Jamaica, select, \$24·00 to \$25·00; culls, \$15·00 to \$16·00; Trinidad, select, \$25·00 to \$26·00; culls, \$16·00 to \$17·00 per M.
Coffee—Jamaica, $14\frac{1}{2}$c. to $16\frac{3}{4}$c. per lb.
Ginger—9c. to $10\frac{1}{4}$c. per lb.
Goat Skins—Jamaica, 52c.; Antigua and Barbados, 48c. to 50c.; St. Thomas and St. Kitts, 45c. to 47c. per lb.
Grape-Fruit—Jamaica, \$4·00 to \$4·50.
Limes—\$6·00 to \$6·50.
Mace—58c. per lb.
Nutmegs—110's, $12\frac{1}{2}$c.
Oranges—Jamaica, \$2·00 to \$2·25 per box.
Pimento—3*d.* per lb.
Sugar—Centrifugals, 96°, 4·49c. per lb.; Muscovados, 89°, 3·98c.; Molasses, 89°, 3·74c. per lb., all duty paid.

Trinidad,—Messrs. Gordon, Grant & Co., April 1, 1912.

Cacao—Venezuelan, \$12·30 per fanega; Trinidad, \$11·60 to \$11·90.
Cocoa-nut Oil—\$1·06 per Imperial gallon.
Coffee—Venezuelan, $15\frac{1}{2}$c. per lb.
Copra—\$4·65 per 100 lb.
Dhal—\$4·00.
Onions—\$4·25 to \$5·25 per 100 lb.
Peas, Split—\$7·00 to \$7·25 per bag.
Potatoes—English, \$2·10 to \$2·25 per 100 lb.
Rice—Yellow, \$4·80 to \$5·00; White, \$6·50 to \$6·75 per bag.
Sugar—American crushed, no quotations

Barbados,—Messrs. James A. Lynch & Co., Ltd., April 6, 1912; Messrs. T. S. Garraway & Co., April 6, 1912; Messrs. Leacock & Co., March 29, 1912.

Arrowroot—\$6·50 to \$7·00 per 100 lb.
Cacao—\$10·50 to \$11·50 per 100 lb.
Cocoa-nuts—\$16·00.
Hay—\$1·90 per 100 lb.
Manures—Nitrate of soda, \$65·00; Cacao manure, \$45·00 to \$48·00; Sulphate of ammonia, \$80·00 per ton.
Molasses—No quotations.
Onions—\$4·00 to \$6·00 per 100 lb
Peas, Split—\$7·00 to \$7·25 per bag of 210 lb.; Canada, \$3·00 to \$4·80 per bag of 120 lb.
Potatoes—Nova Scotia, \$2·00 to \$3·50 per 160 lb.
Rice—Ballam, \$4·85 to \$5·40 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
Sugar—American granulated, \$5·50 per 100 lb.

British Guiana.—Messrs. Wieting & Richter, March 30, 1912: Messrs. Sandbach, Parker & Co., March 29, 1912.

Articles.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	——	——
Balata—Venezuela block	No quotation	Prohibited
Demerara sheet	70c. per lb.	——
Cacao—Native	19c. to 20c. per lb.	18c. per lb.
Cassava—	96c.	No quotation
Cassava Starch—	\$7·00	No quotation
Cocoa-nuts—	\$12 to \$16 per M	\$10 to \$16 per M., peeled and selected
Coffee—Creole	18c. per lb.	16c. per lb.
Jamaica and Rio	18c. to $18\frac{1}{2}$c. per lb.	19c. per lb.
Liberian	13c. per lb.	12c. per lb.
Dhal—	\$3·75 per bag of 168 lb.	\$3·75 to \$3·90 per bag of 168 lb.
Green Dhal	\$4·50	——
Eddoes—	96c.	——
Molasses—Yellow	None	——
Onions—Teneriffe	——	——
Madeira	——	8c.
Peas—Split	\$7·00 per bag (210 lb.)	\$7·35 to \$7·40 per bag (210 lb.)
Marseilles	——	No quotation
Plantains—	20c. to 48c.	——
Potatoes—Nova Scotia	\$3·50 to \$3·75	\$3·50 to \$3·75
Lisbon	——	No quotation
Potatoes–Sweet, B'bados	\$1·68 to \$1·80 per bag	——
Rice—Ballam	No quotation	——
Creole	\$5·25 to \$5·50	\$5·50
Tannias—	\$1·80	——
Yams—White	\$2·40	——
Buck	\$2·64	——
Sugar—Dark crystals	\$3·30 to \$3·40	\$3·30 to \$3·40
Yellow	\$4·25 to \$4·50	\$4·25
White	——	——
Molasses	\$2·90 to \$3·00	——
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	\$3·75 to \$6·00 per M.	\$4·00 to \$6·00 per M.
,, Cordwood	\$1·80 to \$2·00 per ton	No quotation.

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AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

OF THE

IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

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CONTENTS.

Education in Rural Schools.

FOR some time past, the need has been felt in the West Indies for improvement in the educational methods employed, in rural schools particularly. The same circumstance has existed in Great Britain, where a stage in progress has been marked recently by the issue of a Memorandum on the Principles and Methods of Rural Education, by the Board of Education, England. In England, the distinctions between the circumstances surrounding schools in town and those in the country are much greater than the differences which obtain in the West Indies, where almost all commercial effort is directly connected with agriculture. The same general principles apply nevertheless in both cases, and actually in a broader degree in the West Indies: and it will be well to see in what way several of the matters in the Memorandum mentioned may be made useful in regard to West Indian conditions.

Dealing first with rural elementary schools, there has been in late years, in England, a desire to make the teaching more practical in nature, and although this has been effected from small beginnings, many of the schools employ in large measure the great wealth of material supplied by the conditions surrounding them. In such cases the teacher is continuing to receive education, in the best sense, at the same time as the pupil, and the chief requisites for his success are a real interest in the affairs in which he finds himself placed, and willingness and courage to undertake experiments and to benefit by what others may have to teach him.

It has been pointed out already in this journal that the chief effort in such matters should be to make the teaching possess an intimate connexion with the life of the child and with the daily circumstances with which he comes into contact. The adoption of this method will supply abundant material for dealing with nearly all the subjects that are commonly found in the curriculum of an elementary school. Further, a lively interest will be given to these subjects, in that the pupil will be made to see in what way they are of use to him in the conditions of the ordinary course of his life. Lessons in English, arithmetic, geography, history, and especially nature study, will all be simplified in character and increased in interest if they are made to relate as far as possible to those conditions. Further, with respect to nature study, this is the subject which lends itself particularly to the provision of assistance with geography, practical arithmetic and drawing. It may be said that the fact is recognized in several parts of the West Indies, and that the employment of the school garden in relation to the general curriculum of the school has reached a degree that was not imagined when it was first suggested that school gardening should be taken up on a general scale.

Turning now to a consideration of practical work in rural secondary schools, some of the first efforts were made in a small part of England by engaging the county horticultural lecturer to teach practical horticulture in a few of the schools. The results have been disappointing, chiefly on account of the fact that the adoption of the scheme led to the detachment of certain boys from the regular work of the school. The danger of this was recognized early in the West Indies, so that the agricultural and science masters first appointed under the Imperial Department of Agriculture were definitely placed on the teaching staff of the school in which their work was to be done, and their classes were included in the ordinary school curriculum. The principle was extended further, in order to prevent the appearance of detachment of any of the pupils in the school, by making every boy take up at least one science subject during the whole of his time at school; so that later, when there came to be specialization in the direction of agriculture, on the part of some of the pupils, these did not appear to be detached from the ordinary interests of the school, any more than others who happened to specialize in subjects that are not agricultural. Another matter that was recognized by the Imperial Department of Agriculture at the beginning was that the course of science in these schools should be actually fundamental to agriculture, and the Memorandum mentioned shows that the importance of this principle has been appreciated in England, for it states: 'Agriculture has to do with the production of crops and stock, and a course of biology, mainly dealing with plant life, together with such a thorough course of chemistry and physics, as is necessary thereto, constitutes the fundamental science.'

The employment of the school garden, and of visits to experiment stations and estates where work with a definite agricultural object may be seen in progress, is of special importance in this stage. This is well expressed in the Memorandum, as giving the science instruction an agricultural bias: and it is pointed out that this bias does not in any way depreciate the value of the science instruction to those who do not intend to take up agricultural occupation ultimately; 'on the contrary, a subject which is brought into touch with environment tends to become real and living, and more easily mastered.' The matter is seen to be important, then, with respect to general education, whether agriculture or other subjects are to receive attention when the pupil leaves school.

In dealing with the subject with reference to England, the matter is considered further in connexion with farm schools. Institutions of this nature have not been adopted to any extent in the West Indies, except in Jamaica and British Guiana. Their place is taken to a degree by the Cadet System that is in operation at several of the Botanic and Experiment Stations, and by the Courses of Reading instituted on the part of the Imperial Department of Agriculture. In England, experience of the existing farm schools shows that the work should be very practical in character. The time expended on a short course does not allow the teaching of the principles of chemistry, for example, to those who are unfamiliar with this subject: whereas there is no need for this teaching in the case of those who already possess a knowledge. This does not prevent it from being true that the method of education should be thoroughly scientific—that experiment should form the basis for instruction, and that nothing should be taken for granted. It will be evident, in any case, that the proper correlation of the educational work in the secondary schools with that in institutions of a higher order will give such instruction in the elements of useful science subjects as is necessary, and will greatly simplify the work of the higher course.

Matters of this kind have not reached such a stage, in the West Indies, that attention can be given in a brief and general way to the subject of the provision of agricultural colleges. Sufficient has been said to show that experience in education, that is of a more directly agricultural nature, in this part of the world, has resembled in many ways that which has been met with in other countries; and that the West Indies have been saved some of the mistakes that might have been made, as well as some of the delay that would be caused while knowledge was being gained in order to rectify those mistakes.

SUGAR INDUSTRY

THE NEW YORK SUGAR TRADE LABORATORY.

Accounts of this institution were given in the *Agricultural News*, Vol. IX, pp. 19 and 291. They are now supplemented by the following information, taken from the *Louisiana Planter* for February 10, 1912:—

The accuracy of the laboratory work has been greatly enhanced by the utilization of a refrigerating plant, by means of which the polarizing room is maintained at a constant temperature. The average temperature utilized in 1911 was 20·02°C., the average maximum being 20·72°C., and the average minimum 19·48° C. This artificial cooling was found necessary during 107 days in 1911. It seems that after the introduction of the refrigerating plant the cost of operating the same, that is for the electric current utilized for power, was $129·69, and the cost of 22,400 cubic feet of water was $22·40, this being used for the ammonia condenser, making a total of $152·09.

During the year 1911, over 15,000 polarizations were made for the buyers of sugar and over 15,000 were made for the sellers. These polarizations varied in their indications of sucrose content from 68·69 test up to 98·90 test, ranging chiefly in four grades, 94-95, 95-96, 96-97 and 97-98. A few samples above these limits and a few below were received, but these just named constituted the bulk of the entire list.

It might have been fair to infer that the efforts of the sugar-making world for a general betterment of the product would be shown in the average polarizations made accessible in this large way. From the data given, however, we can hardly detect any gradual rise in the quality of the sugars imported into the New York market. The government statistics showed, however, at the time of the adoption of the Wilson bill, in 1894, that the average polarization of sugars was about 90 per cent. sucrose. The figures for the last four years, including 1908, are reported as 94·83; 1909 as 94·88 test; 1910 as 95·19 test, and 1911 as 94·68 test. Our readers, of course, are aware that under the colour restrictions of the tariff, which practically exclude all sugars above No.16 Dutch standard, there is very little very high-grade sugar imported, and the tendency of sugar producers is to work between 94 and 97 test, as below 94 the regulations of the New York trade penalize the importer 10c. per 100 lb. for each point below 96 test, and after reaching 94 there is a drop of $\frac{1}{8}$c. per lb., in addition to the penalizing one tenth. The allowance granted above 86 is one sixteenth for each point of test higher than 96, and sugars of 97 to 98 test are rather difficult to keep down in colour, as not above No. 16 D.S.

The capital necessary with which to start this enterprise seems to have been contributed, or rather loaned to the organization by the leading sugar refiners and importers. A charge of $1·00 per test seems to have been made. This gave a revenue during 1911 of some $31,000. After the general expenses, such as salaries, rent, expenses of refrigeration, etc., with the cost of the refrigerating plant, have been paid off, the actual gain made by the organization has been returned to those patronizing it, to the extent of nearly one-half of the total receipts, thus cheapening the work of the laboratory to the buyers and sellers of sugar by about one half, and at the same time insuring positive satisfaction to all concerned.

As is usual in such organizations, special accountants were delegated by the trustees to examine into the records, receipts, and expenditures, and their report indicated extreme accuracy in every direction, all of which in turn was reported by the trustees to the importers and refiners of raw sugar.

THE EFFECT OF HOT-WEATHER PLOUGHING ON SOILS.

The results of partially sterilizing soils by heat have been considered on several occasions, in the *Agricultural News*, more especially in an editorial article in Vol. IX, p. 33. The work that is described in this has led to the suggestion, in India, that the increased fertility, considered in some districts of that country to be caused by ploughing in hot weather, may be due to partial sterilization; this was dealt with on page 107 of the same volume of the *Agricultural News*. A further phase of the matter has been the making of actual experiments, which are described in the *Report of the Agricultural Research Institute and College*, Pusa, 1910-11, p. 74:—

A special study has been made of the effect of hot-weather ploughing upon the bacterial content of the soil, and its possible relation to the undoubted increase in fertility resulting therefrom. It has been found that this operation increases the rate of ammonification of the soil humus, probably by the selective action of combined desiccation and abnormal temperature; similar results can be obtained by heating the soil to 60° C., the soil plates showing a survival of the more active ammonifiers, such as *Bacillus mycoides* and *B. subtilis*, whilst the highly aërated condition of the soil inhibits the activity of surviving anaërobic spore forms. The net result is an extremely rapid formation of ammonia, part of which is retained by the soil and nitrified or taken up directly by plants, and part is lost by diffusion; in this way rapid depletion of the soil nitrogen must take place, and subsequent fertility will depend upon the judicious use of green manures; the economic value of the method depends upon the power which it places in the hands of the agriculturist, of rapidly converting green manure or other organic nitrogen into plant food, although this may be counterbalanced to some extent by loss of nitrogen as ammonia.

Study of Pusa soil, taken from depths down to 9 feet, shows large numbers of bacteria even at this low level; nitrification has been found actively proceeding in the third foot from the surface, the greatest amount of this taking place in the second six inches. Owing to the open texture of this soil it is improbable that denitrification occurs to any appreciable extent, but the rapid rate of ammonification, and the vigorous growth of soil bacteria, no doubt interfere with the production of nitrates.

A method of quantitative estimation of the changes in soil due to bacterial action, by periodical analysis of the soil gases, has given much information as to the conditions favourable for nitrification in soils; it is hoped that this method will be invaluable in the future for dealing with such problems as arise out of soil irrigation and drainage, and the use of green manures.

FRUITS AND FRUIT TREES.

PRIZE-HOLDINGS COMPETITION, DOMINICA, 1912.

The following information regarding the Prize-holdings Competition held recently in the Grand Bay District, Dominica, is taken from a report made by Mr. G. A. Jones, Assistant Curator:—

Owing to one or two unavoidable causes it was found impossible to commence this year's competition before August; four months were in consequence lost. It is hoped that this year a start may be made much earlier

As in previous years, there were two classes of holdings: one class of 1 acre and over, not exceeding 4 acres; and one class of 1 acre of bearing cacao, and not less than 100 trees, calculated at proper distances apart In 1908-9 there were sixteen competitors, ten being in Class I and six in Class II This year there were twenty-four, eleven in Class I and thirteen in Class II. This district is particularly well suited for such a competition, there being a very large number of small proprietors.

In a year or two we would probably be successful in obtaining a still larger number of entries.

Mr. J. O. Henderson acted as local instructor. He possesses the confidence of the people of the district, and is himself a successful cacao grower. During August Mr. Henderson visited all the holdings, and made suggestions for improvement. During October 16 to 21 Mr. Henderson, accompanied by myself, again visited all the plots, giving all the assistance we could. We were very well received, and gave demonstrations in pruning, etc., together with advice as to draining and wind-breaks when necessary. From March 10 to 15 we again visited the plots, chiefly for the purpose of judging; but in anticipation of a continuance of the competition, we spent considerable time in further instruction.

During the eight months that we have been working in this district, I am pleased to report that very good work has been accomplished. Much of course remains to be done, even in the best holdings, but the people are willing, and many anxious, to receive instruction.

After dwelling on the importance of, and the necessity for, the removal of side branches and suckers, the report goes on to say, in regard to this matter:—

Most of the persons entered for the competition realize this in so far that they are willing to remove any tree which we indicate to them. But they seem quite incapable of their own accord to decide which tree should be allowed to remain and which should be removed. The result is that those without instruction do nothing. This point seems more important than methods of removing the pods, forking, and even manuring. If competitors can only be made to realize that the trees must have room to develop, the scheme will have more than justified its existence.

The prospects are promising; the prize winners are people who have responded best to the advice of the instructors. But the work of thinning is of necessity slow work, and must extend over a period of two or three years; in that time, with three visits per annum by the instructor, I feel confident that most of the plots will again be in excellent condition, producing heavy crops, which the soil of this district, almost unaided, is capable of doing.

Due notice has been paid to the necessity for drainage, wind-belts, manuring and proper pruning. All the plots are remarkably healthy and free from disease.

I would strongly recommend the continuation of the competition in this district during 1912-13, and the best thanks of the Department are due to Mr. Henderson for his valuable assistance in carrying this competition to a successful issue. I append a list of prize winners. The total cost of the competition was £21 5s.

The prize winners were as follows:—

Class I.

Jeremie Remie	1st prize	£2 10 0
J. L. Angol, G. Thomas	2nd ,,	£2 0 0
B. J. Lewis, D. Durand	3rd ,,	£1 10 0
A. Henry, A. Celestine, J. J. Lewis	4th ,,	£ 10 0

Class II.

E. Henderson	1st prize	£2 0 0
B. Leatham	2nd ,,	£1 5 0
M. Mathew	3rd ,,	£ 15 0
Alice David	4th ,,	£ 7 6
M. Liverpool		£ 7 6

GRENADA: REPORTS ON THE BOTANIC STATION, EXPERIMENT PLOTS, AGRICULTURAL INSTRUCTION, AND LAND SETTLEMENT SCHEME, 1910-11.

The report dealing with the condition of the Botanic Gardens shows that these have been maintained in good order during the year. The distribution of economic plants continues to be large, both as regards variety and quantity. There is, however, scope for an increase in this matter, and it was sought to attain this by distributing lists of plants of which there was a good supply. The information concerning the work in the experiment plots at the gardens contains an interesting account of an investigation that is being carried out in regard to the growing of green dressings under cacao shade. A glance at the table detailing the results is sufficient to show that little success has been attained in this matter, so far. Other trials have been conducted with alfalfa, the Bambarra ground nut (*Voandzeia subterranea*), and ground provisions, including sweet potatoes, yams and tanias. The results with alfalfa have continued to be disappointing, and it was not found that the amount of seed set was increased by 'tripping' the flowers. More useful results have been obtained with the Bambarra ground nut and the ground provisions.

As in some of the other islands, the work of agricultural instruction in Grenada is assisted by means of prize-holdings competitions, and interesting and detailed information of the competition of the year under review, which was again held under the auspices of the Agricultural and Commercial Society in all the parishes of the island, is included in the report. A short section, dealing broadly with general agricultural progress in the island, shows that the cacao crop was smaller than that of the previous year, the latter having been the largest that has received record in Grenada. Some trouble has been experienced through the incidence of root disease and thrips. A large import was made of Para rubber seeds, and in regard to Castilloa, some slight indication has accrued that this may be successful, although time is required before definite information in the matter can be obtained. The results from cotton cultivation, as far as this has been conducted, show that a fair industry may be built up gradually. It is expected that the new Land Settlement Scheme will assist in its extension, and further aid has been given by the purchase, on the part of the Government, of two gins and an oil engine for handling the crop.

Following the precedence of last year's report, a short account is given of agricultural matters in Carriacou, where the first prize-holdings competition was held during the year. The judges' report on this shows that agricultural matters in the island are very satisfactory, although a great deal of inducement is required before the peasants will enter the competition. There are indications that Carriacou will be in possession of a lime industry of some large importance, in the near future.

The succeeding section, dealing with scale insects and black blight, may be said to provide an illuminating example of the useful results that are likely to be obtained from the conduct of investigations in a scientific manner. It was expected that a comparatively large sum of money would have to be spent on the acquisition and use of spraying apparatus; whereas careful observation resulted in showing that much might be done by the dissemination of fungus parasites of scale insects, and the adoption of this method of control has been of the greatest practical use, while the expenditure on experimental work has proved eventually to be very small, in comparison with that expected at the outset.

The report on Agricultural Instruction refers to the fact that the Botanic Station has been placed in the charge of the Agricultural Instructor, under the Superintendent of Agriculture, and gives an account of the chief work that has been done. A description is also afforded of the work conducted in the newly attached Spout Lands. The labours of the Agricultural Instructor have also included visits to country districts, mainly in connexion with giving instruction to the peasantry, and in relation to the Prize-holdings Competition. It appears that these efforts are resulting in an amelioration of the conditions under which the peasantry live, as well as of the circumstances of their cultivations. The reports conclude with that dealing with the Land Settlement Scheme, and as this scheme is only of recent adoption, the matter presented has mainly to deal with the preliminary work that has been undertaken.

VIRGIN ISLANDS: REPORT ON THE EXPERIMENT STATION, TORTOLA, 1910-11.

The details that are included in this report concerning the demand for plants, at the Experiment Station, show that this continued to be small in comparison with the extent to which it should attain: a somewhat encouraging feature is the fact that the amount of Sea Island cotton seed sold and otherwise disposed of continues to be maintained; there is also the circumstance that there exists a steady, though small, demand for lime plants.

The work in the experiment plots has received considerable interference through drought. As is pointed out, the months of June, July and August were very dry, the total rainfall for this period being 7·37 inches below the average for the same period in the preceding nine years; further illustration of the extent of the drought is given in the meteorological records, which show that the rainfall measured at the Experiment Station during 1910-11 was 10·24 inches below the average for the past ten years. The plants included in the experiment plots were cotton, sugar-cane, sweet potatoes, cassava, limes, as well as several miscellaneous plants both in permanent and seasonal cultivation. In spite of the drought, some interesting results are available from these.

In connexion with the extension of the agricultural interests of the Presidency, a successful agricultural show was held, exhibits were sent to the Canadian National Exhibition held during the year, addresses were given by the Agricultural Instructor, and periodical visits were paid by him to the out-islands mainly in connexion with the cotton industry.

An interesting Appendix to the report gives information concerning the cotton, lime, and sugar industries. In regard to the first, considerable work had to be done with the object of bringing the industry back to its former position, after the severe check experienced in 1909-10; this object was almost completely accomplished. Progress has been made with the lime industry, and the small output of sugar has been maintained

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date April 3, 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. Kitts, Antigua and Anguilla at 19*d.* to 20*d.*; also St. Vincent at 24*d.* A few fancy Barbados have also been sold at 22*d.* to 22½*d.* The market remains firm.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending March 30, is as follows:—

There has been a limited demand for some of the Planters' Crops of Extra Fine, which resulted in the sale of two small crops on private terms, the buying being for the Continent. Otherwise the market is very quiet. The Factors still show more disposition to make some concessions in price in order to sell the crop lots held in stock. The old bags continue to be firmly held on a basis of our quotations.

We quote viz :—

Extra Fine	32c. = 18*d.*, c.i.f., & 5 per cent.
Fine to Fully Fine	26c. to 28c. = 15*d.* to 16*d.*, c.i.f. & 5 per cent.
Fine to Extra Fine, off in preparation	18c. to 25c. = 10½*d.* to 14¼*d.* " " "

A forecast of the area sown in this season in cotton, in Eastern Bengal and Assam, states this to be about 101,300 acres—practically the same area as that of last year. For various reasons, the total outturn is expected to be much smaller than that of the season 1910-11, namely 19,700 bales instead of 31,100 bales.

Nature, for March 7, 1912, presents a note of observations on the stomata of the cotton plant, that have been carried out in Egypt by W. L. Balls, as follows: 'A five-days' record of the opening and closing of the stomata of the cotton plant in Egypt is given, showing the stomata wide open during bright sunshine. The author has elsewhere shown that during this part of the day no growth occurs, and there is evidence that the apparent waste of water then occurring is of importance, as keeping the leaves cool, since, when transpiration is artificially checked, the leaves are rapidly injured, or even killed, by the high temperature.'

THE WORLD'S COTTON INDUSTRY.

A yearly volume, dealing with the cotton industry of the world, is published in Germany, under the title *Das Illustrierte Jahrbuch mit Kalender für die Gesamte Baumwoll-Industrie.* The thirty-third issue of this, made in the present year, is reviewed in *La Chronique Coloniale et Financière* for February 18, 1912; and advantage has been taken of this to present the following account of the contents of this work.

Professor M. Lehmann, of Krefeld, who supervises the publication of this annual work, has collected in it a notable amount of information on the history of the cotton industry, and on the culture and exploitation of the cotton plant, not only in a general way, but in relation to the principal countries of production—and that in a detailed fashion.

As an ordinary fact, little consideration is made of the growing development of the cotton industry that is taking place, not only in Europe, but even in those countries which have only entered into the movement in recent years.

Without giving attention to all the details that are contained in this interesting annual, it may be said that it shows that, in 1910, more than 633,384,794 spindles were at work. The largest number of these was in England, namely 53,397,466; the United States of America possessed 28 million, and Germany 10,200,000; while in British India there were more than 5 millions. It may be considered that there were more than 2,500,000 automatic looms working, to which must be added a number of hand looms.

One of the countries in which the cotton industry has developed most vigorously is China, where the number of spindles increased from 275,000 in 1896 to 1,500,000 in 1904; the number of automatic looms in this country is 7,500.

The work contains a very interesting article by Moritz Schanz, on cotton in the United States of America; the authority as regards matters connected with cotton, of this writer, is well recognized.

As regards the special study of machinery, which completes this volume, the latter goes beyond its character as a work of merely annual import, for it includes several pages devoted to this subject which go to form a veritable treatise on cotton. The book itself will be of the greatest service to all those who in any way whatever are interested in a textile that is attaining from day to day a greater importance in the world.

THE TEMPERATURE OF THE SOIL UNDER DIFFERENT CONDITIONS.

The following article has been received from Mr. W. R. Dunlop, Agricultural and Science Master, St. Kitts-Nevis. It deals with observations carried out by him in connexion with soil temperatures in the tropics, and is of particular interest as it treats of a subject that has not received any great attention under the conditions described:—

The warmth of the soil under different conditions is an important matter, since it is closely connected with root development, bacterial activity and the conservation of soil moisture.

During March 1912, observations were made in St. Kitts, under as widely different conditions as possible, with a view to ascertaining the extent of temperature variations in ordinary cultivated fields. The first series of observations consisted in taking readings, simultaneously twice a day, for one week, in plots situated respectively in the dry and wet localities of the island. Molyneux estate was selected for the purpose in the case of the latter locality and La Guérite in the case of the former. Readings were taken at 7 a.m. and 1 p.m., at a depth of 3 inches. The main result of these observations was the indication that the surface soil at Molyneux estate maintains a temperature 2°F. lower in the early morning and 5°F. lower in the early afternoon than the surface soil at La Guérite. The cause of this is attributed to the cooling effect of rainfall, with its subsequent evaporation; to direct sea breezes; and to the absorption of radiant heat in the afternoon by the clouds and mountains of the Molyneux district. At both La Guérite and Molyneux the temperatures kept fairly constant, day by day; at La Guérite, at 7 a.m., the temperature was 75° to 77° F; at 1 p.m. it was 91° to 94° F. The thermometer at Molyneux showed, at 7 a.m., 72° to 75° F, and at 1 p.m. 85° to 89° F. The lowest readings could in every case be correlated with fall of rain on the day that readings were taken.

The second series of observations had for its object the determination of the temperature of the soil at different depths. Readings were taken every hour from 8 a.m. to 8 p.m., and at 6 a.m. on the next morning, at a depth of 3 inches, 6 inches, and 1 and 2 feet.

The temperature of the soil at a depth of 3 inches, at 6 a.m. was 72° F., and increased with the intensity of the heat from the sun. The maximum of 91° F. was reached at 1 p.m. During the early hours of the afternoon this temperature remained fairly constant, but there was a quick drop after sunset. The diurnal range at 3 inches was twenty degrees. The temperature at 6 inches remained more constant; it was lower during the day than at 3 inches, but higher at night. There was, however, a steady rise and fall, but the maximum of 89° F. was not reached until 4 p.m. Again, a quick drop occurred after sunset. The diurnal range at 6 inches was ten degrees.

At a depth of one foot, the temperature remained nearly constant during the day, but it was two degrees lower at night than during the day. The maximum temperature was 85° F.

At a depth of 2 feet, the temperature was 83° F., and remained constant day and night. A heavy shower of rain lowered the temperature by one degree, on another occasion.

The temperatures of soils of different texture and colour were investigated, in the third series of observations. Readings were taken at 7 a.m. and 1 p.m., at a depth of 3 inches, in four plots, composed respectively of dark-grey sand, reddish-brown clay, dark-brown pen manure mixed with sandy soil, and lime mixed with a small amount of sandy soil. The temperatures of these soils were taken under two different conditions: (a) after the soils had lain untouched for one month; (b) the day after the soils had been forked, raked and watered. The sand plot was warmer at 1 p.m. than the soils of the other plots, and was cooler at 7 a.m. The temperature of the untouched sand at 1 p.m. was 99° F.; that of the cultivated sand 90° F. The temperature of the dry sand had a diurnal range of 26° F.; this was considerably greater than that of the air. In the case of all the plots, the effect of water in levelling up the specific heats was clearly indicated. At 1 p.m. the clay was warmer than the humus plot, but cooler at 7 a.m. The lime plot (untouched) was thirteen degrees cooler at 1 p.m. than the sand plot (untouched), and the lime plot also possessed the lowest diurnal range, which amounted to 6 to 8 degrees.

The fourth series of observations consisted in an investigation of the temperature of the soil under different conditions of cultivation, at a depth of 6 inches. The first point of interest brought out was the cooling effect of cultivation, particularly forking or ploughing. Rolling warmed the soil in dry weather, but had the opposite effect when the land was wet. As regards ridging or banking up, the important fact was brought out that land cultivated in this manner from east to west is at least three degrees warmer during the day than when the soil is ridged north and south. At a depth of 3 inches the difference would be at least six degrees. The well-known fact that wind cools the soil was also supported by observations made in sheltered and unsheltered places. The soil under pasture was rather cooler than arable soil, and covering arable soil with light trash lowered the temperature during the day by four degrees. Finally, observations in connexion with the soil warmth of cacao plantations showed that soil thus shaded and sheltered was eleven degrees cooler, at 1 p.m., than the soil exposed to the sun, outside; and at 7 a.m., it was cooler by three degrees.

DEPARTMENT NEWS.

Mr. H. A. Ballou, M.Sc., Entomologist on the Staff of the Imperial Department of Agriculture, left Barbados on April 17, 1912, by the S.S. 'Korona', for St. Kitts, for the purpose of conducting investigations regarding insect pests of plants in the Leeward Islands.

Mr. P. T. Saunders, M.R.C.V.S., Veterinary Officer on the Staff of the Imperial Department of Agriculture, left Barbados on April 16, by the S.S. 'Ocamo', in order to visit St. Vincent in connexion with his official duties.

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

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number gives attention to the subject of Education in Rural Schools. It compares and contrasts broadly the means for education, particularly of an agricultural nature, existing in the West Indies, with those in England.

Page 132 contains an account of a prize-holdings competition held recently in Dominica.

Two departmental reports are reviewed on page 133. These are concerned with the work of the Agricultural Department in Grenada, and the work of the Agricultural Instructor for the Virgin Islands.

On page 135, there appears an article presenting information in connexion with the temperature of soils in the tropics, under different conditions. The details are based on the results of experimental work that has been carried out recently in St. Kitts.

The Insect Notes in this issue appear on page 138. They have reference to the subject of eel worms, or nematodes. Another article, in continuation of the information there given, will appear in the next number of this journal.

A note treating of the action of radium on plants will be found on page 141.

On pages 142 and 143, there is presented the second and concluding article, giving the latest information that is available in regard to the Panama disease of bananas, and reviewing earlier work on the subject.

The Longevity of Seeds.

The *Kew Bulletin*, 1912, p. 110, contains a note which presents an interesting instance of seeds that have retained their power of germination for a long period—as much as sixty-eight years. These belong to a leguminous plant called *Albizzia lophantha*, related to the West Indian ebony or 'women's tongues' (*Albizzia Lebbek*). They were received by Sir John Herschell from the Cape of Good Hope, in 1843, and preserved in his cabinet since his death in 1871. In 1910 and 1911, seven plants were grown from the seed, of which one, two years old, has attained a height of 10 to 11 feet, and flowered abundantly, but did not produce seed, toward the end of last year.

Part of the information given concerning the seeds and plants is contained in a letter sent to Kew by Sir William Herschell, Bart., and since it was written the interesting plant has been presented by him to the collection at that Institution.

A Method of Cleaning Ramie Fibre.

The difficulty of separating the gummy matter from the fibres of ramie has engaged the attention of inventors and others for several years, as it is the existence of this gum which lessens to a large degree the extent to which the cultivation of the ramie plant (*Boehmeria nivea*) is taken up. With reference to the subject, the *Journal d'Agriculture Tropicale* for December 1911 states that the *Bulletin* of the Sociedad Agricola Mexicana announces the invention by a chemist of a soap with a petroleum base which is perfectly suited to the cleaning of ramie. This soap contains about 40 per cent. of petroleum, combined in such a way that it is not dissociated from the soap while this is in use. It is stated to possess a useful power of cleaning fibres of all kinds, and in particular to dissolve completely the gum which causes the fibres of ramie to stick together.

As is mentioned in the article from which these details are taken, it is impossible without further information to give any opinion in regard to what is claimed for this soap. Nevertheless, at first sight, consideration of the power possessed by distillation products of petroleum to dissolve certain substances makes it appear possible that unrefined petroleum may exhibit active properties in regard to gums and resins, and that the cleaning of ramie fibres may be facilitated by means of this product.

It is stated further that it will be interesting to have additional information concerning this soap, for success in its use should lower considerably the price of clean ramie fibre.

It may be mentioned that the plant from which ramie, or rhea or Chinese grass cloth, as it is sometimes known, is obtained, belongs to the same Natural Order as the stinging nettle, and that, like that of flax (*Linum usitatissimum*), the fibre is obtained from the inner bark of the stem.

Trials of the Soy Bean in England.

As is well known, the soy bean is a tropical and sub-tropical plant, and may be grown with a certain amount of success in the warm temperate zone. In view of the fact, interest is aroused in trials with this plant that have been made in England, and are described in the *Journal of the South Eastern Agricultural College*, Wye, 1910, page 318.

The experiments were conducted with seed obtained from the United States, which was sown in a chalky loam. The plants grew well, and produced a small amount of seed: later on they turned yellow. It was found that the roots of these plants did not possess any nodules.

Other seeds of the plant were sown in pots, the soil in half of these being treated with soil in which soy beans had grown, in the United States: while that in the other pots did not receive any addition of such soil. In the former case, the plants that were obtained grew well, and nodules were produced in large numbers on their roots. The results with the plants in the pots containing untreated soil were similar to those obtained in the field.

It is concluded from these trials that the soy bean may be grown in England, but that in land where it has not been present before, inoculation is necessary.

School Gardens in Great Britain.

As is the case in other countries where attention is being given to agricultural education, the usefulness of the school garden as an aid to nature study is well recognized in Great Britain. The subject receives attention in The Report of the Board of Education for 1910-11, issued recently, and the following interesting matter is taken from the section of that report dealing with school gardens in elementary schools:—

'Closely connected with the growth of interest in nature study is the subject of school gardens. How great has been the increase in the number of schools where gardening is taught since 1902 can be gathered from the following comparison: In 1902 gardening was taught in 389 schools, and the total number of boys on whom grant was paid was 4,359. In the year 1909-10 the subject was taught in 2,014 schools, and grant was earned by 811 girls and 28,948 boys. The subject is taught in practically every county area in England, and in all but two in Wales.

'In all school gardens, with hardly an exception, the cultivation of vegetables is the main feature: in some a special point is made of fruit and flower growing. The practical work is organized in various ways. In one school each child will cultivate a separate plot of ground: in another two children will work together at each plot: often a boy in his second year of instruction will be put to work with a beginner: in a third school the whole class is jointly responsible for the garden. Sometimes there is a "common plot", in which experiments are shown and special operations carried out, such as fruit-budding, grafting, spraying, the use of artificial manures, "thick and thin" sowing. Throughout the year the work in the gardens and the work in the school are closely associated. The plants whose life-history is to be studied in the class-room are grown in the garden, the habits of caterpillars and other pests are illustrated, often with distressing clearness, by the damage they do among the children's plots: calculations as to quantities of seeds and crops make admirable exercises in arithmetic; children draw the gardens to scale and paint and model from the fruits and flowers which they have themselves grown. These drawings and paintings form a useful record of what has been done from year to year.'

The Leaf Green of Plants and the Building up of Food Bodies in the Leaf.

It is a matter of common knowledge that the possession of what is broadly described as green colouring matter (chlorophyll) by leaves is connected intimately with their power to employ carbon dioxide from the air, and water from the roots, in the building up of more complex bodies that are employed as plant food. Work has been undertaken by a Russian investigator, among others, in order to find out the relation between the amount of chlorophyll possessed by a given kind of leaf and its power to build up food bodies. This receives attention in an abstract that appears in the *Experiment Station Record*, Vol. XXIV, page 718.

It was found that the work of the leaf commences as soon as light begins to be absorbed, provided that a minimum of chlorophyll is present already, and the greater the amount of chlorophyll the less is the quantity of light required. The energy of the building up process is said to increase with the amount of chlorophyll, up to a maximum attained only in young leaves; in older leaves the quantity of chlorophyll present is in excess of that which can be employed for absorption in bright light. The effect of too strong light is to cause the energy of food-building to diminish.

The greatest action of leaves, as regards the decomposition of carbon dioxide, takes place in red light, and the smallest in green light. The opposite is the case in regard to the production of dry matter. A consideration of the phenomena observed indicates that there are two stages in the process of food-building in the leaf: the first is characterized by the breaking up of carbon dioxide and the second by actions taking place through the influence of light which are connected with the transportation and utilization of material that has been built up already.

The work has afforded other results that are equal in interest to those just given, though there is not available space to detail them completely. Mention may be made, however, of one of them, which consists in the fact that two physiological types may be recognized among plants, namely those which produce little chlorophyll and require much light; and those in which large quantities of chlorophyll are formed, so that they are able to grow in comparatively feeble illumination.

INSECT NOTES.

EEL WORMS, OR NEMATODES.

PART I.

In previous numbers of the *Agricultural News*, eel worms have been discussed from the points of view of the amount of injury which these minute worms inflict on crops and other cultivated plants, methods of control, methods of spread, and means to be adopted for the detection of this pest in sugar-cane fields. The following references to these notes may be given: Vol. III, p. 283; Vol. VI, p. 123; Vol. VIII, pp. 138, 280, 327; Vol. IX, p. 314.

At the present time, much interest is being shown in the subject of eel worms in different parts of the world, since it is now realized that many crops are being seriously injured, and much loss is resulting, from the attacks of these minute worms.

The summary is reproduced here that is given in Bulletin No. 217 of the Bureau of Plant Industry of the United States Department of Agriculture, entitled Root Knot and its Control:—

(1) the disease known as root knot, characterized by enlargements of the roots, and often leading to the death of the plant affected, is caused by a nematode (*Heterodera radicicola* (Greef) Mull.). This was probably originally native in the tropics (of the Old World?) but has spread into nearly every part of both temperate zones.

(2) The plants recorded as more or less subject to attack number almost 480 species and varieties, including nearly all the larger families of flowering plants. Probably many more are actually susceptible, but have not yet been reported as hosts. Most of the important field and garden crops and ornamental plants are more or less subject to root knot.

(3) The life-cycle of this nematode, from egg to egg, may take place in four weeks, or longer, depending upon the temperature of the soil. The larval stage is that in which entry into the host takes place. It then becomes motionless and soon enlarges and undergoes a sort of metamorphosis, the males eventually recovering the original worm shape, while the females become pear- or flask-shaped and very much enlarged in their transverse dimensions. Each female lays 500 or more eggs. The winter is passed probably most frequently in the larval stage in the soil, but in the case of galls of perennial roots the nematodes may overwinter in these in a more advanced stage, even as practically mature and perhaps already fertilized females.

(4) For the rapid multiplication of the root knot nematode the following conditions are necessary: (a) A certain degree of warmth of the soil. Thus in southern Florida this nematode is active the year round, in part of South Carolina the active season is from April 20 or May 1 to the middle or end of October, while farther north the period is still shorter. (b) Loose-textured soil. Only sandy or at least light soil is favourable to its spread. (c) Moisture. The drying out of the soil is frequently fatal to the nematode, and in any case prevents it from doing any harm. Apparently the moister the soil, as long as it is well supplied with air, the more favourable it is to the nematode's development. However, wet soil, that is soil in which the air spaces are filled with water, is at length fatal to the nematode. (d) Food supply. The larvae are able to exist in the soil for more than one year, but apparently not for two years, without the presence of living plants into which to enter. They are apparently unable to develop beyond the larval stage unless they enter a suitable host plant.

(5) The nematode is distributed in several ways: (a) The larvae move through the soil by their own motion, but the distance traversed thus is probably not more than 6 feet or so a season (b) They are carried from field to field in earth clinging to implements, the hoofs of animals, the shoes of labourers, wagon wheels, etc. (c) They are conveyed in the soil; that is washed from one field to another by heavy rains, a very common mode of distribution of this pest. (d) It is possible that heavy winds may carry larvae or eggs with the soil blown from one field to another, but probably most would be so dried out in the process that this is not much to be feared. (e) They are introduced into new places in the roots or in the dirt adhering to the roots of nursery stock, in rooted cuttings, potted plants, etc., especially those of the peach, grape, fig, mulberry, potato and ginseng; also dirt in which some seeds are packed. (f) They are sometimes brought to a field in manure, if the manure pile has stood on infested soil.

(6) The following methods of control in greenhouses and seed beds may be used: (a) The most efficient method of control is the use of live steam at fairly high pressure. The steam is forced through a system of perforated pipes laid at the bottom of the bed or bench. (b) The old, infested soil may be entirely removed and the benches thoroughly cleaned out. The non-infected soil may be put in its place. This method is not advisable in regions where the nematode occurs out of doors in the vicinity. (c) Infected soil, when it is desired to save it and steaming is impracticable, may be freed by allowing it to lie through the winter in a place where it will be exposed to alternate freezing and thawing, and especially to drying. (d) Soil containing perennial plants can be nearly, if not quite, freed from nematodes by the use of an abundance of a solution of formaldehyde (1 part of commercial formaldehyde to 100 parts of water). This solution is fatal to many plants and can be used only with great caution.

(7) For the control of the nematode in the field where the land is occupied by perennial crops no entirely satisfactory chemical application can be recommended. Places where trees are to be reset should be freed from nematodes by the use of carbon bisulphide at a rate of 3 or 4 oz. per square yard, placed in about nine holes per square yard, these holes being about 6 to 12 inches deep and to be filled with soil as soon as the chemical is placed in them. Carbon bisulphide cannot be used with safety around living trees. Flooding the land seems to be unsatisfactory, as flooding long enough to kill the nematodes is usually fatal to trees. High fertilization and constant cultivation to induce growth often so help the trees that they are able, as it seems, to outgrow the trouble, the roots either penetrating to levels where the nematodes are less abundant or being formed faster than the galls can be produced. Avoid growing susceptible cover crops, like the ordinary non-resistant varieties of cowpeas, for example, for these multiply the nematodes in the soil manifold. In preparing the land for setting out a perennial crop the soil should be freed from nematodes by the use of the methods suggested below.

(8) For land infested with nematodes and not bearing a perennial crop, the following methods may be recommended: (a) Keeping the land free from vegetation of all kinds for two years. This is the most effective method, but it is not practicable in many cases. (b) Planting the land to non-susceptible crops for at least two (perhaps better three) years, using in the winter small grains, such as wheat, rye or oats, and in the summer the velvet bean, Florida beggarweed, the iron cowpea, or even ground nuts, scrupulously destroying all

weeds that might harbour nematodes. (c) Making heavy applications of fertilizer, especially those containing potash, except where the soil already contains this in abundance. This treatment often reduces nematode injury greatly. (d) Flooding the land for a period of some weeks. (e) Where rain is not likely to interfere, ploughing and allowing the soil to dry out for several months. (f) Preventing, by the use of embankments, ditches, etc., the washing of soil from infested fields to the field which is free from the pest. The introduction of the pest by tools, wagons, farm animals, etc., should be avoided. The trap crop methods, and the use of various chemicals, have not proved practical as tested by the writer. The former needs, perhaps, further trial.

(9) The ideal procedure is to develop non susceptible strains of plants, so that the expense and trouble of exterminating the pest may be avoided. Such strains may be obtained by the selection of more resistant plants, or by crossing with resistant strains, followed by the careful selection and breeding of the progeny.

Further attention to this subject will be given in the next number of the *Agricultural News.*

EXPORT TRADE OF UGANDA, 1910-11.

The great expansion of the export trade is phenomenal, an increase of £130,675 on domestic produce being recorded. The amount of the increase in domestic exports over the previous year exceeds the value of the total exports of the Protectorate of five years ago. The articles chiefly responsible for the increase are cotton, chillies, ivory, hides, cotton seed, and ground nuts. The figures would have been still further increased had not transport been seriously affected by an unfortunate outbreak of rinderpest along the main routes from the cotton fields. Large quantities of produce remained in the outlying districts towards the end of the year, which could not be moved. A railway is, however, in course of construction between Jinja and Namasagali, and additional steamers and lighters are being placed on Lake Kioga, which will effectively deal with all the produce from the fertile Bukedi District.

FOOD, DRINK AND TOBACCO. The increase under this head was £13,918. The quantity of chillies exported was nearly double that of the previous year and ground nuts show a satisfactory increase.

RAW MATERIALS, UNMANUFACTURED. The increase under this head was £115,791. The greatest expansion in the export trade is shown under this class and is largely due to the increase in cotton export, the value of which—ginned, unginned, and seed— increased from £60,445 in 1909-10 to £168,620 in 1910-11. The approximate quantity of lint cotton exported during the year under review was 2,740 tons, as compared with 1,158 tons in 1909-10. Hides show a decrease in quantity, but an increase in value. The decrease is due to the outbreak of rinderpest and consequent prohibition of the export of hides. A slight decrease is shown in the value of wild rubber exported, owing to the trees and vines being rested for a few months during the year. Plantation rubber is now being exported, and extensive planting of rubber trees of different varieties is being carried out.

RAW MATERIALS, MANUFACTURED. The increase under this head was £966. The exports of cotton seed and sesame oil show an improvement, and a still further extension of these industries is anticipated. (*Colonial Reports*—Annual, No. 708.)

AGRICULTURAL SHOW, MONTSERRAT, 1912.

The following account has been received from the Curator of the Botanic Station, Montserrat, Mr. W. Robson:—

The seventh agricultural show in Montserrat was held in the Roman Catholic Schoolroom at Plymouth on March 6, an adjoining enclosure being used for stock.

The show, which was a great success, was promoted by the Agricultural and Commercial Society and was liberally supported by the local Government and by the Imperial Department of Agriculture, the latter of which gave a grant of £15, and offered six diplomas of merit, for competition.

His Honour the Commissioner, in opening the Show, congratulated all concerned in its promotion. He referred to the marked increase in the number of exhibits and to the excellent manner in which they were arranged. He further stated that it was very gratifying to find that the prejudice which has hitherto inclined many of the small growers to think that there is an ulterior motive in the promotion of such exhibitions, was to some extent breaking down, and he hoped that it would disappear altogether. The very large increase in the importation of American foodstuffs into the island, in recent years, suggested to His Honour, that the small grower was neglecting his provision ground, and he strongly urged that greater attention be given to local food crops, generally.

The total number of exhibits was 890, compared with 370 at the show held in 1911. There was a very marked increase in the number and quality of the exhibits in the classes for stock, sugar products, minor products including starches and meals, and preserves. Vegetables were fairly well represented, but the quality of the samples, on the whole, was not as good as that in last year, owing no doubt to the prolonged drought previous to the show. The classes for fruit and cotton were poorly represented, probably chiefly because of the time of year at which the show was held.

The marked increase in the stock exhibited was one of the most pleasing features of the show. The number of animals entered for competition in 1911 was 40; at the recent show there were 120 entries. The principal sections were colt or filly under two years, 9; horse over 14 hands, 4; horse under 14 hands, 7; bull, 7; milch cow, 15; heifer, 11; mule, 4; donkey, 14; pigs, 9; sheep, 16; and goats, 23.

A special prize given by His Excellency Sir Bickham Sweet-Escott, Governor of the Leeward Islands, for the best collection of estates produce, brought forth three competitors, the prize going to the Olveston Estate of the Montserrat Co., Ltd.

Of two prizes given by His Honour the Commissiner for the most satisfactory piece of joiners' work, the first was awarded to two well finished mahogany chairs, made from a tree felled in Montserrat.

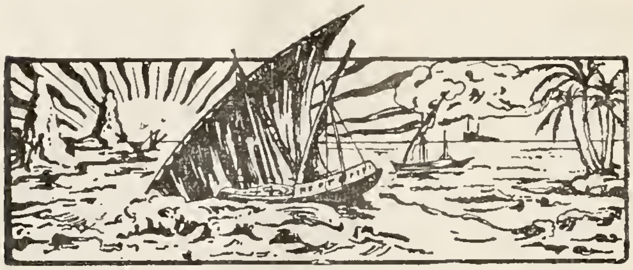
Competition was also very keen for prizes offered by Mrs. Davidson-Houston for drawn-thread work, many excellent samples being shown.

The six Diplomas offered by the Imperial Department of Agriculture were awarded for samples of seed-cotton, cotton lint, an imported Canadian sheep and boar, a cow, a piece of furniture and drawn-thread work.

An interesting function just previous to the closing of the show was the distribution of the prizes by Mrs. Davidson-Houston.

The attendance at the show was the largest on record, and the gate money nearly double that of any previous year.

There is ample evidence that the show as an institution is appealing to all classes of the people, and it is anticipated that it will be an annual event for some years to come.



GLEANINGS.

An article in the *Union Gazette* of South Africa for January 19, 1912, shows that last year 1,018,630 bags (of 200 lb. net) of maize were shipped from British South Africa. The amount in 1910 was 1,760,208 bags.

The distribution of plants from the St. Lucia Botanic Station continues to indicate a maintained interest in lime-growing, for during March it included 1,350 lime plants. There were sent out 1,661 plants altogether, of which 300 were cacao plants. Seventy-one packets of seeds were also distributed.

The distribution of plants from the Botanic Station, Dominica, during March last amounted to 1,463, including: limes 1,050, Para rubber 300, cacao 50, nutmegs 18, grafted mangoes 4, miscellaneous 41. The total distribution from this Station during the twelve months ended March 31, 1912, was 76,363 plants.

The Board of Trade Journal for March 7, 1912, showed that the number of bales of cotton imported into the United Kingdom, up to the end of February last, was 1,303,714, including 1,518 bales of British West Indian, 90 British West African, 5,936 British East African, and 396 bales Foreign East African.

In connexion with the importation and erection of an oil engine and mill for the purpose of assisting in the work of sugar-cane experimentation in Antigua, it is reported that this machinery is now available for use, and that the engine has shown satisfactory behaviour in a trial run conducted during last month.

With reference to Phylloxera, the well-known parasite of the grape vine, it is of interest that in the year 1909, 6,120 tons of carbon bisulphide was used, in Hungary, for the control of this pest. As it is found on the roots as well as on the leaves of the plants, the employment of carbon bisulphide as a measure against it is easily understood.

Attention is given, in the *Experiment Station Record* for August 1911, p. 120, to experiments that have been conducted for the purpose of observing the rate at which common salt and sodium nitrate travel through soil. It was shown that, even in sand, the rate of travel of the former is very low, while it is strongly absorbed by clay. The rate at which nitrate of soda diffuses through loam soils was found to be much less than is generally assumed, and the trials would indicate that there is little danger of loss of nitrate, in strong soils, during the time that the crop is growing.

The work in the Botanic and Experiment stations, St. Kitts, received serious interference during last month through drought. At the Experiment Station, the plots were kept clean, and in the Botanic Station the plants were maintained alive by watering them. Much of the effort during the month was concerned with the important work of cotton selection

A note in the *Bulletin Agricole*, Mauritius, for January 1912, draws attention to experiments that have been conducted in Cuba, which have shown that the yield obtained by using the roots of sweet potatoes for planting is about three and a half times as great as that given when cuttings are employed for the same purpose. Similar results have been obtained in the British West Indies, more definitely in the Leeward Islands and in Barbados.

It is to be doubted whether the extent of monetary loss caused by parasitic fungi is generally realized. The following figures are, therefore, not without interest. The official estimate of the loss due to the attacks of rust on cereals amounts, in Prussia alone, to about £20,000,000. The loss from this cause amounts to about £3,000,000 in the case of wheat, to nearly £9,000,000 in that of rye, and to about £8,000,000 in oats. (The *Gardeners' Chronicle*, February 24, 1912.)

Twenty-four thousand eggs of the silkworm weigh a quarter of an ounce; the worm lives from forty-five to fifty-three days; it increases in weight, in thirty days, 9,500 fold, and during the last twenty-eight days of its life eats nothing. For 739 lb. of mulberry leaves, 70 lb. of cocoons are obtained; 10,000 cocoons give 8½ lb. of silk, and 1 lb. of cocoons will produce a single thread 88,000 fathoms, or 100 miles, in length. (The *Queensland Agricultural Journal*, February 1912.)

An abstract, in the *Journal of the Chemical Society*, 1910, page 1106, gives an account of an indicator that is made by placing radish skins in alcohol of 96 per cent. strength, and carefully neutralizing the solution, if necessary, with seminormal potassium-hydroxide. The indicator turns green with alkalis, and intensely red with acids. It is claimed to be more sensitive than methyl orange or phenolphthalein; it resembles the latter, however, in giving an acid reaction with carbon dioxide.

It is reported from Montserrat that, during March, the destruction of old cotton plants in the island was well advanced, and that a large area was ready for the sowing of seed. It is expected that this area will be at least as large as that planted in cotton in 1911. As regards selection and manurial experiments with cotton, Mr. K. P. Penchoen has again kindly placed 2 acres of land, situated at Dagenham estate, at the disposal of the Agricultural Department, for the carrying on of this work.

An abstract contained in the *Bulletin of the Bureau of Agricultural Intelligence and of Plant Diseases* for January 1912, p. 95, states that the examination of authentic specimens of a plant from the island of Tenos in the Cyclades (Greece) has led it to be considered that they belong to a new species of Trifolium, namely *T. pilulare*, which was regarded hitherto as being confined to Asia Minor. It is supposed that the dispersal of the seed of the plant has been effected by wind.

STUDENTS' CORNER.

MAY.

First Period.

Seasonal Notes.

In the present quarter of the year, the work that was indicated to be done in lime plantations for the last quarter should be continued. This includes drainage, pruning, weeding and mulching. Under what conditions are lime cultivations most likely to exhibit a need for drainage, and what are the signs that such conditions exist? In what circumstances do you consider that lime trees require pruning? State what objections, if any, there are to the pruning of limes, and what precautions should be employed in carrying it out.

Manure may be applied at the present time, and when the period of regular rainfall begins. Among useful manures for the purpose are sulphate of ammonia, nitrate of lime and various proprietary manures. What are the essential differences between manures contained in the last mentioned designation and those named first? It will be observed that they all contain nitrogen. What changes usually take place in regard to this substance before it is absorbed by plants? With reference to these changes, it must not be considered that they are absolutely necessary with respect to many substances that contain nitrogen, for recent work has proved that several compounds carrying this element can be absorbed by plants under conditions such that there could not be any transformation into nitrates, with the aid of bacteria.

Usually, the time for setting out young lime plants in the field arrives in June, and in May the holes should be prepared for the purpose of receiving them in the carefully marked out positions that the plants will occupy. These holes should be about 2 feet deep, and 2 feet wide and long. They are allowed to remain open for a few weeks before the limes are planted in them. Why is this done?

Give an account of the characteristics of a well-grown lime seedling, and supply the details of the treatment that seedlings receive in the nursery in order that they may acquire the desirable characteristics.

The sowing of lime seeds at the present time is likely to be successful in those islands possessing the larger rainfall, as they are not liable to be killed by the disease known as damping off—a disease that is most generally found to prevail during wet weather. Give an account of the life-history of the fungus that produces this disease.

The work that has been outlined for limes will include the careful treatment of all wounds made in pruning or in any other way. Wounds should be dressed with an antiseptic substance or mixture which will discourage the attacks of fungi and insects. A useful mixture for the purpose may be made from resin oil and tar. Observe the way in which the wounds heal, both large and small, and make sketches of the progress of the healing process.

Lastly, in regard to limes, the present time is likely to form a useful opportunity for the study of scale insect pests of the plant, and of the fungi that are parasitic on them.

Questions for Candidates.

Preliminary Questions.

(1) Give a list of manures that are used specially for providing phosphorus.

(2) Write a description of what is seen in the case of a scale insect attacked by a fungus parasite.

(3) Provide a list of the chief exports of the island in which you live, in the order of their importance.

Intermediate Questions.

(1) Write an account of the manufacture of any manure that is used to supply phosphorus.

(2) Give as many examples as you can of scale insects that you have seen to be attacked by fungi.

(3) Supply a description of the way in which any agricultural product with which you are familiar is packed and shipped.

Final Questions.

(1) What part does the element phosphorus occupy in regard to the nutrition of plants?

(2) Write an account of the natural and artificial methods employed in practice for keeping scale insects in check.

(3) Give a general account of the conditions existing in regard to the two chief crops of the island in which you live, and state how far the replacement of the first in value, by the second, is expedient.

PLANTS AND RADIUM.

Details of experiments that have been undertaken for the purpose of ascertaining the effect of radium on plants, under certain conditions, are given in the *Comptes Rendus de la Société de Biologie*, Paris, 1910, p. 523, and 1911, p. 419. The accounts are abstracted in the *Experiment Station Record*, Vol. XXV, p. 523, and the matter there given is used for presenting the following facts.

The unopened flower buds and the ovaries of Lilium were exposed to radium rays of different strengths, with the result that the former organs were arrested in their development and commenced to dry up, while complete atrophy of the ovaries and stigmas took place, and the anthers either did not attain complete development or the period required for them to come to maturity was much lengthened.

Microscopical examination of the anthers and ovaries showed that there were either no nuclei, or incompletely developed nuclei, in the former; in the ovaries the embryo-sacs were atrophied, and this was not the extent of the damage, for the same circumstance had occurred in the entire ovule.

In further work, it was found that it was sufficient merely to subject the flowers of Lilium to the action of the rays to cause the underground stems (rhizomes) to rot or fail to grow, so that it is concluded that the exposure of the floral organs to strong radium rays has the result of causing a general derangement of the vegetative part of the plant.

Observations were also made with *Linum catharticum*, a plant commonly known as purging flax, which was grown from seed in soil containing radium salts. Under the condition, a general retardation was caused in the germination of the seeds and the growth of the plant. A further observation went to show that the number of leaves produced on plants of this kind was increased by exposure to the radium rays.

FUNGUS NOTES.

THE PANAMA DISEASE OF BANANAS.
Part II.

In April 1911, Rorer published a full account of the Moko disease of bananas and plantains in *Phytopathology*, Vol. I, pp. 45-9, a reprint of which was issued by the Board of Agriculture, Trinidad. The disease attacks the Moko, Creole, and French varieties of plantain, and the dwarf or Cavendish banana, but does not usually affect the Gros Michel. It has been proved by inoculation experiments to be caused by a bacterium, to which the name of *Bacillus musae* has been given. The symptoms of the disease, as described by Rorer, are as follows:—

'The presence of the disease is as a rule first detected in the lower leaves. The leaf blades droop a little more than usual and have a slightly yellowish tinge—symptoms very similar to those brought about by drought. Soon, however, the petiole of one of the leaves gives way just at the base of the leaf blade, and all the other leaves quickly break down in a similar manner. Eventually the terminal leaf, too, bends over and the plant dies and rots down to the ground.

'Transverse sections of the pseudo-stem show that practically all the vessels are discoloured, the colour ranging from pale yellow to dark-brown or bluish-black, and filled with bacteria. The discoloured bundles run back into the true stem and thence into the young suckers and buds. Sometimes in badly diseased plants the tissues of the leaf stalks and stems are broken down completely, so that fairly large bacterial cavities are formed.

'If transverse sections of leaf or stem are let stand for a short time the cut surfaces soon become covered with bacterial drops which have been forced out from the ends of the bundles. If the sections when freshly cut are put in large covered dishes away from the air, pure cultures of the organism may be obtained directly from these drops. If the disease is not severe, or a plant does not become infected until it has just formed a branch of fruit it may remain perfectly healthy-looking, but many of the young fruits, or "fingers" do not properly mature; they remain small and eventually become black and rotten. In such cases it is found that there are some discoloured bundles filled with bacteria in the leaves, stem, fruit stalk, or fruits. When diseased suckers are planted the terminal leaf frequently turns black and dries up, so that the plant dies.'

The similarity of this description with that of the disease in Panama and Costa Rica suggested to Rorer that they might possibly be the same Further study, however, showed that they were clearly distinct, the principal points of difference being that *Bacillus musae* has never been isolated from the vessels of plants attacked by the form of Panama disease occurring in Trinidad; that in every case a species of Fusarium has been isolated by Rorer from plants both in Trinidad and from Surinam, which were attacked by the Panama disease; that the longitudinal splitting of the leaf sheath—a characteristic of the latter disease—is not found in plants attacked by the Moko disease; and finally, that the Gros Michel variety, which is the most susceptible to the Panama disease, seems to be naturally resistant to the Moko disease.

Besides this statement by Rorer of the existence of the Panama disease in Trinidad, there is another mention by the same author in the *Annual Report of the Mycologist*. 1909-10, published by the Board of Agriculture, Trinidad. No general account, however, has as yet been issued of the form of the disease present in that island.

In April, 1911, Essed published in the *Annals of Botany*, Vol. XXV, p. 343, an account of the Panama disease as found in Surinam. He attributed the disease to a fungus, which he named *Ustilaginoidella musaeperda*. This had a Fusarium condition, and, in so far as this stage was found, his account supports those of other workers. His description of this Surinam disease differs from McKenny's description of that found in Panama, principally in the absence of any smell; and from Levy's account, in the facts that no rotting is recorded in the Surinam form of the disease, and that the roots remain healthy until the tissue at their base is affected.

In the same month, Basu published in the *Quarterly Journal of the Department of Agriculture*, Bengal, Vol. IV, p. 196, an account of a disease attacking certain varieties of banana in the neighbourhood of Chinsurah. Part of this is reproduced:—

'The chief symptoms of the disease are: (1) the turning yellow of some of the older though otherwise healthy leaves, (2) the formation of one or more much reduced leaves at the crown, (3) the gradual withering of the younger leaves, (4) and finally, the breaking down of the plant. The disease progresses so rapidly, that in ten or fifteen days from the first appearance of it, the plant is found dead.......... .....

'By cutting a plant transversely near the base of the leaf sheath, the disease becomes noticeable; either as black, brown or yellow spots, varying in size from that of a circle 3 or 4 inches across. In longitudinal sections these spots appear like streaks, which seem to pass from the roots upwards into the root stock and the leaf sheaths. In many places where a young plant is still attached to another plant the disease passes from the mother plant to the young offshoot directly through the point of contact.'

A fungus having a Cephalosporium and a Fusarium condition was isolated from the diseased tissues; numerous bacteria, believed to be of a secondary nature, were also present, as is the case in the forms of Panama disease prevalent in the West.

The most recent contribution to our knowledge of the subject has been made by Drost, in Bulletin No. 26 of the Department of Agriculture, Surinam. This author states that this disease is different from that prevalent in Panama and Costa Rica, though it has long been known as the Panama disease, and although it also attacks principally the Gros Michel variety. He bases this statement on a comparison of Levy's description of the true Panama disease with the symptoms of the Surinam form as observed by himself. He proposes the name Surinam Panama disease, to distinguish it from the form prevalent in Central America.

The principal symptoms of the Surinam disease are as follows: (1) The occurrence of yellow spots on the leaves; this is best seen in young plants; it cannot be taken as a definite symptom, as it may be occasioned by other causes. (2) The sudden appearance of one or more incompletely developed leaves. Plants whose leaves were formerly healthy may show this symptom when growing in infected soil, as also may infected suckers when planted in healthy soil. When it appears during the first development period of the banana, it is an indication of a very strong infection, and the bulb will be found on examination to be badly diseased throughout. (3) Longitudinal splitting of the external leaf sheath. This is usually found on infected soil, in cases where the disease is spreading in from the outside; it is due to the disintegration of the vascular bundles, which so weakens the leaf sheath that it can no longer resist the pressure of the still vigorously growing inner leaves which it enfolds. (4) In the most usual form, plants of six months or older, which have been previously healthy, show a softening, ribbing and folding of the heart leaf, provided no fruit is present. The older leaves break off at the junction of the stalk and the leaf sheath, turn yellow, and die in a few days. The plants are quite dead a few weeks later. When fruit is present, the stem remains with the bunch at the top, but the fruit is without value, as even when it is apparently ripe it has no taste. The root systems of diseased bananas do not appear to be less strong than those of healthy plants.

On cutting open a diseased bulb it is seen that the vascular bundles are discoloured brown and that the discoloration extends into some of the bundles of the leaf sheath as well as, in some cases, into certain of the vascular strands of the roots. The central portion of the bulb may commence to rot when the disease is in an advanced condition, but the outside remains firm for some time. The main differences between this description and that of Levy are that there are no external symptoms of disease in the roots, that the plants dry up and do not rot, and that there is no smell The absence of rotting in the bulb is a particularly noticeable point of difference. except in the final stages of the disease.

Drost has shown by infection experiments that the Surinam Panama disease is due to a fungus named *Leptospora musae* which has Cephalosporium and Fusarium stages in its life-history. It can penetrate the root hairs, and thence spread into the central bundle of the roots, whence it passes into the root stock and ascends the vascular bundles of the leaf sheaths. Usually, however, it attacks directly the bundles exposed at the place where the suckers have been cut from the mother plant, under the surface of the soil. The fungus is not as a rule found in the leaf blade or in the fruit stalk.

It would seem, from a consideration of the literature cited, that the disease described by Earle from Stony Hill, Jamaica, has probably no connexion with the other forms described, and is purely a leaf disease. This opinion is supported by some remarks made by Cousins, and published in the *Jamaica Gleaner* for January 19, 1912, in which he states that the plants in that locality did not show any indications of bacterial disease of the roots, but clear evidence of a fungus disease of the leaves. Apart from this, there are two fully described diseases affecting the vascular bundles, and therefore the water-supply, of certain varieties of plantains and bananas. The first is the Moko disease described from Trinidad, due to *Bacillus musae*, occurring on certain varieties of plantains and bananas, but not usually on the Gros Michel. The second is the Surinam Panama disease, due to *Leptospora musae*, and attaining its greatest virulence on the Gros Michel. Further, there seems to be a reasonable possibility that the incompletely described forms of Panama disease mentioned as occurring in Trinidad and Cuba will prove, on more complete investigation, to be identical with that in Surinam; while the similarity of the description of the disease in Bengal with that of the latter cannot escape attention. It seems advisable to regard the true Panama disease of Central America as distinct from any of the above, at any rate until it has been further investigated It may be that the noted differences in symptoms between this and the Surinam Panama disease are occasioned by secondary parasites, probably bacteria, which develop in the tissues damaged by the primary agent, and that this primary agent is the same in both cases. This, however, is purely a speculation.

All these diseases are characterized by a destruction of the vascular bundles which results in the death of the aerial portions, owing to the failure of the water-supply. At the same time, the discoloration of the diseased bundles is very similar in all the cases. This being so, it is natural that there is some difficulty in determining the exact identity of any given disease by mere examination of the field symptoms, unless the investigator is well acquainted with the various forms, and with the minor differences by which they may be distinguished. It is conceivable that, at certain stages in the progress of the infection, even an experienced observer might be mistaken; and, in any event, the isolation and identification of the organism responsible for the disease furnish by far the most satisfactory, and perhaps the only definite, method of distinguishing them.

Previous articles on the subject of banana diseases have appeared in the *Agricultural News*, Vol. X, pp. 110 and 254; the latter deals more particularly with the work of Rorer and Essed, to which reference has been made above.

PAINTING METAL PLANT LABELS.

The following note on this matter has been received from Mr. J. C. Moore, Agricultural Superintendent, St. Lucia:—

White metal plant labels, having the names formed in raised black-faced type, are in common use throughout the West Indian botanical gardens, and they are undoubtedly the best form of permanent legible label for public gardens, particularly in the tropics. An occasional scouring, followed by a coat of paint over the raised type, is all that is necessary to keep them perfectly legible. To paint over the raised type without painting the white-metal body of the label may at first appear a tedious and somewhat costly undertaking, when several hundred labels have to be dealt with, but I have devised a simple and expeditious method, which has proved to be so successful that I think it is worth describing, in case it may be found useful for trial in other public gardens.

All that is required is paint well mixed to the consistency of printers' ink, a slate such as is used in schools, or some smooth, flat surface on which to spread the paint, and a small rubber roller (I have employed a small roller intended for use in connexion with photographic prints).

A small quantity of the paint (about a teaspoonful) is poured on the slate and rolled out into an even film. Passing the roller along the slate coats it with paint, and it is then carefully rolled over the raised letters once or twice. With a little practice, from forty to sixty labels can be renovated in an hour.

A table is contained in Bulletin No. 234 of the Bureau of Plant Industry of the United States Department of Agriculture, just issued under the title The Cultivation and Manufacture of Tea in the United States, which shows that the quantity of tea imported into that country was, in 1908, 94,149,564 ℔, having an import value of $16,309,870. Of this weight, about 27 million pounds came from China, 47 million from Japan, and 20 million pounds from India and Ceylon. It is stated in the Bulletin that, although the two last-named countries are increasing their trade in tea, in the United States, the Chinese and Japanese teas remain in the lead, perhaps because of the demand for green and oolong teas. It is further considered that black teas are constantly becoming more popular in the United States, and that they may in time supplant the green tea, as has been the case in Great Britain.

MARKET REPORTS.

London.—The West India Committee Circular, April 9, 1912; Messrs. E. A. De Pass & Co., March 29, 1912.

Arrowroot—$3\frac{5}{8}$*d.* to $4\frac{3}{4}$*d.*
Balata—Sheet, 3/8; block, 2/9 per lb.
Beeswax—£7 10*s.* to £7 12*s.* 6*d.*
Cacao—Trinidad, 55/- to 75/- per cwt.; Grenada, 49/- to 54/-; Jamaica, 49/- to 55/-.
Coffee—Jamaica, 71/- to 80/- per cwt.
Copra—West Indian, £26 15*s.* per ton.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 19*d.* to 24*d.*
Fruit—No quotations.
Fustic—No quotations.
Ginger—48/- to 65/- per cwt.
Isinglass—No quotations.
Honey—No quotation.
Lime Juice—Raw, 1/3 to 1/10; concentrated, £18 12*s.* 6*d.* to £19; Otto of limes (hand pressed), 6/3.
Logwood—No quotations.
Mace—Steady.
Nutmegs—Steady.
Pimento—Common, $2\frac{13}{16}$*d.*; fair, $2\frac{7}{8}$*d.*; good, $2\frac{15}{16}$*d.*; per lb.
Rubber—Para, fine hard, 4/$9\frac{1}{2}$; fine soft, 4/9; Castilloa, 4/11 per lb.
Rum—Jamaica, 1/8 to 5/-.
Sugar—Crystals, 19/- to 22/-; Muscovado, 15/6 to 18/-; Syrup, 12/6 to 18/3 per cwt.; Molasses, no quotations.

New York.—Messrs. Gillespie Bros. & Co., March 22, 1912.

Cacao—Caracas, $11\frac{3}{4}$c. to $12\frac{1}{4}$c.; Grenada, $11\frac{1}{4}$c. to $11\frac{3}{8}$c.; Trinidad, $11\frac{3}{4}$c. to $12\frac{1}{4}$c. per lb.; Jamaica, $10\frac{1}{4}$c. to $11\frac{1}{4}$c.
Cocoa-nuts—Jamaica, select, \$24·00 to \$25·00; culls, \$15·00 to \$16·00; Trinidad, select, \$25·00 to \$26·00; culls, \$16·00 to \$17·00 per M.
Coffee—Jamaica, $14\frac{1}{2}$c. to $16\frac{3}{4}$c. per lb.
Ginger—9c. to $10\frac{1}{4}$c. per lb.
Goat Skins—Jamaica, 52c.; Antigua and Barbados, 48c. to 50c.; St. Thomas and St. Kitts, 45c. to 47c. per lb.
Grafe-Fruit—Jamaica, \$4·00 to \$4·50.
Limes—\$6·00 to \$6·50.
Mace—58c. per lb.
Nutmegs—110's, $12\frac{1}{2}$c.
Oranges—Jamaica, \$2·00 to \$2·25 per box.
Pimento—3*d.* per lb.
Sugar—Centrifugals, 96°, 4·49c. per lb.; Muscovados, 89°, 3·98c.; Molasses, 89°, 3·74c. per lb., all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., April 15, 1912.

Cacao—Venezuelan, \$12·40 to \$12·60 per fanega; Trinidad, \$11·80 to \$12·25.
Cocoa-nut Oil—\$1·05 per Imperial gallon.
Coffee—Venezuelan, $15\frac{1}{2}$c. per lb.
Copra—\$4·70 per 100 lb.
Dhal—\$3·90.
Onions—\$4·00 to \$4·25 per 100 lb.
Peas, Split—\$7·00 to \$7·25 per bag.
Potatoes—English, \$1·90 to \$2·25 per 100 lb.
Rice—Yellow, \$4·80 to \$5·00; White, \$6·25 to \$6·50 per bag.
Sugar—American crushed, no quotations

Barbados.—Messrs. James A. Lynch & Co., Ltd., April 20, 1912; Messrs. T. S. Garraway & Co., April 22, 1912; Messrs. Leacock & Co., April 12, 1912.

Arrowroot—\$6·50 to \$7·00 per 100 lb.
Cacao—\$11·50 to \$12·00 per 100 lb.
Cocoa-nuts—\$16·00.
Hay—\$1·60 to \$1·80 per 100 lb.
Manures—Nitrate of soda, \$65·00; Cacao manure, \$45·00 to \$48·00; Sulphate of ammonia, \$80·00 per ton.
Molasses—No quotations.
Onions—\$4·00 to \$9·00 per 100 lb.
Peas, Split—\$7·00 to \$7·25 per bag of 210 lb.; Canada, \$3·00 to \$4·80 per bag of 120 lb.
Potatoes—Nova Scotia, \$2·50 to \$4·00 per 160 lb.
Rice—Ballam, \$4·90 to \$5·35 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
Sugar—American granulated, \$5·25 per 100 lb.

British Guiana.—Messrs. Wieting & Richter, April 13, 1912; Messrs. Sandbach, Parker & Co., April 12, 1912.

Articles.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	—	—
Balata—Venezuela block	No quotation	Prohibited
Demerara sheet	70c. per lb.	—
Cacao—Native	17c. per lb.	18c. per lb.
Cassava—	48c.	No quotation
Cassava Starch—	\$8·00	No quotation
Cocoa-nuts—	\$12 to \$16 per M	\$10 to \$16 per M., peeled and selected
Coffee—Creole	17c. per lb.	16c. per lb.
Jamaica and Rio	18c. to $18\frac{1}{2}$c. per lb.	19c. per lb.
Liberian	12c. per lb.	12c. per lb.
Dhal—	\$3·75 per bag of 168 lb.	\$3·75 to \$3·90 per bag of 168 lb.
Green Dhal	\$4·50	—
Eddoes—	\$1·80	—
Molasses—Yellow	None	—
Onions—Teneriffe	—	—
Madeira	—	—
Peas—Split	\$7·00 per bag (210 lb.)	\$7·35 per bag (210 lb.)
Marseilles	—	No quotation
Plantains—	24c. to 60c.	—
Potatoes—Nova Scotia	\$3·50 to \$3·60	\$3·50 to \$3·75
Lisbon	—	No quotation
Potatoes–Sweet, B'bados	\$1·56 per bag	—
Rice—Ballam	No quotation	—
Creole	\$5·25 to \$5·50	\$5·50
Tannias—	\$2·04	—
Yams—White	\$2·64	—
Buck	\$2·40	—
Sugar—Dark crystals	\$3·30 to \$3·40	\$3·30 to \$3·35
Yellow	\$4·25	\$4·25
White	—	—
Molasses	\$2·90 to \$3·00	—
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	\$3·75 to \$6·00 per M.	\$4·00 to \$6·00 per M.
,, Cordwood	\$1·80 to \$2·00 per ton	No quotation.

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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, 2d. The subscription price, including postage, is 2s. 2d. per half-year, or 4s. 4d. per annum. Volumes IV, V, VI, VII, VIII, and IX complete, with title page and index, as issued —Price 4s. each.— Post free, 5s. 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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CONTENTS.

The Interpretation of the Results of Field Experiments.

I.

AT the meeting of the British Association for the Advancement of Science held at Sheffield on September 6, 1910, papers were read before the Agricultural Sub-section, dealing with the magnitude of error in agricultural experiments. These have been published recently, with suitable modifications, at the suggestion of the Association, in a Supplement to the *Journal of the Board of Agriculture*, under the title The Interpretation of the Results of Agricultural Experiments. Attention has been given already to the subject in the *Agricultural News*, in an editorial article in Vol. VIII, p. 369, and it is intended to employ the papers mentioned for the purpose of supplementing the information that was then presented.

The first of the papers is entitled Field Trials and Their Interpretation, by A. D. Hall, M.A., F.R.S., and E. J. Russell, B.Sc., of the Rothamsted Experimental Station. This commences by pointing out that the value of an experiment depends on the confidence that may be placed in its results: that is to say, on the likelihood that, with a repetition, the same results will be obtained. In agricultural experiments, the matter is complicated by the fact that the material with which the trials are made consists of living organisms, which respond in various ways to different factors of environment. The import of this is understood when it is considered that, in manurial experiments for instance, the object is to compare the effects of the provision of different kinds of plant food; but the real issue is not as simple as this, for the manures may affect directly the texture and water-holding capacity of the soil, so that the response of the plants is not connected immediately with the power of the manures to provide food. The circumstance makes it necessary that the object of experiments should be clearly defined, and that the methods by which they are carried out should be made as simple as possible. This is specially important in agricultural experimentation, as it has to be conducted over a considerable period, for results to be obtained, and any mistakes made at the outset can rarely be rectified, so that they may cause it to be necessary eventually to modify the whole scheme of investigation.

Even though such a scheme may have been drawn up most carefully, it is not possible to expect an exact answer to the questions that it is sought to elucidate—a matter that is amply illustrated by the differences obtained in various years or various places. The aim of the investigation is to find the most probable result that can be given by the differing answers. In obtaining this most probable result, in the first case, a selection must not be made of the results to which the greatest importance is attached; all the figures that are given by the trials must have consideration. In the same way, it must be realized that the average result of a series of experiments cannot always receive dependence. This is illustrated from the consideration that the effect of a manure on different soils, to take an example, will not be truly represented by the mean of the results, on account of the fact that several among them may give no response of any kind to the manure. In such a case the only accurate method is the repetition of the trials on the same soil. Lastly, however great may be the care with which the experiments are carried out, there is always some error where measurements have to be made. It is therefore necessary to recognize the existence of this inevitable error, to reduce it as far as is practically possible, and to measure its probable amount for the purpose of determining what must be allowed for its effect, in arriving at definite conclusions. Methods have been devised for estimating this probable error, and although they were invented for use in astronomy and physics, they can be employed equally in agricultural experimentation.

In considering the causes of variation in the results of field trials, it is evident that these can never be repeated under exactly the same conditions. This fact, together with what has just been stated, shows that the differences observed arise in two ways: from the true error of the experiment, and from the divergence between the conditions of the various trials. One of the most potent among such conditions is lack of uniformity in the soil. Another is the effect of hedges and trees, in subjecting plants in different parts of the plot to varying circumstances. A slight difference of level, even, in an experimental field may suffice to render the undulating part of it useless for the purpose of investigation. In temperate latitudes, more than in the tropics, lasting effects of a disturbing nature arise from old applications of pen manure. Again, the conditions of plant growth may not be uniform, and this is why the outside row or rows often does not receive consideration in arriving at results. Further, there is the effect of the unequal incidence of diseases and pests: it must be remembered, however, that this may possess a useful significance in regard to the subject at issue; thus a lack of potash is liable to be shown by a greater susceptibility to disease. These considerations would not be complete without a reference to the effect of the individuality of plants, which however is small because of the large number that is usually employed in an agricultural experiment. Lastly, there is the effect of variation in season, which may be very large. All the sources of variation that have been dealt with may be divided into two groups: firstly, those that get smaller with the decrease in the size of the plot, as for instance variation in the soil and the conditions of growth; and secondly, those that become greater as the size of the plot decreases, these being the variations in the individuality of the plant and in the incidence of disease, and the effect of the outside rows.

The facts that have been adduced are sufficient to show that the chances of accuracy of experiments are enhanced by increasing the number of plots. In this way, the effect of unequal conditions in the soil tends to become eliminated, and the errors made in experimentation and observation go to balance one another. As, however, the addition of plots increases the laboriousness of the work, the number of plots used must be the result of compromise between accuracy and convenience.

At this stage, it is evident that the magnitude of the experimental error in field trials will be dependent on the character of the soil and sub-soil, the previous history of the former, and the nature of the crop and of the season, so that it is necessary for this error to be calculated on each occasion that the trials are made. It is, however, desirable to know what may be the order of the error to expect, and the determination of this and of other similar matters will receive attention in the next number of the *Agricultural News*.

Experiments in which the Bambarra ground nut (*Voandzeia subterranea*) was fed, with hay, to wethers is described in *Der Tropenpflanzer*, 1911, p. 413. The unshelled pods were used, and the percentage co efficients of digestibility proved to be: fat 100, proteids 84·2, nitrogen-free extract 84·3, cellulose 25·6. Analysis of the pods thus employed gave the following percentages: water 15, proteids 17·9, fat 3·9, nitrogen-free extract 49·1, fibre 10·7, ash 3·4. The Bambarra ground nut was described in the *Agricultural News*, Vol. IX, p. 340. It is under trial at several of the Botanic Stations in the West Indies.

SUGAR INDUSTRY

SUGAR FROM SHREDDED CANE.

The manufacture of sugar from shredded cane, by what is known as the McMullen process has been described, or has received attention, in the last volume of the *Agricultural News*, on pages 67, 83, 195 and 303. The following further information is contained in the *American Sugar Industry*, for April 1912:—

A correspondent of the *Chemiker-Zeitung* gives the following account of the manufacture of dried sugar cane as now carried out in Cuba under the auspices of the United Fruit Company.

In the so-called bagasse factory situated in Preston, on Nipe Bay, in north-eastern Cuba, neither sugar nor cellulose is made. The products of this factory are the so called 'fibre' and 'pith'. The 'fibre' is the bast-like long fibres of the cane, and the 'pith' is the fine cellulose fibres of the marc. These two products combined contain the entire quantity of sugar originally present in the cane.

It has been found a very difficult matter to separate the two very different kinds of fibre in the cane by one and the same boiling process, because one kind requires a vigorous chemical treatment which destroys the other kind. For this reason the United Fruit Company has adopted the McMullen process, in which the two kinds of cellulose are first separated and then treated separately to obtain their sugar and cellulose. To boil the dry cane first and then separate the two fibres, as is recommended in another process, is not the correct way.

In order to separate the components of the sugar-cane, fibre and pith, the cane is first cut up by rotating, chopping, and at the same time tearing knives, without loss of sugar. The fragments are then quickly dried and subjected to a second beating; the fibre and pith are then separated in rotating sieves. Analyses of these two sugar-cane products, which were exhibited at the Industrial Exposition in Havana in February of last year [see *Agricultural News*, Vol. X, p. 303], showed the following results:—

DRIED CANE.

	In fibre, per cent.	In pith. per cent.
Moisture	8·20	6·10
Sucrose	33·05	50·36
Glucose	2·08	3·42
Non-sugar	9·93	5·10
Fibre	46·74	35·02

After this mechanical separation, the components of the sugar-cane are subjected to high pressure in a press and shipped in the form of bales. If the moisture content exceeds a certain per cent., the juice is pressed out of the fibres with the result that there is formed a compact solid mass of the consistency of wood. This contingency must be avoided in order to prevent difficulties in the subsequent operation. The cane being prepared in this form, further operations can be carried out in Cuba itself, or in any industrial district of other countries where there may exist more favourable labour conditions, and where the cost of obtaining fuel for heating is not so great.]

The dried cane is utilized chiefly in obtaining sugar and cellulose for the manufacture of paper, and it is reported that considerable quantites of wax are obtained as a by-product. At the present time the sugar is obtained from this dried sugar-cane by diffusion in a beet sugar factory at Madison, Wisconsin. The fibre extracted from this material is then worked up in a paper mill to cellulose. The quality of the resulting cellulose lies between that obtained from straw and that obtained from esparto—a species of Spanish grass (*Macrochloa tenacissima* [synonym of *Stipa tenacissima*]), of which cordage, shoes, baskets, etc , are made. It is also used in making paper.

At the present time the process employed in obtaining the fibre is the soda process, but there exists a question as to whether this process can survive, because large quantities of chloride of lime are required for bleaching and the use of this chemical is accompanied by decreasing yields. The two situations together make the economic standing of the process very doubtful. A better process is urgently needed, and it is very likely that a new method which has been proposed will give the desired results.

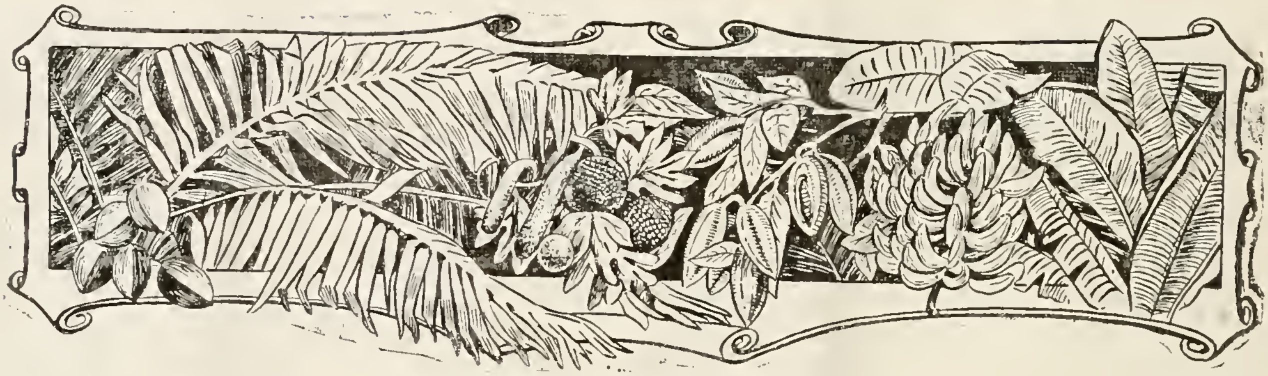
The material called 'fibre' yields long, strong, bast-like fibres The pith contains about 75 per cent. water-soluble substances. Three-fourths of its weight, therefore, consists of sugar. After extraction the crude fibre of the pith is found to consist of cellulose, oxycellulose, and about 12 per cent. of lignocellulose, determined by the method of Dr. Renker. The very short fibres of the pith are said to coustitute a very good material for the manufactnre of nitro-cellulose.

The advantages of the McMullen process consist in the fact that it permits sugar-cane, which can be kept only a comparatively short time, to be subjected to a preliminary treatment without affecting the quality and quantity of the sugar it contains. It is thus put into a condition which makes the factory manager independent of the season The cane thereby acquires good keeping quality, is easily transported, and may be worked up in localities where fuel and labour conditions are more favourable than in the tropics. It is self-evident, says the correspondent of the *Chemiker-Zeitung*, that if the McMullen process becomes capable of general introduction, it will bring about great changes in the sugar industry. If, under favourable conditions, the cane sugar industry becomes able to furnish cellulose for paper manufacture, this may mean that cane sugar will come to play an important part in the European markets, since the profits on the by-products will enable the sugar to be sold at a lower price.

DEPARTMENT NEWS.

Mr. F. W. South, B. A., Mycologist on the Staff of the Imperial Department of Agriculture, returned from St. Lucia by the S.S. 'Guiana', on April 26, after visiting that Presidency for the purpose of making investigations in connexion with plant diseases in the island.

According to the *Board of Trade Journal* for March 28, 1912, it is reported by H. M. Consul at Dairen that for the last two or three years attempts have been made to introduce the Lima bean (*Phaseolus lunatus*) into Manchuria. It has been found necessary, however, to abandon the attempt on account of the expenses incurred in protecting the seedlings from high winds, which, when added to other unavoidable expenditure, render the venture unprofitable.



FRUITS AND FRUIT TREES.

THE CURING OF VANILLA.

The increased interest that is being shown in certain parts of the West Indies with regard to the production of vanilla has made important the consideration of the question as to the best way of carrying out the process of curing, on which the ultimate value of the product so much depends. In view of this fact, it may be well to give an abstract of the information that is presented concerning the subject in the publication issued recently under the title Spices, by H. N. Ridley, M.A., C.M.G., F.R.S., F.L.S., late Director of Botanic Gardens, Straits Settlements.

The objects of the artificial methods for curing vanilla are to hasten maturity, to produce a uniform and simultaneous ripening of all parts of the pod, and to prevent splitting of the pod and consequent loss of the perfume. The means for artificial curing include the employment of hot water, sun heat, and stove heat. Particulars of the best known among them are as follows.

THE GUIANA PROCESS. After the pods have been placed in ashes until they begin to shrivel, they are removed and wiped, rubbed with olive oil, and tied at the lower end in order to prevent them from splitting. They are then left to dry in the open air.

THE PERUVIAN PROCESS. The pods are hung in the open air for twenty days, after being dipped in boiling water and tied at the end. They are then smeared lightly with castor oil, and tied in bundles a few days afterwards.

THE MEXICAN PROCESS. The pods are allowed to shrivel under cover, and then are sweated in two different ways, according to the weather at the time. In warm and fine weather, they are exposed to the rays of the sun, on a woollen blanket, in the early morning. At mid-day, or soon afterwards, the blanket is folded over the pods, and the bundle left in the sun until evening, when the vanilla is sweated in air-tight boxes during the whole night. On the next day they are again left in the sun, after which time their colour turns to a dark coffee shade, the depth of the shade varying with the success of the sweating. In cloudy weather, the pods are made into bundles, which are formed into small bales covered first with a woollen cloth, then with banana leaves, and finally in a thick matting, which is sprinkled with water. The bales containing the largest beans are placed in an oven at a temperature of 140° F., and the temperature is allowed to fall until it reaches 113° F., when the smaller beans are introduced, and the oven closed tightly. The smaller beans are kept in the oven for twenty-four, and the larger for thirty-six, hours, when they acquire a fine chestnut colour. In order to dry them, the pods are exposed to the sun on matting, every day for nearly two months, and then the drying is completed in the shade. This process is said to have been employed successfully in Réunion for some years; it requires, however, care and skill.

THE BOILING WATER PROCESS. This has also been found successful in Réunion. In the first stage the pods are placed in cylindrical baskets of rattan and lowered into large iron cauldrons containing water nearly at boiling point (about 194°F.). The time of dipping varies: sometimes it lasts for fifteen to twenty seconds, when it only takes place once; and at others two or three dippings are given, each lasting three or four seconds. The water is then allowed to drain away from the pods, on tables covered with black cloth, or on mats. After all the pods have been scalded, they are piled together, covered up, and put into an oven for a quarter of an hour. In the next stage, they are exposed to the sun, on tables covered with blankets, until two or three o'clock, when they are rolled up in the blankets and either kept warm in a closed room, or put to retain their heat into cases lined with wool. Four, six or eight days are required for this stage of the process, according to the weather, and the pods are examined from time to time in order that those which are ready may be removed, the condition being recognized by the pod becoming flexible, and the skin of a uniform deep chocolate-brown, and marked with longitudinal furrows. Drying is carried out on tables, made of rattan or perforated, placed in a drying house usually roofed with zinc, and with windows that are open during the middle of the day. They remain here for about a month or a little longer, and are turned frequently in order that they may dry easily. The completion of the process is shown by the fact that the pods have become black and may be twisted easily round the finger without cracking. Before they are sorted they are passed through the fingers repeatedly in order that the oil that they exude during fermentation may give them the proper suppleness and lustre.

POTIER'S PROCESS. After having been soaked in rum for twenty to thirty days, the pods are exposed to the air for thirty-six to forty-eight hours, without becoming completely dry. They are then shipped in the rum in which they were first soaked. Simplicity is claimed for the method, but it is expensive.

A process for drying vanilla with the aid of calcium chloride is described in the *Kew Bulletin* for 1898, p. 43, and the account is abstracted in the work that has been employed in presenting the following details.

The pods are placed on end, close enough to secure pressure without damage by rubbing, in tins fitted with lids closing on the outside of the tin, the pods in the last layer being placed on their sides They are then covered with a woollen cover, and the lids put on. The tins are put into halves of wine barrels, which are filled with water up to the lids of the tins, care being taken that no water gets into the latter. After the barrels have been left for the night, covered with a piece of sacking, the pods are taken out and dried in the air, and then placed under woollen coverings in full sunlight, for two or three days.

This is the preliminary curing process, used before the method of drying with calcium chloride that is described. For drying, there are used closed boxes, made of galvanized iron and containing calcium chloride. Each box is about a yard square, and fitted with a hinged, air-tight door, closing on an india-rubber edging. There are eleven trays in each box, in the sixth of which, as well as on the bottom of the box there are placed about 40 lb. of calcium chloride, while the remaining trays contain about 100 lb. of vanilla; the bottom of each tray is perforated. The receptacles for the calcium chloride are double bottomed, the inner bottom being perforated in order to allow the calcium chloride that has absorbed water to run away from the rest; more calcium chloride is added as it is wanted. Every two or three days the vanilla is examined, and any damp pods are placed in the sun. Twenty-five to thirty days is required for this part of the process.

The vanilla is next put into frames, in a covered, well-ventilated place for several days, and then into tin boxes each containing a weight of about 40 lb. It remains in these for several weeks, during which time any pods that show mildew are carefully wiped.

When the perfume is well developed, the vanilla is subjected to treatment for the purpose of removing any dust and spores of mildew upon it. For this purpose, 40 lb. of the vanilla is put into about 6 gallons of water at 140° F., and vigorously stirred by hand. Lastly, the pods are taken out, wiped lightly, and put to dry in the shade.

A process called Macfarlane's process is employed specially for *Vanilla Pompona*, as that for *V. planifolia* cannot be used for the former without loss through splitting of many of the pods. In this, the pods are placed in the shade in layers 6 or 8 inches deep, for about three weeks, until they turn to a uniform, deep, red-brown colour, when they are exposed to the sun in wooden trays, 3 feet by 6 feet and 2 inches deep, in layers of about $1\frac{1}{2}$ inches. They are turned two or three times a day, and at about 3 p.m., or whenever rain threatens, the trays are stacked one upon another, under cover, and blankets are placed over them. In three or four days the pods are packed while hot into old 40-lb. biscuit tins, in which they remain for two days, when they are then spread out in the trays, and covered with blankets. From this time the processes are alternated, one day in the sun and one or two in the tins, until the pods have become soft and pliant, when they may be left for a couple of weeks at a time in the tins, as long as the latter are fairly air-tight. The chief precautions to be observed are the frequent turning of the pods, and care never to spread them singly in the trays.

A safer plan, but one requiring more house room, is to remove the pods when they have lost about half their weight, and are distinctly wrinkled, to frames covered with wire-cloth or thin sacking, the frames being placed in a well-ventilated building so that the pods may become dry.

THE TONKA BEAN.

Information concerning the tonka bean has been given, more recently, in the *Agricultural News*, Vols. V, p. 212: and IX, p. 149. The following additional details are taken from an article appearing in the *Journal of the Royal Society of Arts* for March 15, 1912:—

The tonkin, tonqua or tonquin bean of commerce is supposed to have first reached Europe from the Province of Annam, Tonquin. It is the dried seed of the fruit of the leguminous tree called by botanists *Dipteryx odorata*, which grows in the forests of the northern part of South America. The tree attains a height of 80 feet, and the fruit is an oblong, fibrous pod that contains one seed, almond-shaped but larger, and covered with a shiny black skin. The seeds have the sweet odour of new-mown hay. Tonka trees flourish in the Guianas, in the state of Para, Brazil, and the Orinoco basin of Venezuela.

The tree is found scattered singly throughout the forest, rarely in groves Experience has shown that the third-year crop is generally the best, although it is almost impossible to forecast the harvest of any one year. In Venezuela the tree is known as the 'Serrapia', from which the men engaged in collecting the beans earn their name 'serrapieros'.

Men, women and children all take part in the collection. The fruit is much like the mango in appearance, and serves as food for the natives. It has but little pulp, which is sticky and of insipid taste, while the seed is covered with a hard, fur-like substance. When the serrapiero has gathered sufficient fruit, he carries it to some open spot in the forest, where he can get the benefit of strong sunlight; he here carefully breaks open the hard shell and extracts the single oblong, dark-brown bean. The seeds are then spread to dry on large granite slabs common in Venezuela. The dried beans are then shipped to Ciudad Bolivar and sold to local merchants, who may subject them to the process called crystallization, or who may send the beans on to Trinidad, where this process can be carried on much more cheaply. Crystallizing is an alcoholic treatment. Open casks are ranged side by side and filled with beans to within 1 foot of the top. Strong rum is then poured over them until the casks are quite full, when they are covered with gunny bags At the end of twenty-four hours the rum not absorbed is run off, and the beans are spread out to dry where the air circulates freely. When first emptied from the casks the beans are of a dull black colour, soft and swollen, but, on drying, shiny white crystals appear on their surfaces, and by the time they are ready for packing they seem to be sugar-coated. The beans shrink in drying, and present a wrinkled appearance when ready for final exportation. Tonka beans, pulverized, are mixed with snuff and tobacco to give a bouquet, and their sweet scent finds them a ready market with perfumery and soap manufacturers. Somtimes they displace the vanilla bean, but strictly speaking, it is the fragrant odour that gives value to the fruit.

The tonka bean is also found scattered through the forest lands of Colombia.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date April 22, with reference to the sales of West Indian Sea Island cotton :—

A fair amount of business is reported in West Indian Sea Islands since our last report and prices are firm The sales comprise Antigua, Nevis, St Kitts, Montserrat, Anguilla, Barbados, 18*d.* to 20*d*, and St. Vincent 23*d.* Some stains have also been sold from 7*d.* to 10*d.*

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

The market remains very quiet with little or no demand. There is some enquiry for a few of the Planters' Crop Lots, but at prices below the average views of the Factors. There has been shipped this week to Northern mills 300 bales which were held in stock by an exporter, consisting of part of a purchase made last October, at 18c. to 20c., of cotton more or less off in preparation.

In the absence of any demand we can only renew our last quotations, viz :—

Extra Fine	32c. = 18*d.*, c.i.f., & 5 per cent.
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COTTON EXPERIMENTS ON THE GOLD COAST.

Experiments in cotton-growing are being carried out at the Agricultural Station, Tamale, on the Gold Coast. The information below is taken from a description of them that is given in the Report of the Agricultural Department for the year 1910, which has just been received:—

The Station is worked on the principle of a farm for annual crops, as this suits the agricultural needs of the Dependency. Plots are set apart for various perennial economic plants, and the remainder of the farm has been placed under rotation. in which cotton figures prominently.

The rotation to be observed is as follows: first year, leguminous crops, such as ground nuts, native beans, cowpeas, pigeon peas; second year, cotton. American, or other variety; third year, native Hibiscus fibre, maize or other grain crops, followed by quick-growing leguminous crops to be turned in for green manure; fourth year, cotton, native or other variety.

Plots have also been set aside for the cultivation of selected types of native cottons, for testing exotic varieties, and experiments in different times of sowing have been instituted

The total yield obtained from the cotton sown in 1909, gathered during the first quarter of the year under review, has been most unsatisfactory. The experiment was confined to testing different times of planting the Black Rattler (American) variety, with the ordinary native variety.

The yields are so poor that the results of the different sowings can hardly be relied on, but unless better returns can be shown in future it would appear that cotton cannot be successfully grown for export. There was at first some difficulty in obtaining an adequate supply of labour, so it is probable that the poor returns are due in some measure to the land having been insufficiently prepared. The soil at the Station, however, although said to be representative of that in the Dependency is not very fertile, and in any case large returns cannot be looked for.

During the past year, six different varieties have been cultivated, viz.: American Black Rattler, American Jones Improved, American Hawkins, American Upland, Nyasaland American, and Dagomba Native.

A few selected types are also being grown, and are showing interesting variation. The present crop of Black Rattler is from seed of the previous year's crop. It appears to be acclimatized. The seed of the other exotic varieties was received from Southern Nigeria.

Five experimental plots were sown with native cotton, and four with American Black Rattler at different times, with a view to ascertain the best season in which to plant.

The first sowings were made on July 13, and subsequent sowings at intervals of fourteen days.

The value of these experiments has been diminished by heavy rains making the plots swampy, and by an attack of insects which destroyed the first crop of bolls.

The climate seems suitable for cotton-growing if necessary precautions against drought are taken. It is essential to get a deep-rooted plant before the Harmattan commences, otherwise the plant will quickly dry up, giving poor returns. Mulching has been found to be of great benefit.

The quality of some of the cotton is excellent; it is of fine colour and lustre, and the seed is good.

Gathering of the crop is proceeding, and gives indications of better yields than in last year.

AGRICULTURE IN TRINIDAD, 1910-11.

CACAO. The exports of cacao continue to increase in quantity, 57,858,640 lb., of the value of £1,230,097, having been exported during the year ending December 31, 1910. The manurial experiments at River Estate have been continued, and also on private estates in different parts of the Colony. It is too early yet to draw conclusions. Spraying experiments, conducted by the Board of Agriculture, indicate a profit over the cost of the spraying. Diseases of cacao, fortunately not very serious, have continued to receive careful attention. To promote better methods amongst small growers, a Cacao Prize Competition [see *Agricultural News*, February 17, 1912, p. 53] has been arranged, and is expected to produce useful results; the number of entries, 430, was much larger than was anticipated.

SUGAR. The exports during 1910 amounted to 46,218 tons—an increase of slightly under 1,000 tons over those of 1909. Special attention has again been devoted to the study of the froghopper, which is a destructive insect pest. In addition to the local officers, an entomological expert from England, specially engaged by a group of proprietors, has conducted investigations. The pest, however, is one which is very difficult to cope with, and no certain and practical method of eradicating it has yet been discovered.

COCO-NUTS. The cultivation of this tree is being extended in certain districts of both Trinidad and Tobago. Diseases, as in other parts of the world, have caused some difficulty, but care is being taken to keep them in check. The exports during 1910 amounted to 18,872,962 nuts, 2,046,621 lb. of copra, and some oil, making a total value of £86,823.

RUBBER. This product continues to receive much attention. Large supplies of Castilloa and Funtumia seeds are available locally, as also moderate supplies of Hevea seeds from local trees. Experiments in tapping and preparing rubber have been continued by the Department of Agriculture, and planters in Tobago are making marked advances. Trees of both Castilloa and Hevea rubber give normal yields; of Funtumia but little is known at present; 7,375 lb. of rubber, valued at £1,395, was exported.

RICE. This industry continues as hitherto in the hands of small growers, the majority of whom are East Indians, who mostly produce for their own use.

BANANAS AND OTHER FRUIT. The experiments conducted by the Department of Agriculture on the Government Estate, St. Augustine, continue to demonstrate the profitable use of pen manures. The disease which earlier threatened the banana cultivation has been largely reduced by rotation of crops. At St. Augustine the expenses of the banana cultivation were £1,092 (including rent charges, etc.), and the receipts £1,647. The profits would have been greater, but 3,500 bunches were lost during the disorganization of the mail service. The total shipments of fruit from the Colony amounted to £19,952.

AGRICULTURAL SHOWS. One successful show was held during the year.

GOVERNMENT FARMS. The Farm in Trinidad has been enriched during the year by the importation of Guernsey, Jersey, Shorthorn and Gujarati cattle, a hackney mare and pigs. The stallions, etc., continue to be in good demand.

The future of the Tobago farm has formed the subject of investigation by a committee, which has recommended limiting it to a stud farm. A shorthorn bull, pigs and poultry have been imported.

RIVER ESTATE. This estate, managed by the Department of Agriculture and used for experimental work, has had a successful year. The crop was the largest on record; the expenses were £1,312 (including £654 capital charges) and the receipts £1,585.

INFLUENCE OF BOTANIC STATIONS ON MINOR INDUSTRIES. One important means of encouraging minor industries is by the distribution, at reasonable rates, of good plants and seeds. During the year there has been a check in this direction owing to other views having been held previously, with consequent diminution in the nursery stock available. However, 60,484 plants were distributed (by sale, exchange or gratis) including in order of numbers: cacao, sugar-cane, sisal hemp, timber trees, fruits, rubber, coffee. In addition large numbers of seeds were disposed of. Seed of hybrid cotton and tobacco, raised in Tobago for the Department of Agriculture, are being distributed free from the Botanic Stations. Grafted mangoes and other high-class fruits are prepared. In addition, the officers of the stations maintain touch, as far as is practicable, with the cultivators, and give advice when desired. Rubber tappers are being trained to be available on estates. (*Colonial Reports*—Annual, No. 699.)

PARTIAL STERILIZATION AND FERTILITY.

The effect of partial sterilization in increasing the fertility of soils has received attention in several issues of the *Agricultural News*, as for instance, in Vol. IX, pp. 33 and 107, and in the last issue, on p. 131. Further experiments, having for their object the investigation of partial sterilization on the activity of nitrogen fixing bacteria in artificial culture, are thus described shortly on pp. 14 and 15 of Bulletin No. 113 of the Pennsylvania State College Agricultural Experiment Station:—

It has been noted by many observers that the treatment of the soil by ether, chloroform, carbon bisulphide, and other antiseptics that are capable of sterilizing it more or less completely, is followed, at least after a short time, by increased vigour of crop growth, similar to that produced by a dressing of nitrate of soda.

Two theories have been advanced to account for this effect: one, that the antiseptic kills the organisms hostile to the useful soil bacteria, and thus favours their highest development and effect; the other, that these antiseptics directly stimulate the plant itself.

In the course of an extensive study of the bacterial flora of a General Fertilizer Series, G. C. Given compared the amounts of nitrification in different portions of a culture medium, severally inoculated from the soils of various plots. Of these inoculated media, some were partially sterilized by heating in an autoclave for five minutes, at a pressure of 17 lb. to the square inch, corresponding to a temperature of 254° F.; the remainder were left without such modifying treatment before incubation. At the end of an incubating period of thirty days, it was found that the partially sterilized cultures had produced from 1·6 to 2·9 times as much nitric acid as the corresponding unsterilized cultures; or an average of twice as much from the soils of five plots representing as many different fertilizer treatments.

These results show that the resistant nitrifying bacteria of these soils have been far more active after partial sterilization of the inoculated culture media, and support the former of the two theories above stated. In partial sterilization, either by heat or by aid of antiseptics, greenhouse men have the means for diminishing the activity of certain injurious organisms, and for increasing that of other helpful agents.

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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NOTES AND COMMENTS.

Contents of Present Issue.

In this issue, the editorial is entitled The Interpretation of the Results of Field Experiments. It is intended to pursue this subject further in the next issue of the *Agricultural News*.

Under the heading Fruits and Fruit Trees, on pages 148 and 149, detailed information is given concerning methods that are employed in the curing of vanilla. The matter is of some importance with reference to the increased interest in this product that is being shown in the West Indies.

Page 151 contains an interesting note dealing with observations on the partial sterilization of soils and their fertility. This is in continuation of the subject in several articles that have appeared from time to time in the *Agricultural News*.

The Insect Notes, on page 154, contain the concluding article dealing with eel worms or nematodes. There is also presented on the same page a note on the pernicious or San José scale.

On page 158, the Fungus Notes contain an article in which consideration is given to the possibility that Hevea rubber stumps may carry disease. The subject is of special interest in view of the fact that these are being imported in certain cases for the purpose of supplying planting material of Hevea.

The same page contains an account of rubber experiments that have been conducted in recent years, in Uganda.

Publications of the Imperial Department of Agriculture.

The *West Indian Bulletin*, Vol. XII, No. 2. containing an account of the West Indian Agricultural Conference, 1912, is just being issued. The details included in the account are arranged under the following heads, as an abstract of the papers and proceedings: List of Representatives: Presidential Address; Agricultural Progress in Trinidad and Tobago; Cacao; Sugar: Plant Diseases and Pests: Cocoanut, Lime and Fruit, and Rice Industries; Cotton: Agricultural Education: Excursions and Demonstrations: Trade Commissioner in Canada: Telegraphic Service: Entomological Research Committee: Committee on Entomological Research, West Indies; Nomenclature Committee; Usefulness of Agricultural Conferences; Forestry: Closing of the Conference.

The *West Indian Bulletin*, Vol. XII, No. 2, may be obtained at an early date from all agents for the sale of the publications of the Imperial Department of Agriculture: price 6*d.*, post free, 9*d.*

Medical Work in St. Lucia.

With the St. Lucia *Gazette* for Saturday March 16, 1912, there is issued a supplement presenting the Laboratory Report for the Half-year Ending September 30. 1911, by Dr. Lucius Nicholls. This deals with many matters and some of them are of sufficiently general interest to receive attention here.

As regards the prevention of malaria, the distribution of the fish millions, and of quinine, is stated to be proceeding satisfactorily, and good results are undoubtedly being shown. A large amount of the information has regard to research in connexion with yaws (*Framboesia tropica*), and considerable success has been obtained from treatment with the remedy salvarsan, commonly known as 606. With reference to prophylactic measures against this loathsome disease, the suggestion is made that these should include: (1) the strict isolation of all cases which arise; (2) the thorough treatment of these cases; (3) the careful watching of all cases which are discharged as cured; (4) the look-out for 'chronic carriers': (5) the disinfection of clothes and dwellings. As is pointed out, the only practical scheme includes freely supplying dressings, disinfectants and ointments for the protection and treatment of injuries, and the keeping away of flies, and it may be other insects, as far as possible. The suggestion is made that the dressings should be doled out at suitable situations on all estates and in villages, and that agricultural overseers should be asked thoroughly to acquaint the labourers with the fact that these are available: further that, when they see uncovered abrasions or ulcers, they should ensure that the labourer properly attends to them. Stringent regulations for isolation should be made, and a thorough trial conducted of salvarsan; so that if this is successful the remedy may be used continually hereafter.

Additional means of control for yaws are suggested, including the compulsion of patients to appear for examination, and stress is laid upon the importance of the co-operation of the planters and their overseers with the Government, in the matter.

A New Artificial Manure.

A report from H.M. Acting Consul at Christiania, Norway, states that the local newspapers have signalized the production of a new artificial manure, which has received the name Bi-phosphate. This is stated to be actually a by-product in the manufacture of nitrate of lime at the Notodden Works. The nitric acid produced in making nitrate of lime is used to dissolve apatite (bone earth) or other raw material, and the manure is produced by subsequent treatment of the product.

It is expected that the price of the new manure will be low; its chief use will be in the replacement of superphosphate and basic slag.

Legislation against Anthrax in St. Vincent.

At a meeting of the Legislative Council of St. Vincent held on December 4, 1911, the Council went into committee over a Bill for an Ordinance to Provide for the Compulsory Vaccination of Animals, as a Precaution against Anthrax in Infected Districts.

Among other matters, in addition to that of compulsory vaccination, the Ordinance is intended to define and limit the conditions under which a district might be declared infected, and to make provision for the payment of compensation for animals dying from the effects of vaccination. A clause, included at first in the Bill, by which owners had to pay for the vaccination of their animals, was eliminated.

With reference to this Ordinance, it should be pointed out that powers are only given by it in proclaimed districts, and as an emergency measure.

Manurial Experiments with Tea.

Attention is given in the *Experiment Station Record*, Vol. XXIV, p. 738, to experiments that have been carried out at the Heeleaka Experiment Station, India, for the purpose of investigating the effects on tea of various methods of cultivation and manuring.

The experiments have been made continuously for the five years during which the station has been in existence. In this time, five plots which received no manure, but were given careful and repeated cultivation, showed a considerable increase in yield.

Consideration of the returns of leaf during the five years has led to the conclusion that the yields are influenced both by the local climatic conditions and by seasonal variation. The heaviest yields were generally received during the months of greatest rainfall.

The trials showed further, that the best method of employment of suitable manures was their application in small divided doses during the year, in order to lessen the loss in drainage water.

Prize-holdings Competition in Jamaica.

At the end of last year, a prize-holdings competition, held in the parish of St. Andrew, Jamaica, received the attention of the judges, and the report is printed in the *Journal of the Jamaica Agricultural Society* for February 1912.

There were fifty-four entries in the competition, forty-nine of which were inspected and judged; of these there were ten in the first class, a similar number in the second class, and twenty-nine in the third class, the total number being smaller than that in the previous competition, probably because of the severe drought during the year.

Among matters that showed weakness were the keeping of stock and the paying of attention to fences and gates. It was advised that after the drought the coffee trees should be pruned, and that the old ones among them which had been seriously affected should be removed entirely. The suggestion is made that the cultivation of bananas might be profitably extended in various districts. Catch crops such as yams suffered seriously in the drought, and more attention to mulching is advised.

Eradication of Noxious Weeds in Grenada

An Ordinance, No. 2 of 1912, dated March 23, 1912, the purpose of which is to make provision for the eradication of noxious weeds in Grenada, has received the assent of the Governor of the Windward Islands. In the schedule of the Ordinance, 'to clear' is defined as meaning to dig up and burn, or to pull up and burn, noxious weeds; or to employ other means of destruction prescribed by an inspector under the Ordinance; and 'persons responsible' shall, in relation to lands, mean the occupier of land or, in the case of unoccupied lands, the owner thereof or his agent in the Colony.

According to the regulations, it is the duty of responsible persons to clear lands of noxious weeds and to report the occurrence of such weeds to a Justice of the Peace, Magistrate, or Inspector, or at the nearest police station, or directly to the Superintendent of Agriculture. Any land, whether enclosed or not, may be entered upon by an Inspector for the purpose of ascertaining if any noxious weeds exist thereon. In case of such existence, the Inspector serves a notice giving details of the nature of the weed and the localities in which it occurs, and the person responsible is required to clear the land within the time specified in the notice.

If, after notice has been given, the land is not cleared of the weed, the responsible person will be liable, on conviction, to the penalties provided in the Ordinance, and the Court may further order such person to pay the cost of clearance. In the event of failure to clear the land, an Inspector may enter upon it, with or without assistance, and eradicate any noxious weed found thereon.

Other regulations provide for the serving of notices and for the protection of the Inspectors during the exercise of their duties.

A preliminary note on this Ordinance appeared in the *Agricultural News* for March 16.

INSECT NOTES.

EEL WORMS, OR NEMATODES.

PART II.

A circular of the Bureau of Plant Industry, United States Department of Agriculture, issued on February 20, 1912, entitled The Nematode Gallworm on Potatoes and Other Crops in Nevada, deals with the serious occurrence of eel worms in Nevada in 1910-11. The summary of this circular is given herewith:—

'During the seasons of 1910 and 1911 there has been a serious infestation of certain potato fields in Nevada, caused by a nematode gallworm known as *Heterodera radicicola*. This has resulted in hindering the marketing of Nevada potatoes in California, where the crop has been sold heretofore.

'The parasite causing the disease is a very small unsegmented worm, which invades the roots of many different plants, causing malformations, and often seriously hindering the growth of the plants. The nematode multiplies very rapidly under favourable conditions. The life-cycle may be completed within a few weeks, and each female may lay as many as 500 eggs.

'The nematode may be carried from place to place in the roots of living plants, in potatoes, on soil on the roots of nursery stock, or with potted plants. It may also be carried from one field to another in earth, on farm implements, or in irrigation water. Manure from yards where diseased roots or tubers have been fed may carry the worm, and garbage containing peelings of diseased potatoes is also a prolific source of infestation.

'The use as seed of any infected potatoes is to be strongly condemned. No effort should be spared to locate all infested fields in a district where the nematode is known to occur, and seed potatoes should be secured from fields known to be uninfested, or, better still, from a region where, because of adverse climatic conditions, the nematode is unknown.

'A thorough inspection should be made of all fields in each district where the nematode is suspected to occur, and all infested fields should be devoted to crops which the nematode does not attack. There are many plants besides the potato which are susceptible to nematode injury, and these should never be planted or allowed to grow in fields where the gallworm is found. There are a number of crops that are not attacked by this parasite, and these only should be grown on infested fields until the nematode is practically starved out.

'It is very difficult to eradicate the nematode completely when it is once well established in a field, but its numbers may be so reduced by the use of immune crops that susceptible crops may be grown again without serious injury.'

In the summary given above, reference will be seen to the effect which the outbreak of eel worms exercised on the Californian market for Nevada potatoes. The presence of this pest in certain counties in Nevada was considered such a serious matter that a quarantine order was issued prohibiting the importation of all potatoes from those counties.

The following copy of the Order establishing the quarantine prohibition on such potatoes is taken from the *Monthly Bulletin* of the California State Commission of Horticulture, Vol. I, No. 1, December 1911, where it was published in an article by Mr. E. O. Essig, Secretary of the Commission:—

'Whereas, potatoes from Lyon, Churchill and Washoe counties in the State of Nevada shipped into California, have been discovered to be infested with eel worm, a destructive nematode worm; and Whereas, the planting and throwing of such potatoes or parts thereof on the earth would likely infest the soil with this serious pest; and

'Whereas, Once in the soil, its riddance is almost impossible, therefore, a horticultural quarantine be and

'*Is hereby declared and established*, against all potatoes shipped from the counties of Lyon, Churchill, and Washoe, State of Nevada, into the State of California, and all horticultural commissioners and local inspectors are instructed to destroy or return infected potatoes from the counties aforesaid to the place of shipment, at the option of the shipper or his agent, and to take all proper precautions against the introduction of the eel worm into the State of California.'

An indication of the increasing recognition of the importance attaching to the presence of eel worms and the occurrence of root knot may be seen from the attention that has been given to the subject and the stringent quarantine regulations that have been issued. A further indication is to be found in an article by R. D. Anstead, B.A., Planting Expert to the United Planters' Association of Southern India, entitled Eelworms Attacking Tea Seedlings, which appeared in the *Planters' Chronicle* for February 17, 1912. In this article an account by Dr. C. A. Barber, Government Botanist, Madras, of the Nematode *Heterodera radicicola*, contains information similar to that which has appeared in other parts of the world recently, and also describes the attacks of the pest on tea seedlings.

Most of the crops which are described as being attacked by eel worms, in the various publications mentioned, are not those with which West Indian planters have to deal, but it would be well to keep constantly in mind the fact that crops in the West Indies are liable to attack and that climatic conditions favour the development of the nematode worms. Whenever any plants in the field, garden or nursery are seen to be suffering from disease, the cause of which is not apparent, it would be well for planters to suspect the presence of eel worms and make a careful search for them. They may not be now, or in the future, the cause of really serious injury to staple crops in the West Indies, but the knowledge of the possibility which exists that this may happen should serve to place West Indian planters on their guard.

The Pernicious or San Jose Scale.—According to the *Agricultural Journal of the Union of South Africa*, Vol. II, p. 821, the Pernicious or San José scale (*Aspidiotus perniciosus*) has made its appearance in Natal. This insect has proved a most destructive pest in North America, and has been the cause of enormous loss to various fruit-growing industries. It has necessitated extensive experiments with spraying material, and the records of the work done in connexion with the control of this pest forms an enormous bulk of experiment station literature. As a result of the experience thus gained and placed upon record, invasions of other countries by this pest have not occasioned an equal amount of loss, and it is encouraging to note that in the United States, where the most severe attacks occurred, their virulence has become less, partly on account of the greater degree of control exercised by natural enemies, and partly because of the better understanding of the nature of the pest and the method of control, on the part of agriculturists.

DEPARTMENTAL REPORTS

DOMINICA: REPORTS ON THE BOTANIC STATION, EXPERIMENT PLOTS, AND AGRICULTURAL SCHOOL 1910-11.

As has been announced in the *Agricultural News*, the work of the Agricultural Department in Dominica has been re-organized to the extent that the agricultural pupils will be trained in future at the experiment plots, under the Botanic Garden staff; this change is noted in the report on the Botanic Station. The latter report shows that the garden and experiment plots have been maintained in good order, and interesting details are given concerning striking ornamental and economic plants that are in permanent cultivation at the former institution. The statistics presented concerning the distribution of plants show that the total number sent out during the period under review was 69,295, among which may be noted more particularly: limes 46,112, Para rubber 11,664, cacao 4,856, spineless limes 1,500, shade trees 1,265, vanilla 1,162, and grafted cacao 574. The seed that was sold included 600 Para rubber seeds and 717 packages of vegetable seeds, as well as quantities of seeds of *Castilloa elastica*, Congo coffee, avocado pear, ordinary and spineless limes, papaw, fodder grasses, and of green dressings.

In the notes on economic plants, it is stated that a continuation of the investigation in regard to the acidity of the juice of spineless limes still indicates that this feature is more or less constant in individual trees. Failure has been experienced with soy beans, and the roots have formed no nodules, notwithstanding the fact that seeds have been sown several times in the same soil. The notes in this section of the report, after giving information concerning Eucalyptus and grafted cacao at the station, proceed to deal with experiments that are being conducted with grafted Alligator and Forastero cacao, which show that grafted cacao benefits, in Dominica, by the provision of light shade during early growth. With reference to samples of Alligator cacao (*Theobroma pentagona*) sent to the firms of Messrs. J. S. Fry & Co., Rowntree & Co., and Cadbury Bros., Ltd., in England, and to the Pennsylvania Chocolate Company in the United States, the reports agreed in stating that the product possessed a peculiar flavour, and it seems that its only use in commerce would be of a very special kind; it does not appear that it would be a source of profit, either to growers or manufacturers. Samples of the cured beans of Tiger cacao (*Theobroma bicolor*) submitted to the three English firms mentioned above elicited the unanimous opinion that this is of practically no value. It may be said that further details concerning these reports have appeared in the *West Indian Bulletin*, Vol. X, No. 4. In regard to rubber, samples of *Ficus elastica* rubber produced at the station were examined at the Government Laboratory in Antigua, and it was shown that some improvement is needed in the preparation in order to obtain a product without stickiness. It is recommended that this plant should be utilized for planting ridges and protective belts, rather than in systematic cultivation. Observations on Para rubber at the Botanic Station, and in parts of the island, have shown that the conditions at the station are not completely suitable for its successful cultivation, and that the growth of Hevea trees in the wet districts is satisfactory, so far. This part of the report concludes with interesting information concerning fruit trees of various kinds that have been imported recently, for trial.

The meteorological returns show that the rainfall at the Botanic Station during the year 1910 was 90·64 inches, which is the heaviest annual rainfall since 1893, with the exception of that in 1903, when it measured 90·72 inches. As is pointed out in the report, the weather conditions in the island appear to have entered upon a wet period, following a series of years that were fairly dry. The means for eighteen years indicate that, in Dominica, April is the driest month and July the wettest.

The next subject of more general interest that is dealt with in the report has reference to the testing of lime juice, which might well be taken up on a larger scale in Dominica. An improvement in lime juice manufacture in the island, that has taken place in the past few years, is signalized; this consists in allowing the juice to settle in vats, and boiling the clear juice instead of the juice mixed with the sediment. With respect to limes, again, among the more important results that have been elucidated by experiment are the facts that the smaller limes are usually more acid than the larger ones; the acidity of the fruits increases as the trees attain maturity; different trees growing under identical conditions show distinct variation in the acid content of their fruits; and that in crushing the largest amount possible of juice should be extracted from the limes. An interesting account follows, of observations on the pollination of cacao flowers.

Details concerning the Permanent Exhibition Committee show that Dominica was represented during the year under review at the Colonial Fruit Show and at the Dominion Exhibition at St. John, N.B. With regard to other means in connexion with the encouragement and direction of agricultural effect there should be mentioned the collection of economic products at the Victoria Museum, and the Prize-holdings Competition, the latter of which receives a detailed account.

The lime crop increased by 85,000 barrels, being 369,000 barrels; the exports of green limes have increased steadily from 13,564 barrels in 1905 to 27,427 in 1910. The export of citrate of lime continues to increase, being 5,194 cwt. value £16,880, in 1910, as compared with 3,447 cwt. value £11,203, in 1909. The recent exports of cacao have been as follows: 1908, 9,820 cwt.; 1909, 10,844; 1910, 11,272 cwt.

The experiments in the manuring of cacao, conducted at the Botanic Station, still exhibit the large benefit that is received from mulching. As is stated in the report, the yields from the mulched plot continued to show a considerable excess over those obtained from the plots receiving other forms of manurial treatment, and it will be of interest to see how long the yearly increase of productiveness will continue; these results are supported by experiments that have been commenced more recently at the station, in plots some of which are situated on the hill-side. As regards cacao experiments in country districts, those at Picard maintained the superiority of treatment with pen manure, and supported the conclusions that are reached in the trials at the Botanic Station. Other interesting matters in this part of the report refer to further experiments with cacao, and with citrus plants.

The series of reports concludes with information of the usual kind concerning the Agricultural School, the work of which, it has been stated already, has been re-organized. The experiment plots at this institution included cacao, rubber and grafted cacao, ground nuts, and trials of different methods of tree-planting.

GLEANINGS.

Official returns show that the exports of rubber from Ceylon during the period July to December 1911, amounted to 4,317,064 lb. Of this quantity 2,509,279 lb. went to the United Kingdom and 1,065,850 lb. to the United States. The total export during the similar period in 1910 was 2,364,880 lb.

During the month of March cotton-picking was practically completed in Nevis, and owing to the drought the average yield will be low. The fields were being prepared for planting, with the hope that the weather will be favourable for earlier sowing than could be carried out last season.

The quantity of wool produced in the Argentine Republic during the season of 1910-11 was 194,229,275 lb. The similar amount for the season of 1909-10 reached 174,405,249 lb. As is shown by these figures, the importance of the wool industry to Argentina is becoming steadily greater year by year.

The organization of a cotton-growing association is being discussed by Moscow cotton mill owners, who propose cultivating a number of large plantations in the Caucasus. The required working capital is said to be ready, and will be invested gradually, as suitable cotton land is acquired. (The *Textile Mercury*, February 17, 1912.)

Attention is drawn to a Course of Practical Work in Agricultural Chemistry for Senior Students, by T. B. Wood, M.A., Drapers Professor of Agriculture in the University of Cambridge, Fellow of Gonville and Caius College; this is issued by the School of Agriculture, Cambridge. The price of the work, which is suited to the needs of advanced pupils in agriculture, is 2*s.* 6*d.* net.

In agreement with opinions that have received expression from time to time in the *Agricultural News*, work that has been conducted at the Pasteur Institute at Nha-Trang, Cochin China, has shown recently that the employment of a special virus for producing epidemics among rats is not to be counted as a serious method of reducing the numbers of these rodents. In presenting the results of the experiments, the *Bulletin Agricole* of Mauritius, for January 1912, draws attention to the fact that the disease produced by the virus shows at first a great activity, but that the ultimate effect is to produce a race of rats that are immune to it and can therefore, for a time, resist any further effects of the virus when it is introduced among them.

The *Gardeners' Chronicle* for February 24, 1912, refers to the fact that the botanical origin of the Irish potato has been a subject of much speculation and discussion, but that little certain knowledge has been gained in regard to it. It states further, that a long and careful investigation, dealing with the anatomy and morphology of the chief cultivated varieties has led to the conclusion that they are all derived from a common ancestor, and that this ancestor is not any of the known wild tuberous solanums. It is therefore to be considered that the potatoes are varieties of a true species of *Solanum tuberosum.*

One of the methods for the purification of water that have been devised most recently consists in exposing it to the ultra-violet rays, that is to say, to the invisible rays beyond the violet end of the spectrum. Experiments with the method have been conducted in Germany, which show that the effect of the rays is greatest when the water is well stirred, and that it increases with the length of the time of treatment. Further, the larger the germ content of the water, the longer is the exposure required. The result of the trials has been to show that the method has not yet been perfected sufficiently to be of large practical use.

A published letter from the Quebec Steamship Company, Ltd., states that the company is placing large fans on board their steamers 'Guiana', 'Parima', and 'Korona', for the purpose of carrying limes in good condition. The company has decided, besides, that whenever sugar is engaged for the steamers at St. Croix that would cause a delay of more than two days for loading, the steamer will return to Dominica for fruit, and then proceed to New York, calling at the Northern Islands for mails and passengers only. The change will be made on the understanding that there are at least 800 barrels of limes awaiting shipment in Dominica.

During the course of experiments conducted in Amani, it was found that the addition of a 1-per cent. solution of calcium chloride to the latex of the rubber tree *Manihot Glaziovii* resulted in a fairly good coagulation. A $1\frac{1}{2}$-per cent. solution of calcium chloride is considered sufficient to bring about complete coagulation, at the end of the rainy period when the latex is especially fluid. The use of calcium chloride reduces the cost of the coagulant considerably, without injuring the elasticity and nerve of the rubber. Barium chloride, magnesium chloride, and magnesium sulphate all proved to be rather strong coagulants, but were not as active as calcium chloride. (From the *Experiment Station Record*, February 1912, p. 141.)

With reference to the information concerning the Gogo vine (*Entada scandens*) that was given in the *Agricultural News*, Vol. XI, p. 62, from the *Kew Bulletin*, the *Agricultural Bulletin of the Straits and Federated Malay States* for February 1912, mentions this as being a fairly common plant throughout the Malay Peninsula, where it is known under the native name of Akar Beluru. The note goes on to say that the flowers are borne in spikes 6 to 10 inches long, but are not attractive, and that the pod, which is said to be 1 to 3 feet long, is spirally curved into a mass, in the Malay plants, and has the appearance of being far too heavy for so slender a climber, which depends, however, on its tendrils for support.

STUDENTS' CORNER.

MAY.

SECOND PERIOD.

Seasonal Notes.

Work with the sugar-cane during this quarter includes the planting and the making of supplies where this is necessary. In your experience, what canes are mostly employed for the purpose of supplying, and why are these used in preference to others? State why cuttings for planting should be treated with Bordeaux mixture, and give an account of any trials with which you are acquainted that were conducted for the purpose of showing that a better stand is obtained from planting material that has been treated with this fungicide. Why is it important that the canes should spring early and regularly, and what are the sources of loss if this does not occur?

After the reaping of the old canes, what is the exact process by which new canes are produced in their place? Explain why it is that the yields from ratoons are usually less than the returns from plant canes. Where the central factory system has been adopted, it is a simple matter to ascertain the weights of canes that are being obtained from different fields, from different varieties, and from plants and ratoons, as well as from different methods of manuring and cultivation. The possession of such information should be particularly useful in deciding how far ratooning is profitable in any given case, and to what extent it may be carried on.

What are the best means of combating the spread of the root disease of sugar-canes, on an estate? Do you know of any kinds of cane that appear to show an increased resistance to this disease? During the whole of the time that canes are being cut, observations should be made on their state as they come from the field, particulary for the purpose of detecting the presence of fungus diseases and damage from rats. Explain the importance of the careful selection of material for planting, with reference to the incidence of fungus diseases. Give an account of the insect pests of sugar-cane with which you have had experience, and describe methods that have been tried for their control, indicating any improvements that may have occurred to you. In what ways does loss occur when canes are kept for some time before being dealt with at the factory? How may quantities of juice be held over for a time without undergoing loss from fermentation?

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) State briefly how improved varieties of sugar-cane are obtained.

(2) In what way does mulching decrease the loss of water from the soil?

(3) According to what methods is selection carried out for the purpose of the improvement of plants?

INTERMEDIATE QUESTIONS.

(1) State what are the six best varieties of sugar-cane for growing in heavy soils.

(2) Mention the chief sources of material for mulching, under conditions with which you are familiar.

(3) What are the main characters that it is intended to obtain when selection with cotton is carried out?

FINAL QUESTIONS.

(1) Give an account of the chief characteristics of seedling sugar-canes with which you are familiar.

(2) How would you devise an experiment in order to show that, under given conditions, mulching is of benefit to the soil, with regard to its employment in plant production?

(3) State how far selection may be employed for the improvement of plants, and supply an account of other methods that exist for such improvement.

AGRICULTURE IN THE STRAITS SETTLEMENTS, 1910.

The information given below, on agricultural industries in the Straits Settlements during 1910, is included in *Colonial Reports*—Annual, No. 709, issued recently:—

The cultivation of Para rubber trees in Singapore showed no sign of decrease, but on the contrary, more and more land was cleared and planted, so that the area under cultivation was, at the end of the year, about 14,000 acres.

The planting of this tree in every corner, even in quite unsuitable localities and in small patches, caused a remarkable diminution in the supply of vegetables, fruit, poultry, and even pigs, many Chinese abandoning other occupations to plant rubber. The fruit crops during the last few years have been very poor, probably from the dying out of the old trees and the failure to plant fresh ones, and there are no signs of any improvement. This is regrettable, as most of the fruit trees take from seven to twelve years to produce a crop. There has been a little improvement in vegetable cultivation, but supplies are still short.

Gambier has increased a little. Indigo and pine-apples have also increased a little. Ground nuts are again coming to the front, and there has been a distinct increase in this formerly neglected cultivation. There is a small increase in flower cultivation, roses, jasmines and tuberoses being the favourites. The water hyacinth (Eichornia), originally introduced as an ornamental plant, has been found by the Chinese to be quite suitable for pig-feeding, and is now much used for that purpose.

There is no increase in pepper, nor in coco-nuts. In the latter case, this is perhaps due to the ground suitable being already planted up. The red beetle, formerly so injurious to this industry, seems now to be nearly extinct, but occasionally a few trees are killed by the black beetle.

A very successful agricultural exhibition was held during the year.

In Penang, the fruit and padi [rice] crops were good, and in Province Wellesley coco-nuts were very successful, and large areas of rubber are coming into tapping.

In Malacca, the planting of rubber proceeded apace, and several blocks of lalang land were taken up for this cultivation. The fruit and padi crops were fair. The decrease in tapioca [cassava] cultivation continues.

FUNGUS NOTES.

HEVEA RUBBER STUMPS AS POSSIBLE CARRIERS OF DISEASE.

The importation of stumps of Para rubber has only occurred to a very limited extent in the West Indies, since by far the greater portion of the existing trees has been grown from imported seeds. Yet occasional shipments of stumps have been made from the Eastern Tropics, so that it may not be entirely out of place to emphasize the need for adequate supervision, to prevent these plants from affording a means of entry for diseases, some of which are as yet apparently absent from the Western Hemisphere, or at any rate from the West Indies and Central America.

In the Annual Report of the Botanic Gardens, British Guiana, for 1910-11, Stockdale calls attention to the need for some form of Government control in the importation of Para rubber stumps into that Colony, in order to protect the rubber industry. His argument is based on the fact that, though the West Indian cacao die-back fungus, *Thyridaria tarda* (= Diplodia cacaoicola) is now generally held to be the same as the form common on rubber in the East, and formerly known as *Botryodiplodia elasticae* and *Diplodia rapax*, yet the extent to which the West Indian form is capable of attacking Para rubber is as yet not ascertained; at the same time, certain shipments of stumps from the East have been found on arrival to be covered with fructifications of the Eastern form of the fungus mentioned above. In view of the possibility that the Eastern form, though morphologically identical with the Western, may have become more adapted to living on Para rubber, it seems advisable that such infected plants should not be allowed to enter these colonies.

A further argument of the same nature may possibly be advanced in favour of Government restriction of careless importions of rubber stumps. The brown root disease, due to *Hymenochaete noxia*, found on both rubber and cacao in the East, does not appear to occur in this region; at any rate it has not been found in any of the West Indian Islands where investigations of root diseases have been conducted, nor does there seem to be any report of its occurrence up to the present in any part of the American Continent upon tropical species of cultivated plants. The same would also appear to be true of the root disease caused by *Fomes semitostus*—a fungus even more widespread in its range of host plants and of even greater economic importance in the East than is *Hymenochaete noxia*. Finally, there is in the East a pink disease common on a wide range of host plants and caused by *Corticium salmonicolor*. Although there is an indigenous species, *C. lilacino fuscum*, in the West Indies, which is similar to and possibly identical with the Eastern form, yet the local fungus is not of great economic importance and appears to be limited to a few species, while the Eastern fungus is possessed of far greater virulence.

In view of these facts, it certainly seems advisable that imported stumps of Para rubber from the East should be submitted to some form of inspection; that diseased plants should be destroyed and suspected stumps quarantined, and subjected to reasonable preventive treatment.

The risk of introducing diseases of Hevea at present confined to the East, on seeds packed in charcoal and sent by parcel post, is much less than that incurred when stumps are imported. Annually increasing quantities of seeds have been sent to the West Indies and British Guiana during recent years, and the fact that up to the present, practically no disease has attacked the plants grown from them supports the idea that the seeds are comparatively free from the spores of the commoner parasitic fungi, or that these spores are unable to survive the long journey under the conditions in which the seeds travel best. There is an instance on record in which a disease did attack seedling plants in the nursery, but it is not certain if this malady was due to an imported or a local fungus; while adequate steps were promptly taken, and the disease was thus easily controlled and has not reappeared.

It is almost impossible for the root diseases to be introduced on seeds, since *Hymenochaete noxia* hardly ever produces spores, in Ceylon and Malaya; while *Fomes semitostus* would not be likely to be fruiting vigorously in the neighbourhood of trees from which seeds would be taken. On the other hand, the spores of *Thyridaria tarda* are of very common occurrence in the tropics while those of *Corticium salmonicolor* might also find their way to Hevea seeds; but even so, the risk of infection from such a source is considerably less than that arising from the presence of vigorously growing mycelium provided with an adequate food-supply such as is furnished by a stump.

RUBBER EXPERIMENTS IN UGANDA.

A section is included in the Annual Report on the Botanical, Forestry, and Scientific Department, Uganda, for the year 1909-10, which has just been received, dealing with the rubber experimentation undertaken during that year. In a general way, in regard to rubber trees growing at the Botanic Gardens, Entebbe, it is shown that the prospects of Para rubber cultivation are most encouraging; this is not so much the case with *Funtumia elastica*, as the growth of the tree is slow when compared with that of Para. A rubber tree that grows rather well is *Castilloa elastica*, but the extent to which it is attacked by a borer (*Inesida leprosa*) causes it to be of little economic importance to the Protectorate. Better results have been obtained with Ceara rubber (*Manihot Glaziovii*) which had yielded well on being tapped. *Manihot dichotoma* and *M. piauhyensis* have been received from Kew; the plants of the former have made exceedingly rapid growth, and it is suggested that it might be used as shade for cacao.

In the period that is the subject of the review, two experiments in tapping Para rubber trees were conducted. Observations made during these and previous experiments have led to the recommendation that the full and half herring-bone systems should be adopted, the former for trees with a girth at 3 feet of over 36 inches, and the latter for those with a girth, at the same height, of 17 to 36 inches. It is thought that the half herring-bone system will eventually give the largest amount of latex, but this is not yet certain. In any case, it has been demonstrated so far that the prospects of Para rubber cultivation in Uganda are most encouraging.

A trial was made for the purpose of ascertaining if the Ceara rubber trees may be systematically and profitably tapped on the herring bone system. The preliminary trials with three trees have shown that, with paring and pricking on consecutive days, the wound response was very rapid for eleven days; from this time the daily yield decreased very materially. It is intended to carry out further experiments on a larger scale, at an early date.

Roadside planting of rubber trees is being tried, with varying results. An experimental forest planting of Funtumia is making very fair progress.

WEST INDIAN PRODUCTS.

DRUGS AND SPICES ON THE LONDON MARKET.

Mr. J. R. Jackson, A.L.S., has forwarded the following report on the London drug and spice market, for the month of March 1912:—

The remarks made in these market reports for January and February relating to the then threatened strike of the coal miners, as affecting commercial activity, has, unfortunately, become more than fully realized during the month of March. Under such conditions the Produce Markets, like all other branches of trade, have experienced considerable depression. It is thought that, with the strike ended, and the re opening of railway and shipping facilities, the markets will quickly resume a brisk condition.

The following details refer to West Indian produce:—

GINGER.

At the first spice auction on March 6, as many as 161 bags of Cochin were sold without reserve, 39*s*. being paid for washed rough wormy, and 34*s*. to 34*s*. 6*d*. for common rough wormy. A week later, 413 bags washed rough Cochin were bought in at 44*s*. to 45*s*. per cwt. On the 20th, the prices realized for the same quality Cochin, was from 42*s*. to 42*s*. 6*d*., at which rates 147 bags were sold. At the last auction on the 27th, Cochin was represented by 120 bags, washed rough and wormy being bought in at 40*s*., and dull washed rough at 43*s*.. Fifty bags of Japanese limed were also offered at this sale, but were bought in at 32*s*. per cwt. No Jamaica has appeared in the market.

NUTMEGS, MACE AND PIMENTO.

At the first sale on the 6th, there was a steady demand for nutmegs; 41 packages of West Indian were offered, and sold at the following rates: 86's to 96's, 5½*d*. to 5¾*d*; 107's to 116's, 5½*d*. to 5¾*d*.; 120's, 5½*d*. On the 13th, 25 packages of Eastern were sold, at 5¾*d*. to 6½*d*. for 76's to 87's, 5⅛*d*. for 104's, and 4¾*d*. for 147's. On the 20th, nutmegs were again in steady demand; 21 packages West Indian sold at 6*d*. for 72's, 5½*d*. to 5¾*d*. for 87's to 94's, and 5½*d*. to 5¾*d*. for 102's to 111's. At the last auction on the 27th, 143 packages West Indian were brought forward, 127 being disposed of, 59's fetching 11*d*., 73's to 83's 5¾*d*. to 6*d*., 89's to 99's 5¼*d*. to 5¾*d*., and 123's 5½*d*. For mace there has been a steady demand. At the auction on the 6th, 13 packages West Indian realized 2*s*. 7*d*. per lb. for fair palish, slightly mouldy; 2*s*. 6*d*. for palish, 2*s*. 4*d*. for fair reddish, and 2*s*. 3*d*. to 2*s*. 5*d*. for fair to good broken. At the last auction on the 27th, 33 packages West Indian were offered, and all sold at the following rates: ordinary to fair 2*s*. 3*d*. to 2*s*. 5*d*., and broken 2*s*. 1*d*. to 2*s*. 2*d*. A firm market ruled in pimento; 2¾*d*. per lb. was the price paid in the early part of the month, but on the 20th, 27 bags were offered, and bought in at 3*d*. per lb. For arrowroot there has been little or no demand, the offerings being for the most part bought in.

SARSAPARILLA.

At the first drug auction on the 7th of the month, sarsaparilla was represented by 11 bales of grey Jamaica, 15 of native Jamaica, and 8 of Lima-Jamaica. Of the first, 9 bales were sold, fetching 2*s*. 3*d*. per lb.; the whole of the native Jamaica was disposed of, 1*s*. 3*d*. to 1*s*. 4*d*. being paid for good red and pinky, 1*s*. 2*d*. for fair red, 11*d*. for red and yellow mixed, and 8½*d*. to 9*d*. for very dull red and yellow mixed. The whole of the Lima-Jamaica was also sold at full prices, coarse and chumpy fetching from 1*s* 4*d*. to 1*s*. 6*d*. per lb. On the 21st of the month, the details of the auction were as follows: Of grey Jamaica, 5 bales were offered, of native Jamaica 10 bales, and of Lima-Jamaica 4 bales, all of which were disposed of, the first at 2*s*. 3*d*. to 2*s*. 4*d*. per lb. for fair grey, the second at 1*s*. 4*d*. for rather dullish, 1*s*. to 1*s*. 1*d*. for dull red, 11*d*. to 11½d. for red and yellow mixed, 10*d*. for common mixed, and 7*d* to 9*d*. per lb. for common to ordinary grey mixed. The Lima-Jamaica fetched 1*s*. 7*d*. per lb. for 3 bales of rather chumpy.

KOLA, LIME OIL, LIME JUICE, TAMARINDS, CASHEW NUTS.

Kola was represented at the first auction in the month by 3 bags of bright dried West India, chiefly in halves, which were bought in at 4½*d* per lb. Again on the 20th, 17 bags of slightly mouldy, said to be from Java, were offered, and held at 5*d*. per lb., an offer of 4½*d*. being refused. A week later, this consignment was reported to have come from the West Indies, and to have found a customer at the 5*d*. per lb. asked. Eighteen cases of lime oil were offered at the first auction, and 8 sold at from 6*s*. 9*d* to 6*s*. 11*d*. per lb. for good hand pressed Dominica. Very little lime juice appeared at auction during the early part of the month, though it was reported that, privately, sales had been effected at 1*s*. 10*d*. per gallon. On the 20th, however, 4 hogsheads of pale raw Dominican were offered and sold at 1*s*. 9*d* per lb; 19 hogsheads from Antigua were also sold at from 1*s*. 5*d*. to 1*s*. 7*d*., and a further 2 from Monsterrat were sold at 1*s*. 7*d*. for fair palish. On the 20th, some 40 barrels of fair black East Indian tamarinds were sold without reserve, at from 8*s*. to 8*s*. 6*d*. per cwt. At the end of the month it was reported that very high prices were being asked for new crop tamarinds from Antigua and Barbados and that 17*s*. 6*d*. had been paid for the latter. A large consignment of Cashew nuts appeared at auction in the early part of the month, a portion of which was sold without reserve at 45*s*. per cwt.

Australian Fruit Industries.—The Government of New South Wales proposes to established fruit-canning, vegetable-canning, and jam-making factories in the Burrinjuck irrigation area on the Murrumbidgee. At these factories the produce of the settler will be handled at moderate rates and, subsequently, the factories may be taken over by the settlers themselves, under a co-operative arrangement. The experiment will be carried on by the Department of Agriculture. The fruit growers will be encouraged to plant only the best varieties of fruit, and will be taught how to specialize in those varieties that are most useful for canning purposes. The Burrinjuck scheme of irrigation will bring under intensive cultivation no less than 350,000 acres of splendid land. It is stated that 500 irrigation farms in this area will be available for settlement in April. A similar proposal is under consideration in Victoria, in the well-known and fertile Bacchus Marsh irrigation district. The Commissioner is endeavouring to induce landowners in that district to subdivide their properties for intensive cultivation, and suggests that a canning department be added to one of the district butter factories, for preserving the fruit raised by the settlers. (*Journal of the Royal Society of Arts*, March 22, 1912.)

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR, April 23, 1912; Messrs. E. A. DE PASS & Co., April 12, 1912.

ARROWROOT—$3\frac{5}{8}$*d.* to $4\frac{3}{4}$*d.*
BALATA—Sheet, 3/8; block, 2/8 per lb.
BEESWAX—£7 10*s.* to £7 12*s.* 6*d.*
CACAO—Trinidad, 56/- to 75/- per cwt.; Grenada, 50/- to 55/-; Jamaica, 49/- to 55/-.
COFFEE—Jamaica, 70/- to 80/- per cwt.
COPRA—West Indian, £27 per ton.
COTTON—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 18*d.* to 23*d.*
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—48/- to 65/- per cwt.
ISINGLASS—No quotations.
HONEY—No quotation.
LIME JUICE—Raw, 1/3 to 1/11; concentrated, £18 12*s.* 6*d.* to £19; Otto of limes (hand pressed), 6/3 to 6/6.
LOGWOOD—No quotations.
MACE—Steady.
NUTMEGS—Steady.
PIMENTO—Common, $2\frac{13}{16}$*d.*; fair, $2\frac{7}{8}$*d.*; good, $2\frac{15}{16}$*d.*; per lb.
RUBBER—Para, fine hard, 4/10½; fine soft, 4/10; Castilloa, 4/6 per lb.
RUM—Jamaica, 1/8 to 5/-.
SUGAR—Crystals, 19/- to 22/-; Muscovado, 15/6 to 18/-; Syrup, 12/6 to 13/- per cwt.; Molasses, no quotations.

New York.—Messrs. GILLESPIE BROS. & Co., April 19, 1912.

CACAO—Caracas, $11\frac{3}{4}$c. to $12\frac{1}{4}$c.; Grenada, $11\frac{1}{2}$c. to $11\frac{5}{8}$c.; Trinidad, $11\frac{3}{4}$c. to 12c. per lb.; Jamaica, 10c. to 11c.
COCOA-NUTS—Jamaica, select, \$22·00 to \$23·00; culls, \$13·00 to \$14·00; Trinidad, select, \$22·00 to \$23·00; culls, \$14·00 to \$15·00 per M.
COFFEE—Jamaica, $14\frac{3}{4}$c. to 17c. per lb.
GINGER—9c. to $9\frac{1}{2}$c. per lb.
GOAT SKINS—Jamaica, 50c.; Antigua and Barbados, 45c. to 47c.; St. Thomas and St. Kitts, 43c. to 45c. per lb.
GRAPE-FRUIT—Jamaica, \$4·00 to \$5·00.
LIMES—\$7·00 to \$8·00.
MACE—55c. to 58c. per lb.
NUTMEGS—110's, 13c. to $13\frac{1}{4}$c.
ORANGES—Jamaica, \$2·00 to \$2·25 per box.
PIMENTO—3*d.* per lb.
SUGAR—Centrifugals, 96°, 4·11c. per lb.; Muscovados, 89°, 3·61c.; Molasses, 89°, 3·36c. per lb., all duty paid.

Trinidad.—Messrs. GORDON, GRANT & Co., April 29, 1912.

CACAO—Venezuelan, \$13·10 to \$13·30 per fanega; Trinidad, \$12·75 to \$13·25.
COCOA-NUT OIL—\$1·00 per Imperial gallon.
COFFEE—Venezuelan, $15\frac{1}{2}$c. per lb.
COPRA—\$4·75 per 100 lb.
DHAL—\$3·90 to \$4·00.
ONIONS—\$2·50 to \$4·00 per 100 lb.
PEAS, SPLIT—\$7·00 to \$7·25 per bag.
POTATOES—English, \$1·90 to \$3·00 per 100 lb.
RICE—Yellow, \$4·80 to \$5·00; White, \$6·50 to \$6·60 per bag.
SUGAR—American crushed, no quotations

Barbados.—Messrs. JAMES A. LYNCH & Co., Ltd., May 4, 1912; Messrs. T. S. GARRAWAY & Co., May 6, 1912; Messrs. LEACOCK & Co., April 26, 1912.

ARROWROOT—\$6·50 to \$7·00 per 100 lb.
CACAO—\$11·50 to \$12·00 per 100 lb.
COCOA-NUTS—\$16·00.
HAY—\$1·60 to \$1·80 per 100 lb.
MANURES—Nitrate of soda, \$65·00; Cacao manure, \$45·00 to \$48·00; Sulphate of ammonia, \$80·00 per ton.
MOLASSES—No quotations.
ONIONS—\$6·00 to \$8·50 per 100 lb.
PEAS, SPLIT—\$7·00 to \$7·25 per bag of 210 lb.; Canada, \$3·00 to \$5·25 per bag of 120 lb.
POTATOES—Nova Scotia, \$2·50 to \$4·00 per 160 lb.
RICE—Ballam, \$4·90 to \$5·00 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
SUGAR—American granulated, \$5·25 per 100 lb.

British Guiana.—Messrs. WIETING & RICHTER, April 27, 1912; Messrs. SANDBACH, PARKER & Co., April 26, 1912.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	—	—
BALATA—Venezuela block	No quotation	Prohibited
Demerara sheet	70c. per lb.	—
CACAO—Native	17c. per lb.	18c. per lb.
CASSAVA—	48c.	No quotation
CASSAVA STARCH—	\$8·00	No quotation
COCOA-NUTS—	\$16 to \$20 per M.	\$10 to \$16 per M., peeled and selected
COFFEE—Creole	17c. per lb.	16c. per lb.
Jamaica and Rio	18c. to $18\frac{1}{2}$c. per lb.	19c. per lb.
Liberian	12c. per lb.	12c. per lb.
DHAL—	\$4·00 to \$4·50 per bag of 168 lb.	\$4·50 per bag of 168 lb.
Green Dhal	\$4·50	—
EDDOES—	\$1·80	—
MOLASSES—Yellow	None	—
ONIONS—Teneriffe	7c. to 8c. per lb.	—
Madeira	—	—
PEAS—Split	\$6·75 to \$7·00 per bag (210 lb.)	\$7·35 per bag (210 lb.)
Marseilles	—	No quotation
PLANTAINS—	24c. to 60c.	—
POTATOES—Nova Scotia	\$3·50 to \$3·60	\$3·50 to \$3·75
Lisbon	—	No quotation
POTATOES—Sweet, B'bados	\$1·56 per bag	—
RICE—Ballam	No quotation	—
Creole	\$5·25 to \$5·50	\$5·50
TANNIAS—	\$2·04	—
YAMS—White	\$2·64	—
Buck	\$2·40	—
SUGAR—Dark crystals	\$3·30 to \$3·40	\$3·45
Yellow	\$4·25	\$4·25
White	—	—
Molasses	\$2·90 to \$3·00	—
TIMBER—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	\$3·75 to \$6·00 per M.	\$4·00 to \$6·00 per M.
,, Cordwood	\$1·80 to \$2·00 per ton	No quotation.

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The Interpretation of the Results of Field Experiments.

II.

IN the last number of the *Agricultural News* consideration was given to the ways in which the results of field experiments may vary, and the need was shown of the possession of means for determining the amount of variation that is likely to take place, under given circumstances, and for applying this in the interpretation of results. The purpose of the present article is to develop the subject, by setting forth in a general way the measures that are available for the purpose under discussion.

When an average is struck, of a large number of results, it is generally obvious that, while most of the results are near the average, a few of them, for reasons that have been explained already, differ largely from this. It is therefore expedient to possess a simple means of ascertaining the amount of dependence that may be placed on the average. Such a means is afforded by constructing what is known as a Frequency Curve, in the following way. First of all, the results are divided into classes, each class corresponding to the same proportion of the terms in which the results are expressed: for instance, each class might be taken to correspond to a difference of one per cent. The number of results falling into each class is then ascertained, and a frequency curve constructed by dividing a horizontal line into equal parts corresponding to the different classes, erecting perpendiculars from the middle point of each equal part, marking on each of these perpendiculars a distance proportional to the number of results falling into the corresponding class, and joining all the points thus obtained. If there is formed a fairly regular curve whose highest point, or peak, is above, or nearly above, the point on the horizontal line corresponding to the average, dependence may be placed upon the latter as the true average of the results.

It happens sometimes, however, that the curve that is obtained may possess more than one peak. In such a case, it is indicated that more than one cause is actively influencing the results, and that no reliance can be placed upon their average alone, when an interpretation of them is sought. There is, however, no need to conclude, in such a case, that the results are useless, for information may have been received which will enable the separate factors causing variation to be discovered, and the apparent incongruity may prove to be of the greatest use in arriving at an interpretation of the experimental figures that have been obtained.

The next step is to find the value that may be attached to any one result; this is done by ascertaining its Probable Error, or the extent to which it may vary from the average on account of the method of experimentation employed. The determination of the probable error is a matter of applying the rules of mathematical chance; these must be taken for granted in this discussion. It will suffice to say that the probable error is found by adding together the squares of all the amounts by which the results differ from the average, dividing the figure obtained by the number of results less one, taking the square root of the quotient, and multiplying this by the constant quantity 0·67. To illustrate the use of the probable error obtained by means of this simple arithmetical process, suppose that it is found to be 2·3, in a certain instance, and that the average of the results was 16·6, it is most likely, under the conditions of the experiment that any one result will fall between the limits differing by 2·3 on each side of 16·6; that is, between 14·3 and 18·9.

Proceeding to the consideration of more than one result in a given investigation, it is useful to know the probable error of the average of all the results, or of a certain number of them; this is obtained by dividing the probable error of one result, found as above, by the square root of the number of results that are being considered. For example, employing the probable error just found, namely 2·3, the probable error of the average of four results would be 2·3 divided by the square root of four; that is 2·3 ÷ 2, or 1·2. In the same way (to take another simple example) the probable error of the average of nine results would be 0·8. It is obvious that the probable error of the average of results decreases with increase in the number of results taken. Further, using the application of the last result as an illustration, it has been shown that, under the special circumstances, when nine results are taken, the average is not likely to vary on each side of 16·6 by more than 0·8; that is, the chances are that it will be between 15·8 and 17·4. It is instructive to compare these limits of variation with those of the similar limits for one result alone, as de termined above namely 14·3 and 18·9.

It is sometimes found convenient, in experimentation, to divide the experiments into two equal, independent groups, to submit each to the same process of investigation, and to take the average of each group, instead of regarding the whole lot as being in one group and finding the average of this. By doing this, a useful check on the work is obtained, especially when the results are employed for comparison in the two groups. The value of the comparison is determined by finding the probable error of the difference between the two results; and when this is done, it must be remembered that each of the results, as it is obtained by the same method, is liable to the same probable error. Taking this into consideration, it may be said shortly, that the probable error of the difference between any two such results is obtained by multiplying the probable error of each result by the square root of two. Thus, with the figures given above, and taking two similar groups of fifty, the probable error of the average of 100 results will be 2·3 divided by 10 (the square root of 100), that is 0·23; and the probable error of the difference of the averages of the two groups of fifty (making up the hundred) will be 0·23 multiplied by the square root of two, giving as the result 0·26.

Further development and illustration of these matters may be found in the papers mentioned in the last article, particularly in that entitled The Interpretation of Experimental Results, by T. B. Wood, M.A., of the Cambridge University Department of Agriculture. The purpose of the next article on the subject will be to bring forward the practical value and results of the methods, as they may be applied specially to schemes of experimentation that are being carried out in the West Indies.

Information concerning the export of rubber from the Federated Malay States is contained in the *Government Gazette* for March 15, 1912. This shows that the quantity shipped in January 1912 was 2,730,576 ℔; during the same month of the previous year, it was 1,329,170 ℔. By far the largest amount of rubber is being produced in the State of Negri Sembilan, the weight for last January being 1,352,473 ℔.

SUGAR INDUSTRY.

THE ANTIGUA SUGAR FACTORY.

The following extracts are taken from the seventh annual report of the Directors of the Antigua Sugar Factory, Limited:—

The island suffered greatly during both the growing and the crop seasons from the lack of rain, the record being the lowest for the past twenty years with the exception of 1905-6. The result was a very short crop and the canes, not properly grown and matured, were the worst which the factory has ever had to deal with; and further, the supply of water for manufacturing was so low that during a considerable part of the crop, there was not sufficient for the proper maceration of the canes, and at one time the Factory had even to stop working altogether.

In accordance with the intimation in the last Report, the Board has carried out large extensions of the factory and the railway, the cost of which is shown in the accounts, with a view to better crushing and a larger production, and has taken in a considerable additional acreage of canes, but owing to the exceptional circumstances of the year, the expected results were not achieved. With the enlarged plant and the extended acreage, there should have been, under normal conditions, a higher yield from the canes and an increase in the sugar output of 30 per cent. on that of the previous year; instead of this the yield has been much worse, and the output shows hardly any increase at all.

An issue has been made (with the assent of the holders of the A and B Debentures) of £20,000 C Debentures repayable within nine years out of a special Sinking Fund of £2,250 per annum to be set aside for that purpose, before the Surplus on Working Account is divided. This money has been applied towards carrying out the new extensions.

The canes supplied have been as follows:—

	1907, tons.	1908, tons.	1909, tons.	1910, tons.	1911, tons.
Contracting planters	28,046	26,912	20,576	24,065	22,506
Outside estates	8,689	12,905	14,646	20,712	29,398
Peasants	4,047	3,243	2,062	3,542	3,212
Total	40,782	43,060	37,284	48,319	55,116

The sugar made and the yield per cent. of canes during the past four years have been as follows:—

	1907.	1908.	1909.	1910.	1911.
Sugar made (tons)	4,230	4,695	3,995	5,390	5,472
Yield, per cent. of canes	10·07	10·90	10·72	11·16	9·93

Prices of sugar per ton: 1907, £9 16*s.* 0*d.*; 1908, £11 15*s.* 9*d.*; 1909, £10 7*s.* 5*d.*; 1910, £12 16*s.* 8*d.*; 1911, £10 11*s.* 5*d.*

Owing to the adverse circumstances mentioned above, after making the necessary charges for the various Sinking Funds, there remains only a surplus of £212 15*s.* 5*d.* for the year, which has been credited, in accordance with agreements, as follows: To outside estates £84 10*s.* 5*d.*, equal to 0·69*d.* per ton on their canes, making their total price 12*s.* 2·03*d.* per ton; to contracting planters £106 7*s.* 9*d.*, equal to 1·13*d.* per ton, making their total 10*s.* 10·34*d.* per ton; and to A Shareholders £106 7*s.* 8*d.*, making a total at their credit (including interest on the undistributed balance) of £12,038 5*s.* 11*d*, out of which it is proposed to distribute 5*s.* per share, or £3,125, carrying forward the balance of £8,913 5*s.* 11*d.*

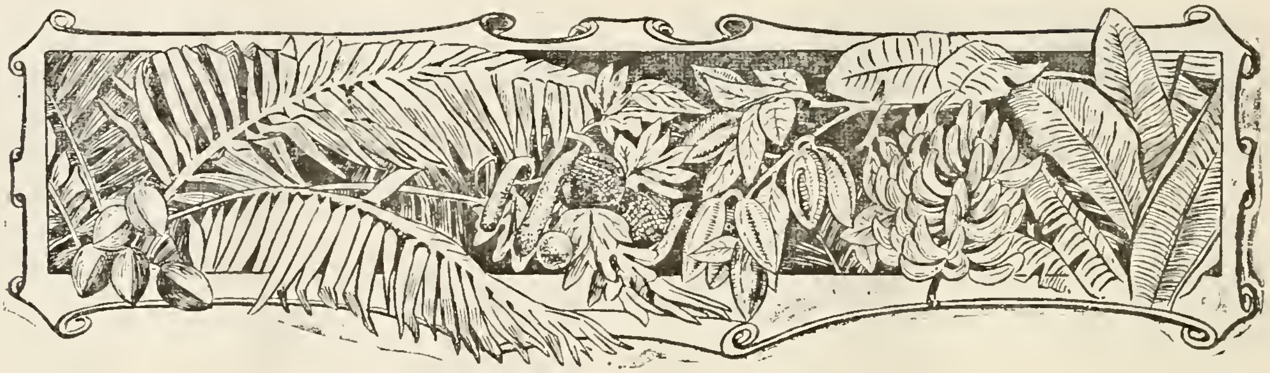
The following details concerning the working of the factory are given here, in addition, on account of their interest:—

Cane crushed, tons	55,117
Sugar made, ,,	5,477
Tons of cane per ton of sugar	10·06
'Indicated' sucrose in juice, tons	6,661
Recovery on 'indicated' sugar, per cent.	82·2
Water in megass, per cent.	47·15
Normal juice lost in megass per 100 of fibre	70·03
Average composition of first mill juice:—	
Total solids, per cent.	20·92
Sucrose ,, ,,	18·49*
Purity ,, ,,	88·39
Total juice, including maceration water:—	
Total solids, per cent.	18·85
Sucrose ,, ,,	15·87
Purity ,, ,,	84·16
Maceration, per cent. on first mill juice	11·0

The last figure, namely 11 per cent. for maceration water on first mill juice, serves as an unmistakable indication of the serious difficulty in obtaining water that has existed, and accounts generally for the inferior work of the season.

Sugar-Beet in England. —The Annual Report of the British Sugar-Beet Council, just published, reviews the work of the Council up to the end of last year, with special reference to the proceedings in 1911 and 1910. It shows confidence in the remunerative character of the sugar-beet industry and ability to develop it successfully in this country. That good crops of sugar-beet can be grown here has already been proved. The results obtained last year at Wye and other college farms confirm the evidence obtained in previous years. It is the financial soundness of the business that exercises the minds of farmers and capitalists. The report explains the efforts made to procure a grant from the Development Fund, which were unsuccessful because the conditions of the International Sugar Convention prohibit Government subsidies or advances of any kind to an undertaking that would produce sugar for commercial purposes. Mr. G. L. Courthope, who succeeded Lord Denbigh as Chairman of the Council, was, however, not discouraged by the failure of the negotiations with the Development Commissioners, and deserves praise for the other arrangements he has made to subject the project to a financial test. The establishment of a factory in Norfolk, which is largely due to his initiative, is a step of great importance. It was felt in the country that what was wanted was a practical demonstration. This, Mr. Courthope, in conjunction with English and Dutch colleagues, has arranged to provide. They can rest assured that, if their calculations are fulfilled, they will have the enthusiastic support of farmers whose land and climate are suitable for the production of the raw material. (The *Journal of the Royal Society of Arts*, March 29, 1912.)

*Or 1·897 lb. per gallon.



FRUITS AND FRUIT TREES.

SELECTION FOR THE LIMA BEAN.

An account of a method of selection practised for the Lima, or Barbuda, bean (*Phaseolus lunatus*) is given in Bulletin No. 224 of the College of Agricultuie, California University, issued last November, and part of this is presented below:—

A plan of work, looking to the improvement of the Lima bean, was begun in the summer of 1908, in co-operation with several farmers. It is expected to continue this work for several years. In the selection of plants, special attention is being given to earliness where found in high-yielding individuals. It was expected that those plants which blossomed heavily early in the season would also fruit heavily and ripen early. Hence, on the first of July, when fields began to bloom, the earliest and heaviest blossoming plants were marked by means of a piece of lath 2 feet in length, set in the ground beside each plant. Ten thousand stakes were thus set to mark the same number of early blooming plants, the time of selection covering a period of two weeks, and being made in both early and late blooming plants in each field. While there were individual cases in which the early blooming plants did not ripen early, the average time of ripening of these marked plants was earlier than the average of the field. Moreover, an advantage was gained in case of selection by marking the plants before the vines became so intertwined as to make it difficult to recognize individuals. If the early selection had not proved satisfactory, there was still the opportunity of selecting early maturing plants in the fall. But the marked plants being satisfactory as to earliness, it was thought to be of no use to make later selections of other plants.

The selected plants, although earlier in maturity by perhaps four days than the average of the field, were found at harvest to be apparently lower-yielding than the average of the field. However, this was not entirely unexpected, and as the original purpose had been to make a second selection for yield within the first selection for earliness, selections being made for 10,000 plants at harvest time. At the time of the first selection in July, earliness of blooming stood almost alone in influencing the marking of plants, except that some attention was given to size and vigour of vine where this did not appear to be due to a difference in room, and hence to available plant food. Vigorous and thrifty plants, which appeared to be so because of inherent character, were selected, if blossoming early, and in no case were small, stunted plants selected. At harvest time, however, it semed necessary to pay a great deal of attention to the yield. The plants were pulled, care being taken to separate the vines from the vines of surrounding plants, and each was inspected quickly after being turned over, so that the pods were easily seen. If the pods were found immature, or if the total number of pods was small, it was dropped, except that some plants with a small number of pods were carried along if the plant was very mature, and some very high-yielding plants were carried on, though immature, it being proposed to run two lines of selection, one for earliness, the other for yield. In this way, about 3,000 plants were selected out of the original 10,000.

After a short period of drying, the pods were picked from each plant and placed in a paper bag. The bags were numbered consecutively, corresponding to cards on which data regarding the number of dry pods, a number of pods to be shelled, and number of pods too immature to shell, length of the vine, and number of pods within 12 inches of the central stem, were recorded. Two numbers were then arbitrarily fixed for each field, one representing number of dry pods, the other representing total number of pods, and those plants which did not exceed either of these numbers were discarded. About 1,500 of the more immature and light yielding plants were discarded in this way. The pods from all the remaining plants were shelled, keeping the lot from each plant separate from all the others. Finally, all but 600 from the original 10,000 were discarded before planting in the spring of 1909. The seed from these 600 plants, some representing early maturity, some representing high yield and some representing a combination of these factors in the same plant, were grown in rows as foundation stock in 1909, the seed from each plant being planted separately, so that the yield, earliness, and other desirable characters of their produce might be determined. A large number of plants was taken to increase the chances of finding one or more with the power to transmit its characters to the next generation, or to increase the chance of isolating mutants.

The results showed that in the case of pole Lima beans in general, the yield is in proportion to the length of the vine or runners, although it may be said that occasional occurrence of individual plants giving high yield, with a reduced vining tendency, would indicate a possibility of reducing this tendency to some extent and still retain a satisfactory yield. It is noticeable that as the percentage of pods within 12 inches of the body of the plant decreases, the yield increases. While the percentage of pods within 12 inches of the central stem shows a direct relation to the percentage of dry pods on the plant, the former shows a slight opposite relation to the weight of shelled beans per plant (yield).

THE VITALITY OF PARA RUBBER SEEDS.

This subject has received attention on several occasions in the *Agricultural News* (Vols. X, pp. 111, 363; XI, pp. 53, 91), and formed the matter of an interesting discussion at the recent Agricultural Conference. An account of investigations undertaken in the Federated Malay States, in regard to it, is contained in the *Agricultural Bulletin of the Straits and Federated Malay States* for February 1912, the purpose of the work being, firstly, to compare the vitality of seeds from tapped and untapped trees, and, secondly, to try the effectiveness of various methods of preserving seeds from tapped trees. The details given with respect to the first of these are reproduced here; those relating to the second will be published later in this journal.

Seeds of *Hevea brasiliensis* do not retain their vitality for a long period, and the consequent difficulty of forwarding them successfully to distant countries is well known. This year several hundred thousand Para seeds from tapped trees were packed in Venesta chests with charcoal and forwarded to Trinidad. The results obtained were far from satisfactory, although the seeds were most carefully selected and packed.

There is no doubt that seeds picked immediately on falling, and carefully packed, give the best results. If they are allowed to be on the ground, or if badly packed, a smaller percentage of germination will be obtained. It must be borne in mind however, that no matter how the packing has been done, the vitality of Para seeds cannot be retained for any length of time if they are not gathered immediately. The seeds must not be packed too many in a box, otherwise fermentation starts and the whole mass heats and loses its vitality; the packing material must be just sufficiently moist to prevent the seeds from drying out and not moist enough to encourage the growth of moulds and bacteria. For the same reason the packing must be fairly tight and yet not quite air-tight. Small boxes seem better than larger cases.

Experiments have been carried out as mentioned in a previous article, at the suggestion of the Director of Agriculture, to compare the germinating power of seeds from tapped and untapped trees and to see if by coating the surfaces of the seeds with various substances the germinating power could be retained for a longer period. The tapped and untapped trees selected for the experiments are twelve years old; the first-mentioned have been tapped for the past two years; the seeds are collected fresh each morning and treated as mentioned.

THE VITALITY OF SEEDS FROM TAPPED AND UNTAPPED TREES. All seeds were packed with burnt padi husk, in biscuit tins, each containing 200 seeds. The tins were wrapped in brown paper, and sealed.

Boxes Nos. 1, 2, 3, 4, 5 and 6 were kept 3, 5, 7, 8, 9 and 10 weeks, respectively, then opened, and the seeds planted in well-prepared nursery beds. It will be seen from the tables that seeds from untapped trees gave on an average 50 per cent. higher germination than those from tapped trees reckoned on the absolute percentage. In each test the former showed from two to three times as many germinations as the latter.

A record of similar experiments is published in the *Circulars and Agricultural Journal of the Royal Botanic Gardens*, Ceylon, Vol. IV, No. 11, May 1908. This circular states: 'seeds from tapped trees kept for five weeks did not germinate but those kept for four weeks showed 28 per cent. germination while seeds from untapped trees kept for four weeks did not germinate and those kept for three weeks showed only 3 per cent. germination. Both in percentage germination, and time of germination the seeds from tapped trees are better throughout.' No information is given regarding the manner in which the seeds were kept previous to planting.

It will be seen that the Ceylon figures are at variance with those obtained here, but it is difficult to say why this should be. The Ceylon Circular states also that seeds from tapped trees are smaller and weigh less per 1,000 seeds than those from untapped trees. This agrees with the figures obtained here, namely, seeds from untapped trees were found to be on an average 10·7 per cent. heavier than those from tapped trees of similar ages [see *Agricultural News*, Vol. XI, p. 31]. The figures in Experiment 1 are of interest not only as regards the suitability of exporting seeds from untapped trees, but they also tend to show the effect tapping has on the vitality of the seed. Tapping lessens the weight and size of the seeds, and according to the present experiments reduces the germinating power.

It is evident that seeds which are to be exported are best selected from untapped trees.

Experiments are to be conducted to compare the growth of plants resulting from seeds of tapped and untapped trees.

PERCENTAGE OF SEED GERMINATION OBTAINED FROM TAPPED AND UNTAPPED TREES.

No. of box.	1	2	3	4	5	6
No. of seeds in box	200	200	200	200	200	200
No. of weeks the seeds were in box	3	5	7	8	9	10
No. of plants obtained; seed from tapped trees	67	46	48	40	40	49
No. of plants obtained; seed from untapped trees	156	133	100	167	164	165
Percentage of seed germination; seed from tapped trees	33	23	24	20	20	24
Percentage of seed germination; seed from untapped trees	78	66	50	83	82	82

It may be added that consideration of the figures given in the table shows that the average percentage germination, for all the periods, of seed from untapped trees was 74, as compared with 24 for seed from tapped trees.

Information is given in the *Quinzaine Coloniale* of February 25, 1912, to show that the general production of wild rubber on the Ivory Coast is satisfactory, except that a certain amount of fraud and adulteration exists. The exploitation of rubber has taken place chiefly in the eastern part of the colony, where replanting is suggested; at the same time the western part contains large areas of trees of *Funtumia elastica*, and little has been done in obtaining rubber from these. Experiments have shown that Hevea and Funtumia grow successfully, and this fact, together with the improvement that is taking place in labour conditions, causes a satisfactory future for the colony to be predicted.

COTTON NOTES.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date May 6, with reference to the sales of West Indian Sea Island cotton :—

Since our last report, about 350 bales of West Indian Sea Islands have been sold chiefly composed of cotton 19*d.* to 20*d.*, from the Islands of St. Kitts, Barbados, Antigua, Nevis, Anguilla and St. Martin. A few superfine bales from St. Kitts, Barbados and St. Vincent have been sold at prices ranging from 21*d.* to 24*d.*, and also a few Stains at 9*d.*

The market remains firm, but there is very little demand for anything over 20*d.*

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending May 4, is as follows:—

There has been some demand during the week, resulting in sales of about 100 bales of Fully Fine and Extra Fine, included in which were several crop lots, which the Factors sold at some concession from previous asking prices. The buying was on account of the Northern mills.

This demand having been satisfied, the market is quiet again, with little inquiry, but Factors are still holding the unsold stock on a basis of our last quotations.

The Cotton Industry in Japan.—In spite of the high prices of raw material, the cotton-manufacturing industry of Japan is in a very flourishing condition. At the present time the number of spindles there is 2,180,000, as compared with 1,274,000 in 1900, while the quantity of cotton consumed increased from 700,000 bales in that year to 1,060,000 bales in 1911. The corresponding figures for the United Kingdom for 1911 were 54,523,000 spindles and 3,782,000, bales. It will be noticed that there is a striking difference in the consumption of cotton per spindle in the two countries; while in the United Kingdom each spindle only consumes ·07 of a bale approximately, each Japanese spindle consumes nearly ·05 of a bale. The reason of this difference is to be found in the fact that as a rule the Japanese spindles are operated day and night, and are for the most part equipped with ring spindles, which consume considerably more cotton than mule spindles. According to the Bulletin on the Supply and Distribution of Cotton recently issued by the United States Department of Commerce and Labour, Japan has at present thirty-eight factories engaged in cotton manufacture, containing 17,000 looms and employing about 93,000 men, women, and children, while it is estimated that there are still about 1,000,000 hand-looms in the country, which produce about one-third of the cotton cloth used by the inhabitants. The principal source of the cotton-supply is British India, although the import of Chinese cotton is steadily increasing The imports from the United States of America have averaged about 200,000 bales annually. Efforts are being made to increase the supply by promoting growth in Korea and Siam. (The *Journal of the Royal Society of Arts*, April 19, 1912.)

A USE FOR PARTIAL SOIL STERILIZATION.

The following abstract of a paper by E. J. Russell and J. Golding on this subject, which appeared originally in the *Journal of the Society of Chemical Industry*, is given in the Annual Report of the Rothamsted Experimental Station for 1911, p. 13:—

This paper deals with an investigation of the state into which the soil of sewage farms arrives after the continued application of sewage, whereby it is so far injured, both in its physical and biological conditions, that it will no longer either let the sewage percolate, or purify what passes through. Sewage-sick soil was found to possess a very limited bacterial activity, and to be exceptionally rich in those protozoan organisms which Russell and Hutchinson have regarded as the limiting factor in the development of bacteria in soils. [See *Agricultural News*, Vols. IX, pp. 33 and 107; XI, p. 131.] Partial sterilization of the soil, either by treatment with antiseptics or by heating, was followed by a very large increase in the number of bacteria; in one case they rose from about 40 million to over 400 million, per gram of the soil. Accompanying this increase in bacterial activity, there was a renewal of the purifying effect of the soil upon the sewage, and it was found possible to restore the sewage-sick soil, and make it become an even more effective filter than before, either by heating the soil sufficiently to char it slightly, or by treating it with the vapour of toluene.

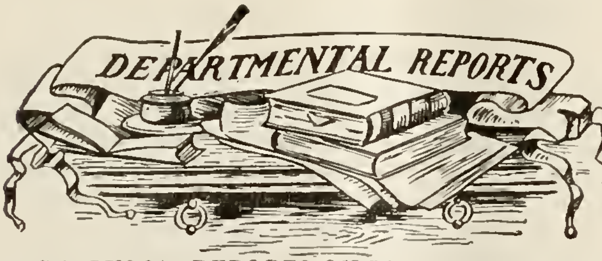
THE MECHANICAL EXTRACTION OF RUBBER.

The last number but one of the *Agricultural News* contained a note on a machine for extracting rubber from bark, based on an article that appeared in the *Journal d'Agriculture Tropicale*, in which it was suggested that the process described might be used for obtaining rubber from *Funtumia elastica*. A subsequent article in the issue of the latter journal for January 1912 describes the mechanical extraction of rubber from this plant, as it is practised by a tribe known as the Bayanzi, in the Belgian Congo.

According to this method, the tree is felled at the base when it has attained a diameter of 6 to 8 inches. The branches are cut off and rejected, while the trunk is passed to and fro over a fire, when the bark becomes detached from the wood and is more easily removed on that account.

After a preliminary maceration, the bark is beaten in a manner similar to that employed for such plants as *Landolphia Thollonnii*. The first mass obtained is generally treated by immersion in boiling water. Ordinarily, no further trouble is taken than the carrying out of this first immersion; by its means, a very impure rubber is obtained which can be easily improved in quality by being beaten and boiled in water again.

The most harmful stage in this crude process, as regards the final product, is the passing of the bark over the fire. It seems, however, that this phase of the operation is necessary, for if coagulation of the latex is not brought about before beating, no rubber is obtained. On the other hand, if the bark is heated too strongly, it is likely to be burned, with the result that the rubber coming from those parts where the heat has been too great rapidly becomes sticky and, if it is mixed with the general product, it lowers its value. It is not, however, the process of heating, itself, that is the cause of reduction in value, but the faults that arise in carrying it out.



ST. LUCIA: REPORTS ON THE BOTANIC STATION, AGRICULTURAL SCHOOL AND EXPERIMENT PLOTS, 1910-11.

The changes made whereby the agricultural pupils receive training at the Botanic Station, instead of at the Agricultural School, have enabled the arrangements at the Botanic Station and at the Experiment Station, Union, to be altered, so that now the Agricultural Superintendent has established his office at the former of these institutions. At the same time, the scope of the work in country districts has been increased by the appointment of an Assistant Agricultural Superintendent.

The condition of the garden was maintained, but for various reasons nothing in the way of permanent improvement was effected during the year under review. An abnormal rainfall was received during February and this, owing to the low-lying situation of the Botanic Station, caused a large amount of damage in certain parts. Something is being done toward raising the level of the more swampy section of the lawn by filling in with the cleanings from surface water drains near the gardens. Some improvements were brought about by the removal of large trees to positions where their effect would be less injurious, or by their complete destruction.

The total number of plants distributed was 59,391; of these, 56,330 were disposed of by sale and exchange, and 3,061 were sent out free to Crown Land purchasers. Chief among those distributed were limes 45,660, sugar-cane 8,500 and cacao in boxes 3,616. Seeds of several kinds were also sent out, including 788 Para rubber seeds and ½-lb. of Central American rubber seeds.

The notes on economic plants show that rubber-planting in St. Lucia is only in an experimental condition at present; trees set out, however, on a few estates in 1908-9 appeared to be growing very satisfactorily, and there is some increasing interest in the cultivation. In relation to this, 10,000 seeds of *Hevea brasiliensis* were obtained from Ceylon, some being distributed to purchasers while the remainder was sown at the Experiment Station nursery. The germination of the whole consignment was only 10 per cent. The number of plants raised at the station was 780, and it was intended that 600 of these should be available for distribution. Trials with *Manihot piauhyensis* and *M. dichotoma* do not make it appear likely that these plants will thrive under the conditions in which they are growing.

As usual, the fumigation of imported plants was carried out, and 139 packages of plants and seeds were dealt with under the Plant Importation Ordinance. An interesting section is included in the report on the Botanic Station, which gives an account of trials with insecticides and spraying machinery. This is followed by notes on fungus diseases and insect pests, which deal with: a root disease of various plants; pink disease (*Corticium laeve*) on guava; pink disease on pigeon peas; a fungus (*Thelephora pedicellata*) on lime branches; a cacao seedling disease that has not been found to cause much injury; and the frangipane caterpillar.

Details given concerning the small cotton industry show that the estimated area of Sea Island cotton in the island was about 122 acres, 58 belonging to peasants and 64 acres cultivated on one estate. Although every reasonable encouragement has been given for the establishment of cotton-growing, the results are not of increasing promise. With respect to the lime industry, the area under the plant has been extended. Concentrated lime juice was made in small quantities on three estates—on two of these for the first time—and satisfactory prices were obtained. At the time of reporting, steam concentrating plants were being installed on two estates. In the lime plantations, no serious cases of injury from scale insects were observed, as these pests appear to be largely controlled by their natural enemies. Statistics given in regard to cacao production show that, in the last twenty years, the greatest activity in cacao-planting took place during the first half of the period. The output for 1908, 1909 and 1910 was, respectively, 6,775 bags (of 200 lb.), 10,855 bags, and 8,187 bags. A description is presented of a Cacao Prize-holdings Competition held in the period under review; an account of this has been given in the *Agricultural News*, Vol. X, p. 153.

Agricultural education in the primary schools receives large attention from the agricultural department in St. Lucia, and the details of the work are presented in an appendix to the report on the Botanic Station. The examinations in practical agriculture, of the Imperial Department of Agriculture, have continued to be taken up, with some success.

Through the changes consequent on the discontinuance of the scheme by which the agricultural pupils receive their instruction, in residence, at the Agricultural School, Union, the work, as has been indicated, is no longer carried on at that institution. The details of what was done in the Agricultural School experiment plots show that the investigations had reference to: the planting of fruit trees, mango propagation, soy bean, Jerusalem pea (*Phaseolus trinervis*), Bambarra ground nut (*Voandzeia subterranea*), cabbages, cacao and limes. With respect to the first, it is of some interest that the trees planted in small holes, with hard ramming and without the exercise of the usual precautions observed in what is called the orthodox method of tree-planting, were at the time of report making the better progress; but it was too early to draw definite conclusions, as the observations had extended only over a few months.

The Propagation of Poinsettia.—Remove the shoots which can be spared from a plant and allow them to lie for about a fortnight in a shady, dry situation. The soft, sappy, useless shoots will immediately shrivel but the firmer wood at the base of the shoots remains sound. At the end of about a fortnight cuttings can be made and inserted in pots.

The size of the cuttings should be about 4 inches, and it is essential that the base of the cutting be cut slightly below a node or bud; that is, where the stem is solid. The internodes or other parts of the stem are hollow and the shoot has generally to rot away until a solid piece of stem is reached. As may readily be imagined, it is a matter of considerable difficulty to arrest the growth of this rot.

Insert the cuttings in 6-inch pots using a sandy compost. Cuttings root much more readily when placed round the side of a pot, so that only four or five should be inserted round the side of the above-mentioned size of pot. Until the cuttings are rooted, the soil requires to be kept slightly drier than is usually the case with other plants. Pot off singly into small pots and provide the treatment afforded other plants of a like nature. (From the *Agricultural Bulletin of the Straits and Federated Malay States*, February 1912, p. 12.)

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

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number is entitled The Interpretation of the Results of Field Experiments. It is written in continuation of the editorial article on the same subject, in the last number of the *Agricultural News.* The intention is to give further attention to the matter in the next issue of this journal.

On page 165, an interesting account is presented of experiments that have been conducted for the purpose of investigating the vitality of Para rubber seeds. A subsequent opportunity will be taken to present the further results of the same investigation.

Page 167 contains a review of the Reports on the Botanic Station, Agricultural School and Experiment Plots, St. Lucia, for 1910-11, issued recently.

Under the heading Insect Notes, on page 170, articles are presented dealing with a disease of grasshoppers and the banana weevil borer. There is also a note on the cotton boll weevil.

Page 171 contains on article presenting useful information regarding agricultural co-operative credit societies in England and Wales. It would appear to be of special interest in relation to developments in the same direction that are foreshadowed and are taking place, at the present time, in the West Indies and British Guiana.

A short account of recent agricultural progress in Dominica is presented on page 173.

The Fungus Notes, on page 174, deal with rose mildew and immortel canker.

Agricultural Conference Picture.

There is issued as a loose supplement, with this number of the *Agricultural News*, a full page reproduction of a photograph of the delegates to the West Indian Agricultural Conference, held in Trinidad from January 23 to 30, last. The photograph was taken on the steps of the Princes' Building, on Monday, January 29. It includes most of the delegates; though it is to be regretted that a few were unavoidably absent. If it is desired, the picture may be bound in, when the present volume of the *Agricultural News* is complete.

Index and Title Page.

The Index and Title Page of Volume X, of the *Agricultural News* are also published as a supplement to the present issue, so that the opportunity is now given, for the numbers of that volume to be bound together.

As in the case of the last index, it has been endeavoured to make that of Volume X more detailed in nature than those issued for the first eight volumes. This, again, applies particularly to the portion dealing with Insect Pests and Plant Diseases, so that this part may be employed as a dictionary of common and scientific names, as well as an index.

The Value of Rat Exterminators.

In relation to this subject, a note was given in the last number of the *Agricultural News* on work that has been carried out in Indo-China. The interest of the matter is further increased by experiments that are described shortly in the *Report of the Agricultural Research Institute and College,* Pusa, 1910-11.

It is stated that experiments were made with fresh samples of Ratin and Trope Ratin received from England, and that a report on the results was furnished to the Inspector General of Agriculture in India. It is explained that Ratin is a bacterial culture of a rat disease, prepared in Copenhagen. In the trials at Pusa, although the cultures were alive when they were received, as was proved by transfers, it was not possible to effect the transmission by them of any disease when they were given with food to captive rats. The suggestion is made that the virulence of the cultures might be regained by re-culturing in India.

It is further explained that Trope Ratin is not a bacterial culture, but a vegetable poison, whose principal characteristic is that it readily kills rats and mice, but is harmless to other animals. The trials carried out with it in India proved that its usefulness in that country depends upon its employment within a limited period of time after its preparation, for it deteriorates rapidly when kept, and loses its poisonous property. The cost is said to preclude any possibility of its use by cultivators on a large scale, but it is suggested that it may be employed in special cases, such as in granaries or warehouses.

A Method for Facilitating the Removal of Ploughs.

The *Journal of the New Zealand Department of Agriculture* for February 1912 describes a very simple arrangement for assisting in the removal of an ordinary plough from place to place. It consists merely of a 2-inch board whose length is a little greater than the total length of the share and mould board. To this is attached a loop made of hoop steel, iron, or wire, which is of such a size that it will just hold securely the point of the share. The sole of the plough is kept in position by means of two iron pins standing up a couple of inches above the board, and driven into it at such an angle as to ensure a good grip.

It is evident that such an arrangement enables the plough to be moved over the field or roads with more comfort to horse and man, and more quickly than is ordinarily the case.

The Stimulation of Nitrogen-fixing Organisms by Humus.

The *Journal of the Chemical Society*, 1911, p. 758, abstracts a paper which presents an account of work that was done for the purpose of determining the reason for the increased growth, and power to fix nitrogen, of *Azotobacter chroococcum*, when soil is added to a nutrient solution containing the sugar called mannite, in which the organism is being grown.

The results, which are in agreement with those of other investigators, showed that the effect was due to the iron contained in the crude humus acids, for if these acids were freed from iron and added to the nutrient solution, there was no corresponding increase in the activity of the nitrogen-fixing organism.

It was found that some of the greatest effect in the stimulation of Azotobacter was produced by iron hydroxide dissolved in an alkaline solution of cane sugar.

Trials of the Soy Bean in England.

The last number but one of the *Agricultural News* contained a note on trials with the soy bean in England, that have received description in the *Journal of the South Eastern Agricultural College*, Wye.

In the *Journal of the Board of Agriculture* for April 1912, p. 33, an account is given of other trials made in England with this plant. For the purpose of these, seeds of sixteen varieties of soy bean were obtained by the Board of Agriculture from an experiment station in North Japan, together with a small quantity of soil in which the crop had been grown already. The purpose was to make trials with seed produced from plants raised in temperatures more nearly approaching those obtaining in England, as it was thought that a reason for failure in past experiments might be found in the circumstance that the seeds had been imported from countries with hot climates.

The experiments were carried out at the Midland Agricultural College, and by Professor Biffen at Cambridge. In the former case, it was reported that many of the seeds produced vigorous plants, which would not flower even when they are placed in a greenhouse. Nevertheless, the plants were strong and healthy, and there was a large number of well-developed nodules on the roots. Similar results were obtained at Cambridge. The interesting observation was made that nodules were absent entirely from plants grown in soil that had not been inoculated with the soil from Japan; whereas, in the cases where the Japanese soil had been applied, the nodule formation was good.

As these experiments seemed to suggest that Japanese varieties of soy bean are not suited to English conditions, seeds of Manchurian soy beans were obtained, some from northern Manchuria and some from the south of that country. These were grown in the same places as the Japanese seeds.

In connexion with this experiment, it was reported from the Midland Agricultural College that vigorous plants had been obtained, bearing abundant nodules, but that no seed had matured. At Cambridge, the trial was more successful although the plants did not grow very vigorously. They flowered at about the middle of August, and ripened a small quantity of seed about the end of September. On being sown in the following April, this seed produced useless plants that did not bear seed in turn, in spite of the hot season.

It is claimed that these results seem to prove fairly conclusively that none of the varieties of soy bean yet tried in England can be relied upon to produce seed in that country, though a certain amount of seed may be obtained under exceptional circumstances.

Recent Entomological Work in Trinidad.

A report of the Entomologist to the Board of Agriculture, Trinidad, dealing with recent work in connexion with insect pests, was presented at a meeting of the Board held on March 22.

Among the work mentioned in the report, record is made of the observation of the eggs of froghoppers in dry trash, in a boucan, in fields in which the cane had not yet been cut, but had been stripped; this is stated to show the necessity for burning the trash in the fields.

Holes of *Castnia licus* have been observed in canes, in the mill yards of the Caroni and Couva districts, and a similar appearance has been noticed in canes carted by cane farmers along the Arima, Couva and Caroni roads. It is stated that the evidences of attack are not numerous in most places, but that they are sufficient to prove that the moth is spread all over the northern part of Trinidad. It is thought that it exists in the southern district also.

Among other matters, there is the interesting fact that the predaceous bug of the froghopper is doing well in confinement, and that the numbers are steadily increasing.

INSECT NOTES.

A DISEASE OF GRASSHOPPERS.

The last volume of the *Agricultural News* contained on page 410 an article describing work that had been carried out, in Yucatan, which showed that a disease germ known to produce fatal results in grasshoppers could be employed in the control of this pest. Subsequently, another article has appeared in the *Journal d'Agriculture Tropicale* for March 1912, p. 70, which states that the study of the disease has been continued at the Pasteur Institute, on the return to France of the investigator, M. d'Hérelle.

A further phase of the same matter receives interesting description in the article that has just been quoted. At the end of last December, the Argentine Government obtained the services of M. d'Hérelle for the purpose of enquiring if it was possible to undertake the destruction of grasshoppers, which are serious pests in parts of the Republic, by employing the disease for the purpose. The importance of the matter was all the greater because of the existence of areas in Argentina which it seems to be impossible to colonize on account of the periodical appearance of the scourge. Past efforts have been made to devise means for lessening the damage done by the pest, in this country, and there exists a commission and a bureau organized for the service, but it was desired, nevertheless, to invoke the services of the investigator mentioned. It may be said shortly that, as in Yucatan, the results of the work have been eminently successful.

The first care of the investigator was to increase the virulence of the bacillus responsible for the disease, by means of successive inoculations of the insects When the maximum degree of virulence had been gained, pure liquid cultures were prepared and were used for infecting flights of grasshoppers.

The first trials were made with insects in captivity, which were allowed to feed on alfalfa on which a small amount of the culture had been spread. After forty-eight hours, the mortality was about 50 per cent.; in five days all the insects were dead. Further, the microbe of the disease was found to be almost the only bacterial organism present in the intestines of the dead insects and in the liquid excreta found on the alfalfa. At the end of such absolutely convincing experiments, practical trials were made in different parts of the country.

On January 16, a flight of grasshoppers was enclosed, by means of barriers made of corrugated iron, in a space having an area of about $1\frac{1}{4}$ acres, and nearly 1 pint of a culture of the bacillus was spread on the ground. In four days, 75 per cent. of the insects were dead, and after a second similar period they had all succumbed.

On January 18, a meadow having an area of 88 acres, where there was a large number of winged grasshoppers, was infected with $1\frac{3}{4}$ pints of the culture, which was scattered broadcast. Five days afterwards, an enormous number of dead and dying insects was found all over the meadow and in the surrounding wood.

Several days after, over 5 pints of the culture was scattered in areas infested by grasshoppers. On the following day, numerous dead insects were found, and the plants were soiled by excreta. All the flights which passed the infected region, and which rested there, were contaminated; and within a radius of several miles, dead grasshoppers were found. Actually, about one million of the dead insects was observed on each acre.

Other experiments have shown identical results, and it has been found that if the insects are infected through the stomach, by eating contaminated plants, they die in a time which varies from eight to twenty-four or thirty-six hours. The effect is increased by the fact that the excreta contaminates fresh plants, and a further destruction of insects is caused

Toward the end of the article, it is claimed that the experiments described place beyond doubt the efficacy of this means for the destruction of grasshoppers. As the matter arose from observations made of a disease of the insects in Yucatan, occurring in a species identical or nearly related to that of the Argentine (*Schistocerca americana*), there may have been the fear that special conditions may not have permitted an easy development of the disease among the South American insects. Happily, this fear has not been justified; on the contrary, even non-migratory grasshoppers have been found infected. It seems that the extreme virulence of the bacillus producing the disease (*Coccobacillus acridorum*) should ensure its usefulness among the most diverse species. At any rate, it is easy to make experiments to determine the matter.

THE BANANA WEEVIL BORER.

In a letter received recently by the Imperial Commissioner of Agriculture from Mr. Frank P. Jepson, Government Entomologist of the Fiji Department of Agriculture, enquiry is made as to methods of control known to be of value in dealing with the banana borer.

This insect, which has been recorded as a pest in Dominica in previous years, under the name *Sphenophorus sordidus*, German, is stated to be the same as *Cosmopolites sordida*, Chevrolat. It is said to be a serious pest of bananas in Fiji, and to defy all artificial methods of control Mr. Jepson proposes to visit certain islands in the East Indies, with the object of endeavouring to discover some efficient parasites of this borer which are supposed to exist there.

The banana borer has not occurred in sufficient numbers in the West Indies, during the past nine or ten years, for it to have been recorded as a pest during that time. It would be of interest, however, to know whether any planters have observed borers in the stems of banana plants, just above the ground, and also how much damage may be attributed to this pest. There is, of course, a possibility that efficient natural enemies of the borer exist in the West Indies, and that they prevent its increasing to sufficient numbers to become a pest. In any case, it would be useful for any observations, that may be made on this insect, to be communicated to the Imperial Department of Agriculture.

The Cotton Boll Weevil.—In the *Cuba Magazine* for January 1912, a short account is given of trials in growing cotton in a district where the cotton boll weevil is known to occur, for the purpose of ascertaining whether cultural methods can be depended upon to prevent attacks by this pest. The result of these trials, so far, has been that by late planting—after the season of greatest abundance of insect pests—and the immediate destruction of all old plants and trash when the crop is finished, cotton has been grown for three years without any sign of boll weevil attack. (See also *Agricultural News*, Vol. XI, p. 121.)

AGRICULTURAL CO-OPERATIVE CREDIT SOCIETIES IN ENGLAND AND WALES.

There has just been issued, by the Board of Agriculture and Fisheries, Leaflet No. 260, dealing with this subject, and from this the following extracts, that are of more general interest, have been made:—

There is nothing in the Friendly Societies Act to prevent the registration of a society in which the liability of the members for the debts of the society is limited to a fixed sum in each case (or limited by guarantee, as it is called); but no society has yet been formed on this basis, and all the existing societies have adopted a rule to the following effect:—

'Every member of the Society shall be, equally with every other member, jointly and severally liable for all debts incurred by the Society, and for any loan which a member or his sureties may fail to pay.'

Thus in all the existing societies the liability of each and all of the members for debts due by the society is unlimited, and the ultimate security offered by the society for advances made to it is the total property of all its members put together.

A society registered under the Friendly Societies Act has to submit its rules to the Chief Registrar, whose duty it is to satisfy himself that they are not contrary to the Act. Most of these societies have adopted the model rules recommended by the Agricultural Organization Society, to which all but two of them are affiliated, and the others have rules which are in all important respects similar, so that regarding all of them it may be said that, besides the principle of unlimited liability, they have the following features in common.

No one can be admitted as a member unless he lives within a certain circumscribed area, such as a parish, or two or more adjoining parishes, and so is personally known to most of his fellow members. He must also be approved by the committee as a man of good character, worthy of admission to the society. All the members have an equal voice in the election of the committee and the management of the society.

Loans to members are granted only on approved security, and must be utilized only for a specific purpose, which, in the opinion of the committee, is such that there is a sufficient prospect to the loan repaying itself by the production, business, or economy which it will enable the borrower to effect. No member can have out on loan more than £50 altogether at any time, but he can repay one loan and afterwards take out another, not exceeding £50.

The society may receive deposits, either from members or non-members, and may pay interest on them.

No profit may be divided among the members of the society. All profits must be carried to a reserve fund, which can only be drawn upon to meet exceptional losses by resolution of the general meeting of the society. Even if the society is dissolved, this reserve fund cannot be divided among the members, but must be spent on some useful purpose in the parish. Thus the only pecuniary benefit a man may expect to gain by becoming a member of such a society is that of obtaining loans for profitable purposes connected with agriculture at a low rate of interest; and if he is unlikely himself ever to require such a loan his motive for joining as member can only be to help on a beneficial movement, and to assist his neighbours, by his guarantee and guidance, to get small loans on advantageous terms.

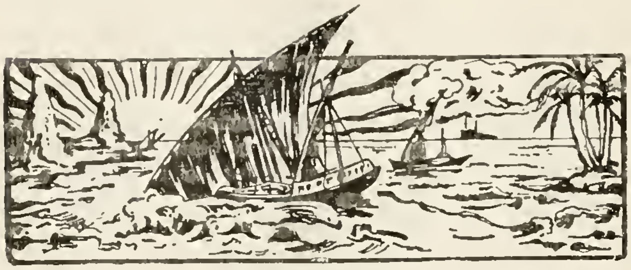
The accounts of the society, with the exception of those relating to individual loans and deposits, are open to the inspection of all interested in the funds. They must be audited annually and submitted to the Chief Registrar, and a copy of the annual balance sheet must be conspicuously displayed for the information of all concerned.

It takes some years for a credit society to get into working order, and the progress made can be better judged by taking separately the totals for the six oldest societies, which have been at work for over fourteen years. Between them, they had in 1910, 145 members (an average of 24 per society), and during the year they gave out thirty-four loans, so that about one in four of the members took a loan. The loans aggregated £511, and averaged £15 per loan. The rate of interest charged on loans to members was, in four societies, 5 per cent., in one 6 per cent., and in one only 4 per cent. They had secured deposits amounting to £481, paying interest on them at 3 per cent. in four societies, and at 4 per cent. in one. Two of them had obtained advances from banks at 4 per cent., and one at 3 per cent. During the year they earned £36 in interest, and received other income amounting to £1, while their interest charge was only £20, and their expenses of management £6, an average of £1 per society; so that the net profit of the year was £11, or nearly £2 per society. Their assets amounted together to £743, including gifts of £65, and £556 out on loan to members; and their liabilities were £538, including the £481 held on deposit. Their surplus of assets over liabilities amounted to £205 (including the £65 received as gifts), so that they have now, after fourteen years of careful management, built up a reserve fund equal to more than one-third of what their members require in loans during the year. This is their own property, on which they have no interest to pay. The loans have been repaid punctually, and the societies have made no bad debts, and incurred no losses, and only in three or four cases have they had to call on the sureties to help in repaying loans due from members. In hardly any case has the surety ultimately failed to recover the money from the actual borrower.

The members agree in saying that they have derived great benefits from the existence of these societies, which have enabled many of them to obtain the small loans needed for their agricultural operations at a lower rate of interest than they would have had to pay elsewhere, and some of them to obtain loans, who otherwise could not have borrowed at all. They cite instances of men who were enabled, by a loan from the society, to buy and feed sheep, pigs or cattle, to hold over stock for better prices, to procure seed, plants, or manure, to work their land to better advantage, or to add to the area of their holdings; and of some who, by means of a succession of such loans, have risen from the position of labourers to that of substantial small holders.

The establishment of these societies in the rural villages in which they are found has evidently not only added to the prosperity of many of the villages, but has stimulated neighbourly feeling by showing men how they can help their fellows by the exercise of care and mutual trust, without any real pecuniary risk to themselves, has encouraged thrift and efficient methods of cultivation, and has at the same time increased the selfrespect of the individual members, and inspired them with hopes of progress.

It is very noticeable that the first efforts in these agricultural credit societies are very small, and that gradual but safe progress is made. This fact may form an object-lesson in regard to similar work in the West Indies, and serve as matter for encouragement in such work.



GLEANINGS.

The amount of cotton shipped from Antigua up to the end of April was about 42,400 lb. Indications existed that the area of cotton planted will be somewhat largely increased during the coming season.

A note in the *Board of Trade Journal* for February 29, 1912, states that, although the rice crop of 1911, in Japan, was considerably below the estimates, it was, however, 10·7 per cent. above the 1910 crop, and 5·2 per cent. greater than the normal crop.

By the end of last month, lands were being prepared on a few estates in St Vincent for cotton-planting; harvesting was practically completed. Cotton seed for planting purposes was, in the usual course, being selected and disinfected at the Central Cotton Ginnery.

The *Proceedings of the Agricultural Society of Trinidad and Tobago* for April 1912 shows that the total amount of cacao shipped from Trinidad during that month was 6,291,709 lb. The total export of cacao from the island for the first four months in the year was 30,702,105 lb.

A report received from the Director General of Agriculture in Egypt shows that, early last month, the temperature was favourable to cotton-growing, and that sowing was generally ten days earlier than in the previous year, 75 per cent. of the crop having been planted. Germination and growth were good; a few attacks of sore shin had been reported.

Information received from Antigua as to the agricultural conditions during last month shows that drought was still being experienced. The condition of the young cane crop was fair, considering the lack of rain. The plantations of young coco-nut palms were standing the drought well, and this was being resisted fairly successfully in the lime cultivations.

The trend of some of the chief agricultural interest in St. Lucia is shown by the fact that there continued to be a fairly large distribution of lime plants, by the Agricultural Department, during last month, the number being 1,850. In addition to these, there were sent out: cacao plants 300, yams 500 lb., corn seed 2 gallons, horse beans 1 gallon, vegetable seeds 29 packets.

A note in the *Demerara Daily Argosy* Mail Edition of April 27, 1912, states that, in connexion with the severe drought that is being suffered in the Colony, cane pests are very prevalent, especially the smaller moth borer, which is doing extensive damage. The statement is made that as many as two million caterpillars of this pest have been collected and destroyed on one estate since the beginning of the year.

The United States Vice Consul General at Buenos Ayres reports that the first cotton-growing colony has been formed in Argentina. A large area of land has been set apart for the purpose, and it is the intention to subdivide this into small farms of 125 to 250 acres, and to offer these to immigrants remaining in the country, on the distinct condition that no other plant than cotton shall be cultivated on them as a main crop

At a recent meeting of the Demerara Permanent Exhibitions Committee, it was decided that, owing to the severe drought, it would not be expedient for the Colony to be represented at the forthcoming International Rubber Exhibition, owing to the impossibility of making a collection of exhibits that would be serviceable and representative of the Colony's resources. It is hoped, however, that arrangements will be made for the distribution at the exhibition of literature presenting an account of the Colony and its industries.

According to the *Bulletin of Agricultural Statistics* of the International Institute of Agriculture, for March 1912, the total area under cotton in India is estimated at 20,631,598 acres as compared with 22,859,363 acres last year; this is a decrease of 9·7 per cent. The estimated outturn is 3,135,000 bales of 400 lb. of clean cotton, as against 3,853,000 bales last year, the decrease being 18·6 per cent. The figures refer to the Indian agricultural year 1911-12, but the greater part of the crop was picked before the end of 1911.

It was stated, in a paper read before the Royal Society of Arts, on March 26, that cotton-planting in British North Borneo has practically passed the experimental stage, and that it has been proved that the soil and climate are well adapted to the cultivation of this plant. Favourable reports were received on samples sent to Hong Kong and Japan, and a suggestion is made that the cultivation should be taken up on an estate scale in one of the more populous districts, where women and children would be easily available for the work of picking.

The question has often been asked if the nodule organism of leguminous plants, *Pseudomonas radicicola*, is capable of living alone in the soil, and fixing nitrogen, without the presence of such plants Some light has been thrown on the matter by experiments conducted in liquid media, sand and soil, and described in Reports of the Virginia Agricultural Experiment Station, 1909-10, p. 138, which appeared to show that the organism will live in the soil where the host plant is not present, and will accomplish a certain amount of nitrogen assimilation.

Investigators have found that carbohydrates may be built up under the influence of the ultraviolet rays, and in the absence of chlorophyll. The *Experiment Station Record* for August 1911 gives a summary of further work that has been done in the matter, showing that neither formaldehyde nor carbohydrates are formed from carbon dioxide and water, if potassium hydroxide is absent; in its presence formaldehyde was formed, but no carbohydrates. For the formation of sugar from carbon dioxide and hydrogen, in the presence of potassium hydroxide, under the influence of the ultraviolet rays, it was found necessary that the hydrogen should be in the nascent state.

STUDENTS' CORNER.

JUNE.

FIRST PERIOD.

Seasonal Notes.

It is a well-recognized fact that no two living beings, whether they are plants or animals, are exactly alike. The phenomenon is known as variation, and its existence enables the agriculturist and the horticulturist, as well as the stock breeder, to obtain superior kinds of the living beings in which he is interested. In nature, the effect of the existence of variation is that the weaker forms, or those less suitable for continued existence under the conditions, disappear, and only the varieties that are most fitted to exist under the circumstances are permitted to survive and reproduce their species. One of the most powerful causes of this kind of selection is competition. In the case of plants, many more seeds of any given sort are produced in each season than are required for the number of plants for which food is available, so that the matter is important in its effect in preventing the numbers of any one kind of plant from increasing to a disproportionate extent.

Sometimes, variations takes place to such a degree that the new plant is completely different in one or more respects from those which produced it. This variation is called mutation. It may happen that the new characteristic makes the form particularly valuable to mankind, but its utility is often small because the plant possessing it is incapable of transmitting the special property to its offspring: the latter are, in fact, most likely (as it is expressed) to revert to the former type. There is also the chance that the new form may not be adapted to its surroundings, and it will then be quickly extinguished. On the other hand, the product of mutation — the 'sport' as it is termed—may be better suited to its environment than the kind of plant from which it came, and it may in addition be able to produce offspring possessing its special characters. In this case, mutation has given rise to a plant that may prove to be of great utility.

The name 'natural selection' is given to the way in which new kinds of plants are produced by these means, in nature. The common weeds have their origin in this manner, and it is their very fitness to survive, under the conditions in which they are found, that makes them so difficult to eradicate. Further, the varieties or races of plants that are only suited to a limited condition of temperature, climate or soil, have been produced in this way. This natural adaption to definite climatic conitions should be considered carefully when it is desired to effect the introduction of some certain variety of a plant.

The chief importance of these matters to the agriculturist is that man is enabled to perform artificial selection, and thus to obtain kinds of plants that are more prolific, or more definitely suited to his needs, in a much smaller time than this can be done in nature.

Give examples that have come within your knowledge, of plants that are being improved or maintained in a condition of superiority to the common forms, by means of artificial selection. State what other means exist for the improvement of plants.

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) Give an account of six plants that are commonly classed as weeds.

(2) How do plants give evidence of injury to their roots?

(3) What is the difference between parasitic and saprophytic fungi?

INTERMEDIATE QUESTIONS.

(1) Write an account of the special characteristics by means of which any weeds with which you are acquainted are enabled to persist.

(2) Why is care required to prevent injury to the roots of plants. Mention any particular case.

(3) Describe the life-history of any saprophytic fungus that you have studied.

FINAL QUESTIONS.

(1) Give an account of any uses of weeds on an estate. In what indirect ways are weeds of use to the agriculturist?

(2) Provide a description of any root disease of plants which you have observed, giving careful attention to its symptoms.

(3) State the usefulness, in any respects, of fungi to mankind.

AGRICULTURAL PROGRESS IN DOMINICA.

The address by His Honour the Administrator, delivered at a meeting of the Legislative Council, Dominica, held on March 21, 1912, gives a review of the official returns of the Presidency, which shows that steady progress continues to be made in the trade and agriculture of the island. A review of the address, as regards matters more specially connected with agriculture, follows here.

During the year 1911, the total trade of the island, excluding the value of whale oil and stores shipped in transit, reached the value of £224,793; the annual average for the five previous years was £221,687. A consideration of the figures has shown that there has been an increase of 68 per cent. in the trade of Dominica during the past ten years. The exports during 1911 amounted in value to £100,705, in which were limes, value £72,929, and cacao, value £21,702. On the basis of the export returns, the lime crop for 1911 amounted to 355,000 barrels; this is less by some 14,000 barrels than the unprecedented crop of 1910, but it is probable that this smaller amount is only apparent, as some quantity of the lime products of 1911 was held over for shipment during the present year. It may be stated shortly that the conditions concerning the lime crop indicate a satisfactory expansion in the lime industry.

The exports of cacao during 1911 were 10,053 cwt.; this is less by about 1,200 cwt. than the exports of the previous year. The cacao crop has remained somewhat stationary for some years past, and the reason adduced for this by the Curator of the Botanic Station is that more attention is being paid to lime cultivation, and that on the death of cacao trees they are replaced by limes in preference to fresh cacao plants.

Reference is made to the excellent report received recently from the Imperial Institute concerning rubber from Dominica. A note on this was given in this volume of the *Agricultural News*, p. 121.

Among the other matters considered in the address, the reference to the work on the Imperial road is of most direct agricultural import. In relation to this it is stated that the work of improving and metalling the first 8 miles of the road, for which a vote of £500 has been made during the last financial year, is in hand, and that a revote of £200 out of this sum will be asked for, as this was the estimated unexpended balance of the vote remaining on March 31, 1912.

FUNGUS NOTES.

ROSE MILDEW.

At this time of the year, mildew is very common on rose trees, and may be found in almost every garden. The disease attacks the leaves principally on the underside and causes them to curl up and become distorted. It also attacks the young, growing stems and the flower buds. On the latter it causes crumpling and frequently brown discoloration of the outer petals, while it also reduces the size of the flower. The fungus causing the trouble appears as a very thin dusty white covering on the surface of the parts attacked. The dusty appearance is due to the production of myriads of spores that are able to germinate on healthy plants, and thus start the disease on them.

Some varieties of roses are much more susceptible to mildew than are others, but this fact is of little use in preventing the disease from appearing in West Indian gardens, partly because it is not easy to obtain information as to what varieties are comparatively immune and what are not, but mainly because the best roses are often the most susceptible, and unless immune varieties can be found with almost identical flowers, the more attractive forms will be planted whether they are immune or not.

Various measures have been recommended for the control of the disease. One method is to dust the plants with a mixture of 2 parts by volume of flowers of sulphur with 1 part of quicklime. This mixture should be put in a muslin bag and shaken on to the plants in the same manner as that in which cotton plants are dusted with Paris green. The treatment should be repeated about every ten days, until the trees are free from mildew. The powder adheres best when the leaves are slightly damp with dew or from the effects of a light shower. Another method of treatment is to spray or wash the plants with a solution of liver of sulphur, scientifically known as potassium sulphide. This may be made by dissolving 1 oz. of liver of sulphur, obtained from a chemist, in 3 gallons (Imperial) of water; this is equivalent to $3\frac{3}{5}$ wine gallons such as are used in Barbados A suitable vessel to use is an old kerosene tin that has been thoroughly freed from oil by scrubbing with hot water and sand. Another solution, recommended by Massee, is that consisting of 1 part of sulphuric acid in 1,500 parts of water. For practical purposes, there should be obtained from the chemist a solution containing 1 part of strong sulphuric acid and 9 parts of water. One ounce of this mixture should be added to one Imperial gallon of water contained in a clean wooden tub or in an earthenware dish. Both the liver of sulphur and the sulphuric acid solutions will scorch young leaves, if the mixture is too strong; and the effect of their application should be carefully watched.

In addition to the two solutions already described, various proprietary substances are recommended for treating rose mildew, and some of them have been found to give quite satisfactory results. Directions for preparing these substances for use are as a rule supplied with them.

The actual application of solutions of fungicides often presents some difficulty, in a garden. The ordinary garden syringe, even when it is provided with a fine rose nozzle, does not usually give a spray that will adhere well all over leaves with a thin, waxy coating. Either the solution falls as minute, practically spherical drops on the leaves, or if the plants are further wetted the liquid runs into big drops which evaporate slowly, leaving a somewhat too concentrated solution on the leaves in some places and none at all in others. The drops of strong solution scorch the leaves, and on the other parts the disease is not affected. In either of the above cases the spraying is of very little use. A method that would probably be found far more satisfactory, and one that is quite practicable on a small scale, is to wipe carefully each of the diseased parts with a soft sponge dipped in disinfecting solution. The leaves should not be made too wet; all that is necessary is to leave a thin, continuous film of liquid over the surface of the affected parts. The application of liquid disinfectant should be repeated at intervals of about a fortnight, until the trees are free from mildew.

In addition to applying a fungicide, it is advisable to pick off and burn all dead leaves, dead buds, flowers or other parts killed or badly damaged by the disease, and to collect and burn fallen leaves lying beneath the trees. These measures, if carefully carried out, should prevent the fungus from doing any serious damage.

IMMORTEL CANKER.

A disease of the immortel (*Erythrina umbrosa*), the Bocarie of Trinidad, has been known to exist for some time in St. Lucia, and an account of its symptoms, with suggested remedial measures, was given in the report of the Mycologist on the Staff of the Department, Mr. F. W. South, B.A., on his recent visit to that Island. This account is as follows:—

The disease usually starts from a cut surface, as for instance, where a branch has been removed. It spreads fast, and usually kills the tree. Where it is in its early stages, the bark is somewhat split, and covered with a thin, shiny, transparent coating, of a yellowish brown colour, probably consisting of a dried gummy secretion, while dark red-brown secretions of a gummy nature exude through the lenticels. Inside, the bark is rotted, and wet, and reddish brown in colour. Between the wood and the bark, and in the bark itself, are very numerous insects of several kinds. The insects work almost up to the advancing margin of the diseased area, where the bark is only a little darker in colour on the inside than is the adjoining healthy bark. As the disease progresses, the parenchyma of the bark is destroyed, and the brown fibres alone are left. The bark dries and comes away in sheets, exposing the wood. The wood does not appear to be affected, except that it is bored by a beetle. The diseased tissues have a strong, characteristic, and very unpleasant smell.

It would seem that careful excision and burning of the diseased bark, followed by tarring, should control the disease. The excision should be done with a knife that is frequently sterilized, and should extend well into the healthy bark. The exposed surface of the wood should be well flamed with a torch, before being tarred.

A disease of the same species of Erythrina was reported by Carruthers from Ceylon, and he believed that it was due to the same fungus as that causing canker of cacao. At the present time, however, cacao canker is known to be caused by *Phytophthora Faberi*, while this fungus has not so far been found to develop from diseased immortel bark in St. Lucia. Moreover, Carruthers believed the immortel disease to be due to a species of Nectria, to which he attributed cacao canker. Inoculations with fungi obtained from the diseased trees in St. Lucia are contemplated, and these may throw some light on the cause of the disease.

WEST INDIAN PRODUCTS.

DRUGS AND SPICES ON THE LONDON MARKET.

Mr. J. R. Jackson, A.L.S., has forwarded the following report on the London drug and spice market, for the month of April 1912:—

The month of April began with a more cheerful outlook for the future than has been the case with the previous months of the year, and was hoped that the brighter prospects of peace in the coal trade dispute, and the gradual resumption of work in factories, that had for weeks been idle, together with the gradual return to the normal railway traffic would bring with it, when Easter had passed, an increase in trade generally. To a certain extent this hope has been realized, but it was not till the end of the month that business matters began to assume anything like their normal conditions. No individual product affecting these notes has claimed special attention, as the following summary will show.

GINGER.

At the first auction on the 3rd of the month, no sales were effected, the offerings being all bought in. and it was not until the end of the month, namely, at the auction on the 24th, that any amount of business was done, when the offerings amounted to 343 packages of Jamaica and 454 bags of Cochin and Calicut; of the former only 24 bags were sold, dull washed realizing 52*s.* 6*d.*, and common 50*s.* 6*d.* per cwt. Of the Cochin and Calicut, 77 bags were disposed of without reserve, washed rough fetching 40*s.* per cwt., and B cut 68*s.* 6*d.*

NUTMEGS, MACE AND PIMENTO.

At the first spice auction on the 4th of the month, 112 packages of West Indian nutmegs sold at the following rates: 64's to 68's, 7*d.* to 7½*d.*; 73's to 79's, 6*d.* to 6½*d.*; 82's to 92's, 5¼*d.* to 6*d.*, 109's to 120's, 5¼*d.* to 6*d.* At the next auction on the 17th, West Indian nutmegs were represented by 157 packages, most of which were disposed of at slightly altered prices, as follows: 55's, 7*d.*; 64's to 72's, 6*d.* to 7*d.*; 76's to 86's, 5¼*d.* to 6¼*d.*; 103's to 113's, 5¼*d.* to 5¾*d.* At the last auction no nutmegs were offered. Mace was represented at the first auction by 42 packages West India, and sold at 2*s.* 2*d.* to 2*s.* 8*d*, broken also fetched 2*s.* 2*d.* A fortnight later West India was again represented by 42 packages, part of which was disposed of at slightly reduced rates, namely 2*s.* 2*d.* to 2*s.* 5*d.* for good, and 2*s.* 1*d.* to 2*s.* 2*d.* for broken. No further quotations have been made. Pimento has been quiet throughout the month. At the last sale on the 24th, 33 bags were brought forward, and bought in at 3*d.* per lb. Arrowroot has also met with little or no demand the offerings for the most part being bought in.

SARSAPARILLA.

The general scarcity of this drug has been a subject of comment for some weeks, and none has been forthcoming till at the auction of the 18th; 16 bales of grey Jamaica, 31 bales of Lima-Jamaica, and 10 bales of native Jamaica were brought forward. The whole of the grey Jamaica and native Jamaica were disposed of, as well as 26 bales of the Lima Jamaica, 2*s.* 4*d.* was readily paid for the bulk of the grey Jamaica, while 2*s.* was paid for ordinary part dark, and 1*s.* 8*d.* for mixed. The native Jamaica also fetched good prices, 7 bales of dull pale reddish fetching from 1*s.* 1*d.* to 1*s.* 2*d.*, per lb. and ordinary pale red 11*d.* to 1*s.* For 24 bales of Lima Jamaica 1*s.* 6*d.* per lb. was paid, whilst two other bales fetched 1*s.* 7*d.* per lb.

LIME JUICE, LIME OIL, KOLA, TAMARINDS.

At the beginning of the month, lime juice was reported very scarce and hardly any was offered in the open market, good pale unracked was fetching 2*s.* 3*d.* per gallon, at auction on the 17th; 3 hogsheads of fair palish raw West Indian realized 1*s.* 11*d.* per gallon, while it was said that 2*s.* had been paid for fair raw. At auction on the 17th of the month four cases of hand pressed oil of limes from Dominica were offered, and held at 6*s.* 6*d.* per lb. 1*s.* 6*d.* per lb. being asked for five other cases of ordinary distilled. A steady business was done with kola in the early part of the month, 5*d.* being quoted for fair halves, at auction on the 17th 3 bags of West Indian whole nuts and fair halves were held at 4½*d.* per lb. At the same auction tamarinds were represented by 10 barrels of new crop Barbados, which were held at 17*s.* 6*d.* per cwt. in bond, and 43 casks of fair black East Indian which sold without reserve at 9*s.* 3*d.* per cwt.

GOAT IMPROVEMENT ASSOCIATIONS IN BELGIUM.

Belgium has many important syndicates for the improvement of goats, and, in a subordinate degree, of sheep, at least in East Flanders. Their object is the provision of their members with first class milk-giving goats, placing at their disposal choice he-goats of selected stock.

The goat improvement syndicates amounted, on December 31, 1909, to 425—191 in West Flanders and 182 in East Flanders; they had 40,260 members, owners of 48,505 goats.

The working of these syndicates is very simple. Active members pay a quite infinitesimal annual contribution, 25 centimes [nearly 2½*d.*] for example. The revenue of the societies is increased by donations made to them by subsidies granted by the public authorities. The management buys the he-goats and chooses the members to whom they are to be entrusted. For each service members pay the keeper a fixed amount, for example 50 centimes, which is forwarded to the syndicate. The keeper must register the services. He receives an allowance. The breeding registers are kept by the secretary. Heads of division selected from among the council are entrusted to register the she-goats and to see that the regulations are strictly observed. Experts judge the qualities of the she-goats registered, supervise the maintenance of the he-goats, and present proposals for the improvement of the breeds. The syndicate has right of preference as purchasers of the kids. It pays 50 to 60 centimes a head. It also concerns itself with the rearing of the animals it has bought and arranges to place a certain number at the disposal of the active members of the syndicate, either chosen by lot, or in some other way.

If possible, every year, the Board organizes a show among its members. These syndicates have united in arrondissement and provincial federations: there are four provincial federations in West Flanders, five in East Flanders and one in Brabant. They keep books, and organize shows and exhibitions. (The *Bulletin of the Bureau of Economic and Social Intelligence*, of the International Institute of Agriculture, November-December 1911, p. 40.)

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR, May 7, 1912; Messrs. E. A. DE PASS & Co., April 26, 1912.

ARROWROOT—3⅝*d.* to 4¼*d.*
BALATA—Sheet, 3/8; block, 2/8 per lb.
BEESWAX—£7 10*s.* to £7 12*s.* 6*d.*
CACAO—Trinidad, 57/- to 75/- per cwt.; Grenada, 52/- to 57/6; Jamaica, 49/- to 55/-.
COFFEE—Jamaica, 71/- to 81/- per cwt.
COPRA—West Indian, £27 per ton.
COTTON—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 19*d.* to 24*d.*
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—48/- to 65/- per cwt.
ISINGLASS—No quotations.
HONEY—No quotation.
LIME JUICE—Raw, 1/7 to 2/1; concentrated, £18 17*s.* 7*d.* to £19; Otto of limes (hand pressed), 6/6.
LOGWOOD—No quotations.
MACE—2/4 to 2/6.
NUTMEGS—5½*d.* to 6*d.*
PIMENTO—Common, 2 13/16*d.*; fair, 2⅞*d.*; good, 2 15/16*d.*; per lb.
RUBBER—Para, fine hard, 4/8; fine soft, 4/7¾; Castilloa, 4/5 per lb.
RUM—Jamaica, 1/9 to 5/-.
SUGAR—Crystals, 18/6 to 21/6; Muscovado, 15/6 to 18/-; Syrup, 12/6 to 16/9 per cwt.; Molasses, no quotations.

New York.—Messrs. GILLESPIE BROS. & Co., May 3, 1912.

CACAO—Caracas, 12¼c. to 12¾c.; Grenada, 12c. to 12½c.; Trinidad, 12¼c. to 12¾c. per lb.; Jamaica, 10c. to 11c.
COCOA-NUTS—Jamaica, select, $22·00 to $24·00; culls, $14·00 to $15·00; Trinidad, select, $23·00 to $24·00; culls, $14·00 to $15·00 per M.
COFFEE—Jamaica, 14½c. to 17c. per lb.
GINGER—8c. to 10¼c. per lb.
GOAT SKINS—Jamaica, 50c.; Antigua and Barbados, 43c. to 45c.; St. Thomas and St. Kitts, 41c. to 42c. per lb.
GRAPE-FRUIT—Jamaica, $2·00 to $3·50.
LIMES—$8·00 to $9·00.
MACE—53c. to 56c. per lb.
NUTMEGS—110's, 11⅜c. to 11¾c.
ORANGES—Jamaica, $2·00 to $2·25 per box.
PIMENTO—3*d.* per lb.
SUGAR—Centrifugals, 96°, 3·98½c. per lb.; Muscovados, 89°, 3·48½c.; Molasses, 89°, 3·23½c. per lb., all duty paid.

Trinidad.—Messrs. GORDON, GRANT & Co., May 13, 1912.

CACAO—Venezuelan, $13·25 per fanega; Trinidad, $12·75 to $13·25.
COCOA-NUT OIL—98c. per Imperial gallon.
COFFEE—Venezuelan, 15½c. per lb.
COPRA—$4·50 to $4·75 per 100 lb.
DHAL—$3·90 to $4·00.
ONIONS—$2·50 to $4·00 per 100 lb.
PEAS, SPLIT—$7·00 to $7·25 per bag.
POTATOES—English, $2·00 to $2·75 per 100 lb.
RICE—Yellow, $4·70 to $4·80; White, $6·25 to $6·35 per bag.
SUGAR—American crushed, no quotations

Barbados.—Messrs. JAMES A. LYNCH & Co., Ltd., May 18, 1912; Messrs. T. S. GARRAWAY & Co., May 20, 1912; Messrs. LEACOCK & Co., May 10, 1912.

ARROWROOT—$6·50 to $7·00 per 100 lb.
CACAO—$11·00 to $14·00 per 100 lb.
COCOA-NUTS—$16·00.
HAY—$1·60 to $1·80 per 100 lb.
MANURES—Nitrate of soda, $65·00; Cacao manure, $45·00 to $48·00; Sulphate of ammonia, $80·00 per ton.
MOLASSES—No quotations.
ONIONS—$6·00 to $6·50 per 100 lb.
PEAS, SPLIT—$7·10 to $7·25 per bag of 210 lb.; Canada, $3·00 to $5·25 per bag of 120 lb.
POTATOES—Nova Scotia, $2·50 to $3·25 per 160 lb.
RICE—Ballam, $4·65 to $5·00 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
SUGAR—American granulated, $5·25 per 100 lb.

British Guiana.—Messrs. WIETING & RICHTER, May 11, 1912; Messrs. SANDBACH, PARKER & Co., May 10, 1912.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	—	—
BALATA—Venezuela block	No quotation	Prohibited
Demerara sheet	70c. per lb.	—
CACAO—Native	14c. per lb.	18c. per lb.
CASSAVA—	48c.	No quotation
CASSAVA STARCH—	$8·00	No quotation
COCOA-NUTS—	$16 to $20 per M.	$10 to $16 per M., peeled and selected
COFFEE—Creole	17c. per lb.	16c. per lb.
Jamaica and Rio	18c. to 18½c. per lb.	19½c. per lb.
Liberian	12c. per lb.	13c. per lb.
DHAL—	$4·00 to $4·50 per bag of 168 lb.	$4·50 per bag of 163 lb
Green Dhal	$4·50	—
EDDOES—	$2·40	—
MOLASSES—Yellow	None	—
ONIONS—Teneriffe	7c. to 8c. per lb.	—
Madeira	—	—
PEAS—Split	$6·75 to $7·00 per bag (210 lb.)	$7·35 per bag (210 lb.)
Marseilles	—	No quotation
PLANTAINS—	24c. to 60c.	—
POTATOES—Nova Scotia	$4·00	$3·75
Lisbon	—	No quotation
POTATOES—Sweet, B'bados	$2·88 per bag	—
RICE—Ballam	No quotation	—
Creole	$5·25 to $5·50	$5·50
TANNIAS—	$2·88	—
YAMS—White	$2·64	—
Buck	$2·40	—
SUGAR—Dark crystals	$3·30 to $3·40	$3·45
Yellow	$3·90 to $4·00	$4·25
White	—	—
Molasses	$2·90 to $3·00	—
TIMBER—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$3·75 to $6·00 per M.	$4·00 to $6·00 per M.
,, Cordwood	$1·80 to $2·00 per ton	No quotation.

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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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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.*

Seedling and other Canes in the Leeward Islands,
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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,
in 1902-3, No. 30, price 4*d.*; in 1903-4, No. 36, price 4*d.*;
in 1904-5, No. 42, price 4*d.*; in 1905-6, No. 47, price 4*d.*;
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in 1908-9, No. 64, price 4*d.*; in 1909-10, No. 68, price 4*d.*

SCALE INSECTS.

Scale Insects of the Lesser Antilles, Part I. No. 7, price 4*d.*;
Part II., No. 22, price 4*d.*

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AGRICULTURAL NEWS.

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IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

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CONTENTS.

The Interpretation of the Results of Field Experiments.

III.

THE last two articles on this subject were written for the purpose of indicating and describing the means by which the extent of the errors due to the methods adopted, in experimentation, may be determined. In the first, attention was given more directly to some of the ways in which such errors may arise; and emphasis was laid on the importance of the determination of the magnitude of these errors, in order that allowance may be made for them in arriving at an interpretation of the results of experiment.

The second article was devoted to a description of the way in which the chief kinds of information in regard to experimental error are obtained. It was shown, firstly, that the value of an average calculated from a series of experiments, in relation to its use in obtaining a definite result of the work done in conducting these experiments, may be determined in a simple way by the construction of a Frequency Curve, and directions for this were given shortly: attention was also paid to the kind of information with respect to the results themselves that may be obtained from the properties of a curve of the kind. Consideration was next given to the determination of the probable error of any one of the results; that is, to the ascertaining of the extent to which it may vary from the average, on account of the method of experimentation employed. This led naturally to the presentation of the method of finding the probable error of the average of all, or a certain number of, the results.

The matters dealt with then proceeded to the determination of the probable error of the difference between the results of two sets of experiments conducted in exactly the same way. In passing, it may be useful to remind the reader that the reason for making two such sets of experiments is to provide a means of estimating the value of the methods employed, and of gaining information as to the amount of dependence that may be placed upon the numerical results.

These means of obtaining checks on the results of observations and experiments made in the course of agricultural and other scientific investigation do not exhaust all the methods that have been devised for the purpose. They are, however, sufficient in scope for adoption in all ordinary cases. In practice, as a matter of fact, it is often found that the needs of investigations of the usual kind are supplied adequately by the employment of two of the methods of obtaining assistance in finding the true significance of sets of experimental results. These are the determination of the probable error, of the average and, less frequently, of the probable error of any one result. It is to these, therefore, that attention will be given shortly for the purposes of illustration from actual investigations that are being undertaken in the West Indies.

The particulars of the means of illustration that have been chosen for the special purpose are presented in the table printed after the conclusion of this article. In the first part of the table there are included, among others, the results of calculating the probable error of the average, and that of one experiment, in some of the sugar-cane investigations that have been conducted continuously at Dodds, Barbados, for the seventeen years 1894 to 1910. It is seen here that the differences obtained when nitrogen and when nitrogen and potash are supplied to plant canes in addition to pen manure are significant (that is outside of the limits of experimental error) particularly in the case of the latter method of manuring; while in the case of any one experiment, in regard to the addition of nitrogen alone, dependence cannot be placed on the numerical result, as this may be entirely due to the error of experiment. A similar conclusion is to be drawn from the figures given for the Leeward Islands, 1901-6 in the second part of the table, referring to the result of the employment of nitrogen (in artificial manure), potash and phosphorus, in addition to pen manure; the average of the results shows a gain of 3 tons of cane from the last-named method of manuring, whereas the probable error of the average in each case, is only 0·44 and 0·63. Further, the result of any one experiment is here again without significance; actually, in such a case, it is possible for the difference arising from the errors of experiment to be greater than that which may be expected from the addition of the manures.

It is instructive to compare the significance of the general results for the Leeward Islands (actually for Antigua and St. Kitts) with that of the results for one estate, for a period of years; this has been done in the third and last parts of the table, presenting figures obtained at Buckleys, St. Kitts, for plant canes during 1900-5, and for ratoons during 1902-7. Here, with plant canes, the probable error of the average is very much the same in amount as the differences that are made to be apparently due to the different methods of manuring, and it is evident without further consideration that there is nothing to be gained from the application of artificial manures to plant canes, under the conditions of the experiment. In view of what has been said, the figures showing the probable error of one experiment require no comment. The case of the trials with ratoons presents, however, very different features; here, basing the judgment on the figures for the differences for the manures and for the probable errors of the averages, alone, significant gains are indicated where artificial manures have been employed.

It may be well to explain that these conclusions have been stated solely for the purpose of illustration connected purely and simply with the determination of the experimental error of field trials. It is especially important that this fact should be realized as regards the results that are considered for plant canes, particularly with respect to the results in the first and second parts of the table. Here, the average differences are shown to be sufficiently large, as compared with the probable error of the averages, to be significant, when they are considered alone; but it is easy to understand that the matter is not complete until the value of the increase of cane indicated from the special method of manuring (with the probable error subtracted) is compared with the cost of the manures that may be regarded as the cause of the increase.

The assistance given by the mathematician to the experimenter, whether the work of the latter is connected with agriculture or not, has enabled him to gauge with accuracy the value of the results obtained by him and to test exhaustively their dependence. Practical agriculturists have not been slow to recognize this fact; and the determination of the experimental error is gradually becoming a matter of ordinary routine, in trials conducted both in the field and in the laboratory.

The table to which reference is made in the above article appears below. It presents results, for the purposes of illustration, calculated from data, chosen at hazard, given in the Annual Reports on Agricultural Experiments Conducted in Barbados, and in the Annual Reports on Experiments Conducted in Antigua and St. Kitts, for the years mentioned.

In the table, the numbers in brackets refer to the numbers designating the experiments as they are detailed in the reports. Further, N P and K denote experiments with artificial manures supplying chiefly nitrogen, phosphoric acid and potash, respectively.

It is to be understood that, for the purposes of illustration, the results given in the table have been reviewed in a perfectly general manner.

BARBADOS. 17 YEARS' EXPERIMENTS AT DODDS, 1894-1910.

PLANT CANES.

	Tons cane, average.	Difference.	Probable error of average.	Probable error of one experiment.
Pen manure	24·0	—	0·76	3·1
Pen manure, and 40 lb. N	27·4	3·4	0·83	3·4
Pen manure and 40 lb. N and 40 lb. K.	30·5	6·5	0.79	3·3

LEEWARD ISLANDS. AVERAGE OF EXPERIMENTS, 1901-6.

PLANT CANES.

(1) Pen manure*	24·8	—	0·14	4·8
(4) 40 lb. N and K and P	27·8	3·0	0·63	4·8

BUCKLEYS, ST. KITTS, 1900-6. PLANT CANES.

(1) Pen manure	32·3	—	0·96	4·7
(2) Pen manure	32·4	0·1	1·00	4·9
(6) N.P.K	33·9	1·6	1·40	4·9
(14) N.	32·4	0·1	1·53	5·3
(18) N.K.	34·5	2·2	1·60	5·5
(26) N.P.	34·1	1·8	1·35	4·7

BUCKLEYS, 1902-7. RATOON CANES.

(1) No manure	15.7	—	1.81	4·0
(2) Pen manure	17·5	1·8	2·12	4·7
(6) N.P.K.	21·2	5·5	1·11	3·5
(14) N.	22·0	6·3	1·11	3·5
(18) N.K.	22·1	6·4	1·31	4·1
(26) N.P.	20·9	5·2	1·47	4·7

In regard to the silk industry of Europe and Japan, a statement issued by the International Institute of Agriculture, Rome, is to the effect that the condition of the mulberry trees, during the past season was satisfactory in Austria, Croatia and Slavonia, and Japan, and bad in Italy. The quantity of silk worm eggs placed for incubation was in Austria 29·414 oz. of 30 to 36 grammes; in Bulgaria 14·336 hectogrammes or 96 per cent. of last year's figure; and Japan 521·000 hectogrammes, the latter being 102 per cent. of the amount placed for incubation last year.

*In the experiments in the Leeward Islands, No. (1) which is described in the reports as no manure actually receives, as plant canes, a dressing of pen manure. The manurial constituents referred to under the subsequent numbers are applied in addition to pen manure as received by No. (1). In ratoons, however, No. (1) actually receives no manure at all.

SUGAR IN THE UNITED STATES, 1911.

Sugar consumption in the United States in the calendar year 1911 exceeded that of any earlier year. The total quantity consumed in continental United States was, according to the latest estimate of the Bureau of Statistics, Department of Commerce and Labour, 7,670 million pounds, or an average of 81·78 pounds *per capita*, against the former high record of 81·19 pounds *per capita* in the fiscal year 1907.

These figures are official so far as relates to the quantity brought into continental United States during the calendar year from Hawaii, Porto Rico, the Philippines and from foreign countries. To this the Bureau has added the latest estimates of sugar produced in the country during 1911, and by subtracting the official figures of exports from the grand total of imports and domestic production obtains a total of 7,670 million pounds, or practically 82 lb. *per capita*, as the indicated consumption of the calendar year 1911. Ten years ago, in the fiscal year 1901, the indicated consumption was 5½ billion pounds, or 72 lb. *per capita*; twenty years ago, in 1891, 3¾ billion pounds, or 61 lb. *per capita*; thirty years ago, in 1881, 2¼ billion pounds, or 43 lb. *per capita*; and forty years ago, in 1871, 1½ billion pounds, or 36½ lb. *per capita*.

The import valuation of the sugar brought from foreign countries in 1911 was, speaking in round terms, $90,000,000; from the non-contiguous territories, $78,000,000; and the estimated value of that produced in continental United States, $90,000,000. The Bureau of Statistics estimates the duty paid on sugar imported from foreign countries in 1911 at $50,000,000.

One striking fact which comes to the surface in this study of sugar consumption in the United States is found in a comparison of production and growth in production of cane and beet sugar respectively. While exact figures of domestic production in 1911 have not yet been completed, the latest and best available estimate puts the production of beet sugar at 1,105 million pounds, and that of cane sugar at 700 million pounds, the production of beet sugar thus exceeding that of cane sugar by more than 50 per cent. Prior to 1907, the production of beet sugar was never as great as that of cane sugar. In 1901 the quantity of beet sugar produced was less than one-third that of cane; in 1906 it nearly equalled that of cane; in 1907 it exceeded that of cane, and has continued greater in each year since that time, being in the year just ended, as above indicated, more than 50 per cent. in excess of the cane sugar produced.

Approximately one-fourth of the sugar consumed in the United States is of domestic production, another quarter is brought from the non-contiguous territories, and the remainder from foreign countries, chiefly Cuba, from which the importations in the calendar year 1911 were 3,193 million pounds out of a total of 3,732 million pounds from all foreign countries. The next largest foreign contribution to the sugar supply of the United States was the Dutch East Indies—353 million pounds in 1911. The contributions from islands belonging to the United States were, from Hawaii, 1,136 million pounds; Porto Rico, 654 million; and the Philippines, 402 million; and of sugar produced in continental United States, 1,105 million pounds from beets, and from cane, 700 million pounds, the figures of domestic production being necessarily estimates. (In the *Modern Sugar Planter* for March 2, 1912; from a Special Report of the United States Department of Commerce and Labour.)

FRUITS AND FRUIT TREES.

THE KEEPING QUALITIES OF LIME JUICE.

The following report by Mr. G. A. Jones, Assistant Curator, Dominica, dealing with work conducted by him for the purpose of investigating the keeping qualities of three grades of lime juice, stored in open casks under conditions similar to those in lime factories in the island, has been received through Mr. J. Jones, Curator of the Dominica Botanic Station:—

In November last it was decided to start observations to determine the loss (if any) which occurs in the storing of lime juice in open vats.

These observations were made for a period of fifteen weeks, and as this is considerably in excess of any time which is likely to be required for the handling of raw juice on any estate in Dominica, I think it advisable at this stage to bring the observations to a close and to present a report on the results.

Three different strengths of juice were obtained, namely strong (S), medium (M) and weak (W), the last being press juice. Sixteen gallons of each were placed in a wooden cask, and left exposed in a large, airy building.

Samples of the juice were taken and tested at the commencement, and at fairly definite intervals, with the following results as given in the table:—

Interval from first testing, weeks.		—	2	4	6	8	10	12	15
Acid, oz. per gal.	S	12·3	12·2	12·17	12·12	12 06	11·8	10 8	10·1
	M	11·8	11·5	11·4	11·36	11·2	10·2	9·6	8·1
	W	9·5	8·7	6·3	2·9	2·68	2·2	1·8	0·65
Acid, gr. per oz.	S	33·6	33·4	33·3	33·1	33·0	32·3	29·5	27·6
	M	32·3	31·5	31·2	31·1	30·6	27·9	26·3	22·2
	W	26·0	23·8	17·6	7·9	7·3	6·0	4·9	1·8
Acid lost, per cent.	S	—	0·89	1·3	1·7	2·2	4·0	12·4	17·8
	M	—	0·98	3·1	3·6	5·0	13·5	18·6	31·3
	W	—	8·00	33·0	69·3	71·7	76·8	81·2	93·1

The dates of testing were November 4, 20; December 4, 18; 1911; and January 3, 15, 31; February 19; 1912.

From these figures it will be seen that the weak juice has deteriorated much more than the other two. In four weeks 33 per cent. of the acid was lost, in six weeks 70 per cent. and in fifteen weeks 93 per cent.

A good average juice testing 12·3 oz. per gallon may, it seems, be kept for a considerable time without any serious loss of acid; when stored for six weeks it lost only 1·7 per cent. On storing for twelve weeks, however, the loss became rather heavy, namely 12 4 per cent., and in fifteen weeks 17·8 per cent.

The medium juice behaved as one would expect from the above. The loss in six weeks amounted to 3·6 per cent, in twelve weeks 18 9 per cent., and in fourteen weeks 31·0 per cent.

These observations have shown:—

(1) That a good average juice may be stored for a considerable time without any serious loss of acid.

(2) That the weaker juices, such as those obtained from presses, should be dealt with without delay.

It is intended to carry on similar experiments with juice stored in closed casks, and also to determine the effectiveness of the various preservatives which may be in use.

AGRICULTURE IN THE LEEWARD ISLANDS, 1910-11.

The year 1910-11 may, on the whole, be said to have marked a period of considerable progress and activity in agricultural matters.

Sugar cultivation is the largest and most important of the agricultural industries of the Colony and constitutes the principal source of revenue in Antigua and St. Kitts. In both Presidencies the year 1910-11 may be said to have been fairly propitious for sugar cultivation.

The sugar export of Antigua during the year amounted to 13,488 tons, of which 6,397 tons were 96° grey crystal sugar and 7,091 tons muscovado. The central sugar factory at Gunthorpes manufactured 5,400 tons of crystals, taking 8·95 tons of cane to make one ton of sugar, while the Bendals Factory was responsible for 1,015 tons of crystals.

The export from St. Kitts amounted to 12,330 tons, consisting almost entirely of muscovado sugar.

At the present time, the sugar industry of Antigua is somewhat severely handicapped by the wide-spread prevalence of root disease of sugar-cane (*Marasmius sacchari*). The disease is somewhat difficult of recognition, especially as its intensity is greatly affected by external conditions. The importance of the disease as a controlling factor in sugar-cane cultivation is gaining in appreciation, but it is only where it is completely recognized that remedial measures can be applied with real prospects of success.

Peasant canes have continued to be purchased at the Gunthorpes and Bendals factories in Antigua During the year the former purchased 3,542 tons, and the latter 4,176 tons of peasants' canes. There is no doubt that the provision of an adequate market for peasant-grown cane has had a considerable effect in improving the position of the peasantry in Antigua.

The year may, on the whole, be said to have been distinctly satisfactory as regards the cotton industry. As the outcome of the favourable results obtained in the previous year, considerable increases in the area planted under the crop occurred in all the Presidencies.

Moderately favourable weather was on the whole experienced, and satisfactory yields were almost everywhere obtained. A notable feature of the season was the relatively small prevalence of insect pests. Prices declined somewhat from the high value of those in the previous year, and during the earlier months of 1911, owing to trade depression in England, the product was difficult of sale. At the time of writing the bulk of the crop has been disposed of at fairly satisfactory prices.

The cultivation of limes continues to occupy the position of principal agricultural industry in Dominica, and further expansion has once again to be recorded. The crop for the year was 369,000 barrels, an increase of 85,000 barrels over the crop of 1909. This remarkable increase is partly attributable to the coming into bearing of young plantations established within recent years. Considerable efforts continue to be made by the Permanent Exhibition Committee of Dominica to popularize limes in England and Canada by means of judicious advertisement and representation at exhibitions. The export of citrate of lime amounted to 5,194 cwt., valued at £16,880; this showed an increase of 1,747 cwt. over the export of 1909.

In Montserrat, the total exports of lime products were valued at £9,000. Trouble continued to be experienced in connexion with scale insect pests.

In Antigua interest in the crop continues to grow, and considerable increases are being made in the area planted under the crop, especially in the southern district of the island. In Nevis also, interest in the crop continues to grow, while in the Virgin Islands attempts are being made to foster the growth of a small industry.

In Dominica the cacao crop amounted to 11,012 cwt., valued at £23,769, a small increase over the exports of the previous year. Small exports of cacao were again made from Montserrat.

Interest continues in the possibility of cacao production in suitable localities in St. Kitts and Nevis. The plantations are small in area: that in St. Kitts has been slightly extended, but the total amount of land suitable for this form of cultivation is relatively small.

Rubber-growing is now attracting considerable attention in Dominica. Trials have shown that the Para rubber tree (*Hevea brasiliensis*) grows well under the conditions obtaining in many localities; an appreciable area has already been established under the crop, and this is being considerably extended. It is hoped that this form of cultivation may prove especially suitable to the conditions obtaining in the interior lands of the island.

The cultivation of coco-nuts continues to attract attention in Antigua and Nevis. About 200 acres have already been established under the crop in each of these islands, and the area is being extended. The older trees present a promising appearance, especially in Nevis, where they are now coming into bearing. Should these pioneer plantations prove financially successful, it appears probable that they may lead to considerable further developments in this direction in the future, as the Colony possesses considerable areas of land at present in waste, which appear likely to be well adapted to this form of cultivation.

The possibilities of vanilla cultivation on a systematic basis are now engaging some attention in Nevis and Dominica, and small trial plantations have been established; the development of these attempts will be watched with interest.

Onion cultivation for export continues to be carried on with success as a small industry in Antigua. The onions are chiefly grown as a catch crop on land prepared for cane planting. In the other islands onions are raised in small quantities, chiefly for domestic use. (From *Colonial Reports*—Annual, No. 711, p. 10.)

CARBON ASSIMILATION IN PLANTS.

The leaf of a plant has been likened to a factory engaged in elaborating complex substances from the simple raw materials supplied to it. In the case of the carbohydrates, the final product, starch, and the simple raw materials, carbonic acid and water, are known definitely, but there is some uncertainty as to which of certain sugars are formed as intermediate products of assimilation. It is now some years since Brown and Morris brought forward experimental evidence, based on the study of Tropaeolum, to prove that the first sugar to be synthesised by the leaf is cane sugar. When the concentration of this sugar exceeds a certain amount, it is transformed into starch, which is a more stable and permanent reserve material than sucrose. These conclusions have not escaped criticism, but it is only recently that fresh experimental evidence on the subject has been obtained by Parkin, in England, and Strakosch, in Austria. Parkin selected the snowdrop for his experiments, choosing it because it is one of the few plants which do not elaborate starch in their leaves. It is therefore a more simple material for investigation than the Tropaeolum. Parkin comes to the same conclusion as Brown and Morris, namely that cane sugar is the first product formed. Subsequently it is broken down by an enzyme in the leaf into the more simple sugars dextrose and levulose, which according to the older views of Sachs and others, are those first formed in the leaf The older view, however, has received some confirmation in the work of Strakosch, carried out with the leaves of the sugar beet. Using a somewhat different method for determining the sugars from that employed by the English workers, he claims that dextrose is the first sugar to appear, part of it soon becoming transformed into levulose, and the two combining to form cane sugar. Starch is only formed when a considerable quantity of cane sugar has accumulated in the leaf sap. The cane sugar produced in the leaf of the beet travels in this form to the root to be stored; in the Tropaeolum, Brown and Morris considered that cane sugar is not translocated as such, but in the form of its simple components—dextrose and levulose. A similar conclusion is reached by a study of the beet in the second year of growth. The cane sugar stored up in the root is translocated to the growing parts as a mixture of dextrose and levulose, which are recombined on reaching their destination. The evidence at present seems to favour the retention of the view expressed by Brown and Morris; but it is evident that the problem is not fully solved. (The *Gardeners' Chronicle*, April 20, 1912.)

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date May 20, with reference to the sales of West Indian Sea Island cotton :—

Since our last report the sales of Sea Island cotton have been confined to about 20 bales of St. Vincent at 22*d.* to 22½*d.*

Consumers who have supplied their immediate wants are not eager buyers at the moment, but we think the remainder of the crop will all be wanted before the season is out.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending May 18, is as follows:—

There was some enquiry this week, and Factors conceding to the views of buyers, it resulted in sales of several crop lots and of odd bags brought over from last season, amounting in all to about 200 bales, which will be officially reported next week. A good proportion of the remaining stock, however, is still being held at higher prices, above the views of buyers.

We quote, viz:—

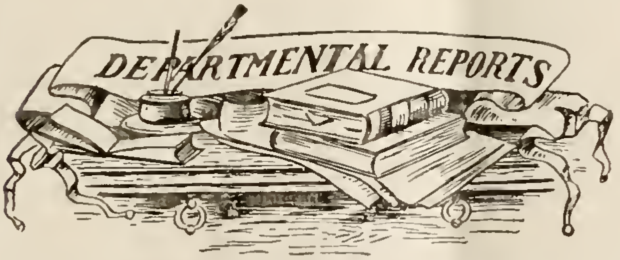
Extra Fine	30c. to 32c. = 17*d.* to 18*d.* c.i.f., & 5 per cent.	
Fully Fine	28c. to 29c. = 16*d.* to 16½*d.*	,, ,, ,, ,,
Fine	26c. = 15*d.*	,, ,, ,, ,,
Fine to Extra Fine, off in preparation	18c. to 25c. = 10½*d.* to 14¼*d.*	,, ,, ,,

Consumption of Egyptian Cotton in the United States.—In 1892-3 the mill-owners of the United States used 42,475 bales of 750 lb. each. In the 'boom' year of 1906 the consumption was 122,806 bales, the highest on record. It fell off after that, but last year it reached 122,525 bales. The total number of bales used in Great Britain is from about 320,000 to 325,000 bales a year, or about one-half of the total bales of Egyptian cotton spun annually throughout the world. Taking one year with another, Germany makes use of about the same quantity as the United States. France's share is from 60,000 to 70,000 bales a year, while Russia gets through 50,500 bales, Austria over 30,000, Switzerland about 22,000; all other countries vary from about 220 bales, as in Belgium, to 16,000 or 17,000 bales, as in Italy. England, therefore, is still a long way ahead of other countries in the spinning of Egyptian fibres. At the end of 1910 there were 12,508,873 spindles using this cotton, while Germany had only 1,233,078 and France 1,390,147, as shown in the returns of the International Cotton Spinners' Federation. (The *Textile Mercury*, April 6, 1912, p. 257.)

Cotton-Growing in Jamaica.—The Secretary submitted statements of the results of the various experimental plots of cotton grown in Trelawny, St. Ann and St. Elizabeth. Also the results of shipping the cotton produced and other lots purchased at 3*d.* per lb. from small growers in St. Elizabeth, ginned by Mr. Conrad Watson, and marketed along with his own, but marked separately. The cotton fetched 1*s.* 3*d* per lb. in London, and freight, being now per ton measurement, worked out at 1*d.* per lb.; still the result showed a net return of ½*d.* per lb. on the seed cotton purchased at 3*d* Later, through Mr Watson's representation, the Royal Mail Company reduced the freight from 47*s* 6*d.* to 17*s.* 6*d.* per ton measurement, and gave a refund, making the net return 1½*d.* per lb.

It was resolved to discontinue any further effort to encourage cotton-growing in the dry sections at St. Ann and Trelawny, as people had not responded in these districts, but to concentrate effort on St. Elizabeth, Portland, Vere, where fair crops had been got in spite of a series of very dry seasons, and where the people were taking well to this crop. From the money at credit to cotton account it was decided to offer prizes of £2 and £1 on the best grown cultivations of cotton of not less than half an acre in the districts of St Elizabeth and Portland, Vere. (The *Journal of the Jamaica Agricultural Society*, March 1912.)

Cotton Cultivation in Turkestan.—The Russian Government has been assisting in many ways the growers of Trans-Caspian cotton. It appears from official reports that, in the autumn of 1910, the Agricultural Department organized the first cotton seed plantation in Turkestan. In 1911 one such station was working in the Namangansk district of the Ferghana Oblast, covering an area of 53 dessiatines (about 143 acres). Here, three systems of cultivation were applied: first, by machinery only, the seeds being sown in rows, and the soil between the rows ploughed; secondly, by using both machinery and hand labour for sowing, but working the soil between the rows; thirdly, by manual labour only, the natives being employed. The best results, from the point of view of an abundant crop, were achieved by relying entirely on machinery, the results being 3,190 lb. per acre for machinery, 2,058 lb. per acre for machinery and labour, and 1,823 lb. per acre for hand labour alone. Manure was used in the first instance only. The average crop of cotton obtained on the plantation amounted to 1,367 lb. per acre, but a second crop of 200 lb. to 270 lb. is expected, so that the average for the station for 1911 may be estimated at about 1,600 lb. (From the *Journal of the Royal Society of Arts*, April 26, 1912.)



ST VINCENT: REPORTS ON THE BOTANIC STATION, AGRICULTURAL SCHOOL, LAND SETTLEMENT SCHEME, AND OF THE GOVERNMENT VETERINARY SURGEON, 1910-11.

Some of the first matter of interest contained in the report on the Botanic Station is concerned with the condition of the garden and with particulars of striking plants that have been introduced, or have flowered or fruited. It is stated that the continued spread of scale insects was a matter for concern; control is specially difficult because of the presence of these pests in large quantities, in the forest behind the Garden, up to a height of nearly 2,000 feet. In spite of the presence of the chief West Indian insect and fungus parasites of scales, with the possible exception of *Ophionectria coccicola*, the pests are not kept under control, and special efforts in the introduction of the fungus parasites from Dominica have not yet brought about any useful improvement.

It does not appear that *Manihot dichotoma* and *M. piauhyensis* will be successful under the conditions of trial. The trees of *Hevea brasiliensis* have flowered for several years in succession, but have not produced any seed. *Castilloa elastica* has shown great susceptibility to attacks by scale insects and mealy-bug, and the plants have been removed and replaced by *Hevea brasiliensis*. It is not considered desirable under present conditions to recommend any extensive planting of Castilloa in St. Vincent. Other interesting plants which receive attention include the mangosteen, a species of Tecoma, pimento, and *Michelia Champaca*, the last of which produces in profusion delightfully fragrant flowers; it is the champak of Shelley's *Indian Serenade:—*

'The champak odours fail
Like sweet thoughts in a dream.'

The large attention that is given by planters to the cotton and arrowroot industries prevents the distribution of plants from the station from being either large or varied, the number of economic plants sent out during the period under review being 4,340; of these 4,003 were cacao, and the next largest distribution—126—rubber: there were also miscellaneous plants, as well as a certain amount of produce and seeds that were sold.

The particulars given concerning the rainfall show that the amount recorded at the Botanic Station during 1910 was 104·03 inches, which is 1·25 inches below the average of the past seventeen years. Particulars of the rainfall for the past twelve years indicate that the driest months are February, March and April, and the wettest June and October, each of the last having an average precipitation exceeding 10 inches.

In regard to exhibitions, St. Vincent was well represented at the Canadian National Exhibition held in August 1910, and at the Dominion Exhibition at St. John, N.B., in September of the same year, and a very favourable report on the exhibits was received. Following instructions from the Imperial Commissioner of Agriculture, samples of Sea Island seed-cotton and lint from St. Vincent have been forwarded for exhibit in the Colonial Products Section of the Imperial Institute. Connected with such effort, a useful example that might well be followed more commonly is the maintenance of a show case by the Agricultural Department, at the Public Library, in which are placed from time to time samples of the different products of the Colony.

The details concerning implemental tillage given in the previous report are supplemented by information bringing the matter up to the date of writing.

The notes on agricultural industries are concerned mainly with cotton, and it is shown that the export of Sea Island and Marie Galante lint, during the period under review, was 540,339 ℔., valued at £41,836, as compared with 394,667 ℔. valued at £26,775, in 1909-10. Since 1903-4 the total exports from St. Vincent of these two kinds of cotton have, to the date given, amounted to 2,392,884 ℔. having an estimated value of £160,407. During the past three years, there has been a steady increase in the yield of lint per acre, the amount stated being a return of 156 ℔. In this section of the report are contained interesting details concerning legislation in regard to the cotton industry, labour-supply for cotton-growing, peasant cotton-growing, selection for improvement, and pests and diseases.

It is shown in the section dealing with the starch industry that the output of arrowroot for 1910 was valued at £30,089, the weight produced having been 5,302,725 ℔; the similar figures for 1909 were £31,792 and 5,594,498 ℔. The export of cassava starch was 138,112 ℔. value £781, as compared with 195,166 ℔. value £1,009, in 1909. Samples of meal and starches have been sent to Canada for examination, and arrangements were made to acquire a small experimental plant for conducting investigations in regard to these. The exports of cured cacao showed a decrease, notwithstanding the existence of a progressive annual increase in the previous five years; the diminished output was caused chiefly by an outbreak of thrips in several of the plantations: the actual export during 1910 was 235,236 ℔, as compared with 241,294 ℔. during 1909.

The report on the Agricultural School shows that the average number of boys receiving instruction during 1910-11 was about 19; the examiner's reports on the half-yearly examinations were, on the whole, satisfactory. This section of the reports contains an account of work of collecting certain new species of insects, done by the Resident Master.

The usual information is included in the report on the Land Settlement Scheme and Agricultural Instruction. This would tend to show that the efforts of the Agricultural Instructor had been successful in bringing about improvements in estate and peasant cultivation, in several of the districts.

The Veterinary Surgeon states that the number of inoculations against anthrax during the period was 7,550, making a total of 3,725 head of stock fully treated with the vaccine. A short history of anthrax in St. Vincent is included, and information concerning various disorders of stock is succeeded by detailed statistical tables concerning the incidence of anthrax in St. Vincent.

It is placed on record that the *Bulletin du Jardin Botanique de Buitenzorg*, Series 2, No. 3, contains the continuation of observations of Cecidomyiid and other galls on plants. The first part of the work was published in the journal *Marcellia*, Vols. VIII, 1909, to X, 1911.

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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NOTES AND COMMENTS.

Contents of Present Issue.

This number contains the third of a series of editorial articles entitled The Interpretation of the Results of Field Experiments. Its purpose is to recapitulate and illustrate shortly the matters that were brought forward in the former articles.

Page 180 sets forth an account of work that has been carried out in Dominica in regard to the keeping qualities of lime juice of various strengths when it is stored for periods extending to fifteen weeks.

On the same page, there is also the commencement of an article describing agricultural conditions in the Leeward Islands during the period 1910-11.

An article on page 183 reviews the reports on the various agricultural institutions in St. Vincent, issued as a departmental report, for the period 1910-11.

The Insect Notes, on pages 186 and 187, contain illustrated articles dealing with the arrowroot worm, and an explosion of carbon bisulphide under a special condition which is described.

The condition of agriculture in British Guiana is described shortly in an extracted article on page 187.

On page 190 are presented the Fungus Notes, dealing with the general treatment of root diseases of permanent crops. The subject is taken up in a broad manner, and much practical advice is given in connexion with the means to be employed.

Characteristics of a Hybrid Hevea.

Through the courtesy of Mr. H. C. Pearson, Editor of the *India Rubber World*, a description has been received of the main characteristics of the hybrid Hevea that is supposed to be a cross between *Hevea brasiliensis* and *H. confusa.*

It appears that the hybrid branches much more abundantly than either of the plants from which it is considered to have originated; the leaves are larger, broader, and with a point showing a slight curve between the apex and the leaf proper. The bark of the hybrid is thin; wound response is not continuous, and the rubber is short and very resinous. After plants of it have been tapped and the latex removed, the wounds are apt to discharge a greenish, sticky resin, which runs down the bark.

It is not possible at present to make any definite statements in regard to the identification of seedlings of the plant. The opinion of Mr. Pearson is, however, that there will be found eventually to be differences in venation that will permit the hybrid to be identified, even as a seedling.

Effects of Different Proportions of Lime and Magnesia in Some Soils.

An account of a large number of experiments dealing with this matter, conducted during 1907, 1908 and 1909 on six different types of soil and with eight different crops, receives attention in the *Experiment Station Record* for December 1911, p. 725.

As regards the yield from the plants grown, it was found that, even when the proportions between the lime and magnesia were varied largely, there was no effect on the return. Thus the investigations did not give support to Loew's supposition that the power of plants to produce crops depends in a very definite way on the ratio between the amounts of lime and magnesia in the soil. It may be stated, in passing, that information concerning this theory, and details of other matters connected with it, may be found in the *Agricultural News*, Vols. IX, p. 95 and X, pp. 60 and 328.

The behaviour of plants toward lime and magnesia varied with the kind of plant, and even when these substances were added to soils containing very small amounts of them, no increase in yield was obtained so that the conclusion is reached that the same plants must be studied in the same soil for several consecutive years before definite results can be gained. Another interesting conclusion of a general nature was to the effect that, although substantially the same yields may be obtained from plants on different occasions, the amounts of lime, magnesia and phosphoric acid contained in them may vary greatly.

With respect to matters that are of more isolated importance, it was found that the usefulness of lime in growing mustard is dependent on other factors, in addition to the nutritive value of that substance. Again, the observation was made that the lime content of grain is much smaller than that of straw; there is more magnesia than lime in the former, while the opposite condition obtains in regard to straw. Further, the composition of straw is more susceptible to changes in the amounts of lime and magnesia than is that of grain.

When the manures applied were rich in magnesia and poor in lime, the lime content of the crop was lowered, while there was an increase in its content of magnesia and phosphoric acid. In determining the exact relation of lime and magnesia in the soil, the varying solubility and absorption of the manures supplying them must be considered.

A last matter of more general interest is that, as with the higher plants, no distinct proportion of lime to magnesia, which was particularly favourable to development in the case of bacteria, was found.

Removal of Cattle from St. Vincent to the Grenadines.

The St. Vincent *Government Gazette* for April 18, 1912, publishes a Regulation, made by the Governor-in-Council on April 16, 1912, in the place of Regulation No. 10 of the Regulations made by the Governor-in-Council on August 26, 1909 (see St. Vincent *Government Gazette*, September 9, 1909), under the authority of the Cattle Diseases Prevention Act, 1869. By the new Regulation the old one is revoked, and the former substituted for it as follows:—

'No animal shall after the date of these Regulations be removed to any of the Grenadines Islands within the Government of this Colony from the Island of Saint Vincent unless the same shall have been vaccinated by a Government Vaccinating Officer as a precaution against Anthrax not less than fourteen days and not more than twelve months prior to such removal, or unless it is accompanied by a certificate signed by the Government Veterinary Surgeon to the effect: (a) that such animal has been taken from an area in which there has been no case of anthrax for fourteen days immediately prior to shipment; (b) that such animal was not taken through an area infected with anthrax while being conveyed to the vessel for shipment, and (c) that the fodder put on board for the use of such animal has not come from an area infected with anthrax.'

Plant Protection in Papua.

A Plant Diseases Ordinance was put into effect in Papua during last year, and according to the Territory of Papua *Government Gazette* for February 7, 1912, a Proclamation has been made by the Lieutenant-Governor declaring that certain diseases and insects shall be regarded as diseases and insects within the meaning of the Ordinance.

The diseases mentioned are as follows: of coco-nuts—leaf disease, root disease, bleeding disease and bud rot; of rubber—root rot; of sugar-cane—leaf disease and red rust.

The insects that are mentioned are the following: affecting coco-nuts—the Solomon Islands stag beetle (*Eurytrachelus pilosipes*), Solomon Islands elephant beetle (*Xylotrupes nimrod*), Solomon Islands rhinoceros beetle (*Trichogomphus semilinki*), Ceylon rhinoceros beetle (*Oryctes rhinoceros*), red beetle or Asiatic palm weevil (*Rhynchophorus ferrugineus*), cane beetle (*Sphenophorus obscurus*), small palm weevil (*Calandra taitensis*), cabbage beetle or leaf hispa (*Brontispa froggattii*), copra bug (*Necrolia rufipes*), the longicorns *Xixuthrus costatus* and *Olethrius tyrannus*, phasma or leaf insect (*Graeffer* [Lopaphus] *cocophagus*), stink bugs (Pentatomidae).

Proceeding, the proclamation refers in the same way to the following insects: affecting rubber—white ants (*Termes* sp.); affecting sugar-cane—cane beetle (*Sphenophorus obscurus*), leaf hoppers including *Perkinsiella vastatrix*, *P. lalokensis*, *P. rattlei*, *P. variegata*, *P. bicoloris*, *P. papuensis*.

In regard to the diseases, the proclamation mentions the following under the heading Fungi: of coconuts—*Pestalozzia palmarum* and *Pythium palmivorum*; and of rubber—*Fomes semitostus*.

A Handsome Flowering Plant.

There may be seen in the Dominica Botanic Garden a specimen of *Baikiaea insignis*, which is a plant belonging to the family of pod-bearing plants (Leguminosae), and is noted for the size of its flowers. Information concerning this plant may be found in the Reports on the Dominica Botanic Station for 1907-8, 1908-9, and 1909-10, and in the *Agricultural News*, Vol. VIII, p. 405.

The following interesting details regarding *Baikiaea insignis* are also given in Einige Nutzhölzer Kameruns, published as appendixes to *Notizblatt des Königlischen Botanischen Gartens and Museums zu Dahlem* (Appendix XXI, No. 2). The tree reaches a height of about 60 feet; it is provided with short pinnate leaves which bear very stiff, naked, large, elongated leaflets which are often alternate: there may be two or three pairs, or only one. The white flowers are in short racemes, and are among the largest and most splendid flowers of the Leguminosae. The thick calyx is provided with velvety hairs, and is more than 3 inches long; the petals are broadly oblanceolate or inverted egg-shaped spatulate, and reach the considerable length of over 6 inches.

The account goes on to say that this beautiful flowering tree was discovered originally in Fernando Po (in the Gulf of Guinea), and among much additional information, states that it has also been collected near Lolodorf (in Kamerun), where it was found as a bushy tree 36 to 60 feet high, with a brownish-grey bark, glassy, bright-green leaves, and a not very hard wood. A very similar plant to *B. insignis* is *B. minor*, which only differs in the possession of smaller flowers and more pairs of leaflets.

INSECT NOTES.

THE ARROWROOT WORM.

The arrowroot worm (*Calpodes ethlius*)—see Fig. 1—is known in the United States as the larger canna leaf-roller, and this name appears as the title of an interesting circular (No. 145) by F. S. Chittenden D. Sc., issued by the Bureau of Entomology of the United States Department of Agriculture.

Calpodes ethlius attacks canna plants in the West Indies, but is better known as a pest on account of the injury which it sometimes causes to arrowroot. References to this insect have appeared in previous numbers of the *Agricultural News*.

The larvae protect themselves during the entire larval period by rolling over a portion of the margin of the leaf to form tunnels, within which they live and feed.

FIG. 1. MOTH OF THE ARROWROOT WORM.

Attention was attracted by this insect during 1911 because of the unusual abundance of its occurrence in several localities in the Eastern States. The following information is abstracted from the circular mentioned above.

This insect has been known as a pest of cannas in the United States since 1904, occurring in considerable numbers in certain of the years of this period, and being much less abundant in others. The injury has been the result of the feeding of the larvae, which causes a very ragged appearance of the leaves that detracts greatly from the value of the canna as ornamental plants.

It has been found that the eggs, which are deposited singly on the surface of the leaf, require from four days in Florida to six days in Washington, D.C., for hatching.

The larva moults five times before pupation. The pupa is attached to the leaf by means of a silk band, within the resting place formed by the rolled up leaf margin.

Many of the eggs are parasitized by *Trichogramma pretiosa*.

The larger canna leaf-roller is a tropical insect, and it is not believed that it can withstand the temperature which prevails during the winter in the latitude of Washington. The attacks in successive seasons depend therefore on the migrations of the adult insects from the more southerly localities in which it occurs. As there are three or four generations in a season, the insect is capable of increasing to considerable numbers, between the advent of spring and the beginning of cold weather.

The remedies which have been found useful for the control of this insect are hand picking or crushing of the larvae and pupae in the rolled-up leaves, and the use of arsenical poisons such as Paris green and arsenate of lead applied in the form of sprays. The only objection to the use of these on ornamental plants in parks and gardens, is the fear that children may pick the leaves and by putting them in their mouths, suffer from poisoning; but this danger is small.

A CARBON BISULPHIDE EXPLOSION.

For several years past carbon bisulphide has been extensively used as a fumigant for destroying insects in grain, and in the ground.

One of the cautions always expressed in connexion with the application of carbon bisulphide refers to its highly inflammable nature, and the likelihood of an explosion if any flame, or even glowing matter, such as that at the end of a lighted cigar, pipe, or cigarette, is brought into contact with the fumes, when these have become mixed with air.

An article which appeared in the *Journal of Economic Entomology*, Vol. IV, No. 6, gives an interesting account of an explosion which occurred in Alabama, as a result of applying carbon bisulphide to grain which had been stored while wet, and in which fermentation had commenced.

The following is an abstract of the article already mentioned, which was written by Dr. W. E. Hinds, Entomologist, Alabama Experiment Station.

In the southern part of Alabama, the black, or rice weevil (*Calandra oryza*)—shown at Fig. 2—is a serious pest of stored Indian corn, and in order to reduce the seriousness of these attacks, carbon bisulphide is used to a very large extent, and with good results in most instances

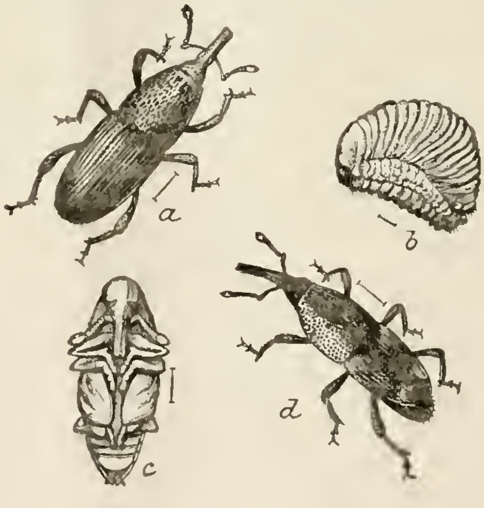

FIG. 2. (*a*) GRANARY WEEVIL; (*d*) RICE WEEVIL.

The farmers in this section believe that by storing the corn with the husk on the ear they reduce the amount of injury by weevils, and, consequently, this is the usual practice.

In the case under consideration, a large amount of corn, about 1,200 bushels, was collected in one day, when the weather was too wet for cotton-picking, and stored in one mass in a room with a capacity of some 2,400 cubic feet.

The building in which it was stored was constructed for the purpose, the walls being of concrete, while the partitions and ceilings were made with tongued and grooved boards, forming a very tight enclosure.

One week after the corn was placed in the concrete building, 30 lb. of carbon bisulphide was placed in several dishes on the surface, and the workmen made their way out as quickly as possible.

The door was immediately closed and locked, and the owner and a helper commenced to paste paper over the cracks around the door. Before this could be finished, an explosion occurred, which blew off the door and threw the men to a distance of about 30 feet. Fire immediately followed the explosion, and in spite of the convenient presence of a good supply of water, and the energetic efforts of a large force of men, it was found very difficult to extinguish it.

The force of the explosion produced large cracks in the concrete walls, which were a foot or more in thickness, and blew out wooden partitions; one of the men standing outside near the door, when the explosion occurred, was rather severely burned by the flames.

A careful investigation of all the circumstances attending the explosion indicated that it was practically impossible that it could have resulted from the presence of any fire, or similar cause, and it was concluded that the heat of fermentation in the interior of the mass of corn must have been great enough to have caused the carbon bisulphide to ignite. It is known that, at a temperature of from 295°F. to 300°F., carbon bisulphide will burst into flame, and it is not doubted that this temperature may have been equalled, or even exceeded, in the case under discussion.

Serious accidents have not often resulted from the use of carbon bisulphide during fumigation. It is recorded, however, that a workman caused an explosion in nailing the cover on a packing case, the contents of which had been heavily treated with this insecticide. The impact of the hammer on the nail produced a spark sufficient to ignite the escaping fumes, and the flame thus caused was communicated to the interior of the packing case.

In addition to the cautions given heretofore with regard to the danger from fire, from artificial light of all kinds, from the spark caused by turning electric light off or on and from electric fans, that arising from the heat of fermentation in masses of grain will have to be mentioned in future.

AGRICULTURE IN BRITISH GUIANA, 1910-11.

The various public agencies for the improvement of agricultural efficiency continued their work during the year.

The area under cane was 69,736 acres. The cane cultivation suffered in certain districts to such an extent from the ravages of insect pests that it has been decided to secure the services of an economic biologist* for the Department of Science and Agriculture.

The experimental cultivation of varieties of cane was continued by the Board of Agriculture, and in the sugar plantations the area planted with varieties of cane other than the Bourbon increased from 39,850 acres to 45,484 acres, about 65 per cent of the total area under cane cultivation.

RICE. The area under rice has increased in late years and amounted to 31,680 acres last year; but owing to various causes of a temporary nature there was a decrease of 6,174 acres on the area cultivated in 1908-9. Attention is being given to the cultivation and reaping of it by mechanical means, but this method can only be said to be on trial so far as this Colony is concerned. The rice grown is of excellent quality. In the opinion of the Director of Science and Agriculture there is an enormous area of the front lands of the Colony pre-eminently suitable for the cultivation of rice.

CACAO. The area under cacao has not increased and is about 2,200 acres. The export fell from 75,355 lb. in 1909-10 to 46,347 lb. this year This may, however, to some extent be explained by an increased local consumption in the shape of sweets, and otherwise. There is an extensive belt of land in the Colony well suited for cacao.

RUBBER. The practical interest in the prosecution of the rubber industry referred to in the report for 1909-10 continues in an increased degree, and a large number of inquiries have been made in regard to indigenous latex-producing plants. The Government Botanist reports that, while the difference between the distinctive leaves of the various species of Hevea are very minute, marked differences exist in the flowers and seeds of the various species, and by them it is comparatively easy to distinguish between the various local species and the true Para rubber tree, *Hevea brasiliensis*. The local species are known not to yield a product of commercial value

Work at the several experimental stations established by Government was systematically carried on during the year, *Hevea brasiliensis*, *Funtumia elastica*, and *Castilloa elastica* being grown as well as the various native Sapium rubber trees. Some 1,156 lb of rubber was exported during the year. Upwards of 1,700 acres are now under cultivation in rubber.

The 'rubber boom' reached the Colony, and a certain number of properties changed hands under the operations of the company promoter. Few of them are established plantations, and dividend-earning is not a near possibility.

COFFEE. The area under coffee was 2,546 acres. Of this upwards of 1,600 are situated in the Canal Polder area of West Demerara. Experiments carried on at the Botanical Gardens and at Onderneeming Farm indicate that the variety known as *Coffea robusta* (a Congo coffee grown largely in Java) is well suited for some of the river lands of the colony, especially, perhaps, as a catch crop between rubber.

COCO-NUTS. Coco-nuts are planted on some 9,760 acres of land; the acreage last year was 9,466. The export of nuts increased from 711,512 to 1,023,631. The caterpillar pest (*Brassolis sophorae*) of coco-nuts was common in some districts during the year, and cases of bud rot have been reported. There is, however, a vast area of land suitable for the planting of coco-nuts, and given proper cultivation and drainage the yearly crop could be very largely increased.

CATTLE. There are large areas of land suitable for the raising of cattle. The number in the Colony is estimated at 71,500, but it is probable that this estimate is considerably below the actual figures. The value of cattle was £6,663. Horses are returned at 2,160, sheep, 17,500, goats, 10,300, swine, 16,600, donkeys, 5,400. (*Colonial Reports*—Annual, No. 702.)

* An Economic Biologist for British Guiana has been since appointed; see *Agricultural News* for March 2 and 30.—Ed., *A.N.*

Attention is given in the *Tropical Agriculturist* for March 1912 to the butter nut or Souari nut (*Caryocar nuciferum*), a native of Brazil and British Guiana which was introduced to Peradeniya, Ceylon in 1891. It is stated that the introduced plants are growing luxuriantly, and have flowered freely for the last two years, so that they are expected to give fruit in the near future. The statement is further made that the retail price of the nuts at Covent Garden is 3*d*. or 4*d*. each.

GLEANINGS.

It is stated in the *Louisiana Planter* for April 27, 1912, that the sugar production in Brazil for the season 1911-12 is estimated at 270,000 tons. Of this amount 210,000 tons will be employed for home consumption.

According to *The Board of Trade Journal* for February 29, 1912, the exports of cacao from Para, Itacoatiara and Manaos, by way of Para, during the year 1911, amounted to 5,871,800 ℔. In the previous year the corresponding export was 8,122,400 ℔., and in 1909 10,628,200 ℔.

Writing from Matamoras (Mexico) the United States Consul there says that the region is rapidly becoming a cotton-growing country. In 1910 there were raised 600 bales, and last year 2,000 bales while there will probably be a crop of over 3,000 bales in 1912. There has been plenty of rain for the new season, and up to March 6 about 25 per cent. of the acreage has been planted. (The *Textile Mercury*, April 13, 1912.)

At a meeting of the committee of the Lawes Agricultural Trust held on March 30, Mr. A. D. Hall, F.R.S., Director of the Rothamsted Experiment Station, tendered his resignation. Mr. Hall's resignation takes effect in September, after which he will give his whole time to the work of the Development Commission. The committee of the Lawes Agricultural Trust will proceed to the election of a new director in June. (*Nature*, April 11, 1912.)

A note is presented in the *Experiment Station Record* Vol. XXVI, No. 3 (issued March 20, 1912), stating that particular attention should be given to the proper sampling of mixtures containing copper salts, meant for spraying, when it is intended to subject them to analysis. The reason is that the most valuable portion, consisting of the copper salts, is likely to settle to the bottom of the sack during transportation; this was proved by analyses of mixtures taken at different levels of the material in a sack.

Statistics of the customs of Haut-Sénégal et Niger show that an increasing export is being made of the nuts of the palm *Borassus flabellifer*, var. *Aethiopum.* The use of these is mainly as a substitute for the vegetable ivory obtained from the fruits of *Phytelephas macrocarpa*, a palm growing chiefly in the Andes of Colombia, Ecuador and Peru. An illustrated description of this palm was given in the *Agricultural News*, Vol. VII, p. 58.

It is shown in the Uganda *Official Gazette* for March 31, 1912, that the amount of ginned cotton exported from the Protectorate during the nine months ending December 31, 1911, was 4,798,192 ℔., value £142,622; in the same way the quantity of unginned cotton exported was 2,944,816 ℔., value £29,945, and of cotton seed 4,960,480 ℔., value £4,462. The similar figures for the same period of 1910 were: ginned cotton, 2,302,384 ℔., value £75,356; unginned cotton 3,150,112 ℔., value £24,896; and cotton seed 2,364,656 ℔., value £2,102.

Der Tropenpflanzer for April 1912, p. 208, contains an abstract of an account of work carried out with *Manihot Glaziovii* in German East Africa, in which the results of the investigation permit it to be gathered that the branches of this tree contain quite 12·1 per cent. more rubber than the corresponding parts of a stem belonging to a tree which has branched high up, but that the cost of tapping is at least 30 per cent. greater. It is further admitted that no more favourable results are produced in cases where more branching exists than is found in the average tree.

In the *Bulletin Agricole* of Mauritius for March 1912 attention is drawn to the fact that the United States Department of Agriculture has just published the conclusions of its investigations relating to the presence of phosphoric acid in leaves of different plants, at different stages of their growth. The general result of these investigations is that the phosphoric acid content of leaves is found to be at its greatest proportion at the time when vegetative growth is at the highest, and that gradual diminution fellows. It may be added that the fact of the withdrawal of food substances from leaves, previous to their falling, is well known.

Information has been received from the Department of Agriculture, Commerce and Labour, Cuba, to the effect that certain dependencies of this department have in the past employed in their calculations the Spanish ton of 2,000 ℔. for sugar-cane and the English ton of 2,240 ℔. for sugar. As, however, the first of the units is not suited for practical commercial purposes, it has been decided that the cane ton in future calculations shall be that of 100 arrobas, or 2,500 ℔., while the sugar ton will remain at 2,240 ℔., that is the English ton, in accordance with the usage of the principal markets of the world. These facts will facilitate calculations in which figures eminating from that department are employed.

The *Gardeners' Chronicle* for April 20, 1912, states that the researches of Professor Bottomley have shown that the roots of the sweet gale or bog myrtle (*Myrica Gale*), a plant occurring frequently in Great Britain, in mountain bogs, possess root nodules which are inhabited by *Pseudomonas radicicola*, the organism which is responsible for the formation of similar nodules on the roots of leguminous plants. Thus it has been shown that this, although it is not a pod-bearing plant, must rank with the Leguminosae as a nitrogen-fixing plant. In the experiments, the interesting observation was made that plants of the bog myrtle possessing nodules were able to thrive in soil containing no combined nitrogen, while those which did not show the nodules were unable to live under the conditions.

STUDENTS' CORNER.

JUNE.

SECOND PERIOD.

Seasonal Notes.

Much of the work on sugar estates during the present period will have been concerned with giving attention to the young cane crop, in order that as regular a stand as possible may be obtained. In connexion with this, a knowledge of the characteristics of the different varieties of seedling canes employed is necessary, particularly as supplies should be made with quickly-maturing cane, in order that the work of taking off the crop may be simplified as much as possible, and that the canes may be all in a fit state for reaping when the time comes to do this.

In reaping canes where the central factory system is employed, opportunity will have been given to obtain the weight of cane from the different fields, and useful facts should now be available in regard to the returns from different varieties, and from various methods of manuring. The results that are given by such observations are of the greatest importance for future guidance, particularly, as has been stated recently already, in deciding the question as to whether ratooning is profitable, and the extent to which it should be continued.

When a favourable rainfall has been received, cotton will have been planted. Later on, when the seedlings have reached a height of about 1 foot, they will be thinned out so as to leave one in each hole. State exactly the reason why this is done. Should cotton be planted more closely or more widely apart in rich than in poor soil? It is often observed that, where trash has been burned in part of a field, the cotton sown in that portion grows much more quickly and luxuriantly. What reasons can you give for this fact? State why the effect is not found to be lasting. Adduce the reasons for and against the burning of refuse plant material, instead of burying it in the soil, in the West Indies.

State the effects of burying compost and green manures as regards (1) the soil itself, (2) the bacteria in the soil. Give a description of the plants with which you are familiar, that you have seen employed for green manuring. What circumstances would guide you in deciding whether a green manure should be buried in the fresh state, or not?

How is cotton seed selected on estates for planting? Give the reasons why it is important that such selection should be carried out regularly. How far does the improvement that may be obtained through plant and seed selection extend?

When the receipt of rain affords an opportunity, sweet potatoes and yams will be planted. Give particulars of such preparation of the soil as is made for these. Describe the chief varieties of sweet potatoes and yams of which you know, stating any special characteristics that make them valuable. What precautions, when planting, will tend to cause gradual improvement of the product?

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) Give an account of any animal pest of cotton that is not an insect.

(2) State any reason why it is sometimes necessary to apply lime to soil.

(3) How does water travel through the soil?

INTERMEDIATE QUESTIONS.

(1) By what signs would you recognize the presence of leaf-blister mite in a cotton field?

(2) Give a short account of the uses of lime on a sugar estate making its own sugar.

(3) State shortly the ways in which the loss of water from the soil may be lessened.

FINAL QUESTIONS.

(1) Write an account of the best methods of controlling leaf-blister mite in its early stages.

(2) What are the uses of lime in relation to the useful bacteria in the soil?

(3) State all the benefits that may accrue to a soil when it is supplied with a mulch of vegetable material.

Cotton in Ceylon.—The Secretary inspected a 20-acre block of land planted with cotton in Kayts. The plants had suffered severely as the result of the heavy rainfall of December last, and the greater part is not likely to come to anything. This is a very unfortunate experience for the enterprising owner, who, in spite of the disappointment, has resolved to plant a larger area this year.

Cotton is doing well at Balalla, Kalalgamuwa, and Madipola gardens.

The variety known as Sakellarides, of which seed was sent to the Society by the British Cotton Growing Association, is a particularly hardy plant. The cotton is named after the discoverer, M. Sakellarides, who isolated it from a field of Mitaffifi on his Egyptian estate. Professor Dunstan, reporting on a sample forwarded by the Director-General of Agriculture in Egypt, speaks highly of its strength, lustre, colour, texture and length, and valued it at at $14\frac{1}{2}$*d.* per lb., with fine Jannovitch at $13\frac{3}{4}$*d.* (*Progress Report* No. LVIII of the Ceylon Agricultural Society.)

The Grenada *Government Gazette* for May 1, 1912, contains the Annual Report of the Commissioner of Carriacou for 1911. In this, dealing with the work at the Experiment Station, it is stated among other matters that the orange snow scale (*Chionaspis citri*) has again made its appearance in the lime orchards; sulphur and lime-wash are being employed against this pest. A plot of land having an area of $\frac{1}{4}$-acre is being cultivated as a provision garden, in order to afford an illustration, to peasant landowners in the island, of the results that may be obtained from a small and well tended garden; records of the returns are being made, and it is intended at the close of the season to circulate the information by means of leaflets. The sale of limes by peasants to a factory in the island is being encouraged, and continues successfully.

FUNGUS NOTES.

THE GENERAL TREATMENT OF ROOT DISEASES OF PERMANENT CROPS.

During recent months, a considerable amount of attention has been called to the damage inflicted upon permanent cultivations, such as cacao and limes, by fungi, which attack their roots, and are capable of passing from one tree to another wherever a diseased and a healthy root come into contact with one another beneath the surface of the soil. These diseases occur throughout practically all of those West Indian islands in which permanent crops form the staple cultivation, and their existence has long been known and recognized by scientific workers, and to some extent by planters. More recently, however, there has been growing up among those interested in agriculture a wider appreciation of their true nature, and of the definite, though limited, proportion of damage they inflict. The increased attention and more general observation that have been bestowed upon them have resulted in some instances, as is natural, in a tendency to regard the damage as greater than it is actually. In spite of this, it cannot be denied that the harm inflicted is, in many instances, of sufficient importance to warrant the expenditure of some time and money on adequate means for preventing the spread of the fungus in infected areas, and it is thought that an account of the measures likely to prove successful in attaining this object may be acceptable to those who have to contend with the problem.

It is not intended here to enter into a description of the fungi responsible for the diseases under consideration, as this may be found in the *Agricultural News*, Vol. X, pp. 360 and 382. Suffice it to state here that, in a majority of cases at any rate, the causative fungus is only capable of spreading from a diseased to a healthy tree when the infected roots of the one come into immediate contact with the previously healthy roots of the other; that is, the fungus is incapable of spreading by independent strands of mycelium running through the soil. If left to itself, the disease progresses gradually in an ever-widening circle, and, theoretically, would only be arrested by the presence of natural barriers, such as ravines, streams, or ditches, which form a break in the continuity of the soil. The first object, therefore, is effectually to isolate the diseased area. When this has been done, all infected material must be removed from the soil and burned, and the soil itself must be well aerated, and thoroughly treated with a fungicide.

The isolation of the diseased area is usually effected by means of a trench; this must be not less than 3 feet deep, and should be about 18 inches wide. It must be kept open to its full depth until the area it isolates has been freed from the presence of the root fungus. Shallow trenches are useless for isolation purposes, as are also trenches that are allowed to silt up before the fungus has been entirely eradicated. Another matter of great importance in successfully isolating the disease is the location of the trench in such a position that all infested roots are included within it. Many of these diseases commence on the stumps of forest trees or on living avocado pear or bread fruit trees whose roots extend for a considerable distance and for a considerable depth in the soil. The root fungi are liable to travel along all such roots to their furthest ramifications, and therefore all of them must be included within the area limited by the trench At the same time, it should be remembered that the roots of the outermost infected cultivated trees in the area may possibly extend beyond the healthy trees next to them, and that these healthy trees may in reality be themselves slightly affected, though no symptoms of ill health are visible on their aerial portions. All this indicates clearly that the trench must be run in such a way as to include a margin of at least two or three healthy trees in a belt round the infected area. Furthermore, all roots cut in the process of digging the trench should be carefully examined, and if signs of the disease be found upon them on the side remote from the infected area, the position of the trench must be altered to include them within its boundary. It need hardly be added that the soil taken from the trench should be thrown on to the infected area. These details have been emphasized here as there is reason to believe that, occasionally, failure to consider them has resulted in a corresponding failure to control successfully the progress of the disease.

Once the infected area has been thoroughly isolated, the next step is to destroy as carefully as possible all infected material in the soil and thus with the aid of disinfectants to eradicate the fungus and render it once more safe for the planting of supplies. The dead trees must first be felled, the soil then cleared away from the stumps, and the roots very carefully followed up as far as possible; the whole tree, top, stump and roots, should then be cut up and burned in the hole from which the stump has been removed. It is important that dead trees, especially the fungus-infested portions below the soil, should not be dragged through the healthy portions of the cultivation. When it is observed that fructifications of the fungus have been formed at the base of the stem above the ground, dry leaves or other inflammable material should be piled up round the tree and lighted, so that the spores are burned. This prevents the scattering of the spores into the air when the tree is disturbed. When the diseased roots of dead trees are followed up, it may be found that they have come into contact with, and infected, those of apparently healthy trees near the margin of the quarantined area. Such roots should be carefully followed up in turn and cut off at a point some 3 or 4 inches above the limit of the visibly diseased tissues; the cut ends should be tarred, and the soil in their neighbourhood treated with lime or some other fungicide, as is described below. This process may be expected to save the lives of the healthy trees left on the margin of the diseased area.

Having freed the soil as far as possible from material carrying the fungus, the next step is to apply a heavy dressing of lime at the rate of about 6 lb. per square yard, and to mix it thoroughly with the soil by forking. Any small pieces of root turned up in this process should be collected and burned. The dressing of lime recommended here is heavy, but is not likely to be excessive on heavy clay soils or in situations where the soil is liable to be acid. Certain fungicides such as sulphate of copper and of iron have been recommended for soil disinfection, but it is not certain that they will prove satisfactory in all cases, and their use cannot be encouraged until it has been thoroughly tested by experiment The exposed soil inside the isolated area should be forked over sufficiently frequently to maintain it free from any strong growth of weeds. This will serve at the same time to keep it well aerated and to expose fresh surfaces to the sun. It is possible that where this treatment is carefully carried out, replanting may be commenced after an interval of six months, though it might be preferable to wait twelve months. Experiments have been arranged to determine how long a time should elapse before replanting, so that absolute safety may be ensured. Before leaving this part of the subject it may perhaps be advisable to point out that during all forking operations, care should be taken to prevent the breaking down of the side of the trench, and to avoid as far as possible inflicting damage on the roots of the healthy trees left in the isolated area.

All the measures so far indicated have dealt with the spread of the fungus, once its attack has commenced; it is now proposed to mention one or two measures that might be of service in preventing the occurrence of attacks. In one type of root disease, infection almost always commences on avocado pear or bread fruit trees; this suggests that in infected districts where these trees are plentiful as shade to cacao, their gradual though steady removal might be advisable. It would be necessary not only to cut them down, but to remove their principal roots at the same time. Their place should be taken by some other tree not as liable to serve as a starting point for the disease. Such a plant is the immortel which, though it is occasionally attacked, does not usually serve as an original centre of infection. Some of the species of Eucalyptus may also be found useful as wind-breaks for cacao while proving resistant to root disease.

Another type of disease is common on newly cleared estates in the forest, where infection commences from decaying stumps. The complete removal of such stumps is often a matter of difficulty, and is often said to be impossible. In this connexion a useful suggestion is made by Dr. D. G. Williams, in Western Australia. (See *Root Rot*, by A. J. Despeissis, Bulletin 15, Department of Agriculture and Industries, Western Australia.) He recommends that when newly cleared land is being planted, each tree should be set in the centre of a spot of soil 12 feet square, in which the earth has been well dug over to a depth of 3 feet and the soil has been freed from all decaying roots. This gives the roots of the young trees an extent of clean soil in which to grow; while at the time they begin to penetrate beyond this distance, the old roots in the outside soil will have had time to decay completely. This suggestion is perhaps more applicable when establishing valuable trees such as oranges, but it might be found that it was useful also in the case of limes, since it might do away with the recognized tithe of vigorously growing trees that would otherwise certainly be levied by root disease.

WOOD SPECIMENS IN NATURE STUDY.

The following information concerning the preparation and use of specimen woods, for nature study in schools, has been taken from *Farmers' Bulletin*, No. 468, of the United States Department of Agriculture, issued recently:—

COLLECTIONS OF WOOD SPECIMENS. The pupils should be encouraged to make collections of specimens of woods found in the locality of the school. A number of possible ways of preparing and mounting such specimens will doubtless suggest themselves, but the following method is recommended as likely to prove convenient and satisfactory.

(1) Whenever possible, use seasoned woods for the specimens. If nothing but green wood is available, cut rough sticks and allow them to dry as thoroughly as possible before preparing the finished specimen.

(2) Collect specimens as nearly as possible uniform in size and character as to the parts of the trees and ages of the trees from which they are taken If some are taken from the branches and some from the trunks, or some from young saplings and others from old trees, they should be marked accordingly.

(3) For each specimen, select a stick about 2 or 3 inches in diameter and cut from it a section about 4 inches long, sawing the ends squarely across. Split or saw this block through the centre and smooth the split or sawed surface so as to show the grain longitudinally. Beginning about 1 inch from the end on the bark-covered surface, cut with a sharp knife out to the end of the flattened surface, so as to slope one end. Now, if the wood is thoroughly dry and well seasoned, sandpaper the flat surfaces well. If it can be done, it will add to the appearance of the specimen to apply a single coat of thin varnish or shellac, so as to bring out the grain. The specimen is now ready for mounting.

(4) Probably the best plan to follow in mounting a specimen is to insert a small screw eye into the square-cut end of the block prepared as above described, and to hang it on a hook in the wall or in the cabinet. This will make it possible to take the specimens down for use in the class-room. It will also be possible to pack them in a small space, if it is desired to move them about.

(5) Great care should be taken to see that each specimen is properly labelled. When the sections are first cut, they should be carefully marked so as to make it easy to identify each one, and these marks should be kept on the specimens until they are finally labelled. The label should state the name of the tree, whether taken from the trunk or branch; whether from an old tree or a sapling; locality and habitat; and, possibly, a brief statement as to the uses of the wood, especially in the case of woods like hickory or oak which are used in making implements, furniture, or other special articles.

THE USE OF THE MUSEUM. The materials collected for the museum should be used, not merely displayed. As far as possible the specimens should be so prepared that they may be handled and closely studied by the pupils without injury. Interest soon wanes in blocks of wood or samples of wood products shut up behind glass cases. The child wants to handle the objects he studies, not merely to gaze at them through panes of glass. The material should be gathered by the pupils themselves, as much as possible.

They should be encouraged in thinking of the collection as their museum. It would defeat this aim to deprive the pupils of the privilege of using and handling the specimens, since they could not but feel that they have a right to use what is their own.

Of course there will be some specimens, the rare or delicate ones, which will not bear handling and must necessarily be used for display only. But the real value of the museum will come from the 'working collection'. It is suggested, therefore, that the wood specimens, the samples of wood products, the sets of pictures, or whatever material be obtained for the museum, be prepared and arranged with the aim of use constantly in view. If, in addition, provision can be made for the display of the material when not in use, this should not be neglected. But at all events the use of the materials should not be sacrificed for the sake of making an attractive display.

The chief exports from St. Vincent during the first three months of the present year were as follows: arrowroot, 494,383 lb.; Sea Island cotton, 25,975 lb. ($79\frac{1}{4}$ bales); cotton seed, 253,690 lb.; muscovado sugar, 95,280 lb.; molasses, 3,830 gallons; cacao, 18,194 lb.

MARKET REPORTS.

London.—The West India Committee Circular, May 21, 1912; Messrs. E. A. De Pass & Co., May 10, 1912.

Arrowroot—3⅝*d.* to 4¾*d.*
Balata—Sheet, 3/8; block, 2/7½ per lb.
Beeswax—£7 10*s.* to £7 17*s.* 6*d.*
Cacao—Trinidad, 59/- to 75/- per cwt.; Grenada, 55/- to 61/-; Jamaica, 50/6 to 56/-.
Coffee—Jamaica, 72/- to 81/- per cwt.
Copra—West Indian, £26 15*s.* per ton.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 22*d.* to 22½*d.*
Fruit—No quotations.
Fustic—No quotations.
Ginger—48/- to 65/- per cwt.
Isinglass—No quotations.
Honey—No quotation.
Lime Juice—Raw, 1/8 to 2/2; concentrated, £18 12*s.* 6*d.* to £19; otto of limes (hand pressed), 6/5.
Logwood—No quotations.
Mace—No quotations.
Nutmegs—No quotations.
Pimento—Common, 2¾*d.*; fair, 2 13/16*d.*; good, 2⅞*d.*; per lb.
Rubber—Para, fine hard, 4/7½; fine soft, 4/6½; Castilloa, 4/2 per lb.
Rum—Jamaica, 1/10 to 5/6.
Sugar—Crystals, 18/3 to 20/6; Muscovado, 14/6 to 17/-; Syrup, 15/- to 17/- per cwt.; Molasses, no quotations.

New York.—Messrs. Gillespie Bros. & Co., May 3, 1912.

Cacao—Caracas, 12¼c. to 12¾c.; Grenada, 12c. to 12⅛c.; Trinidad, 12¼c. to 12¾c. per lb.; Jamaica, 10c. to 11c.
Cocoa-nuts—Jamaica, select, \$22·00 to \$24·00; culls, \$14·00 to \$15·00; Trinidad, select, \$23·00 to \$24·00; culls, \$14·00 to \$15·00 per M.
Coffee—Jamaica, 14½c. to 17c. per lb.
Ginger—8c. to 10¼c. per lb.
Goat Skins—Jamaica, 50c.; Antigua and Barbados, 43c. to 45c.; St. Thomas and St. Kitts, 41c. to 42c. per lb.
Grape-Fruit—Jamaica, \$2·00 to \$3·50.
Limes—\$8·00 to \$9·00.
Mace—53c. to 56c. per lb.
Nutmegs—110's, 11⅝c. to 11¾c.
Oranges—Jamaica, \$2·00 to \$2·25 per box.
Pimento—3*d.* per lb.
Sugar—Centrifugals, 96°, 3·98½c. per lb.; Muscovados, 89°, 3·48½c.; Molasses, 89°, 3·23½c. per lb., all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., May 27, 1912.

Cacao—Venezuelan, \$14·25 per fanega; Trinidad, \$13·75 to \$14·25.
Cocoa-nut Oil—96c. per Imperial gallon.
Coffee—Venezuelan, 15½c. per lb.
Copra—\$4·50 per 100 lb.
Dhal—\$4·25.
Onions—\$2·50 to \$4·00 per 100 lb.
Peas, Split—\$7·00 to \$7·25 per bag.
Potatoes—English, \$2·00 to \$2·75 per 100 lb.
Rice—Yellow, \$4·70 to \$4·80; White, \$6·25 to \$6·25 per bag.
Sugar—American crushed, no quotations

Barbados.—Messrs. James A. Lynch & Co., Ltd., June 1, 1912; Messrs. T. S. Garraway & Co., June 1, 1912; Messrs. Leacock & Co., May 10, 1912.

Arrowroot—\$7·00 per 100 lb.
Cacao—\$13·00 to \$14·00 per 100 lb.
Cocoa-nuts—\$16·00.
Hay—\$1·80 per 100 lb.
Manures—Nitrate of soda, \$65·00; Cacao manure, \$45·00 to \$48·00; Sulphate of ammonia, \$80·00 per ton.
Molasses—No quotations.
Onions—\$4·00 per 100 lb.
Peas, Split—\$7·10 to \$7·25 per bag of 210 lb.; Canada, \$3·00 to \$5·25 per bag of 120 lb.
Potatoes—Nova Scotia, \$3·25 per 160 lb.
Rice—Ballam, \$5·05 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
Sugar—American granulated, \$5·00 per 100 lb.

British Guiana.—Messrs. Wieting & Richter, May 25, 1912; Messrs. Sandbach, Parker & Co., May 24, 1912.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	—	—
Balata—Venezuela block	No quotation	Prohibited
Demerara sheet	70c. per lb.	—
Cacao—Native	14c. per lb.	18c. per lb.
Cassava—	72c.	No quotation
Cassava Starch—	\$7·00	No quotation
Cocoa-nuts—	\$16 to \$20 per M.	\$10 to \$16 per M., peeled and selected
Coffee—Creole	17c. per lb.	16c. per lb.
Jamaica and Rio	19c. per lb.	19½c. per lb.
Liberian	12c. per lb.	14c. per lb.
Dhal—	\$4·00 to \$4·50 per bag of 168 lb.	\$4·50 per bag of 168 lb.
Green Dhal	\$4·50	—
Eddoes—	\$2·16	—
Molasses—Yellow	None	—
Onions—Teneriffe	7c. to 8c. per lb.	—
Madeira	—	—
Peas—Split	\$6·75 to \$7·00 per bag (210 lb.)	\$7·15 per bag (210 lb.)
Marseilles	—	No quotation
Plantains—	24c. to 60c.	—
Potatoes—Nova Scotia	\$3·50	\$3·75 to \$4·00
Lisbon	—	No quotation
Potatoes—Sweet, B'bados	\$2·40 per bag	—
Rice—Ballam	No quotation	—
Creole	\$5·25 to \$5·50	\$5·30 to \$5·50
Tannias—	\$2·40	—
Yams—White	\$3·00	—
Buck	\$2·40	—
Sugar—Dark crystals	\$3·25 to \$3·40	\$3·25 to \$3·45
Yellow	\$3·90 to \$4·00	\$4·25
White	—	—
Molasses	\$2·90 to \$3·00	—
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	\$3·75 to \$6·00 per M.	\$4·00 to \$6·00 per M.
,, Cordwood	\$1·80 to \$2·00 per ton	No quotation.

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CONTENTS.

Reading Courses and Examinations in Practical Agriculture.

THE present time gives a convenient opportunity for reviewing the progress that has been made in regard to the Reading Courses and Examinations in Practical Agriculture conducted by the Imperial Department of Agriculture, and for indicating the way in which the work connected with these is to be continued. The examinations are now held annually by the Department, and it is intended again to follow, this year, the plan adopted of holding them in October and November. This brings it about that candidates will now find it expedient to make their reading follow a definite plan, so that they may be prepared in time; and where assistance is given in the shape of meetings for instruction and discussion, steps will have to be taken to establish communication among candidates and to organize the work so that it will follow a precise scheme.

The number of examinations held in all the stages up to the present has been nine—four in the Preliminary, three in the Intermediate and two in the Final Stage. In the Preliminary Stage fifty-eight candidates have been examined and forty-three have passed; in the Intermediate the similar figures are twenty-eight and twenty-one, and in the Final Stage eleven and seven. It follows that the total number of candidates examined so far in all the stages is ninety-seven, and of these seventy-one, or seventy-three per cent., have passed. A consideration of the proportions of the results falling in the different classes shows that, especially on the occasion of the last examination, the number in the higher classes was comparatively low. This is a matter for regret, and points to a lack of thoroughness in the work of most of the candidates. There is an evident need for a greater attempt to go deeply into the subjects that are prescribed for study, and to obtain something more than a moderate knowledge such as may be calculated as being sufficient to enable its possessor to pass the examination in the lowest class.

For the guidance of candidates in their reading, a leaflet has been published by the Department, containing a syllabus of the subjects of examination, in so far as this is concerned with the more theoretical parts of the work. The principal contents of this were first published in the *West Indian Bulletin*, Vol. IX, pp. 293-6; the matter was, however, revised considerably, for inclusion in the leaflet, as experience gained in conducting the examinations had indicated the expediency of making such a revision. It may be added that the leaflet contains lists of books that will be found useful by the candidate, though there is no intention to limit his reading to these; they are mentioned in order to assist him in making a comprehensive choice of agricultural literature that is of a more specially educational nature.

Further aid is given to candidates by the inclusion, in the *Agricultural News*, of the feature designated as the Students' Corner, which has appeared continuously since October 1908. In this, the assistance given to the student is intended to possess a more special relation to his practical work, and in order shortly to indicate its scope, quotation may be made from the introductory article, as follows: 'In this space there will be put forward hints and suggestions concerning the serious objects of study and observation together with questions which students should endeavour to answer. Notes on seasonable events of agricultural importance in the different colonies will also be a frequent feature in this column.' More recently, the questions given in the different stages have been chosen to apply to the same subjects, so that some idea may be afforded as to the scope of the knowledge required in each of those stages.

These stages—Preliminary, Intermediate and Final—of the examination are not only arranged to correspond with the increase in the knowledge that is expected from candidates, but are intended to possess an intimate relation to their experience and progress as practical planters. In pursuance of this, as is explained in the syllabus, the special purpose of the Preliminary Examination is to enquire into the adequacy of the general knowledge and education of the candidate in relation to his fitness to enter the planting profession. Proceeding, the standard of the Intermediate Examination is such as to require the knowledge of planting work and of the principles of agriculture that should be possessed by an intelligent overseer of a few years' experience. Lastly, for success in the Final Examination, the knowledge expected is that in the possession of a man who is capable of being entrusted with the management of an estate. In entering upon, and passing through, the course, students must register their names with the chief Agricultural Officer in the island in which they live, for transmission to the Head Office of the Department, and take the examinations in the order in which they have just been named.

Emphasis has just been laid on the practical nature that it is intended the Courses of Reading shall possess. It is easy to understand that if they are to bear this character in an adequate degree, the Intermediate and Final Examinations must themselves be essentially practical in kind. There was early realization that this condition could not be fulfilled to any extent if the sole means of examining candidates was to consist in papers of questions to be answered under the formal and limited circumstances of a written examination. In order, therefore, to make the examinations sufficiently practical in nature, those of the Intermediate and Final Stages are conducted with the co-operation of planters of standing, in each colony, who have courteously subjected canditates to an oral test which is usually carried out on an estate, or similar place presenting conditions with which the candidate is familiar. In cases of success, the certificates issued by the Imperial Department of Agriculture have to be signed by the planter examiners before they are presented to candidates; without such signatures they are invalid, and the fact that they bear them is the only adequate testimony that their possessors have shown sufficient practical knowledge to be included in the class in which they are stated to have passed.

As has been indicated already, meetings of students have been arranged in the past by Agricultural Officers, in some of the islands, for the purpose of giving useful aid, when the scheme was new. Valuable work has been done by those officers in this way, but it has not been intended to provide anything in the nature of regular courses of lectures for students. The scheme has been in operation for a period that is sufficiently long for students to be independent of such outside help: although there is no reason why it should not be given if circumstances permit. In any case, the services of the local Agricultural Officers are always available, where they are required in suggesting lines of study, answering questions, or in giving other, similar assistance.

Returning to the general consideration of the scheme, the matter would not be complete without the inclusion of a statement as to the progress that is being made year by year. Though it is desirable in every way that a larger number of candidates should take up the Courses of Reading, and enter for the examinations, it may be said that this progress is satisfactory, and what was stated in a former article* on the subject may be repeated: 'Many of the papers sent up by the candidates at the examinations are of a very encouraging nature, and show that, in their case at least, there was only needed the inducement that has been given by the Department for them to put themselves in the way of gaining an orderly and methodical view of the ideas and principles underlying their work.'

*Agricultural News, Vol. VIII, p. 386.

SUGAR INDUSTRY.

BORDEAUX MIXTURE IN CANE-PLANTING.

Experiments have been conducted recently at the Estacion Experimental Agricola, Tucuman, Argentina, for the purpose of investigating the effects of dipping cane-planting material in Bordeaux mixture for protection against plant diseases. These are described in the *International Sugar Journal* for May 1912, and the following conclusions are taken from this source. It may be mentioned that similar experiments have been conducted in the Leeward Islands and Barbados, under the Imperial Department of Agriculture. The results obtained in Argentina have shown:—

There seems to be no doubt that dipping cane has given an increased tonnage, although it cannot be said that this year's experiments have proven the matter a financial success.

It appears that it is better to employ Bordeaux mixture of normal concentration, this 1 per cent. strength giving the better results, and nothing being gained by the use of the stronger solution.

It appears that there is no injurious effect upon the germination of the cane where it is simply dipped in the Bordeaux mixture or not exposed to it for more than one hour, either in the case of the double or normal strength.

The cane dipped for an hour in normal strength and in double strength Bordeaux mixture has given better results than the undipped cane.

Emphatically, it is best to dip for a short time only.

It may be stated, in explanation, that 'normal' Bordeaux mixture is described in the article as consisting of 2 kilos. of copper sulphate and 3 kilos. of lime in 200 litres of water: that is to say, 1 per cent. of the copper salt is used in making the mixture. A mixture of the same strength would be obtained by employing 1 lb. of copper sulphate, 1½ lb. of lime and 10 gallons of water, or similar proportions.

WAX FROM THE SUGAR-CANE.

Information concerning sugar-cane wax and the possibility of its extraction on a commercial scale has been given at different times in the *Agricultural News* (Vols. VIII, p. 360; X, p. 51; and XI, p. 124). In continuation, the following summary of much that is known about the matter is taken from the *Modern Sugar Planter* for April 27, 1912:—

Wax is an important constituent of the filter press cake, being present to an extent up to 12 per cent. of the dry cake. This wax can easily be extracted by boiling the dried cake with organic solvents, like alcohol, carbon tetrachloride, etc., and the extract thus obtained is filtered off and cooled when the wax solidifies out as a yellowish white mass.

Very considerable attention has been given to the possibility of extracting this wax. Among recent work may be mentioned that of Wynberg, in Java, who redetermined carefully the properties of the wax, and perfected a method of extracting it from press-cake. The wax was said to have similar properties to the expensive carnauba wax, and therefore to be worth probably 20 to 25c. per lb.

After this the question was taken up by the Hawaiian planters two or three years ago, and with characteristic progressiveness they submitted large samples of the wax to Lewkowitsch, the eminent London specialist on waxes, fats, etc., whom they engaged at considerable expense to examine the wax and pronounce upon its commercial value. Lewkowitsch's investigation was duly made and his report communicated to the Hawaiian Planters' Association Animated by the secretiveness which during the last few years has characterized this Association (the replacing of the *Hawaiian Planters' Monthly* by a similar journal for private circulation among the members) the results of this work were not published to the outer world. From a private source, however, the writer learned that Lewkowitsch's report had been to the effect that the wax consisted of a mixture of several chemically different waxes, and that the substance had only a small commercial value of from 4 to 5c. per lb.

The prospects of economical utilization of the wax are, therefore, vague. The first difficulty is the danger of fire due to the use of alcohol in extracting the wax. This can, however, be overcome by the use of carbon tetrachloride which is non-inflammable. The value of the product is, of course, what it would fetch on the market, and until quantities of it are produced we cannot be sure what the value would be. It is questionable whether it would pay to extract a product whose value was less than 8 to 10c. per lb., at the least. Other ingredients of the filter press cake do not offer any prospect to economical extraction.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture left Barbados on June 17, 1912, by the R.M.S.P. 'Magdalena', for the purpose of paying visits connected with official matters to Grenada and Trinidad. Dr. Watts is expected to return to Barbados by the S.S. 'Verdi' on the 28th instant.

Mr. F. W. South, B.A., Mycologist on the Staff of the Imperial Department of Agriculture, left Barbados for St. Kitts on June 4, by the S.S. 'Korona', for the purpose of investigating fungus diseases of plants in the island. Mr. South was expected to return by the S.S. Parima, on June 21.

FRUITS AND FRUIT TREES.

THE INTRODUCTION OF VANILLA INTO REUNION AND MAURITIUS.

Vanilla was introduced into the island of Réunion in 1822, by an official of the colony, M. Marchant, who brought the planting material from the Jardin du Roi, Paris. According to the *Bulletin Agricole* of Mauritius, for March 1912, from which this information is taken, M. Marchant saw a plant of vanilla flourishing at the place mentioned, while on a visit to Paris in 1817 or 1818. His surprise at the circumstance that so valuable a plant had not been introduced into Réunion was shared by M. Thouin, the Director of the Jardin du Roi, and in consequence two or three cuttings were prepared so that they may be taken to that colony on the return thither of M. Marchant. In 1825, one of the plants flowered, and in the following year two perfectly mature pods were formed. His desire to increase the cultivation of such an interesting and useful plant, led M. Marchant to take several cuttings, some of which were sent by him to Mauritius, to M. A. Genève, an old colonist of Mauritius, who made the original note from which these details are derived. He received the cuttings in November 1827; and after much care, and in spite of damage to the original plant by a storm, in the next year, was able to raise cuttings and eventually obtain the fruit. This fruit consisted of eleven beans, which were obtained on M. Genève's property of Rivère Noir.

THE DOUBLE COCO-NUT PALM.

At the recent Agricultural Conference, a specimen of the fruit of the double coco-nut or coco-de-mer (*Lodoicea sechellarum*) was exhibited, which had been grown in the British Guiana Botanic Gardens (*West Indian Bulletin*, Vol. XII, p. 182). The exhibit possessed all the greater interest because, as was explained, the specimen shown was probably the first example of the fruit produced in the Western Hemisphere. A suggestion was made, however, by the Hon. J. S. Hollings, of Nevis, as to a possibility of the fruits having been produced, in past years, in St. Kitts; though no confirmation of this is so far available.

As was stated on p. 324 of the last volume of the *Agricultural News*, germinating nuts of the double coco-nut have been introduced into the islands of St. Lucia, Dominica, St. Vincent and Grenada, by the Imperial Department of Agriculture, and information given in the article mentioned shows that the introduction has failed in St. Lucia and St. Vincent, and that one plant has survived in Grenada; while the greatest success has been obtained in Dominica, where two established plants were raised from the three germinating nuts that were sent.

This interesting fact has led to the publication of the illustration on the next page of the present number of the *Agricultural News*, which was prepared from a photograph supplied by Mr. J. Jones, Curator of the Dominica Botanic Gardens. It shows one of the young plants of the coco-de-mer that, as has been indicated, may be seen in those gardens. The illustration has also appeared in the last Annual Report on the Dominica Botanic Station, namely that for 1910-11.

Coco-nut-growing in Antigua and Barbuda.—A report has been furnished by the Curator of the Botanic Station, Antigua, dealing with the exteusion of coco-nut growing that is taking place in that island and in Barbuda. In addition to the orders for 2,400 coco-nut seedlings received by the Antigua Agricultural Department during April, orders have been further accepted for 2,150 plants, to be set out in Barbuda. Apart from these, there are at present 1,000 coco-nut plants growing in the nurseries, which because of the drought were not sent out last year. The demand has increased greatly the work at the Station, especially as the requirements of planters for other kinds of plants has been enormously enhanced during the last year or two.

The parts of the island where it is intended to plant coco-nuts are: Brooks, Cades Bay, Yorks, Orange Valley, Yeptons, Fitches Creek, Parham Hill, Betty's Hope, and Hodge's Bay; it is also possible that they will be planted at Gambles, McKinnons, Dimsdale and Claremont. The area to be planted in Barbuda, if nothing arises to prevent it, is about 50 acres.

THE GERMAN AGRICULTURAL INSTITUTE AT AMANI.

Reference has been made frequently in the *Agricultural News* to the Imperial Biological Agricultural Institute at Amani, German East Africa, and it will be of interest to present further details of this Institute abstracted from an account made for the *Bulletin of the Bureau of Agricultural Intelligence and of Plant Diseases* for April 1912

The establishment of the Institute dates from 1902, and its objects include: research in connexion with the raising of cultivated tropical plants, and on their pests and diseases, with means of prevention and cure; soil analysis and analysis of raw materials and other products of interest; manurial experiments; and lastly the study of the flora and fauna of German East Africa.

Amani was chosen as the site for the work because of its favourable conditions of soil and climate. The land that is used has an area of 741 acres, and extends from a height of 1,300 to 3,575 feet, above sea-level. This inclusion of areas at different altitudes is of particular utility in that it enables experiments to be made with sub-tropical, as well as tropical, plants. The Amani Experiment Station is completed by a station at Mombo where there is a large area of land in the plain. The site of the principal buildings and of the laboratories is at nearly 3,000 feet above the sea. The clearing of forests has amounted already to about 250 acres, and about 30 miles of roads have been made.

The abstract from which these details are taken proceeds to give an account of the past activities of the Institute, which as may be well understood have been many and varied. The propaganda of the station is carried on at present by the issue at Dar-es-Salam, of a journal called *Der Pflanzer*. A more important publication sent out by the institute is constituted by the *Berichte über Land- und Forstwirtschaft für Deutsch Ost-Afrika*.

Among the useful features of the station, that serve as an annex to it, is a building intended for the accommodation of visitors; these are mostly European settlers in the colony, including students and farmers and employées of the neighbouring English and Italian colonies.

Fig. 3 Plant of Coco-de-Mer, or Double Coco-nut, at the Dominica Botanic Garden.

THE GERMINATION OF OLD SEEDS.

The *Bulletin Agricole* of Mauritius for March 1912 contains an interesting note which commences by drawing attention to the legends that exist concerning the extreme longevity of seeds, particularly those regarding the germination of grains of wheat found in sarcophagi in Egypt—a matter which has been entirely discredited.

The note proceeds to state that, nevertheless, Professor Becquerel in Paris, and Professor Ewart in Melbourne, have instituted experiments which demonstrate that seeds do actually possess great vitality. They have taken from museums old seeds that are known authentically to have been in the museums for at least twenty-five years,and have found that 10 per cent. of these were capable of sprouting. The oldest among the seeds were those of *Cytisus biflorus* (eighty-four years), *Cassia bicapsularis* (eighty-seven years), and *Horea linearis* (105 years). In each of these cases, germination was obtained with two or three seeds out of ten.

The two observers have remarked that the species of plants in which the seeds present the largest vitality belong generally to the pod-bearing plants, or Leguminosae.

Professor Becquerel has placed a certain number of seeds in round glass vessels in which the most perfect vacuum obtainable has been produced; and these vessels, after having been sealed, have been deposited in a safe place where they will be found by future generations and employed for testing the vitality of the seeds contained in them.

In regard to the germination of seeds that have been kept for only a few weeks, the following account of work conducted in Italy, taken from the *Experiment Station Record*, Vol. XXII, p. 326, is of interest: 'At temperatures ranging from 9° to 17° C., with a daily temperature at 3 p.m. of 12° to 16°., 18 per cent. of maize, 51 of barley, 70 of millet, 22 of beans, and 23 of chick peas germinated in three weeks when the seed was fresh, while of the old seed only 7 per cent. of maize, 5 of barley, and 12 of millet germinated. Where the temperature was increased to 20 to 24, the fresh seed gave the following germinations: 86 per cent. of millet, 96 of maize, 100 of barley and beans, and 97 of chick peas, while the old seed did not show any considerable increase.'

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date June 3, with reference to the sales of West Indian Sea Island cotton :—

Only a limited business has been done in West Indian Sea Island cotton since our last report. The sales amount to about 80 bales, chiefly St. Croix and Anguilla at $19\frac{1}{2}d.$ to $20d.$, and Stains at $9d.$ to $12d.$

Spinners having supplied their immediate wants are not eager buyers at the moment.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending June 1, is as follows:—

The market has been very quiet throughout the week, with apparently no demand. The Factors are disposed to sell the stock on hand, which they are unwilling to carry over into another season, consequently with orders in hand we can buy to advantage on a basis of the following quotations, viz:—

Extra Fine	30c. to 32c.	$=16\frac{3}{4}d.$ to $17\frac{3}{4}d.$	c.i.f., & 5 per cent.
Fully Fine	28c.	$=15\frac{3}{4}d.$	,, ,, ,, ,,
Fine	26c.	$=14\frac{3}{4}d.$	,, ,, ,, ,,
Fine to Extra Fine, off in preparation	18c. to 25c.	$=10\frac{1}{2}d.$ to $14\frac{1}{4}d.$	,, ,, ,,

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The Government Cotton Ginnery, Grenada.—The above ginnery which contains two Platt roller gins driven by a 6 h.p. Crossley's Patent oil engine, and one hand baling press was worked for the first time on March 12, 1912.

The first cotton ginned was 1 bale of Sea Island and 2 bales of Marie Galante produced in Grenada, and one bale each of Marie Galante and Sea Island is expected to arrive shortly from Islet Ronde. Some of the cotton ginned was grown at True Blue Estate, the property of Mr. John Barclay, and the balance by a peasant from the Southern district.

A bale of cotton was also ginned for Grand Ance Estate. The engine is run by one man, each gin by a woman and a boy, and the baling press by a man. (From a note on the Government Cotton Ginnery, Grenada, supplied by the Superintendent of Agriculture.)

THE BRITISH COTTON GROWING ASSOCIATION.

The following is taken from a report received of a recent meeting of the British Cotton Growing Association:—

The ninety ninth meeting of the Council of the British Cotton Growing Association was held at the Offices of the Association, 15 Cross Street, Manchester, on the 7th instant, the President (The Right Hon. The Earl of Derby, G.C.V.O.) in the Chair.

WEST AFRICA. The purchases of cotton in Lagos to the end of April amount to 6,902 bales, as compared with 4,152 bales for the same period of last year, 3,475 bales for 1910 and 8,525 bales for 1909.

The purchases in Northern Nigeria to date are 1,634 bales against 504 for the whole of last year. With the extension of the railway there is every reason to believe that the expectations which the Council have always held as to the suitability of Northern Nigeria for cotton cultivation will be fully realized. The Association's manager estimates that the present crop will amount to over 2,000 bales, and there is every reason to believe that 5,000 bales will be produced next year and possibly 10,000 bales in 1914. The ginnery which the Association has erected at Zaria was completed towards the end of last year, and has given entire satisfaction. Owing to the prohibitive cost of coal, the engine is run by means of a gas producer plant fed with cotton seed, and this plant is giving excellent results.

NYASALAND. In order to encourage the native industry it has been decided to erect a ginnery in the Chiroma District, which is becoming the most important native cotton-planting centre, the crop produced in the district last year by natives being over 100 tons of lint.

UGANDA. The cotton-growing industry in this Protectorate continues to expand, and it is estimated that the crop this year will be 32,000 bales, as compared with 19,500 bales last year. Mr. Simpson (who was formerly Director of Agriculture in Nyasaland) has been appointed the Government Director of Agriculture in Uganda, and the Association has discussed with him the best means of developing the industry, and of improving the quality of the cotton grown.

A financial statement is appended to the report, which shows that a sum of £24,664 remains to be raised in order to complete the total authorized capital of the Association, of £500,000.

INFORMATION CONCERNING THE MANIHOTS.

The following notes refer chiefly to Jequié and Remanso Maniçoba rubber (*Manihot dichotoma* and *M. piauhyensis*), and are based on details concerning these plants supplied directly to the Commissioner of Agriculture, by Mr. Gilbert Railton, as well as those contained in an article in *Tropical Life*, for January 1912, written by Mr. Railton. It may be said that Mr. Railton has had useful experience in growing the Manihots in the hinterlands of Brazil.

Dealing generally with the Manihots, it is the opinion of this authority that the claims for a production of rubber equal to that from Hevea are not founded on fact; nor is it necessarily true that the returns from the species mentioned are far greater than those from Ceara rubber (*M. Glaziovii*).

Both *M. dichotoma* and *M. piauhyensis* grow well in dry climates, and do not suffer great damage from the conditions of ordinary drought. They prefer the slopes of hills and the valleys near them, and have been found growing successfully up to an altitude of as much as 4,000 feet. Land that is likely to become water-logged, even if the condition is only temporary, is entirely unsuitable to these species. With respect to the former plant, it is stated by Mr. Railton that it may thrive on poor pasture land, but he lays stress on the particular suitability of recently burned land to the needs of this tree, as a seedling.

Reference to the article in *Tropical Life* will show that seeds required for planting should be allowed to mature thoroughly in the sun, or be kept on a dry floor for at least nine months after falling, in order that a regular germination may be obtained. It is recommended that they should be sown two or three in a hole at least an inch deep, at stake, in the places which the plants will occupy permanently. The employment of seed beds and subsequent transplanting is discouraged, chiefly because the length of the tap root of seedlings is so great and the bark so tender that it is easy to cause injury from which the tree will not recover. The use of cuttings is discouraged to an even greater degree; plants grown from them develop a shallow root system which makes it possible for the tree to be blown over by the first high wind; this objection also applies to the transplanting of seedlings. In order to ensure and encourage germination, the seeds should be soaked in water for one to two days, just before they are sown; in some cases a longer soaking than this has been found successful

The objections that have been stated in connexion with the use of seedlings and cuttings, for planting, apply equally to the employment of stumps, which in the same way produce plants of inferior growth and having a badly developed root system.

Practice has shown that *M. dichotoma* and *M. piauhyensis* may be planted much more closely than *Hevea brasiliensis* and *M. Glaziovii*; they may be placed as near as 7 feet × 10 feet.

The amount of weeding that is required will depend naturally on the conditions under which the plants are grown. For the stage to be reached at which weeds will be kept down by the shade from the plants themselves generally requires a period much longer than a year; though assertions are sometimes made that the shorter period is sufficient.

Dealing particularly with *M. dichotoma*, it is generally agreed that this flourishes on good clay soil; it is considered by Mr. Railton that it does not pay to tap this species before the trees are six years old.

M. piauhyensis is suited more especially for the lighter soils; the height attained by it is not as great as that reached by *M. dichotoma*. In regard to the rate of growth, Mr. Railton has observed trees, that had received good care, with a diameter of 25 to 28 inches, the trees being six to seven years old. At this stage the height of the unbranched portion of the main stem was about 6 to 9 feet.

CANDELILLA WAX.

Notes on the candelilla plant and its wax have been given several times in this journal (see *Agricultural News*, Vol. XI, p. 73), as the matter is of particular interest in relation to the fact that it has been introduced into Antigua, St. Kitts and Montserrat by this Department. In continuation, the following is taken from the *Bulletin of the Imperial Institute*, Vol. X, p. 128, just issued:—

In a previous number of this Bulletin (1909, p. 411) a note by the late Dr. Olsson Seffer was printed, giving information regarding the botanical origin, method of preparation and characters of this wax. Dr. Seffer gave *Euphorbia antisyphilitica* Lucc., as the source of the wax, but other authorities have attributed it to *Pedilanthus pavonis*, Boiss. and *Euphorbia cerifera*, and it appears that the confusion may be due to the fact that in Mexico the natives apply the name 'candelilla' to a number of widely different plants.

A pamphlet has been published recently by the National Medical Institute in Mexico, and in this, on the authority of Professor Alcocer, the plant yielding the wax is given as *Euphorbia cerifera*. The following additional particulars are summarized from the pamphlet already referred to.

The wax can be extracted by cutting up the plant into small pieces and either wrapping in wire cloth and immersing in boiling water, when the melted wax rises to the surface and can be skimmed off, or by subjecting the mass to live steam in order to melt the wax, which can then be separated from the condensed water. The impure wax so obtained is purified by re-melting and filtering through charcoal mixed with iron filings; it then varies in colour from greenish-yellow to almost chocolate black, but can be partially bleached to such an extent as to compete with carnauba wax. The candelilla wax is not so hard or brittle as carnauba wax. The composition is said to be affected by the age of the plants, the region where they grow, and the time of year they are collected, but it also seems likely that the great differences that plants show in this are at least in part due to the differences in botanical origin of the samples examined.

According to Sanders the wax contains myricyl alcohol and the hydrocarbon hentriacontane.

The wax is said to be useful for a variety of purposes, among which may be mentioned the manufacture of boot polishes, sealing-wax, insulating materials, and varnishes.

The wax has appeared on the Hamburg market (*Chemist and Druggist*, 1910, p. 59), and at first sold at about 77*s* per cwt., since manufacturers preferred carnauba wax, as its properties are well known to them. Recently, however, candelilla wax has sold in Hamburg at 115*s*. per cwt., so that it has apparently found definite uses in Germany, probably as a substitute for carnauba wax.

According to the British Vice-Consul at Monterey (*Board of Trade Journal*, 1911, p. 430), the supply of the candelilla plant is practically inexhaustible, and there are now four factories at Monterey extracting the wax, two of which are said to be shipping the product to the United Kingdom.

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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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this issue reviews the position of the Reading Courses and Examinations in Practical Agriculture organized by this Department, and makes suggestions in connexion with future work in those courses.

Page 196 contains a short article on the plant known as coco-de-mer or the double coco-nut palm. It is illustrated on the next page by a picture showing a young specimen of the plant that may be seen in the Dominica Botanic Garden.

On page 199 there will be found an article presenting useful information regarding the Manihots, particularly *M. dichotoma* and *M. piauhyensis.*

The Insect Notes are contained on page 202. They consist of two short articles dealing with the yellow fever mosquito and with silk fish lines. It is of interest that the latter are made in South China from the silk glands of the caterpillars of a moth that has been identified as *Saturnia pyretorum.*

An interesting article will be found on page 205, dealing with the sugar yields that were obtained in twenty-two factories in the island of Réunion, in 1910.

The Fungus Notes of this issue are presented on page 206. They consist of a summary of information concerning the physiological condition of citrus and prunus plants known as gummosis.

A second article describing experiments regarding the vitality of Para rubber seeds will be found on page 207. The former of these articles appeared on page 165 of this volume of the *Agricultural News.*

Publications of the Imperial Department of Agriculture.

The issue of the Annual Reports on the Botanic Stations, etc., in the Windward and Leeward Islands has now been completed, and these are available as follows: for Grenada, St. Vincent, St. Lucia, Dominica, Montserrat, Antigua, St. Kitts-Nevis and the Virgin Islands.

Among the reports, as issued, those for Grenada and Dominica are illustrated, on heavy art paper, by means of half-tone blocks showing various parts of the respective Botanic Gardens.

These reports may be obtained from the agents for the publications of the Imperial Department of Agriculture, price 6*d.*, post free 7½*d.*; except in the case of the reports for St. Lucia, Montserrat and the Virgin Islands, the cost of which is 3*d.*, post free 4*d.*

The Grenada Land Settlement Scheme.

The report of the Land Officer appointed in connexion with this scheme, for April 1912, shows that applications for the allotment of land to small holders continued to be received.

Mention was made in the *Agricultural News,* Vol. X, p. 381, of the intention to erect a small factory for the production of muscovado sugar at Morne Rouge. Subsequently, work in connexion with this was commenced, and it was expected that the factory would be completed during last month.

During the month under report, the reconstruction of the roads at Westerhall was begun.

Details of progress of work on the holdings show that these contained no crops at the time of reporting, except for a small quantity of sweet potatoes and sugar-cane. The settlers at Morne Rouge North and Morne Rouge South were stated to be busily engaged in preparing their lots for the coming planting season.

No work was done during the month on the experiment plot constituted under the Scheme.

A Method of Obtaining Pure Drinking Water.

The use of chloride of lime for rendering water free from infection, and fit for drinking is thus described in the *Journal of the Royal Army Medical Corps,* 1911, p. 50.

'(1) Take a spoonful of chloride of lime, containing about one-third available chlorine, and remove the excess of powder by rolling a pencil or other round object along the top of the spoon, or by flattening it with a penknife blade, so that the excess will be squeezed off.

'(2) Dissolve the teaspoonful of chloride of lime in a cupful of water, making sure that all lumps are thoroughly broken up, and to it, in any convenient receptacle, add three more cupfuls of water.

'(3) Stir up the mixture, allow to stand for a few seconds in order to let any particles settle (this stock solution if kept in a tightly-stoppered bottle may be used for four or five days), and add one teaspoonful of this milky stock solution to 2 gallons of the water to be purified, in a pail or other receptacle. Stir thoroughly in order that the weak chlorine solution will come into contact with all the bacteria, and allow to stand for ten minutes. This will give approximately one-half part of free chlorine to a million parts of water, and will effectually destroy all typhoid and colon bacilli, or other dysentery-producing bacilli in the water. The water will be without taste or odour, and the trace of free chlorine added rapidly disappears.'

The Future of the Sleeping Sickness Bureau.

Nature for May 16, 1912, contains a note with reference to the fact that the Secretary of State for the Colonies has issued a memorandum announcing that, from July 1 next, the Sleeping Sickness Bureau will be known as the Tropical Diseases Bureau. As is stated there, the Sleeping Sickness Bureau originated at the International Conference of Sleeping Sickness held in London in 1907 and 1908, and its purpose was to find and set forth measures for the control of sleeping sickness. After the bureau had been established, it was quickly seen that its energies could be extended to include investigations concerning tropical diseases in general.

The new bureau will have its quarters at the Imperial Institute, having outgrown the accommodation provided by the Royal Society. It will deal with all exotic diseases that are prevalent in tropical and subtropical regions, and will publish a Tropical Diseases Bulletin in the place of the present Sleeping Sickness Bulletin. The publication will be partly employed for presenting the results of the most recent researches on tropical diseases, so that the information may be quickly available for workers in the tropics.

Source of a Useful Oil.

The recent high price of linseed oil has given an impetus to the attempts to find a substitute for this product, which possesses so large an importance in regard to the employment of paints and varnishes, and the following information, taken from *Der Tropenpflanzer* for May 1912, concerning an oil yielded by the fruit of *Plukenetia conophora*, which grows as a liane in Kamerun, is of interest.

Official tests have shown that the oil approaches linseed oil, in its physical and chemical properties, and may also be in demand for soap-making; it is especially likely to be useful as a substitute for linseed oil in the preparation of varnish and lacquer. In this connexion, the iodine value of the oil indicates that it is particularly well suited for the restoration of varnishes, while it contains hardly any but drying acids. The iodine value of linseed oil is in general smaller than that determined for Plukenetia oil. Further investigations respecting its drying properties are to be undertaken.

A table giving the results of an enquiry into the properties of the oil shows that the percentage contained in the fruit is 59, and that the product itself possesses a yellowish white colour and a mild and pleasant smell, and taste. Further, the specific gravity of the oil (15°/4°) is 0·936. The refractive index at 15° C. is 1·4835, and the saponification value 190.

The account concludes with interesting observations on the drying properties of the oil.

It may be added that the plants included in the genus Plukenetia belong to the same family of plants as the castor oil plant, the physic nut and the Euphorbias (spurges). They are woody, climbing plants, with alternate heart-shaped leaves, and are found in Africa, the north and centre of South America, and in the West Indies.

Coco-nut Exploitation in British Guiana.

At a meeting of the Court of Policy of British Guiana held on May 7, the Standing Rules and Orders were suspended so that the following motion may be brought forward:—

'Whereas it is known that options to purchase have been secured on a large number of coco-nut or so-called coco-nut estates in this Colony, at prices far above the intrinsic value of such properties,

'Be it Resolved,—That this Court views with apprehension the possibility of the flotation of companies in Great Britain on an unsound basis, thereby imperilling the good name of the Colony as a field for the safe investment of capital.'

In bringing forward the motion, the mover—Mr. R. G. Duncan—referred to the fact that an individual firm or syndicate in London had apparently secured options to purchase a large number of coco-nut or so-called coco-nut properties in the Colony, at prices far in excess of the real market value of the properties. It was his fear that the attempt would be made to induce the British public to take up shares in such a company or companies, and in view of this, and in respect to the good name and future of the Colony, he had brought forward the motion.

Consideration of the motion led to the dropping of the preamble, and the amendment of the motion itself to read:—

'Be it resolved,—That this Court views with apprehension the possibility of the flotation of companies in Great Britain in connection with coco-nut profits on an unsound basis, thereby imperilling the good name of the Colony as a field for the safe investment of capital.'

The amended motion was passed on a division, eight voting for it, and three against it.

INSECT NOTES.

THE YELLOW FEVER MOSQUITO.

At the first International Congress of Entomology at Brussels, in August 1910, Mr. Fred. V. Theobald, M.A., F.E.S., presented a paper entitled The Distribution of the Yellow Fever Mosquito (*Stegomyia fasciatus*, Fabr.) and General Notes on its Bionomics, which has appeared in the volume of the Memoirs of the Congress (p. 145).

The following notes are abstracted from Mr. Theobald's paper.

The yellow fever mosquito occurs throughout the tropical and sub-tropical regions of the world, as the common domestic day-flying mosquito. It never appears to occur far from the habitations of men, and though its attacks are usually most noticeable during the day, it also bites at night, at least in certain localities, notably the West Indies.

Yellow fever occurs as an endemic disease only in the American hemisphere and on the West Coast of Africa. There is a liklihood, however, that with the opening of the Panama Canal, infested mosquitoes will be transported to many of those locations where the Stegomyia mosquito occurs, which have up to the present time been free from yellow fever, with the result that the disease may become world-wide in its distribution.

The possibilities of such transportation would seem to be great, since an adult Stegomyia mosquito is capable of remaining alive for forty-seven to fifty days, which is a period more than will be necessary for steamships to travel to all parts of the Pacific and Indian Oceans from the endemic yellow fever countries in the West Indies and Central America.

SILK FISH LINES.

The *Journal of the College of Agriculture* of the Imperial University of Tokio, Vol II, No. 2, contains an article by Professor C. Sasaki on The Silk Fish Line. The method of obtaining and preparing silk fish lines is briefly noted here as likely to be of interest to readers of the *Agricultural News*.

It would appear that the use of these lines dates back to very remote times, especially in Japan; but the Japanese have had but fragmentary knowledge of the source from which they are obtained and the manner of their preparation.

Professor Sasaki reviews at some length the historical records of the sources of the silk fish lines. He finds that they are procured from wild silk worms.

Recently, specimens of the moth have been identified by Sir George Hampson as *Saturnia pyretorum*, Westwood. The larvae feed upon the leaves of Camphor and *Liquidambar formosana*, and are most abundant in certain districts of South China, where most of the silk fish lines are produced.

When the larvae are fully developed, many of them descend to the trunks and lower branches for the purpose of pupating. These are collected, while the most of those which remain in the higher branches of the trees are allowed to pupate and emerge as moths, thus providing for the next generation of larvae; a few are gathered by means of a funnel on a bamboo. The caterpillars which have been collected are put into a large earthen bowl (4 feet high and about 2 feet in diameter) until it is about one-half full, and the bowl is then filled with water. At the end of from twelve to twenty-four hours, all, or very nearly all, the worms are dead. The caterpillars are taken from the water, a slit is made in the ventral surface of each one, and the two long silk glands are drawn out of the body. These silk glands are then soaked for a time in strong vinegar; after this they are transferred to water and thoroughly washed and rubbed between the fingers. About sixty of these glands are then fastened by one end to a bamboo stick which is then thrust into the mud wall of the house. Each of the glands is then drawn out until it is stretched to its full extent, and fastened to another stick thrust into the mud wall. In this way the silk glands are kept stretched between two supports until they are thoroughly dried in the air, and become firm and strong.

When they are sufficiently dried, the filaments are further washed, and dried again, and then made up into bundles of fifty or sixty filaments; each of these bundles is formed into a ring 8 or 9 inches in diameter, in which condition they are ready for market.

THE RATTANS OR ROTANGS.

The 'rattan canes' of commerce are the stems of two Old World genera of palms—Calamus and Daemonorops—of which, jointly, about 300 species are known. With few exceptions, they are climbers from tree to tree, in dense forests. The distinguished traveller and botanist, Dr. O. Beccari, has devoted a large portion of a long and laborious life to the study of Asiatic palms, both in the forest and in the herbarium, and has contributed much to the literature of the subject. Foremost in his work is the monograph of the genus Calamus, noticed in some detail in the *Gardeners' Chronicle*, Vol. XLVI (1909), p 87, and forming the twelfth volume of the *Annals of the Calcutta Botanic Garden*. The magnificent illustrations, reproductions of the author's own photographs, constitute the valuable feature of these monographs. They are portraits of specimens preserved in various herbaria, but largely in Beccari's own herbarium, and they include the types or co-types of most of the species. The advantage of having these types brought together in one volume is obvious. In Beccari's monograph each species is very fully described in English, to which is added all particulars of its affinities, distribution, uses, and native or trade names. Approximately 200 species of Calamus are known as against somewhat fewer than 100 of Daemonorops. Some authors regard Daemonorops as a section of Calamus, and there certainly is no character by which the one genus can at once be distinguished from the other. Dr. Beccari states that they are not separable by any character easily explained, but by combinations of characters not repeated in the two genera, and he gives the characteristics, positive and negative, side by side. As to the cultivated species of both genera, he says that they are mostly under incorrect names, and there are also names on record of species which have disappeared from cultivation; names which must remain *nomina nuda* for all time. The geographical area of Daemonorops is much more restricted than that of Calamus, and is comprised between Latitude 10°S and 25°N., and between Longitude 85° and 132° E, with much the greatest concentration of species in the Malayan Peninsula and Archipelago, though no species has been found in New Guinea. Calamus extends to the western peninsula of India and to tropical Africa on the west, to Formosa, Australia, and New Guinea on the east. Myrmecophilism (symbiosis with ants), Beccari states, is far more accentuated in Daemonorops than in Calamus, and is particularly easy of verification in *D. verticillaris*, *D. mirabilis*, and *D. formicaria*. The uses of the stems of Daemonorops are nearly equal to those of Calamus, but precise information is wanting, and the real origin of trade produce is often unknown. Dragon's Blood, 'djernang', of the Malays, is the most important product of Daemonorops. It is furnished in abundance and of the best quality by *D. Draco*, *D. Draconcellus* and *D. propinquus* With regard to dimensions. Dr. Beccari states in his *Monograph of Calamus* that none of the stems he measured exceeded 150 feet; yet Roxburg describes his *C. extensus* as having stems 200 yards to 300 yards long. Certain of the mountain species of Daemonorops are of dawrf, erect habit, and suitable for cultivation in a house of moderate size. For example, *D. microthamnus*, *D. monticolus* and *D. tabacinus* scarcely exceed a yard in height. (The *Gardeners' Chronicle*, April 27, 1912.)

AGRICULTURAL POSSIBILITIES OF THE PANAMA CANAL ZONE.

There has been issued recently, from the Office of the Secretary, United States Department of Agriculture, Report No. 95, dealing with the outlook for agriculture in the Panama Canal Zone. In this the following conclusions are reached:—

Large farming operations are impracticable in the Canal Zone on account of the broken topography. Small farms, operated by the proprietors or under a central directive management, through which crop rotations and handling could be systematized and controlled, constitute the probable course of best agricultural development, especially where valuable perishable products destined for shipment outside the Zone are concerned, such as choice mangoes, avocados, pine-apples, mangosteens, chayotes [the Mexican star cucumber], and other tropical fruits and vegetables which are apparently well adapted to conditions in the Zone.

The staple crops best adapted to the conditions appear to be corn, cassava (known as 'yuca'), yams of several species, sugar-cane, plantains, bananas, and upland rice, with a large number of other tropical and sub-tropical crops of lesser importance in the Zone, including cacao, coffee, and rubber.

The methods practised are most primitive and transient, and little effort appears to have been devoted to selecting and developing desirable types, which alone can create an efficient and profitable agriculture. The total crop production of the Zone at present is in consequence very small, and the products in general are of low quality and incapable of maintaining other than very primitive standards of living. The occurrence of occasional choice strains and individual trees and plants of superior excellence indicates that great improvement in productiveness and quality of most of the products could be promptly secured by well-directed, systematic plant introduction and plant improvement work.

The most promising line of attack upon the agricultural problem of the Canal Zone will apparently be to develop a permanent mixed tropical agriculture with a distinct horticultural trend, in which hand labour of tropical origin will be the main dependence for tillage. In this way the existing and prospective conditions would favour the production of high-priced products requiring regular and frequent transportation service, such as will doubtless be available promptly after the opening of the canal for use.

One important feature will be the early working out of a method of mixed cropping, in which soil maintaining and improving leguminous intercrops can be continuously used to replace the wild and intractable native vegetation of the present shack-farm agriculture.

To quickly and effectively develop such a method will doubtless require some intelligently directed experimental work, as it involves careful study of the whole question of plant relationships and antagonisms—one of the most important and far-reaching problems in tropical agriculture, as well as the control of injurious insects and plant diseases. To meet the obvious needs the following lines of work are suggested:—

(1) A careful study of the existing cultivated types of crop plants of the Canal Zone and the adjacent territory of the Republic of Panama, with a view to locating and perpetuating the better strains of such staple crops as have already demonstrated their adaptability to the conditions.

(2) Systematic introduction of promising types and varieties from other tropical countries, with a view to securing the best and most valuable varieties and strains that have been developed under similar conditions elsewhere. This feature is of special importance in the Canal Zone because of the backwardness of the agricultural industry at the present time.

(3) The adjustment of some northern types of vegetables and other perishable crops to tropical conditions by selection and breeding This will probably be a slow and tedious undertaking, but the fact that the maintenance of the canal will probably necessitate the continuous presence of a considerable population of northern birth and tastes, which is not likely to be quickly or easily reconciled to tropical vegetable products, renders it well worth while to undertake it.

(4) The development of more economical, effective and permanent methods of farming, including contouring, tillage, crop rotation, and other points essential to the conservation of soil and the maintenance of soil fertility. Special attention should be given to the introduction and establishment of crops needed for maintaining and encouraging of dairying and the poultry industry, and to the establishment of these industries on a stable economic basis.

(5) The production of useful timbers on lands not suitable or valuable for general agriculture, including such trees as the various species of Eucalyptus, teak, etc.

The report concludes with recommendations concerning the means to be adopted for carrying out the suggestions made, with economy and despatch. These comprise the appointment of agricultural officers under the Isthmian Canal Commission or the United States Department of Agriculture, the provision of experiment stations and plant nurseries, arrangements for co-operative experiments with planters, and the systematic development of school gardens.

The next meeting of the British Association for the Advancement of Science will be held at Dundee from September 4 to 11. Up to the present, eighty-one meetings of the British Association have been held, one of which took place in Dundee in 1867.

GLEANINGS.

A table given in *Diplomatic and Consular Reports*, No. 4862, Annual Series, shows that the exports of bananas, tomatoes and potatoes from the Canary Islands, during 1911, were respectively 2,648,378 crates, 991,047 bundles and 506,032 cases. The similar figures for 1910 were 2,700,352, 1,013,806 and 384,703.

A statistical report from the Philippine Islands shows that in the first quarter of 1911, the sugar exports aggregated 62,625,188 lb., distributed as follows: United States, 50,777,011 lb.; China, 5,878,725 lb.; Hong Kong, 5,953,209 lb.; British West Indies, 16,243 lb. (The *Louisiana Planter*, May 11, 1912.)

According to the *Government Gazette* for March 29, 1912, the exports of rubber from the Federated Malay States amounted to 5,446,343 lb., as compared with 2,820,019 lb. in the similar period of last year. The amount shipped in February 1912 was 2,715,767 lb.; in the same month of 1911 it was 1,490,849 lb.

It is reported from Montserrat that, at the end of May, most of the sowing of cotton on estates had been completed; peasant holders had, however, done very little planting, as they were waiting for more rain. Light showers had been received, which were causing the cotton that had been sown to become well established.

The *Union Gazette* of South Africa gives an estimate of the maize crop of the Transvaal Province, for the present year, as 2,307,970 bags of 200 lb.; the actual yield in 1911 was 3,177,298 bags. The expected decrease in yield is chiefly due to the severe drought that was experienced during the ploughing season, and to insect pests.

Information contained in the *Port-of-Spain Gazette* for June 1, 1912, shows that about 61,000 seeds of cedar (*Cedrela odorata*) and 56,000 seeds of cyp (*Cordia gerascanthus*) have been sold at the Crown Lands Office, Trinidad, during this season. There are still 30,000 cedar seeds and 200,000 cyp seeds available for sale, at 10c. per 1,000.

A report received from Dominica at the beginning of this month states that an average lime crop had been obtained, and that the carême cacao crop had been almost all picked. In regard to the lime industry, 20,000 seedlings that had been advertised were allotted among applicants, and it was intended to send them out during the present month and in July.

It is reported by H. M. Legation at Caracas that the drought in Venezuela during this year has caused one half of the cacao crop to be lost, so that some of those who have a direct interest in the cacao industry in the Republic are in financial difficulties. Another effect of the drought has been that the collection of balata and rubber has been almost impossible.

In the course of experiments made at the Wye Agricultural College, it was shown that the heaviest yield of tobacco leaf and the largest amount of nicotine were obtained by manuring with farmyard manure plus artificials. Thus, whereas farmyard manure alone yielded from 124 to 138 lb. of nicotine per acre, farmyard manure plus artificials yielded from 149 to 161 lb. (From the *Gardeners' Chronicle*, April 20, 1912.)

A notice has been issued by the Trinidad Department of Agriculture stating that, in accordance with Section 7 of the Plant Protection Ordinance, 1911, every nursery must be registered by the owner or occupier thereof, at the office of the Chief Inspector on or before a definite date in the year. In relation to this Ordinance, a nursery is defined as any land or premises whereon are grown or kept any trees, shrubs or herbs intended for sale or distribution.

It may be mentioned that the *Australian Sugar Journal* (Queensland) for March 7, 1912, contains an article that is of some interest in relation to the economy that may be effected by the employment of electric motors in sugar factories. Economy in the matter of steam consumption in sugar factories, in Queensland, is of special importance on account of the circumstance that, under the conditions, each ton of sugar manufactured requires the employment of supplementary fuel to the value of about four shillings.

From *Diplomatic and Consular Reports*, No. 4865, Annual Series, it is gathered that the principal agricultural exports of Réunion for 1911 and 1910, respectively, were as follows: vanilla, 51 tons for both years; coffee 81 and 112 tons; ylang-ylang, 36,366 lb. in 1911; geranium essence, 45 and 64 tons; aloe fibre, 311 and 268 tons; tapioca and starch, 2,860 and 4,077 tons; rum 953,877 and 779,284 gallons; vacoa sacks, 806,500 and 881,685. Satisfactory results have been obtained from the experimental planting of longose (*Hedychium gardnerianum*).

In regard to the preservation of wood, a matter that is receiving special experimental attention in various parts of the West Indies, there is interest in an account of investigations that are mentioned shortly in the *Experiment Station Record*, Vol. XXV, p. 844. It is stated that the work was done with shingles made of loblolly pine, Pennsylvania pitch pine and chestnut, which were treated with creasote by the open tank process. The results showed that the creasote was absorbed in the following amounts: loblolly pine shingles, 11·3 lb. of creasote per bundle at a cost of 32·5 cents; Pennsylvania pitch pine shingles, 15·5 lb. of creasote per bundle at a cost of 41·7 cents; chestnut shingles, 17·1 lb. of creasote per bundle at a cost of 45·5 cents. It is intended to test these shingles, together with those of western cedar, red wood and untreated chestnut, for durability over a term of years.

STUDENTS' CORNER.

JULY.

FIRST PERIOD.

Seasonal Notes.

State what you know of the ways in which the soil is formed, and give examples that illustrate your answer, taken from districts with which you are acquainted. What is the most important substance that is found in soil, as regards the life of the plants that exist in it? Make a sketch map of a district in which you have conducted observations, showing the areas covered by the different types of soil. Indicate any way in which the kinds of soil that are found in the various parts may be correlated with the means by which water from the rainfall runs off the land.

State in what ways the supply of air in soils is renewed, and indicate the manner in which this renewal is important as regards the plant life supported in the soil. What are the broad differences between the kinds of bacteria present, and between their activities, in water-logged and in well aerated soils? How do bacteria assist in increasing the amount of available plant food in the soil, and what artificial means are in employment, in practice, to the same end?

Distinguish between heavy and light soils, stating how heavy soils may be made lighter. What are the most easily available means for effecting this, under conditions in which you have had experience?

What is meant by the organic part of the soil; state how this is maintained in effective proportion (1) in nature, (2) in agricultural practice? It has been found that the presence of humus in soil possesses a particular importance in regard to the activities of the nitrogen-fixing organisms (Azotobacter); what substance contained in the humus is indispensable to this end? How do the higher plants indicate a lack of this substance in the soil or in the food that is being supplied to them?

What condition of the soil do you consider best for the operation of ploughing, and why do you regard this condition as being most suitable? What is the chief objection to ploughing soils when they are (1) very wet, (2) very dry? Distinguish between ploughing, and cultivation in its special sense, stating what is the chief use of the latter. What are the chief circumstances that set a limit to the amount of ploughing that a soil should receive? Give descriptions, with sketches, of ploughing and cultivating implements with which you have had practical experience in employment.

What is meant by (1) the texture of the soil, (2) its tilth? What relationship does the working of the soil bear to the occurrence of weeds, under conditions with which you are familiar? State the chief effects of the presence of weeds in relation to (1) the plants that are being grown especially, (2) the soil? Give a description of any weeds that are useful when they are under proper control, and provide an account of the general uses of weeds in relation to, firstly, the agriculturist, and secondly, mankind in general.

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) Give an account of the chief uses of roots.

(2) Write a description of the special properties of pen manure.

(3) Give a list of the chief reasons why plants are pruned.

INTERMEDIATE QUESTIONS.

(1) Compare the root system of any deep-rooted plant with that of a plant with roots that are confined to the upper part of the soil.

(2) Give directions for the storing of farmyard manure, under conditions in which you have had experience.

(3) Describe the ways in which pruning is effected, stating the reason for the adoption of each method that you mention.

FINAL QUESTIONS.

(1) Show, in the case of any cultivated plant, how the manner of cultivation employed is correlated with the kind of root system possessed by the plant.

(2) Mention the ways in which the employment of pen manure is particularly useful in the tropics, and state the dangers arising from the use of this manure when it has not been properly prepared.

(3) Give an account, in connexion with any plant that you have observed, of the effect of pruning with reference to (a) the manner of growth of the plant, (b) its yield.

SUGAR YIELDS IN REUNION.

Attention is given in the *Journal d'Agriculture Tropicale* for April 1912, p. 122, to a very complete enquiry that has been conducted by the Chamber of Commerce of Réunion into the sugar manufacture, in 1910, of twenty-two factories in the island, and to the returns obtained.

Information in the article in the journal mentioned shows that the output of these factories was 45,549 tons (of 2,204 lb.) of which 43,127 tons was exported; the average manufacture of sugar for the past five years was 42,378 tons.

The general yield of the canes crushed has been about 9·65 per cent., which corresponds to a crop of 472,000 tons of canes, from about 30,000 acres. The crushing leaves something to be desired, as the mills have only extracted ordinarily 70 per cent. of juice on the weight of the cane, as compared with 84 per cent. in Hawaii, the latter crushing being mentioned for purposes of comparison. In publishing this figure, the *Bulletin Commercial de l'Ile de la Réunion* states that the average price realized during the season mentioned, for all kinds of sugar, was about 25 fr. 80 (about £1 0*s.* 9*d.* per ton of 2,240 lb.); at this price the factory owners would have received an additional sum of about £93,000, given a properly organized chemical control and more powerful mills, such as would not mean a cost of more than about £400 for each factory.

The factory expenses have been, on an average, 5*s.* 6*d.* per ton.

The last crop appeared to be less valuable than that of 1910; the same weight of canes had been dealt with, but as they had suffered untoward conditions in February of that year, they had given an inferior juice.

FUNGUS NOTES.

GUMMOSIS OF PRUNUS AND CITRUS.

An interesting paper by O. Butler was published a short time ago in the *Annals of Botany*, Vol. XXV, No. XCVII, p. 107, under the title: 'A Study on Gummosis of Prunus and Citrus, with observations on Squamosis and Exanthema of the Citrus.' It is proposed in this article to give some account of the results arrived at in Butler's paper so far as gummosis is concerned, and to leave the consideration of that part dealing with squamosis and exanthema for a subsequent number of the *Agricultural News*.

DISTRIBUTION AND HISTORY. Gummosis of Prunus and Citrus occurs in France, Germany, Great Britain, Italy, Portugal, Spain and America, as well as in Sicily, the Azores, and in India. The disease has never assumed serious proportions on Prunus but has been responsible for a large amount of damage in the case of Citrus. In St. Michael, in the Azores, it first appeared in 1834, and was at its height in 1840, when it caused the destruction of a large proportion of the citrus trees of the island. By the year 1873 it was no longer feared, though it still occurred. It subsequently made its appearance in Portugal, Sicily, Spain, Corsica and Algeria. It seriously affected the groves of new South Wales between 1860 and 1870, and appeared in California in 1875, in Florida in 1876.

DESCRIPTION. The first external signs of the disease are the occurrence of raised places on the epidermis or of drops of gum on its surface. As the disease progresses, the swollen spots on the epidermis burst and allow the gum to flow out, while in those cases where the first sign was the occurrence of small drops on the surface, the progress of the disease simply increases the flow of gum. At the stage when gum has appeared on the surface of the bark, the inner bark, or cortex, will be found to be permeated to a greater or less extent. The infiltrated bark subsequently dies, cracks, curls and sloughs off. Severe cases of gummosis are always accompanied by chlorosis, that is the disappearance of the green colouring matter of the plant, whose green parts become yellow; this probably results from a decrease in the absorption of mineral nutriment by the roots, brought about by the partial destruction of the bark which entails a partial starvation of the roots as regards the food-supply from the leaves. On cutting a slightly affected branch, two or more years old, through a diseased area, it will be found that the damage first arises in the young wood which has just been formed by the cambium. 'The diseased area is fusoid in form from the greater development of the diseased tissues near the point of gum accumulation and their lesser and lesser development as one proceeds further away. The gum exudes *en masse* from the centre of the sickle, but as one proceeds towards its extremities it will appear in droplets of decreasing magnitude and separated with larger intervening spaces of apparently healthy tissue. The gum in the centre of the sickle is more or less tinted yellow, depending on its age, whereas that pearling from the tissues at its extremities is always colourless.

'If sections are now cut at various distances above or below the centre of disease, it will be found that gum formation proceeds downward to a much less extent than upward. Furthermore, if we imagine a line drawn through the middle of the pathognomic tissues, it will be found, as one proceeds upwards and downwards, that the gumming sickle diminishes in size.'

Gumming may attack the stems, small branches, leaves or fruit, and may affect the tree locally or generally, according to external circumstances and the species attacked. It may arise autogenously, that is to say, without direct outside cause, or may be induced by the attacks of insects or fungi, or by any other form of damage such as may result from wounds caused accidentally by instruments or brought about by frost, sunburn, or the application of acids and poisons.

As has been stated already, the gum pockets may be formed among the embryonic cells of the xylem (the cells of the wood that have been formed most recently from the cambium). The cell walls of this tissue swell up and give rise to the gum This breaking down of the cell wall may proceed until all its layers are disorganized, when the cell contents become mixed with the gum; or it may be arrested when only the two outer layers of the walls of certain of the cells have broken down, so that freed cells contained by the third layer are left floating in the gum. In mild cases this disorganization is confined to the embryonic xylem cells, but in more serious attacks it may extend to the cambium, the medullary rays, and the older cells of the xylem. When gummosis is arrested, the young xylem cells become lignified (provided with woody walls), and the cambium proceeds to lay down normal tissue so that the gum pockets are enclosed in healthy wood

CAUSE. For an outbreak of the disease the simultaneous occurrence of two factors is necessary, namely, active growth and a free supply of moisture. Butler believes that the formation of gum is due to the hydrolysis of the cell walls of the young xylem. Exactly how this is brought about is uncertain, but he is inclined to think that it is not due to the action of an enzyme. He puts forward good reasons for believing that gumming is not produced by the oxidation of the cell walls, nor by the direct action of a cellulose-dissolving enzyme: two theories which have been suggested by previous writers.

It will be seen from this that gumming is likely to occur when trees are grown in heavy, badly drained soils, or in suitable soils underlaid by an impermeable subsoil. Furthermore, it may be encouraged by excessive irrigation, or by high fertility of the soil combined with want of drainage or excessive irrigation; or by the too great application of manures, especially of nitrogenous manures; and, lastly, by continuous wet weather at the commencement of the growing period. These factors may either induce the disease or encourage its development on wounded trees or on those attacked by insects or fungi.

PREVENTIVE AND REMEDIAL MEASURES. When the disease is traceable to wounds, or to the action of insects or fungi, preventive and remedial measures must deal with these agencies, and need not be discussed at length here. Preventive measures in the case of autogenous outbreaks of the disease should aim at attention to drainage, irrigation, and manuring. The use of resistant stocks and of high budding also possesses a preventive effect. The maximum resistance is exhibited by *Citrus trifoliata* and *C. amara*, the bitter orange. The rough lemon, shaddock, orange and citron exhibit intermediate resistance in the order given; while the lemon is highly susceptible. Applications of salt at the rate of from 2 lb. to 3 lb per tree are suggested as being likely to prove of value in preventing gumming. Certain other minor preventive measures are also mentioned.

The most important remedial measure is attention to drainage. Slitting of the bark, crosswise, longitudinally, or spirally, gives some alleviation when trees are subject to gummosis irregularly or accidentally. The excision of all tissues affected, both bark and wood infiltrated the gum, cannot be recommended; excision should be confined to the dead bark only.

THE VITALITY OF PARA RUBBER SEEDS.

The last number but one of the *Agricultural News* contained an account, taken from the *Agricultural Bulletin of the Straits and Federated Malay States* for February 1912, of an experiment to compare the vitality of Para rubber seeds from tapped and untapped trees. The following description of a second experiment, for the purpose of finding the effectiveness of various methods of preserving seeds from tapped trees, is given in the same journal. It was intended to repeat the experiments that are described.

THE PRESERVING OF RUBBER SEEDS FROM TAPPED TREES. The seeds in these experiments were collected and packed in a similar way to those in the first experiment, but they were coated respectively with beeswax, hard paraffin, and vaseline The beeswax and hard paraffin were melted, and the seeds dipped into their respective liquids, allowed to solidify, and then packed. Previous to planting the seeds, the hard paraffin, beeswax, and vaseline were removed.

The percentage of germination of untreated seeds from tapped trees can be seen by referring to experiment 1. On comparing this with the seeds coated with beeswax, it will be seen that the latter showed an increased germination to the extent of approximately 30 per cent. The seeds coated with hard paraffin gave better results than untreated seeds from tapped trees, but not as good as those coated with beeswax.

The seeds treated with vaseline did not germinate. The coating of rubber seeds with any substance is undoubtedly an expensive treatment, but if seeds have to be sent to countries which take from one and a half to two and a half months to reach, and seeds from untapped trees cannot be obtained, then, it is thought, the extra percentage of germination resulting from the seeds being coated with beeswax would more than repay the extra expense entailed by this system of treatment.

PERCENTAGE OF SEED GERMINATION OBTAINED FROM TAPPED AND UNTAPPED TREES.

No. of box.	1	2	3	4	5	6
No. of seeds in box	180	180	180	180	180	180
No. of weeks the seeds were in box	3	5	7	8	9	10
No. of plants obtained; beeswax	107	108	94	82	100	86
No. of plants obtained; paraffin	62	71	74	66	61	58
Percentage of seed germination; beeswax	59	60	52	45	55	47
Percentage of seed germination; paraffin	34	40	41	37	34	32
Percentage of seed germination; untreated	33	23	24	20	20	24

In no case was there apparent a large falling off in germinating power from the third to the tenth week.

AGRICULTURAL MATTERS IN ST. VINCENT.

In the opening address by His Honour the Administrator at the February session of the Legislative Council of St. Vincent, held on the 9th of the month, several references were made to subjects connected with agriculture that it is well to mention here.

In regard to anthrax, His Honour stated that it was particularly gratifying to be able to record an entire abatement of this disease among stock, and that he had no hesitation in declaring the Colony to be so free from anthrax as to render the exportation of stock therefrom no longer of danger to neighbouring colonies. For a period of ten months, that is since April 1911, only one case of anthrax had been found among stock dying from natural causes; this occurred as far back as July 1911, so that for seven months no single case of death has taken place among stock from anthrax. Human anthrax has not occurred in the Colony for nine years. These circumstances, particularly in view of the means that exist in the Colony to prevent and counteract the disease, including an Act providing for compulsory vaccination in case of emergency (see *Agricultural News*, Vol. XI, p. 153), are causing St. Vincent to seek to induce the neighbouring colonies to accept stock from the island under more reasonable and less prohibitive conditions, than exist at present.

Among the matters for which the expenditure under the estimates has provided is the institution of a scholarship and an exhibition at the Grammar School.

Reference is made in the address to the successful advertising campaign that has been conducted by the Committee of Management of the Arrowroot Growers' and Exporters' Association. In mentioning the last annual report of this association, which was reviewed in the *Agricultural News*, Vol. XI, p. 89, the Administrator congratulates the committee, with particular mention of the secretary, on the progress that has been made. Request has been received that the Arrowroot (New Market Fund) Ordinance of 1910 (see *Agricultural News*, Vol. X, p. 9), which expires automatically in December 1912, shall be renewed; and certainty is expressed that such renewal will receive the favourable consideration of the Council, subject to the sanction of the Secretary of State for the Colonies.

The last matter in the address that is connected more directly with agriculture is a reference to the recent visit to the island of Mr. J. W. McConnel, Vice-Chairman of the Fine Spinners' and Doublers' Association in Manchester. It is stated that the useful information that had been received at first hand, in consequence of this visit, should do much, notwithstanding the recent experience of unfavourable conditions for the crop, to encourage cotton planters to continue its production, and ensure perseverance in the careful methods of cotton cultivation and seed selection, that are carried out in St. Vincent in order to maintain the high quality of the product.

Information given in the *Semi-Annual Report* of Messrs. Schimmel & Co., dated April 1912, shows that the production of camphor in Formosa during 1910 was 6,494,375 lb., and that the value of the exports during the same period was £503,552; in the preceding year the similar figures were 4,705,157 lb. and £446,902. It is stated further that an estimate has been made to the effect that the camphor forests of Formosa will be exhausted in forty-five years' time, but that since 1901 the Japanese Government has caused fifteen million trees to be planted.

MARKET REPORTS.

London.—The West India Committee Circular, June 4, 1912; Messrs. E. A. De Pass & Co., May 24, 1912.

Arrowroot—$3\frac{3}{4}d.$ to $4\frac{1}{4}d.$
Balata—Sheet, 3/8; block, 2/7½ per lb.
Beeswax—£7 17s. 6d.
Cacao—Trinidad, 60/- to 78/- per cwt.; Grenada, 55/- to 61/-; Jamaica, 53/ to 58/-.
Coffee—Jamaica, 72/- to 79/- per cwt.
Copra—West Indian, £26 10s. per ton.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 19½d. to 20d.
Fruit—No quotations.
Fustic—No quotations.
Ginger—49/- to 65/- per cwt.
Isinglass—No quotations.
Honey—No quotation.
Lime Juice—Raw, 1/7 to 2/1; concentrated, £18 12s. 6d. to £19; otto of limes (hand pressed), no quotations.
Logwood—No quotations.
Mace—No quotations.
Nutmegs—No quotations.
Pimento—Common, $2\frac{1}{4}d.$; fair, $2\frac{9}{16}d.$; good, $2\frac{3}{4}d.$; per lb.
Rubber—Para, fine hard, 4/6¾; fine soft, 4/4¾; Castilloa, 4/2 per lb.
Rum—Jamaica, 1/11 to 6/.
Sugar—Crystals, 16/6 to 19/; Muscovado, 13/6 to 16/-; Syrup, 12/3 to 16/- per cwt.; Molasses, no quotations.

New York.—Messrs. Gillespie Bros. & Co., May 31, 1912.

Cacao—Caracas, 14¾c. to 15½c.; Grenada, 12¾c. to 13½c.; Trinidad, 13¾c. to 14¼c. per lb.; Jamaica, no quotations.
Cocoa-nuts—Jamaica, select, \$21·00 to \$22·00; culls, \$14·00; Trinidad, select, \$22·00 to \$23·00; culls, \$14·00 per M.
Coffee—Jamaica, 14½c. to 17c. per lb.
Ginger—8¾c. to 11½c. per lb.
Goat Skins—Jamaica, 50c.; Antigua and Barbados, 43c. to 45c.; St. Thomas and St. Kitts, 41c. to 42c. per lb.
Grape-Fruit—Jamaica, \$3·50 to \$4·00.
Limes—\$6·50 to \$7·00.
Mace—No quotations.
Nutmegs—110's, 11½c. to 12c.
Oranges—Jamaica, \$1·50 to \$2·00 per box.
Pimento—3d. per lb.
Sugar—Centrifugals, 96°, 3·98½c. per lb.; Muscovados, 89°, 3·48½c.; Molasses, 89°, 3·23½c. per lb., all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., June 10, 1912.

Cacao—Venezuelan, \$15·00 to \$15·25 per fanega; Trinidad, \$13·75 to \$14·25.
Cocoa-nut Oil—95c. per Imperial gallon.
Coffee—Venezuelan, 15½c. per lb.
Copra—\$4·50 per 100 lb.
Dhal—\$4·50.
Onions—\$2·50 to \$4·00 per 100 lb.
Peas, Split—\$7·00 to \$7·25 per bag.
Potatoes—English, \$2·00 to \$2·75 per 100 lb.
Rice—Yellow, \$4·80 to \$4·90; White, \$6·25 to \$6·35 per bag.
Sugar—American crushed, no quotations

Barbados.—Messrs. James A. Lynch & Co., Ltd., June 15, 1912; Messrs. T. S. Garraway & Co., June 17, 1912; Messrs. Leacock & Co., May 25, 1912.

Arrowroot—\$7·00 per 100 lb.
Cacao—\$14·00 per 100 lb.
Cocoa-nuts—\$16·00.
Hay—\$1·80 to \$2·50 per 100 lb.
Manures—Nitrate of soda, \$65·00; Cacao manure, \$45·00 to \$48·00; Sulphate of ammonia, \$80·00 per ton.
Molasses—No quotations.
Onions—\$1·80 to \$2·75 per 100 lb.
Peas, Split—\$7·00 to \$7·10 per bag of 210 lb.; Canada, \$3·00 to \$5·40 per bag of 120 lb.
Potatoes—Nova Scotia, \$3·60 to \$3·75 per 160 lb.
Rice—Ballam, \$5·05 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
Sugar—American granulated, \$5·00 per 100 lb.

British Guiana.—Messrs. Wieting & Richter, June 8, 1912; Messrs. Sandbach, Parker & Co., June 7, 1912.

Articles.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	—	—
Balata—Venezuela block	No quotation	Prohibited
Demerara sheet	70c. per lb.	—
Cacao—Native	14c. per lb.	18c. per lb.
Cassava—	72c.	No quotation
Cassava Starch—	\$7·00	No quotation
Cocoa-nuts—	\$16 to \$20 per M.	\$10 to \$16 per M., peeled and selected
Coffee—Creole	18c. per lb.	16c. per lb.
Jamaica and Rio	20c. per lb.	20c. to 21c.
Liberian	12c. per lb.	14c. per lb.
Dhal—	\$4·50 per bag of 168 lb.	\$4·50 per bag of 168 lb.
Green Dhal	\$4·50	—
Eddoes—	\$2·16	—
Molasses—Yellow	None	—
Onions—Teneriffe	6c. to 7c. per lb.	—
Madeira	—	—
Peas—Split	\$6·75 to \$7·00 per bag (210 lb.)	\$7·15 per bag (210 lb.)
Marseilles	—	No quotation
Plantains—	24c. to 60c.	—
Potatoes—Nova Scotia	\$3·75 to \$4·00	\$3·75 to \$4·00
Lisbon	—	No quotation
Potatoes—Sweet, B'bados	\$2·40 per bag	—
Rice—Ballam	No quotation	—
Creole	\$5·25 to \$5·50	\$5·30 to \$5·50
Tannias—	\$2·40	—
Yams—White	\$3·00	—
Buck	\$2·40	—
Sugar—Dark crystals	\$3·20 to \$3·30	\$3·25 to \$3·45
Yellow	\$4·00	\$4·25
White	—	—
Molasses	\$2·80 to \$2·90	—
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	\$3·75 to \$6·00 per M.	\$4·00 to \$6·00 per M.
,, Cordwood	\$1·80 to \$2·00 per ton	No quotation.

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OF THE
IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

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CONTENTS.

Theories Concerning Soil Fertility.

I.

IN recent years, great changes have taken place with respect to the way in which the soil is regarded in relation to the nutrition of plants, and investigators are by no means agreed in their views on the subject. The most general opinion is that the soil contains definite food bodies which are taken up by the plant, for its nutrition, and that owing partly to weathering and partly to the action of micro-organisms, among which bacteria are very important, some of these, as well as other substances, are produced or destroyed, according to the conditions that obtain. Other hyphotheses exist, however, among which the most divergent from what has been stated is that of Whitney, Cameron and others, who have been engaged in work for the Bureau of Soils of the United States Department of Agriculture. It is the present purpose to review this hypothesis, under the guidance of what is known broadly concerning the nutrition of plants and their relationship to the soil in which they grow; and as this has been done ably and at length in a recent article by E. J. Russell*, what is said there will be used freely as a guide in dealing with the matter.

Before the special aspect of the subject receives attention, it will oe useful to give a brief account of the main circumstances in the relationship between the soil and plant. In an article published some time ago in the *Agricultural News*,† a review was given, at some length, of the things that are essential for plants to grow properly, and stress was laid upon the fact that insufficiency in regard to the provision of any one of these essentials results in a decreased power of the plant to make use of all the others. The necessary conditions were stated to be, in the order of immediate urgency: (1) a supply of water; (2) a certain range of temperature: (3) a supply of mineral salts: (4) the presence of certain kinds of light; (5) air containing oxygen and carbon dioxide. For a statement of the ways in which these are necessary, reference is made to the article quoted; the important matter is that they are necessary, and that they must all be present in sufficient amount in order that plants may make the best use of them.

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* The Soil and the Plant, by E. J. Russell, D.Sc ; *Science Progress*, Vol. VI, No. 21, p. 135.
† Vol. IX, p. 257.

It has been known for a long time that the soil supplies to the plant several elements that are of value in nutrition, including among others nitrogen, potassium, phosphorus, sodium, calcium, magnesium and iron; there has also been the recognition that an increase of plant growth is brought about when certain compounds of these elements, notably nitrates, phosphates, potassium salts and carbonates, are added to the soil; further, that the crop may be increased by the use of organic matter in the form of green dressings, composts and natural manures. The results of all the observations that have been made have gone to show that the food bodies are taken up by the plant either after being dissolved directly in the water in the soil or after being made to dissolve through the presence, in the water, of carbon dioxide that has been excreted by roots or formed by bacteria. All that has been said demonstrates sufficiently the supreme importance to the plant of the soil moisture. It is the source of the water required by plants, and the means by which the food entering through the roots is absorbed.

This is the reason why so much work has been done for the purpose of learning as much as possible concerning the water in soils. It must be considered, in making the investigations, that four things happen to the water that falls upon the soil: part of it clings to the particles, through surface attraction: part travels slowly downwards and escapes into the subsoil; part evaporates; and where much rain falls in a short time, a portion runs off the surface without entering the soil. The water that clings to the particles is of the greatest importance to plants. By surface action, it is supposed to travel from the wetter to the drier places in the soil, though little is actually known about the matter; and it is constantly reduced in amount through evaporation and absorption into plants, but to an extent to which there is a definite limit that its removal cannot exceed.

It is easy to demonstrate that the spaces in the soil are not only occupied by water, but to a greater extent by air. For the present purpose, however, much consideration of this matter is not required. It may be sufficient to realize that owing to the actions of plant roots and micro-organisms, mentioned above, oxygen is continually being taken from this air and carbon dioxide put back in its place. New supplies of oxygen flow in from the outer air, and the ultimate result is that the air in the soil continually resembles ordinary air in its composition, except that it contains a little more carbon dioxide.

In its relation to plants, the soil derives much of its fitness as a medium for their growth from the extent to which it contains calcium carbonate. Where the proportion of calcium carbonate is small or wanting, the soil is usually called 'sour', and is realized as being but poorly adapted to the raising of crops. It is necessary, therefore, that much account should be taken of the effect of the presence of this substance, when investigations of the soil are being made.

These matters have been brought forward in order to indicate the circumstances of the soil that agricultural workers are called upon to investigate. They show that the conditions which go to make the soil useful to the plant bear an intimate relation with one another: they must all be served in sufficient degree. If therefore, in an investigation, attention is given to one or more of them to the exclusion of the rest, useless and misleading conclusions will be reached. The view of the experimenter must be broad, lest he attribute results to the particular factors that he is investigating, when they are actually due to the limiting effect of some other factor that, in his restricted survey, he has overlooked.

Short reference to the hypotheses of the United States Bureau of Soils has been made already. These hypotheses depend on the recognition of the great importance to plants of the soil moisture, and study of this has led to most interesting conclusions, among such conclusions being: that plants will grow in culture solutions that vary greatly in strength: that variations in the proportions of the nutrient salts in the solutions result in a much more marked effect on the growth and organization of plants; and that the strength of the soil solution is practically the same in all soils. Of these, the last conclusion is the most suggestive, from the practical aspect, and requires consideration at length.

The supposed constancy in composition of the soil moisture is accounted for by Whitney and Cameron by the fact that most soils are derived from a relatively small number of minerals which are very similar in composition, so that when they are dissolved into the water in the soil, similar solutions are always formed. They explain that the constitution of such solutions is not affected by the addition of artificial manures containing definite chemical compounds, for any proportion of the latter that may dissolve is balanced in the solution by the removal of an equal quantity of similar matter that was present already. Further, the mineral particles in the soil serve two purposes with respect to this solution: they supply it with the substances that are removed from it by plants, and they afford a large number of surfaces which hold the soil moisture and enable it to travel to the places where it is required. Thus the differences shown by soils, with respect to their fertility, or usefulness to plants, are not due to variation in the composition of the soil solution, as this does not exist; but to the efficiency of the soil as a water-carrying medium—a characteristic depending on the nature of the mineral particles and on the presence of organic matter, as well as other circumstances. All this means that it is argued that fertility does not depend on the chemical composition of the soil, for the constitution of the soil solution is the same in all soils; and even if it were not, differences in composition would have no influence on plant growth.

The holders of this view of soil fertility were soon confronted by special instances that did not bear themselves in accord with the simple explanation. Cases were adduced in which soils possessing very similar physical characteristics showed striking differences in fertility, either when plants were grown in the soils themselves or when they were raised in solutions obtained by extracting the soils with water; as was expected, however, these solutions were found on analysis to be similar in composition. It was therefore concluded that the infertility of the poor soil could not be due to any deficiency in its content of plant food, so that another cause must be found. The short explanation may be made that, as the result of a large amount of work in connexion with the matter, carried out both in the United States and other countries, it was supposed that the inferiority of the poor soil in such cases is due to the presence of some organic substance that is a poison (toxin) in relation to the life of the higher plants. The solution obtained by treating such soils with water was so poisonous to plants in some cases that they were found to develop to a greater degree in distilled water than in the solution. This toxicity could be reduced in various ways, such as diluting the solution, shaking it with various substances and bodies, and adding artificial or natural manures—the latter kind being the more efficient.

All this led to the suggestion by Whitney that the infertility of soil is caused by the presence of toxic bodies, probably of an organic nature; and the next step in the investigations was to find, by means of water cultures, the effect on plant growth of organic substances likely to occur in the soil, and to try to discover in the soil itself such organic compounds among these as had been identified. Several of these bodies were found and examined, and it was demonstrated that a toxic water solution in which two crops are grown is less poisonous to the second than to the first—probably because of the oxidizing action of the roots that had already developed in it—and that this action was especially powerful in the presence of manure. The attempt to find harmful organic compounds in the soil resulted in the isolation of several such substances, one of which—dihydroxystearic acid—received special investigation.* Attempts to find the way in which these poisonous compounds are formed in the soil led it to be concluded that some arise from the decomposition of organic matter already present, and that others are excreted by plants; the latter consideration led to the revival of the old supposition of de Candolle that, while such products may be harmful to the kind of plant that produces them, they may not necessarily interfere with the growth of other kinds—a supposition that was brought forward to explain the decreases in yield that sometimes take place when the same soil is used for growing successive crops of the same plant. Lastly, it was suggested, as a result of all the work that has been reviewed, that the beneficial action of manures arises—not because they feed the plant—but because they assist in the proper distribution of the soil solution and are effective in destroying the toxic bodies that are formed or produced in the soil.

What has been said shows the directions in which investigations concerning soil fertility must be made, and presents the conclusions concerning this that have been reached in work which takes account of physical and chemical considerations of the soil, rather than of the effect of the life-processes that occur in it continually. The presentation of the criticism by Russell, of this work and of the views to which it has led, as this is unfolded in the article by that investigator, quoted above, is reserved for the next issue of the *Agricultural News*.

According to *The Board of Trade Journal* for May 16, 1912, of the exports from Venezuela in 1911, valued at £428,960, classified as being sent to the United Kingdom and British Colonies, about £262,440 went to the United Kingdom and £162,000 to Trinidad. The imports from Trinidad during the same year were valued at about £26,000 only, owing to the surtax of 30 per cent. levied in Venezuela on imports from the West Indies.

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* Bulletin No. 70; Bureau of Soils, United States Department of Agriculture.

FRUITS AND FRUIT TREES.

THE EMBRYONY OF THE MANGO.

Two articles were published in Vol. VIII, of the *Agricultural News*, on pages 187 and 228, which were concerned with the fact that both monoembryonic and polyembryonic seeds of the mango are known. This means that there are not only varieties of this plant which produce seeds that give rise to one seedling, alone, but that there also exist varieties with seeds from which as many as six to eight, and even thirty, plants may spring. The former of the articles gave an account of observations on the polyembryony of the mango, made by J. Belling and published in the *Annual Report of the Florida Experiment Station* for 1908. In this, attention is given to the fact that where more than one seedling comes from one seed, one of the seedlings is the result of pollination and consequent fertilization, while the others arise in a purely vegetative way—much in the same manner as suckers are formed, and cuttings grow.

An addition to the interest of the subject is afforded in an article by P. J. Wester which appears in the *Philippine Agricultural Review* for February 1912. This commences by making references to other well-known examples of plants with polyembryonic seeds, such as the orange and tangerine and the rose-apple (*Eugenia Jambos*), and proceeds to refer to the work of Webber and Swingle, in which, when several seedlings developed from one seed obtained by crossing the orange and *Citrus trifoliata*, one only shewed hybrid characters, the others exhibiting the characteristics of the mother plant, alone; thus confirmation was obtained of the purely vegetative origin of all but one. It is then pointed out that the consideration of polyembryony in the mango is no new matter, for Gärtner had already noted the peculiar structure of the mango seed, about a century ago, though he probably did not recognize its significance, the matter remaining for discussion at some length by Reinwardt, a few years afterward. Later references to the subject are made by Schacht, Strasburger and Cook, and the places where these, as well as others, are to be found are quoted usefully in Wester's article.

Reinwardt was aware of the existence of monoembryony, as well as of polyembryony, in the mango, though later investigators appear to have paid very little attention to the former. The significance of the matter is that plants true to type are more likely to be obtained from seeds producing more than one seedling, than from seeds giving only one plant: for in the former case, all the sprouts but one are of vegetative origin, and therefore little inclined to variation. This is illustrated practically in a most interesting way by the circumstance that, in Jamaica, Florida and the Philippines, where the varieties of mangoes usually cultivated are polyembryonic, these reproduce themselves true to seed; whereas all the grafted mangoes introduced into Florida from India (except that called Cambodia), which are monoembryonic, have given seeds that afford plants showing much greater variation from the mother parent than is exhibited by polyembryonic kinds. Wester quotes C. Maries as saying, with respect to the Indian varieties, in their own country: 'If the seed from the best and finest sorts are (*sic*) planted, the chances are that fifty per cent. will be as good as the fruit planted, a few better, and the rest worse.' The matter receives further illustration in the significant circumstance that, of all the varieties introduced into Florida from the East, the only polyembryonic form—Cambodia, mentioned above—is the sole kind that reproduces itself truly from seed.

Wester, in continuing his article, mentions Belling's work, to which reference has been made already, and draws attention to the apparent conclusion of this observer, namely that monoembryony is a result of the practice of grafting for several generations, rather than an inherent botanical character. It has occurred, however, to Wester to suggest that, from the data collected, 'the species *Mangifera indica*, L., may be divided into two great types: one, the monoembryonic, to which belong most, if not all, of the mango varieties in India; the other, the polyembryonic type, the mangoes belonging to which transmit their characters to their progeny.' He realizes, nevertheless, that much more study of it is required before the subject can be given a definite conclusion.

The second of the articles mentioned at the commencement of this contains information supplied by Mr. Jones, Curator of the Dominica Botanic Station, which would tend to show that experience there has apparently demonstrated that the polyembryonic mangoes show much greater variation in type than in the Philippines; probably because the seedling that is the result of fertilization is the stronger, and therefore the one that is allowed to survive. Useful suggestions for further work are made by Mr. Jones.

PHOENIX CANARIENSIS.

As it name indicates, this palm is a native of the Canary Islands. *Phoenix canariensis* is, however, now grown in other parts of the world as an ornamental plant, for which purpose it is especially fitted by the possession of leaves that have been described as: 'rich-green fronds like enormous ostrich plumes;' it resembles the date palm (*P. dactylifera*), but has a larger number of leaves and is more slender and graceful in appearance. A variety (*P. canariensis*, var. *macrocarpa*) is sometimes cultivated.

An illustration is given on this page of a plant of *P. canariensis* which is to be seen growing in the Dominica Botanic Gardens. This was also figured in the last Annual Report (1910-11) on the Botanic Station, Dominica.

According to Bailey (*Cyclopaedia of American Horticulture*), a hybrid between *P. canariensis* and an Indian species of Phoenix—*P. sylvestris*—is highly prized among American horticulturists. It may be useful to state that the latter of these plants is the wild date, or date sugar palm, of India. This palm is very similar to the ordinary or edible, date palm mentioned above: in fact it is so closely related that some hold the opinion that the latter was derived from *P. sylvestris*, while others think that *P. sylvestris* is a variety of *P. dactylifera* growing under somewhat unfavourable conditions. In accordance with what is suggested in its name, the date sugar palm is used as a source of sugar. The industry of obtaining the sugar, or jaggery (gur) as it is called, is followed on an extensive scale in India, where the juice is obtained by tapping the trees and is then boiled down to form the jaggery which is usually sold to refiners.

Returning to the consideration of ornamental species of Phoenix, it should be stated that there are several of these, besides *P. canariensis*, among which *P. rupicola* may be mentioned. This plant, in its wild state, is found in India.

FIG. 4. RED-FRUITED PHOENIX CANARIENSIS; DOMINICA BOTANIC GARDENS.

DEVELOPMENT OF THE EMBRYO CHICK.

Twelve hours after incubation has begun, the ligaments of the head and body are discovered. Close observation has found the heart to beat by the close of the day. At the end of forty-eight hours two vesicles of blood are distinguished, the pulsations of which are visible. At the fiftieth hour, an auricle of the heart appears. At the end of seventy hours, the outlines of wings, and on the head two 'bubbles' for the brain, one for the bill, and two others for the forepart and the hind part of the head appear. The liver appears toward the fifth day. At the end of one hundred and thirty-six hours, the first voluntary motion is observed. Seven hours later the lungs and stomach become visible, and the intestines, the loins and the upper jaw are seen at the end of one hundred and forty-eight hours. The seventh day, the brain, which is slimy, begins to have some consistence.

At the one hundred and ninetieth hour of incubation the bill opens and the flesh appears on the breast. Four hours after that the sternum, that is to say the breast bone, is seen. At the two hundred and tenth hour, the ribs come out of the back, the bill is visible, as well as the gall-bladder. The bill becomes green at the end of two hundred and thirty six hours. About four hours later the feathers begin to shoot out and the skull becomes gristly. The eyes appear at the two hundred and sixty-fourth hour; and at the two hundred and eighty-eighth hour the ribs are perfect. At the three hundred and thirty-first hour the spleen draws near to the stomach, and the lungs and the chest. At the end of three hundred and fifty-five hours, the bill frequently opens and shuts, and at the end of four hundred and fifty-one hours, or the eighteenth day, the first cry of the chick is heard. (In the *Bulletin of the Bureau of Agricultural Intelligence and of Plant Diseases*, April 1911, from the *Poultry Advocate*, Toronto, December 1911.)

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date June 17, with reference to the sales of West Indian Sea Island cotton:—

Since our last report, about 230 bales West Indian Sea Island cotton have been sold, including about 100 bales St. Vincent from 22*d.* to 30*d.*, 20 bales Barbados 20*d.* to 21*d.*, and 100 bales Stains at 8½*d* to 10½*d*.

The demand for fine yarn for lace purposes is very limited, and consequently many spinners have turned their machinery on to Sakellarides Egyptian cotton, with a view of manufacturing a coarser article which they can sell readily. This is in spite of the fact that not only is the West Indian Sea Island crop a short one, but the Carolina crop has been an absolute failure, and fairly confirms the caution which we gave planters last season not to increase their acreage. Had it not been for the failure of Carolina this year, the two growths would, in all probability, be a glut at 14*d.* Of course, if the fashion for ladies' dress should change, the whole situation would be altered immediately.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending June 15, is as follows:—

There has been a good demand this week for the odd bags off in preparation classing Fully Fine and Extra Fine, resulting in sales of about 200 bales, at prices ranging from 24c. to 25c., the buying being on account of the Northern mills and French spinners. This demand has taken very nearly the supply of cotton more or less off in preparation, therefore the unsold stock consists very largely of Planters' crop lots, which the Factors are showing more disposition to sell, not wishing to carry them into another season.

We quote, viz:—

Extra Fine	30c. to 32c. = 16¾*d.* to 17¾*d.*	c.i.f., & 5 per cent.
Fully Fine	28c. = 15¾*d.*	" " " "
Fine	26c. = 14¾*d.*	" " " "
Fine to Extra Fine, off in preparation	25c. = 10½*d.* to 14¼*d.*	" " "

With respect to cotton-growing in the Sudan, copies of a resolution passed at the annual meeting of the British Cotton Growing Association, on May 1, have been sent to the Prime Minister, the Secretary of State for Foreign Affairs, and others, and there is reason to believe that the Government will be willing to give some financial assistance toward the development of the industry.

ANNUAL REPORT OF THE BRITISH COTTON GROWING ASSOCIATION, 1911.

In a copy of this report—the seventh of the series—which has just been received, the matter commences by making references to various changes that have occurred on the Council of the Association, and expresses thanks to Government officials and to the President for assistance that has been given by them; reference is made also to the grant of £10,000 made by the Government, that has enabled work to be continued in several Protectorates. The details that follow refer to various means that have been employed towards completing the authorized capital of the Association, of £500.000.

An interesting table is given which shows that the total amount of cotton which has passed through the hands of the Association during recent years, in addition to that sold through other channels is as follows:—

Year.	No. of bales.	Value.
1908	16,713	£224,888
1909	20,028	225,078
1910	21,388	296,160
1911	27,673	373,583

Short reference is made to various meetings and conferences that have taken place during the year with the assistance of the Association, including the addresses delivered last year in Manchester by the Imperial Commissioner of Agriculture and by Professor Carmody, Director of Agriculture, Trinidad, which were reported in the *Agricultural News*, Vol. X, p. 342. The Council expresses the wish to put on record the importance that is attached to such meetings. A final matter of more general interest, in the introductory part of the report, is mention of the expeditions that were sent out during the year, to the Anglo-Egyptian Sudan and to the West Indies, the latter being in connexion with the recent Agricultural Conference. It should also be mentioned that the fact is noted that the quantity of cotton grown in new places in the British Empire during 1911 amounted to over 60,000 bales.

The detailed account of the financial state of the Association is succeeded by a report of work in the colonies, which may be abstracted shortly as follows.

INDIA AND CEYLON. The Council expresses its regret that for various reasons the cultivation of cotton under irrigation, in Sind, has had to cease temporarily; though a fresh endeavour in regard to the matter is being made by the Agricultural Department. It is stated, in a general way, that there is not the least doubt that owing to the influence of the Association improvement has taken place in Indian cotton, which is acquiring in consequence a wider market.

The cotton industry in Ceylon is still being supervised by Messrs. Frendenberg & Co., but drought and other circumstances have caused little progress to be made.

WEST INDIES. It is well to reproduce in full what is said about cotton in this part of the world: —

'There has been no great increase in cultivation recently and this is largely due to the low prices which prevailed during 1911. Those planters who stuck to cotton have, however, secured good prices, for owing to the partial failure of the American crop there has recently been a substantial advance in the price of Sea Island cotton. Although the market for this class of cotton is a limited one it would be a great misfortune if the planters in the West Indies were to materially reduce their acreage. Some of the best authorities are convinced that the day will come when spinners of the finer classes of yarn will have to depend mainly for their supplies on the West Indies. There seems to be every probability that sooner or later the boll weevil will reach the Atlantic States and that ultimately the cultivation of Sea Island cotton will have to be abandoned in that part of the world. The Association are doing their best in co operation with the Imperial Department of Agriculture to help the planters to secure good prices for their cotton, and in this connexion they wish to record their deep appreciation of the invaluable services rendered by the Hon. Francis Watts and Mr. C. M. Wolstenholme, and which are perhaps not as fully appreciated as they should be.

'In accordance with a request from Dr. Watts, arrangements were made for representatives of the Association to attend the Agricultural Conference at Trinidad, and Sir Owen Phillips very kindly offered a free passage for one of the delegates. Mr. John W. McConnel and Mr. William Marsland very kindly placed their services at the disposal of the Council, and they not only attended the Conference but also visited most of the cotton-growing islands. The Council cannot sufficiently thank these gentlemen for giving up so much valuable time to the work of the Association. Their report has been published separately, and it is to be hoped that this expedition may lead to valuable results.'

WEST AFRICA. Continued Harmattan winds during the growing season have again reduced the crop so that it was no larger than that of 1910; the progress that is being made, however, in Northern Nigeria may bring about larger results next year. West African cotton has created a market for itself, and most of it has been sold at relatively high prices, almost on arrival; there has been great improvement, particularly in Lagos cotton. The Council expresses some concern in regard to the proposal to establish a separate silver token currency in the West African colonies.

GOLD COAST. The pioneer work has been continued in accordance with an agreement with the Government, and possible extension in the Northern Territory has received particular attention. Disappointing results have been obtained so far, and it is stated that unless they improve it will be useless to spend any more money in cotton trials on the Gold Coast.

LAGOS. As in the case of West Africa generally, the cotton output has suffered from the Harmattan winds, the output having been only 5,9C0 bales as compared with 6,000 in 1910 and 12,000 bales in 1909. Though this result is disappointing, there has been great improvement in the quality of the lint, and encouragement has been offered to growers in the shape of a minimum rate of payment for all seed-cotton produced during this year. The buying agreement with the merchants has been renewed, and the Council records its appreciation of the valuable assistance that has been given by the mercantile community of Nigeria.

SOUTHERN NIGERIA. Results useful as regards quality, but only moderate with respect to quantity, have been obtained. The work is proving itself valuable as a means of raising seed for distribution elsewhere.

NORTHERN NIGERIA. Consideration of the exports of cotton would lead to the conclusion that little progress has been made, but it continues to be pointed out that the effect of the present work will be felt in future. The practical completion of the Baro-Kano railway and other extensions are bringing a large portion of Northern Nigeria into economic touch with the rest of the world. Special assistance is being given by the Council in the direction of the provision of gins, and of material for trials of improved methods of transport.

BRITISH EAST AFRICA. The results on the coast are again unsatisfactory, though there has been a considerable extension of cotton-growing in the neighbourhood of Kisumu.

UGANDA. The exports for 1911 exceeded 19,000 bales, and it is expected that in a year or two the Protectorate will produce over 50,000 bales of lint per annum. Additions have been made to the ginning plant, and further assistance is available in the completion of the new railway which will open up an important area around Lake Choga.

NYASALAND. The progress is stated to be continued and satisfactory, though more advantage should be taken of the ginning factory and hydraulic press that have been erected at Port Herald. It has been decided for the present not to commence a plantation, as was suggested in the last report, chiefly on account of the competition that may be produced in the labour market. In relation to this difficulty, proposals are being made concerning the employment of motor ploughs and the construction of railways.

The general report, to which several useful appendixes are added, is brought to an end with most interesting information in connexion with cotton-growing in Rhodesia, South Africa, and Egypt and the Sudan, but space does not permit an account of this to be given The present review may be completed, however, by the full quotation of the following conclusion to the report:—

'Although, as will be seen from the above, some of the ventures undertaken by the Association have been unsatisfactory and may ultimately have to be abandoned, on the other hand the results of the past year's working in several of the Colonies are more than encouraging. Uganda is now producing a large quantity of cotton, Northern Nigeria is at last making real progress, and in the Anglo-Egyptian Sudan there are almost boundless possibilities for the future. These three countries, with the assistance of Nyasaland and the West Indies, can supply all the cotton, both as regards quality and quantity, that Lancashire requires. The Council are convinced that the position of affairs to-day is the most satisfactory since the inauguration of the work and that large and important results may shortly be expected.

'Very satisfactory progress is also being made with the development of the purely commercial side of the work, viz., selling, financing, and insuring cotton and seed, supplying machinery, stores, etc., to planters and others. The income derived from this work now goes a long way towards covering the cost of the Head Office in Manchester.

'Before concluding, the Council wish to record their appreciation of the excellent work done by the Staff, and more particularly by those whose lives are spent in tropical and unhealthy countries. Without exception they have willingly and enthusiastically devoted themselves to the great work of promoting and establishing the growth of cotton throughout the British Empire'

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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NOTES AND COMMENTS.

Contents of Present Issue.

In this number the editorial commences a review of certain Theories Concerning Soil Fertility. The subject will be concluded in a second editorial article, in the next issue of the *Agricultural News.*

On page 212, an account is presented of recent work concerning, and theories in connexion with the embryony of the seeds of the mango.

Among other matters, page 213 contains an illustrated article dealing with *Phoenix canariensis* and some allied species of Phoenix. The plant illustrated is at present growing in the Dominica Botanic Gardens.

The same page presents an account of the stages of development of the chicken in the egg. Although the times that are given for the stages described are not invariably followed under differing conditions, the matter forms an interesting short description of the process of growth before the chicken is hatched.

The Annual Report of the British Cotton Growing Association for 1911 is reviewed at some length on pages 214 and 215. The omission of certain interesting matters was necessary for want of space, but these may receive attention at some future time.

The Insect Notes, on page 218, are concerned with an illustrated article describing recent entomological work in Fiji.

On page 222, the Fungus Notes give an account of work connected with exanthema and squamosis of Citrus plants. It may be considered as a continuation of the article on gummosis of Prunus and Citrus, in the last number of the *Agricultural News.*

A New Artificial Manure.

On page 153 of this volume of the *Agricultural News*, the announcement was made that a new artificial manure called Biphosphate was being produced at the Notodden Nitrate Works, Norway.

In the *Board of Trade Journal* for May 2, 1912, further information is given concerning the manure. A sample of this has been forwarded to England by the British Acting Consul at Christiania, and it is stated that the product contains 26 per cent. of phosphoric acid and 23·8 per cent. of nitrate of lime. Of the phosphoric acid, 92 per cent. is in the citrate-soluble form, which means that this proportion will dissolve in a standard solution of ammonium citrate.

The further statement is made that the manure will be placed on the market, in future, with considerably higher percentages of both phosphoric acid and nitrogen.

The Vitality of Farm Seeds.

The last number of the *Agricultural News* contained an article dealing in a general way with the vitality of seeds. The information given there may be supplemented by details that are contained in an abstract describing work in connexion with the same subject, which appears in the *Journal of the Board of Agriculture* for May 1912, the seeds in this case being those usually in employment on an English farm.

The experiments that are described were designed for the purpose of finding: (1) the time that certain seeds live when stored under ordinary conditions; (2) the annual loss of vitality; (3) the real value of seeds kept for one or two years; and (4) the rapidity of germination of the seeds that were chosen.

Among cereals, the vitality of barley and wheat seeds changed little during the first five years, but there was a rapid total loss of vitality during the next five years. The similar periods in the case of white oats were nine and five years; while for black oats they were nine and seven years. The greater vitality of oats is attributed to the fact that the glumes do not fall away as chaff, so that the seeds are protected.

All seeds of grasses died between the eighth and thirteenth year, though there was much variation among the different kinds in the way in which the loss of vitality took place.

Seeds of different sorts of clover, generally speaking, lose little vitality during the first three or four years; there is then a rapid loss for another three or four years, and it takes an additional similar time for the last 10 per cent. of the seeds to die.

There was a remarkable drop in the germination of seeds of turnips and allied plants during the tenth year; and practically all the seeds were dead by the thirteenth year.

With reference to the rapidity of germination, the detailed results are of little interest in this place. An observation of a general nature was made, however, to the effect that seeds specially slow in germinating all showed more rapid germination in the second year than in the first.

The Formation of Nitrates in Cultivated Soil.

Experiments carried out recently in Germany have shown that, in soils protected from leaching, there was a steady increase in nitrates, which however was greater in the first year than later: the observations were made to a depth of 32 inches.

An abstract of the paper describing the work, which appears in the *Experiment Station Record* for March 1912, p. 319, goes on to state that if the aëration of the soil was increased by adding sand or loam there was an increase in the rate of formation of nitrates. The content of nitrates and the nitrifying power of the soil became less as the depth increased: the decline of the former was more rapid than that of the total nitrogen.

It was demonstrated that active nitrification takes place during winter, by means of pot experiments in which ammonium sulphate in quantity amounting to 0·2 per cent. of the weight of the soil was added to the the latter; about one-half of the sulphate applied in November was nitrified by the following March. The process of oxidation under the conditions, however, involved a large loss of nitrogen.

The oxidation of ammonium sulphate took place less quickly in the subsoil than in the surface soil, during the first three months, but later the difference was less.

As may be expected, the addition of caustic lime to soil containing ammonium sulphate caused loss of ammonia; the loss was less when calcium carbonate was added instead of the lime. The nitrification of ammonium sulphate was checked to a marked extent by the addition of caustic lime; but where no manure had been added to the soil, it increased the rate of formation of nitrates from the soil nitrogen as long as the lime continued in the caustic state.

Agricultural Science at the Dominica Grammar School.

The Headmaster of the Dominica Grammar School, Mr. W. Skinner, M.A., has recently issued his report on the school for the year 1911-12, and it is published in the Dominica *Official Gazette* for May 31.

The amounts voted for the present financial year provided for the appointment of an Assistant Master who is qualified to teach agricultural science; this master has since arrived in the island, and taken up the work, in the person of Mr. H. Waterland. In addition to the above sum, there was a supplementary vote of £70 to provide for the erection of a room to be used as a chemical laboratory; a sum of £25 was also authorized to be expended for the purchase of apparatus and chemicals.

The Assistant Master mentioned teaches agriculture and science, in addition to some other subjects. Both parts of the school are in receipt of the same teaching in French, English subjects and mathematics.

As regards the time which the instruction in science has been given, the study of elementary botany was commenced in September, and the classes in chemistry in the Lent term.

Exports from Barbados, 1911.

A return showing the quantity and value of the exports from Barbados during 1911 was issued in April by the Comptroller of Customs. From this the following information is taken, in regard to the chief exports of agricultural origin, that were the produce and manufacture of the Colony:—

Aloes, value £125; cotton, raw, 740,269 lb. value £43,182; cotton seed, 365 bags, value £183; cotton seed meal, 592,570 lb. value £3,704; fresh fruit, value £28; preserved fruit, value £159; hides and skins, value £3,550; falernum, 639 gallons value £129; rum, 2,472 gallons value £185; molasses, choice, 25,067 puncheons value £100,268, and fancy, 59,820 puncheons value £246,757; dark crystal sugar, 7,024 hogsheads value £77,264; white crystal sugar, 7 hogsheads value £82; yellow crystal sugar, 104 hogsheads value £1,196; muscovado sugar, 23,413 hogsheads value £210,717; tamarinds, value £237; fresh vegetables, value £14,423.

The Supply of Bay Oil.

In the *Semi-Annual Report* of Messrs. Schimmel & Co., dated April 1912, the complaint regarding the scarcity of bay oil that has been made for several years is repeated, and it is stated that the small arrivals which have come to hand from time to time at Havre, Marseilles and Hamburg have been readily taken up. It is stated further: 'occasionally the supplies consisted of oil which had been adulterated almost out of recognition, and scarcely deserved the name of bay oil.'

It is considered that the present condition of the market is likely to continue for some time, because the most recent advices show that producers in the West Indies have again begun to complain of the difficulty of procuring leaves in sufficient quantity. In any case, Messrs. Schimmel & Co. will be prevented from resuming distilling operations: further, according to their report, none of the parcels of West Indian bay oil that have come into their possession approach even distantly in quality their own distillate.

In consequence of these circumstances, the plan will be to exercise the greatest possible care in selection from among the available supplies of oil, and the result of this will be to continue the upward tendency of prices.

It is satisfactory that, in spite of the large increases of price that have been made, Schimmel's terpeneless bay oil continues to be in strong demand—a fact which indicates that the prices asked for this product are justified by its excellence.

INSECT NOTES.

ECONOMIC ENTOMOLOGY IN FIJI.

The Department of Agriculture, Fiji, has recently published a report on Economic Entomology, by Frank P. Jepson, B.A. (Cantab.), F.E.S., Government Entomologist.

Mr. Jepson assumed the duties of his office in October 1909, and his report has for its primary object a statement of the manner in which his time was spent during the first year of his appointment.

The report is of very considerable interest, both because of the fact that it includes an account of the first work in Fiji by a Government Entomologist, and also on account of the very large amount of information that it contains.

FIG. 5. GRUB OF WEST INDIAN SUGAR-CANE WEEVIL BORER.

In the introduction, which includes a general summary of the work of the year, the author discusses, among other topics, the necessity for the inspection of imported fruit and plants. It is stated that in all probability the insect enemies of cultivated crops in Fiji have with few exceptions, been introduced from other countries, and the great need for proper inspection of all imported plants is strongly brought out. Several insect pests are named which are not at the present time known to occur in Fiji; the introduction of these would seriously affect the agricultural prosperity of the Colony, while the probability of such introduction is very great, unless adequate means are taken to prevent it.

One instance is given in particular to illustrate this point. The rhinoceros beetle (*Oryctes rhinoceros*, L.) has recently been introduced into Samoa from Ceylon. It is believed that this insect was transported in packages containing rubber seeds. This is a very serious pest of coco-nuts and many acres of full-bearing coco-nut palms have already been destroyed, and as there is no satisfactory manner of dealing with this pest, its importance seems likely to increase rather than to diminish.

The use of natural enemies is also discussed in the report, and the value of combating insect pests by this means is clearly shown.

The section on Arthropoda Injurious to Man and Animals contains accounts of mosquitoes, ticks, lice and related insects which in general are similar to those known in the West Indies, and the same remark applies to the insects mentioned in the sections entitled Insects Injurious to Stored Goods, and Insects Injurious to Timber.

The insects dealt with in this report which seem likely to be of greatest interest to the readers of the *Agricultural News* are certain of those mentioned in the chapter entitled Insects Injurious to Cultivated Crops.

Several insects are regarded as pests of coco-nuts. One of these is a small moth, *Levuana iridescens*. The larva of this insect feeds upon the leaves of the coco-nut palm, eating from the under surface, and in cases of severe attack destroying the entire tissue of the leaf except the upper epidermis. The attacked areas are in the form of narrow lines running lengthwise of the leaflet, and it often occurs that a number of these lines, each the work of a separate larva, may be found in a leaf.

The pupa of this insect is generally formed in the fibrous mass at the bases of the leaves. This habit, together with the fact that the mass of loose fibre in the axils of the leaves affords a shelter for many insects and other animals, suggests the desirability of clearing it away, in dealing with infested trees. This, however, involves a large amount of labour, which renders it impossible on many coco-nut plantations. Spraying is not feasible, often on account of the lack of a sufficient supply of water. It is suggested therefore that the natural enemies of this pest should be sought for in places where the latter is likely to be indigenous.

The coco-nut leaf miner (*Promecotheca reichei*) occurs on certain islands in the Colony, causing a considerable amount of danger on small areas. Trees which are attacked are conspicuous on account of the large brown patches upon the leaflets. These patches are the dead areas resulting from the feeding of the beetle larvae, which eat out the green portion of the leaf, leaving the dry upper and lower epidermis. This pest is largely controlled by a minute hymenopterous parasite.

Coco-nuts are also attacked in Fiji by certain stick insects, closely related to the guava lobster (*Diapherodes gigantea*) and the common god.horse (*Phanocles* spp.) of the West Indies.

The flowering spathes of the coco-nut are often attacked by the boring larvae of moths and beetles, and the cabbage, or bud, is attacked and destroyed by the larvae of a small moth, *Trachycentra* sp.

FIG. 6. WEST INDIAN SUGAR-CANE WEEVIL BORER.

The attack of this latter insect produces a condition which Mr. Jepson states closely resembles that which results from an attack of bud rot in the West Indies.

The only scale insect mentioned as attacking coco-nuts in Fiji is the coco-nut scale (*Pseudococcus pandani*). This insect appears to be fairly well controlled by a small lady-bird beetle, *Anisercus affinis*.

Bananas are reported as being attacked by several insect pests, the chief of which is the banana borer, *Sphenophorus sordidus*. This insect, which has occurred in limited numbers in the West Indies, causes extensive damage to banana plantations in certain localities in Fiji. It is considered likely that it is an introduced pest, having been imported into the Colony with banana suckers for planting.

In the introduction to the report, Mr. Jepson mentions the case of a recent importation of bananas from Jamaica and Barbados, which upon arrival were found to be infested with a borer, quite distinct from the banana or sugar-cane borers, already known in Fiji, although apparently very closely related to them. It is stated that in the case of the Gros Michel varieties, out of 676 suckers, only twenty were found to be free from the attacks of this insect. This instance serves to show the manner in which such a pest may be introduced into a new locality, and also the value to be derived from careful inspection of imported plant material.

An attempt has been made to discover an efficient parasite of the banana borer, but the search has not yet been successful.

Several other insects affecting bananas are mentioned in the report, but these do not seem to be of great economic importance.

Among the insects attacking sugar-cane it is interesting to note that the principal pest is a weevil borer, *Sphenophorus obscurus*. This insect is closely related to the weevil borer (*Sphenophorus sericeus*) which attacks sugar-cane in the West Indies (see Figs. 5 and 6). In Fiji, however, the weevil borer is a principal pest of the sugar-cane and appears to be able to attack healthy canes; while in the West Indies the weevil borer is a pest of secondary importance, and is able to attack the cane only when the rind has been broken or ruptured by some cause such as wind, attacks of rats or moth borer.

The sugar-cane borer in Fiji is controlled by collecting, principally at baits, which consist of pieces of split canes about 12 inches long placed on the ground in the cane field at regular intervals. As fermentation commences, the beetles are attracted to the cane baits, and deposit eggs in them. The bait pieces should be collected and burned before the beetles are fully developed, and others put down in their places.

A parasitic fly has been discovered in New Guinea (see *Agricultural News*, Vol. IX, p. 138) attacking the cane borer; which may eventually prove a valuable natural enemy in Fiji.

Cacao is stated to be attacked by two species of shot borers, and by scale insects. Pine-apples are attacked by scale insects, and a fruit fly, *Tephrites* [Dacus] *xanthodes*), has been reported as being bred from pine-apples from Fiji, although Mr. Jepson states that he has not found it in the Colony.

Cotton is attacked by two species of stainers, *Dysdercus pacifica* and *D. insularis*, and by a tip worm, the larva of a small moth, *Earias fabia*. The injury to the cotton results from the twig-boring habit of the larva.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture returned to Barbados, from visits to Grenada and Trinidad in connexion with official matters, by the S.S. 'Verdi', on June 27.

Messrs. H. A. Ballou and F. W. South, Entomologist and Mycologist on the Staff of the Imperial Department of Agriculture, returned to Barbados from St. Kitts, by the S.S. 'Parima', on June 21.

AGRICULTURE IN ST. LUCIA, 1910.

The information given below, concerning the agricultural industries in St. Lucia during 1910, is selected from details presented in *Colonial Reports*—Annual, No. 713, issued recently:—

The principal products of the Colony are sugar and cacao, but as there are no reliable statistics available of the area of each under cultivation, the value of the industries can be estimated only by the quantities exported.

In 1910, the quantity of cacao exported was 8,187 bags of 200 lb., value £40,935, as compared with 10,850 bags, value £54,275 in 1909. The amount of usine sugar shipped in 1910 was 5,199 tons, value £64,988; in 1909, 5,360 tons, value £59,623. Other sugar, and muscovado and its products, reached a value of £2,674 in 1910, and £2,265 in the preceding year.

The quantity of cacao produced from year to year does not exhibit that rapidity of increase that might be reasonably expected from the area of land to be seen employed in its cultivation, and it is more than probable that this is owing to the lack of attention bestowed by the small growers on their cacao plots, and to their ignorance, despite the efforts made by the officers of the Agricultural Department to teach them, of proper cultural methods. The following summary of figures recently prepared by the Agricultural Superintendent shows that it has taken twenty years for the quantity of cacao exported to double itself.

Quinquennial periods.	Annual average export. (Bags of 200 lb.)
1891-5	4,581
1896-1900	5,070
1901-5	7,094
1906-10	9,434

The production of lime juice is steadily increasing, the value of the export in 1910 being £320, the value in 1909 and 1908 being, respectively, £297 and £126. Honey did not do quite so well, the figures being, for 1910 £402, and for 1909 £479. Cotton, on the contrary, showed a remarkable increase, the value of the output being declared at £1,302, as compared with £432 in the year previous. The cotton industry is one, however, which for various reasons, does not find favour in the planting community, and that this is so is borne out by the fact that cotton cultivation is being largely given up by those who were engaged in it during the year under report.

The number of applications for the purchase of Crown Lands, received in 1910, was seventy-two, the acreage of which was 692, as compared with 121 applications for 1,609 acres in 1909. But the applications in the latter year included two applications in respect of 407 acres, and three in respect of 200 acres. Surveys to the number of eighty-seven were executed during the year, of which fifty-five were re-surveys, and the total alienations amounted to 1,042 acres; twenty-four Crown grants were issued, and fifty-seven remained unissued at the close of the year. Economic plants, comprising coffee, cacao, limes, nutmegs, cinnamon etc., were distributed to Crown Lands purchasers, free of cost, to the number of 5,406, more than double the number issued in the year previous.

The Crown traces, Colombette to Canaries, Esperance to La Borne, and Ravine Soufre were completed during the year; the Raillon trace, which leaves the main road between Dennery and Micoud at the crossing of the Praslin River and extends upwards and along the southern side of the valley of that name for a distance of nearly $4\frac{3}{4}$ miles, was begun, and considerable progress made with its construction.

GLEANINGS.

It is reported from the Antigua Botanic Station that further orders were received recently for 2,150 coco-nuts. Orders were also sent to the Station during May for 50,000 lime plants.

The buying of cotton by the Agricultural Department in the Virgin Islands was brought to an end, for the past season, on June 1. The crop has amounted to about 51,000 ℔. of lint.

The Agricultural Superintendent, St. Vincent, reports that a fairly large area is being planted in coco-nuts in different parts of the island; the imported nuts are obtained as a rule from St. Lucia and Dominica. In connexion with the same matter, 506 coco-nut plants were fumigated at the Station during last May.

A note in the *Bulletin Agricole* of Mauritius for April 1912 shows that larvae of the Anopheles mosquito have been found, in Cambodia, in a cavity full of salt water, in a rock near the sea. As is stated, this is an interesting fact, because it shows that the wrigglers of this dangerous insect may exist in salt water as well as in that which is fresh.

An article is published in *The Auk* for 1911, p. 335, which demonstrates that the English sparrow is often the host of the chicken mite (*Dermanyssus gallinae*), and of the bird mite (*D. avium*). The observations on which the article is based were made in the United States, and it is shown that the sparrows become infested with the mites through employing the feathers of poultry for lining their nests.

Diplomatic and Consular Reports, No. 4859 Annual Series, shows that the chief exports from Nicaragua during 1910 were as follows: coffee, 12,028 tons value £576,198; cotton, 63 tons value £2,258; cacao, 68 tons value £4,291; hides, 590 tons value £40,422; rubber, 285 tons value £71,231; lignum vitae, 138 tons value £600; mora, 2,621 tons value £5,060; bananas, 490,000 bunches value £22,090.

A report recently issued on the trade of Iquitos, Peru, by H.M. Consul in that district, shows that the outlook for the rubber industry is unfavourable; statistics indicate that the exports have been decreasing since 1907. The Chamber of Commerce at Iquitos is making attempts to start cotton-planting in Loreto, where it is considered that the plant should flourish: the chief difficulty is the obtaining of labour at a reasonable price.

A paper in the *Comptes Rendus de l'Académie des Sciences*, Paris, 1911, p. 1629 brings forward the fact that the ultra-violet rays of light may be made to invert cane sugar. The action then proceeds in the direction of breaking up the sugars thus formed, so that formaldehyde and carbon dioxide are produced. This is of interest in relation to another action of the ultra-violet rays that was noted on page 172 of this volume of the *Agricultural News*.

One of the latest Food Inspection Decisions of the United States Department of Agriculture, namely No. 143, is to the effect that the term Candied Citron is to be applicable only to the candied peel of the fruit of the citron tree (*Citrus medica*, var. *genuina*, Engl.). One of the reasons for issuing this decision is that the rind of the citrus melon, (*Citrullus vulgaris*, Schrad.) is sometimes designated as candied citron. It should be labelled Candied Citron Melon, Candied Water-melon, or in some similar way.

Information given in the Semi-Annual Report of Schimmel & Co., dated April 1912, shows that up to the time mentioned, citronella oil had been able, during the preceding six months, to maintain the prices which it had reached in October 1911. The reason for the firmness is found partly in the decline of the exports from those of the previous year, and partly in the systematic withholding from the market of the arrivals by the native traders in Matara. The exports of citronella oil from Ceylon in 1910 were 1,747,934 ℔, and in 1911 1,524,275 ℔.

A note is contained in the *Gardeners' Chronicle* for April 6, 1912, which deals with investigations that show that there is no doubt as to the injurious effects of road tar on trees growing near the road. The observations were made in the Bois de Boulogne, on trees of *Catalpa bignonioides* and *Robinia Pseud acacia* and others, and show that the tarring affects the number of leaves and their size and shape. The influence of the tar is such that the effective leaf surface of trees in parts of the Bois where the roads are tarred is one-half of that on trees in parts of the roads which are not tarred.

The *Experiment Station Record*, Vol. XXVI, p. 526, issued May 7, 1912, reviews an article which describes briefly an attempt to place Phonolith, which is a silicate of potash found in volcanic rocks in the Eifel Mountains, in competition with the potash salts from Stassfurt. The Phonolith is stated to contain from 8 to 10 per cent. of potash, and can be mined and ground for about £1 per car load. Trials have shown that, although conflicting results have been obtained, the material possesses a very low manurial value as compared with that of potash salts.

Official information has been received to the effect that the post of Inspector General of Agriculture in India has been combined with that of Director of the Agricultural Research Institute and Principal of the Agricultural College, Pusa. The new title of the holder of the post will be Agricultural Adviser to the Government of India and Director of the Agricultural Research Institute, Pusa. In consequence, all communications intended for the offices first mentioned should be addressed to the last-mentioned officer. Further, the Assistant Inspector General of Agriculture in India is now to be known as the Assistant to the Agricultural Adviser to the Government of India.

STUDENTS' CORNER.

JULY.

SECOND PERIOD.

Seasonal Notes.

Examine several plants, and find out if the way in which the leaves are borne possesses any relation to the parts of the stem; observe also the different kinds of leaves that may be borne by a plant, and the places on the plant where they are found. Why are leaves usually flat and thin? Adduce any reason for their being cylindrical (roughly speaking) and tapering; that is to say of a form in which there is far less surface, in proportion to the bulk, than is usually the case. What are the uses of the veins of leaves, and how would you show that they possess these uses? The interior of a leaf generally exhibits large spaces between the cells, and there is very free communication between this part and the outer air; why is this? How is a leaf enabled, to some extent, to regulate the rate at which the water leaves it, that it receives from the roots? In considering the different structures that are usually found in leaves, in relation to their uses, it should be remembered that those of many plants give off water freely and in large quantities, in bright sunlight, the purpose being to prevent the temperature of the leaves from rising to such a degree as to cause injury to the protoplasm in them; this fact has been demonstrated particularly for cotton, in Egypt. State what you know concerning protoplasm, and mention the parts of an ordinary woody plant that consist of cells which contain this body.

In what way are leaves concerned in the nutrition of the plant which bears them? State how you would show, in a simple manner, that leaves are necessary for the proper nutrition of a plant. The fact that leaves derive from the sun the energy which they require for building up the food bodies that are formed in them lends much importance to the results of shading plants and to the question of the degree of shade that they require at different stages of their growth. It is evident, again, that the amount of development of the stem and roots of a plant depends to some extent on the effective leaf surface that belongs to it. This is illustrated by the circumstance that trees growing in dense forests possess tall, slender trunks that branch very high up; for the lower branches have been killed through the want of light; and further the resulting reduction in the amount of leaves that they bear generally causes the wood to be of a soft kind, containing relatively little fibrous tissue. The latter condition receives contrast from the case of trees of the same kind growing in the open, where the access of light and the consequent free growth of leaves causes the rate of nutrition to be such that large, strong trunks full of fibrous elements are formed.

The largest leaves, in plants of the same kind, are most often to be found on those receiving the best supply of water; in fact, in any given plant, the size of the leaves as compared with those of other plants of the same sort is closely dependent on the ease with which the plant may obtain water. This is why the leaves borne by the suckers of plants that sprout out quickly during the rainy season are generally larger than the older, ordinary leaves on the plant—a matter that may often be observed in lime trees, to give an example. With such leaves there is usually the accompaniment of a softer woody tissue.

In a collection of similar seedlings, or in different varieties of the same plant, those individuals or forms bearing the largest leaves may be regarded as the most hardy and as possessing the best root development—the latter property being a consequence of the former. This fact should be remembered when selection is being carried out.

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) Give a short account of the different kinds of buds.

(2) What is meant by stomata, and what are their uses to the plant?

(3) State, giving examples, what you know of the different shapes that are possessed by leaves.

INTERMEDIATE QUESTIONS.

(1) How are the buds of plants employed in their propagation?

(2) State briefly how the stomata of a plant are enabled to open and close.

(3) Give examples of plants in which the area of the surface of the leaves has been much reduced, in order to enable the plant to withstand dry conditions.

FINAL QUESTIONS.

(1) Supply examples of the kinds of protection for the interior that may be found in leaf buds and in flower buds.

(2) Write an account, illustrated with examples, of the ways in which leaves are enabled to reduce the amount of transpiration.

(3) What cases have you observed, of the modification of leaves to fulfil purposes other than those which are usual?

THE THIRD INTERNATIONAL RUBBER EXHIBITION.

Useful suggestions, arising as the result of experience in connexion with the forwarding of samples of rubber for exhibition, are contained in the *Agricultural Bulletin of the Straits and Federated Malay States* for March 1912, and are reproduced here :—

(1) All cases of exhibits should be fastened by screws and not nails. Nailed cases frequently split and are spoiled for returning.

(2) The name of the estates, settlement or State should be stencilled or printed on two or three faces of the case. Consignee's address should appear on the top of the case.

(3) Cases to be returned should have the addresses printed on a board and screwed face downward on the top of the case when consigned to New York.

(4) Full instructions: if for competition, description of contents, number of cases, weight of rubber, whether offered for sale or to be returned, address of returning, should be communicated to the local secretary or direct

(5) Instructions should not be enclosed in the cases of rubber.

(6) Instructions, part to local secretary or direct, and part to agent or friend, should be avoided.

(7) Cases should be numbered, and the contents described on the case, as well as mentioned with instructions.

FUNGUS NOTES.

EXANTHEMA AND SQUAMOSIS OF CITRUS.

The following article contains in a condensed form the information given by O. Butler on these two diseases in his paper in *The Annals of Botany*, Vol. XXV, p. 107. It may be looked upon as a continuation of the article on Gummosis that appeared in the last number of the *Agricultural News*.

SYMPTOMS OF EXANTHEMA. This disease is at present only known in the United States, where it affects all varieties of citrus of all ages that are growing on dry permeable soils or on light soils overlying an impermeable subsoil. The parts characteristically affected are the small branches, shoots, and occasionally the fruits. Frequently, the definite symptoms are preceded by a luxuriant growth and dark colour of the foliage, and by the presence of thick-skinned fruit. Then the shoots become more or less stained beneath the epidermis by a yellowish-brown substance, and begin to die back. If this symptom is not observed, another conclusive indication is that the fruit becomes stained, and its epidermis is so hardened that it cracks and splits on account of the pressure of the growing pulp cells. In more advanced stages of the disease the young shoots swell at the nodes—occasionally also at the internodes; while similar swellings may form on the fruit. Then linear erumpent pustules break out on the internodes as the shoots grow older: in some cases the pustules may alternate with nodal swellings. On the older branches nodal swellings are not produced, but the pustules may become very numerous and a small amount of gum may be observed in them. Gum may also exude through the bark in small amounts. When swellings and pustules are not formed on the shoots and branches, an excessive number of buds may be produced which may develop into short branches with yellow foliage; so that a witches' broom effect is brought about.

Cross sections of the diseased shoots show that the swellings are due to an accumulation of gum formed from the young xylem cells, as in gummosis; that the pustules are caused by excessive growth of the cortical tissues accompanied by a sickle-shaped patch of young xylem containing gum pockets; and that the rings of growth are well marked and are too numerous to be considered as variations in growth due to seasonal changes. The malady is very similar to gummosis, and is only differentiated from it by the occurrence of the erumpent pustules. These are possibly caused by the circumstance that the epidermis first becomes inelastic and checks normal growth and then bursts; after this vigorous or excessive growth recommences.

CAUSE OF EXANTHEMA. This disease is so similar in most respects to gummosis that its occurrence is in all probability dependent on the same conditions, namely vigorous growth coinciding with an abundant supply of moisture. At the same time the abnormally large number of rings of growth indicates clearly that there has been a fairly rapid alternation of favourable and unfavourable conditions for development. This might be brought about by a quick alternation of climatic conditions, or by frequently recurring changes in the available supply of water. The last is clearly the cause in this case. The light soils on which plants with the disease are found become readily saturated with water, which they as readily lose.

It has been discovered that excessive applications of organic nitrogenous manures increase the severity of exanthema, in Florida; while inorganic manures have a less marked effect. Butler suggests that this is due to the fact that nitrogenous manures stimulate growth, and that organic manures in which the nitrogen is only rendered available by the process of nitrification are only so altered when the soil is sufficiently damp. Thus the growth stimulus due to the nitrogen takes effect at the very time when an ample supply of water is available and when the presence of that water has already induced a vigorous growth in the trees.

Cultivation is another factor that increases the susceptibility of citrus to the disease. Swingle and Webber suggest that this is because the surface roots are destroyed and the remainder are forced to grow down into an unsuitable subsoil. Butler believes, however, that this is not the true explanation, but that cultivation increases nitrification, particularly in humid climates; while it prevents excessive evaporation from the soil.

REMEDIAL MEASURES. The object to be aimed at in preventing or remedying the disease is to produce a uniformity in the water- and in the nitrogen-supply, which will give rise to regular, and not to fluctuating, growth. Thus drainage, especially on soil overlying an impermeable layer, is a matter of importance, as is the correct regulation of irrigation water where irrigation is necessary. Care should be taken to increase the humus content of light soils, and applications of nitrogenous manures should be carefully regulated. Heavy fertilisation with phosphatic and potassic manures is also frequently found to be useful, as these have a restraining influence on growth. It may also be desirable to discontinue excessive cultivation, especially in soils underlain by an impermeable subsoil; and merely to apply mulches of different kinds to the soil, according to the material available.

SYMPTOMS OF SQUAMOSIS. This is at present limited in distribution to Florida and Southern California, and is a disease confined to the orange tree. The conditions which favour its occurrence are prevalent only infrequently, so that the disease is rare; moreover it develops extremely slowly on affected trees. The chief characteristic is a scaling of the bark which may occur on the limbs or on the trunk, where it first appears as a single scale or group of scales. When the outbreak is on the smaller branches, the leaves turn yellow and eventually the branches are ringed and die, so that much dead wood is present. When the attack commences on the trunk or main limbs, the leaves do not turn yellow until much later and the tree may live for fifteen or twenty years. In fact in these instances, an attack is often hard to identify, as scaling of the bark may arise from other causes, while there are no indications of disease in the foliage and there is no definite correlation with environmental conditions.

Squamosis commences as a rounded or an irregular sloughing of the bark about an inch or somewhat less in diameter. The detached bark soon dies and curls more or less. This curling reveals the underlying cortical tissues which are warty, white, or white with a yellow tinge, and somewhat mealy. When a piece of bark falls, a pustule will be found beneath it: this pustule has a depression in the middle, from which gum frequently oozes. In some cases the pustular outgrowth becomes less prominent, especially in advanced cases, and is replaced by a general swelling of the cortex lying below the epidermis. This causes the bark to flake off in large strips. On shoots and water sprouts, shield-shaped, raised spots are formed which are discoloured beneath the epidermis. These become hard, and the epidermis ruptures round their margins. In more serious attacks the spots are larger and less definite in outline. Cracks parallel to the axis of the shoot occur in them, and the disease-producing tissues form distinct swellings on the shoots

In cross section, diseased limbs are more or less zoned with brown, and rings of growth are prominent. Cross sections of shoots show only one or two discoloured zones. The disease is similar to gummosis, but the degeneration does not proceed as far in the young xylem cells. The connexion is, however, evident and there can be little doubt that squamosis is also dependent for its appearance on a ready supply of water combined with vigorous growth. It occurs under very varying environmental conditions, and its true cause is uncertain. Butler suggests that it arises from bark-binding that causes a pressure on the cambium, this pressure being released at a time when the trees are growing rapidly and the tissues are full of sap.

There is no known remedy for the disease at present, though slitting the bark may be resorted to as a palliative.

WEST INDIAN PRODUCTS.

DRUGS AND SPICES ON THE LONDON MARKET.

Mr. J. R. Jackson, A.L.S., has forwarded the following report on the London drug and spice market, for the month of May 1912:—

The following notes refer to West Indian produce.

GINGER.

At auction on the 8th the offerings amounted to 200 bags of Jamaica, 452 bags of Cochin, and 10 bags of Liberian. The Jamaica was bought in at 55*s.* and most of the Cochin at 42*s.* to 44*s.*, a few bags of mouldy fetching 30*s.* 6*d.* while the Liberian was sold without reserve at 25*s.* per cwt. for small brown. On the 15th, 392 bags of Cochin were offered, and 20 bags of fair washed were sold at 41*s* per cwt. Some small cut Calicut in cases was bought in at 70*s.* It was stated that privately the market both for Cochin and Jamaica was firm, but unchanged; a week later the offerings amounted to 88 barrels of Jamaica and 660 packages of Cochin.

NUTMEGS, MACE AND PIMENTO.

At the first auction on the 2nd of the month 64 packages of West Indian were offered and sold, 68's fetching 7½*d.*, 79's to 85's 5½*d.* to 6*d*, 102's to 109's 5¼*d.* to 5½*d.*, 121's 5½*d.* to 5¾*d.*; 198 packages of Eastern were partly sold at the following rates: 60's to 68's 7*d.* to 9*d.*, 70's to 80's 6*d.* to 7*d.*, and 100's 5*d.* to 5¾*d.*; a week later 43 packages of West Indian were sold at the following rates: 69's to 71's 6*d.* to 7*d.*, 80's to 87's 5½*d.* to 6*d.* and 104's to 109's 5¼*d.* to 5¾*d.* On the 15th, 792 packages of West Indian were offered, and 780 sold, commencing at steady rates and closing rather easier. On the 22nd, 34 bags of West India sold; 69's to 70's at 5¾*d.* to 6*d.*, 89's to 98's, 4¾*d.* to 5¼*d.*, 101's to 115's 4¾*d.* to 5*d.*, and 134's 4¾*d*; 56 boxes of Eastern were sold without reserve at 6½*d.* to 7*d.* for 78's. At auction on the 1st of the month mace was represented by 12 packages of West India, good fetching 2*s.* 4*d.* to 2*s.* 6*d.* per ℔. and broken 2*s.* 1*d.*, at which rates the whole was disposed of. In the following week a few packages only of West India were sold at 2*s.* 2*d.* to 2*s.* 4*d.* and broken at 2*s.* 2*d.* to 2*s.* 3*d.* East India fetched from 2*s.* 3*d.* to 2*s.* 7*d.* On the 15th, 306 packages of West India were sold, fetching 2*s.* 1*d.* to 2*s.* 5*d* for good, and 1*s.* 10*d.* to 2*s.* 3*d.* for broken. On the 22nd, 11 packages of West India were sold at the following rates: for fair, 2*s.* 3*d.*: for red, 2*s.* 2*d.*; and for broken, 2*s.* At auction on the 8th Pimento was represented by 100 bags which were sold without reserve at 2⅝*d.* to 2¾*d.* Again on the 22nd, 186 bags were sold without reserve at 2½*d.* per ℔.

SARSAPARILLA.

There has been a steady demand throughout the month for this drug, though prices have been, for some kinds, lower. At the first auction on May 2, 24 bales of grey Jamaica were brought forward, and the whole disposed of at 2*s.* 4*d.* to 2*s.* 5*d.* per ℔. for fair partly coarse, 2*s.* 2*d.* being obtained for very coarse. Ten bales of native Jamaica were also offered and sold, fair to good red fetching 1*s* 4*d.* to 1*s.* 6*d.* per ℔.; ordinary to palish red 1*s.* 1*d.* to 1*s.* 2*d*, and common yellow mixed 10*d.* to 1*s.* Four bales only of Lima-Jamaica were brought forward and sold, 1*s.* 6*d.* to 1*s.* 7*d.* being paid for good, and 1*s.* 5*d.* for inferior coarse. A fortnight later, namely, on the 16th, the offerings consisted of 6 bales of grey Jamaica, 13 of native Jamaica and 2 of Lima-Jamaica. The whole of the grey Jamaica was sold at 2*s.* 3*d.* to 2*s.* 4*d.* per ℔., being 1*d.* per ℔. cheaper than at the previous sale. Of the native Jamaica 6 bales only found purchasers at 1*s.* 6*d.* for good, 1*s.* 1*d.* to 1*s.* 2*d.* for fair red, and 1*s.* for dull. The 2 bales of Lima Jamaica which were ordinary rough were not sold, a bid of 1*s.* 5*d.* being refused. On the 29th of the month there was again a fair supply at auction consisting of 24 packages of grey Jamaica, 10 of Lima-Jamaica and 4 described as 'Panama', all the grey Jamaica was sold at a still further reduction on the previous auctions, of from 1*d.* to 2*d.* per ℔, 2*s.* 2*d.* being paid for fair, 1*s.* 10*d.* for rather mouldy, and 1*s.* 7*d.* for sea-damaged; of the 10 bales of Lima-Jamaica brought forward, only 4 were disposed of, 1*s.* 5*d.* being paid for rather coarse. The 4 bales described as Panama which was somewhat of the character of rou ghLima fetched 1*s.* 5*d.* per ℔.

KOLA, LIME JUICE, LIME OIL, TAMARINDS, CASSIA FISTULA.

An unusual source of kola was brought to notice at the first sale in the month of a single bag of fair halves from Sydney, New South Wales, which were sold at 3¾*d.* per ℔. At the second auction on the 15th, 35 packages of Kola were brought forward, consisting of Java halves and West India halves, of the former 4½*d.* was paid for fair, 4*d.* for darkish, and 3¾*d.* for small wormy. For the West Indian 3½*d.* was paid for fair bright, 3¼*d.* for dark, slightly mouldy, and 2 bags of small bright, but shrivelled fetched 3*d.* per ℔. Lime juice has commanded firm rates during the month. At the first auction 23 packages of West Indian were brought forward and 19 sold at the following rates: nice pale raw 2*s.* 1*d.*, fair pulpy 1*s.* 10*d.* to 1*s* 11*d.* and ordinary brown 1*s.* 8*d.* to 1*s* 9*d.* A week later it was stated that, notwithstanding recent arrivals, there was practically nothing to offer in Mincing Lane, but at Liverpool some 424 puncheons and 59 hogsheads had arrived from Montserrat 'on behalf of a well-known propriety brand.' On the 15th, 2 puncheons of good pale green raw Jamaica fetched 2*s.* 1*d* and fair green 1*s.* 10*d.* per gallon. Two barrels of brown from Montserrat were also quoted at 1*s.* 10*d.*, as well as one hogshead of brown Antigua at the same price, 13 packages of ordinary brown Dominican fetched 1*s.* 9*d.* per gallon. Of lime oil, a single case only has appeared in the market and was sold at 6*s.* 5*d.* per ℔. for hand pressed West Indian. In the middle of the month, it was reported that 170 barrels and 14 tierces of tamarinds had arrived from Barbados, 25 barrels from St. Kitts, and 392 barrels from Antigua; and that fair juicy new crop Barbados was quoted at 17*s.* per cwt. On the 15th May, 22 bags of fair Dominica Cassia Fistula were offered and all sold at 20*s.* to 22*s.* per cwt. Quite at the end of the month a considerable advance on this price was asked, 11 packages of good sound Dominican were offered and a bid of 24*s.* 6*d.* per cwt. refused.

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR June 18, 1912; Messrs. E. A. DE PASS & Co., June 7, 1912.

ARROWROOT—$3\frac{3}{4}d.$ to $3\frac{7}{8}d.$
BALATA—Sheet, 3/8; block, 2/7$\frac{1}{2}$ per lb.
BEESWAX—No quotations.
CACAO—Trinidad, 61/- to 78/- per cwt.; Grenada, 55/- to 61/-; Jamaica, 53/ to 60/-.
COFFEE—Jamaica, 69/6 to 80/- per cwt.
COPRA—West Indian, £26 10*s.* per ton.
COTTON—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 20*d.* to 30*d.*
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—49/- to 65/- per cwt.
ISINGLASS—No quotations.
HONEY—No quotation.
LIME JUICE—Raw, 2/; concentrated, £18 12*s.* 6*d.* to £19; otto of limes (hand pressed), 6/3 to 6/6.
LOGWOOD—No quotations.
MACE—No quotations.
NUTMEGS—No quotations.
PIMENTO—Common, $2\frac{1}{2}d.$; fair, $2\frac{9}{16}d.$; good, $2\frac{5}{8}d.$; per lb.
RUBBER—Para, fine hard, 4/10$\frac{1}{2}$; fine soft, 4/6; Castilloa, 4/4 per lb.
RUM—Jamaica, 2/- to 6/-.
SUGAR—Crystals, 16/6 to 18/6; Muscovado, 13/6 to 16/-; Syrup, 10/6 to 13/6 per cwt.; Molasses, no quotations.

New York.—Messrs. GILLESPIE BROS. & Co., June 14, 1912.

CACAO—Caracas, 14$\frac{3}{4}$c. to 15$\frac{1}{2}$c.; Grenada, 13$\frac{3}{4}$c. to 14$\frac{1}{4}$c.; Trinidad, 14c. to 14$\frac{1}{2}$c. per lb.; Jamaica, no quotations.
COCO-NUTS—Jamaica, select, \$23·00 to \$25·00; culls, \$13·00 to \$14·00; Trinidad, select, \$22·00 to \$24·00; culls, \$13·00 to \$14·00 per M.
COFFEE—Jamaica, 14$\frac{1}{2}$c. to 16$\frac{3}{4}$c. per lb.
GINGER—8$\frac{3}{4}$c. to 11$\frac{1}{4}$c. per lb.
GOAT SKINS—Jamaica, 50c.; Antigua and Barbados, 43c. to 45c.; St. Thomas and St. Kitts, 41c. to 42c. per lb.
GRAPE-FRUIT—Jamaica, \$4·50 to \$5·00.
LIMES—\$5·50 to \$6·00.
MACE—No quotations.
NUTMEGS—110's, 11$\frac{3}{4}$c. to 12c.
ORANGES—Jamaica, \$1·75 to \$2·00 per box.
PIMENTO—3*d.* per lb.
SUGAR—Centrifugals, 96°, 3·92c. per lb.; Muscovados, 89°, 3·42c.; Molasses, 89°, 3·17c. per lb., all duty paid.

Trinidad.—Messrs. GORDON, GRANT & Co., June 24, 1912.

CACAO—Venezuelan, \$15·00 to \$15·50 per fanega; Trinidad, \$13·75 to \$14·50.
COCO-NUT OIL—92c. per Imperial gallon.
COFFEE—Venezuelan, 16c. per lb.
COPRA—\$4·50 per 100 lb.
DHAL—\$5·25.
ONIONS—\$2·50 to \$3·50 per 100 lb.
PEAS, SPLIT—\$7·25 to \$7·50 per bag.
POTATOES—English, \$2·00 to \$3·00 per 100 lb.
RICE—Yellow, \$4·80 to \$4·90; White, \$6·25 to \$6·35 per bag.
SUGAR—American crushed, no quotations

Barbados.—Messrs. JAMES A. LYNCH & Co., Ltd., June 29, 1912; Messrs. T. S. GARRAWAY & Co., July 1, 1912; Messrs. LEACOCK & Co., June 21, 1912.

ARROWROOT—\$7·00 per 100 lb.
CACAO—\$13·00 to \$14·00 per 100 lb.
COCOA-NUTS—\$16·00.
HAY—\$1·80 to \$2·00 per 100 lb.
MANURES—Nitrate of soda, \$65·00; Cacao manure, \$45·00 to \$48·00; Sulphate of ammonia, \$80·00 per ton.
MOLASSES—No quotations.
ONIONS—\$2·00 to \$2·75 per 100 lb.
PEAS, SPLIT—\$7·00 per bag of 210 lb.; Canada \$3·00 to \$5·05 per bag of 120 lb.
POTATOES—Nova Scotia, \$2·50 to \$4·50 per 160 lb.
RICE—Ballam, \$5·05 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
SUGAR—American granulated, \$5·00 per 100 lb.

British Guiana.—Messrs. WIETING & RICHTER, June 22, 1912; Messrs. SANDBACH, PARKER & Co., June 21, 1912.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	——	——
BALATA—Venezuela block	No quotation	Prohibited
Demerara sheet	70c. per lb.	——
CACAO—Native	14c. per lb.	14c. per lb.
CASSAVA—	\$1·32.	No quotation
CASSAVA STARCH—	\$7·50	No quotation
COCO-NUTS—	\$16 to \$20 per M.	\$10 to \$16 per M., peeled and selected
COFFEE—Creole	19c. per lb.	18c. per lb
Jamaica and Rio	20c. per lb.	20c. to 21c.
Liberian	15c. per lb.	15c. per lb.
DHAL—	\$5·00 per bag of 168 lb.	\$5·50 per bag of 168 lb
Green Dhal	——	——
EDDOES—	\$2·40	——
MOLASSES—Yellow	None	——
ONIONS—Teneriffe	4c. to 5c. per lb.	——
Madeira	——	
PEAS—Split	\$6·75 to \$7·00 per bag (210 lb.)	\$7·15 per bag (210 lb.)
Marseilles	\$3·75	No quotation
PLANTAINS—	16c. to 48c.	
POTATOES—Nova Scotia	——	\$4·00
Lisbon	\$2·75	No quotation
POTATOES-Sweet, B'bados	\$3·36 per bag	——
RICE—Ballam	No quotation	——
Creole	\$5·25 to \$5·50	\$5·30 to \$5·50
TANNIAS—	\$3·24	——
YAMS—White	\$2·64	——
Buck	\$3·24	——
SUGAR—Dark crystals	\$3·05 to \$3·25	\$3·10 to \$3·20
Yellow	\$3·60 to \$3·75	\$3·75 to \$4·00
White	——	——
Molasses	\$2·80 to \$2·90	——
TIMBER—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	\$3·75 to \$6·00 per M.	\$4·00 to \$6·00 per M.
,, Cordwood	\$1·80 to \$2·00 per ton	No quotation.

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CONTENTS.

Theories Concerning Soil Fertility.

II.

THE last article on this subject, contained in the previous issue of the *Agricultural News*, gave an account of the theories concerning soil fertility that have been advanced by Whitney and others, of the United States Department of Agriculture. Before proceeding to an account of Russell's criticism of these:* it will be convenient to give broadly his summary of the hypotheses presented in that article. They are concerned with the following matters: (1) soils result from the breaking-up of rock-forming minerals, the extent of the decomposition that takes place being very small: (2) the result is that all normal soils possess a similar chemical composition and contain a soil solution of the same constitution; (3) but as this solution is the nutrient solution for plants, the amounts of plant food provided in all soils are very similar; (4) this soil solution is distributed over the soil particles, and the way in which certain properties of the particles allow it to travel over them, through the soil, is of the greatest importance in relation to the productivity of soils; (5) some other circumstance must also be active, in many cases, in regulating this productivity, for some soils which are themselves infertile give watery extracts in which plants cannot grow, so that a toxin must be present in such soils; (6) the origin of such toxins may be the normal decomposition of organic matter in the soil, but some are probably given off by the roots of plants; lastly (7) manures are not mere sources of plant food, but act favourably in the soil in a complex way depending on their power to alter the distribution of the soil solution or to prevent the action of some of the toxins, and probably in other ways as well.

It had been long recognized that the fertility of soils depends in a very intimate way on their physical condition, but the first papers† of Whitney were instrumental in putting forward clear and definite ideas in the subject: while other investigations showed the connexion between the properties of soils and those of the particles composing them. The ultimate result was that the mechanical analysis of soils reached its present

* *Science Progress*, Vol. VI, No. 21, p. 142.

†United States Weather Bureau, Bulletin No. 4; United States Department of Agriculture, Division of Soils, Bulletin No. 13.

importance. Russell and other experimenters are not, however, prepared to agree as to the relative insignificance in which the effect of the chemical properties of soils on their fertility is held by Whitney and others. The simplicity of the composition of the coarser soil particles is not possessed by those that are of the smallest dimensions, and investigation is tending to show that their smallness of size will not account alone for their properties. Those who have made the chemical investigation of soils a large part of their work are most prone to follow van Bemmelen in his view that, in the soil, the various decomposition products are largely deposited on the particles in a special state known as the colloidal form, the matter of importance being that, owing to their condition, changes of temperature, of strength of the soil solution, and other circumstances, cause the continuous further decomposition of these products, rather than any sudden completed changes in them. It is therefore the composition of this mixture of colloidal products that determines the strength of the soil solution, so that the latter may be altered to a certain extent by the addition of soluble salts, including artificial manures.

This view is thus seen to depend upon the circumstance as to whether or not the strength of the soil solution is constant, and thus great importance attaches to the investigation of this matter. Chemical examination of the solution itself is so far impossible because no means has been devised for its extraction from the soil. If well water or the soil surface drainage water are taken to be representative of soil water, then there is a large amount of evidence that its composition does vary considerably, and this is true even when consideration is given to the figures upon which Whitney based his contrary conclusion—that the composition of the soil water is virtually constant. The observations and experience of Russell and others lead to the view that the strength of the soil solution is dependent upon the amount of carbon dioxide present (which depends in turn on the distribution of roots and living beings in the soil), on the disposal of water and of calcium carbonate, and on other factors. There is the further consideration that, even if it were possible to obtain some of the soil water by itself, for analysis, it would not necessarily follow that the average composition found would be that of anything occurring in the soil.

The argument advanced against these criticisms is that, even where the strength of the soil solution may vary, the differences are without effect on fertility, as they are incapable of influencing the growth of plants. The opponents of Whitney, again, cannot agree with this view of the matter, and point to the fact that the amount of growth of plants in nutrient solutions increases with the strength of these, up to a certain limit of concentration. Further, the concentration may be increased beyond this limit, over a fairly wide range, without causing any enhanced growth, and this is why experiments in plant physiology may be carried out with a number of culture solutions possessing different strengths; there is, however, nothing to show that the concentration of the soil solution approaches any of these strengths. In relation to the action of manures, it is difficult to deny to these the effect of increasing directly the fertility of the soil, especially as all the substances employed in this way are particularly rich in the very bodies that are necessary for the nutrition of plants. Whitney, even, holds that this action is complex, and it is not obvious why their nutritive function should not be agreed to exist as part of this complexity.

The theory that infertile soils contain substances classed generally as toxins, that are poisonous to plants is held to be supported by the circumstance that organic substances possessing such poisonous properties have been isolated from the soil. Though these may be toxic in water cultures, it does not follow that they retain the property in the soil; in fact its removal has been demonstrated by the addition of various substances, and even of soil itself. So that it has not been proved that toxic substances taken from the soil have been affecting injuriously the plants in it, though the fact is admitted that soils poor in calcium carbonate have given indications of the presence in them of such substances. Agreement with Whitney is therefore expressed: that in soils deficient in calcium carbonate —'sour' soils—infertility may be caused by the presence of toxic organic bodies.

Russell and other investigators have found no evidence whatever of the existence of plant excretions in the soil. Experiments have been made at Rothamsted in which plants were grown continously in nutrient solutions, in sand cultures and in soils, and no signs were obtained that the later plants suffered from excretions of the first. Interesting particulars of other trials from which the same result was obtained are given in the article quoted: all lead to the significant statement: 'it is asserted by the American workers that the continued growth of one and the same crop on the same soil leads to a low crop production, whilst we on this side are unable to obtain any evidence to this effect.' It must be realized at the same time that the experimental difficulties of such investigations are very great: the growth of bacteria in the water cultures, and of bacteria and algae in sand cultures, and the changes that take place normally in soils, all confuse the issue, so that what can be said actually is: 'Our conclusion, therefore, is that there is no unexceptionable evidence of any toxin excretion by plant roots.'

The article by Russell proceeds to deal with the circumstance that agricultural literature contains many statements to the effect that crops may be poisoned through succeeding other crops, and in passing refers to Daubeny's work, of many years ago, which led to conclusions other than that expressed in de Candolle's hypothesis that plants excrete toxins; he also mentions the fact that Pickering's investigations of the harmful effect of grass on fruit trees have not shown that this is due to any poisonous excretion. Attention is then given to several results that have been obtained at Rothamsted, which are inexplicable at present, and do not yield to any form of explanation founded on the theories of Whitney. Reference is made here to the original article for a very interesting treatment of these matters.

The work of those who are engaged in putting forward the theory of toxins in regard to soil fertility has suffered, as Russell states: 'from leaving out of consideration all biological changes going on in the soil.' We can agree nevertheless with that writer in saying: 'The investigations have, however, served a very useful purpose in stimulating enquiry and they have brought home the fact that the relationships between soils and plants are complex,' and again: 'Whether further work support their hypothesis or not, Whitney, Cameron, Schreiner and their colleagues have made agricultural chemists re-examine their ideas on the soil, and such a reconsideration must in the end advance the subject, however troublesome or superfluous it may at the time appear.' In the meantime, it may be added, experimental work on the more practical scale will continue to be done, and those who have its performance in their hands will await eagerly the further guidance that is expected from investigators who pursue their researches in a more detailed manner.

A copy of a publication entitled The Cult of the Coconut, that should be particularly useful from a commercial point of view has been received recently. This deals with the past and future development of the coco-nut, copra and palm oil industries; it also contains a section dealing with the oil palm of West Africa (*Elaeis guineensis*). The work is well illustrated, and may be obtained, price 2*s.* 6*d.* net, from Messrs. Curtis, Gardner & Co., Ltd., Spencer House, South Place, Finsbury, London, E.C.

SUGAR MANUFACTURE IN JAVA, 1910.

There has been received recently a set of tables prepared by J. J. Hazewinkel, setting forth facts connected with sugar manufacture in Java, under the system of mutual control whereby the figures relating to the working of the different factories are furnished for publication and comparison. These tables have reference to the year 1910, and the average results obtained in regard to several of the more important items are presented below for the use of readers of the *Agricultural News*:—

Sucrose, per cent. in cane	12·54
Purity of mixed juice	84·67
Sugar in bags and baskets*	10·18
Sugar in black stroop†, A centr. 0·09, B bags 0·14	0·23
Sucrose obtained in sugar and black stroop per 100 cane	10·26
Available sucrose (Hazewinkel's formula)	10·35
Maceration water in 100 parts normal juice	14·3
Moisture in megass	46·72
Normal juice per 100 fibre‡	55·2
Juice extracted, on 100 parts of juice in cane	91·2
Fibre per 100 cane	12·27
Purity, final molasses	33·42
Sucrose per 100 megass	4·32
Juice of first mill, Brix	17·89
" " " " sucrose	15·55
" " " " purity	86·49
" " final mill, sucrose	6·08
" " " " purity	79·76
Mixed juice, Brix	15·73
" " sucrose	13·32
Glucose ratio in mixed juice	7·26

The Manna Plant.—A recent issue of the *Pharmaceutical Journal and Pharmacist* gives interesting particulars of the manna of the Bible. The plant, *Lecanora esculenta*, is found over a region covering south-west Asia, extending to south-east Europe and to north-west Africa. It appears on small stones, preferably small chalky pebbles, first as thick, wrinkled warty crusts, greyish-yellow on the outside and having a white mealy fracture. Later the flakes become cracked, detach themselves from the stones, and roll up into bullet-shaped or warty masses of about the size of a Hazel nut. When the rain comes the manna quickly absorbs moisture, and bursts into large flakes which have a mealy interior. When we consider that the dry manna plants are carried considerable distances by the wind, and are often blown together in considerable quantities, this rapid change from hard, dry, almost stone-like substances into a flaky food may well have induced the belief of the Israelites that the manna fell from heaven. In Persia manna is used as a food, and is also given under the name of 'Chirzade' to feeble and ill-nourished mothers as a lactogogue in daily doses of 150 to 200 grammes. The food value of manna lies in its 20 to 25 per cent. of lichenin. (The *Gardeners' Chronicle*, June 1, 1912.)

* Sugar already obtained.
† Sugar to be obtained.
‡ Corrected for variation in sucrose and fibre in cane.

FRUITS AND FRUIT TREES.

VANILLA PREPARATION IN SEYCHELLES.

The subject of the curing of vanilla was dealt with at length in a recent number of the *Agricultural News*—in the issue of May 11. In relation to this, the following consular report is of interest. It is taken from the *Planters' Chronicle* for April 27, 1912, which reproduces it from the *Spice Mill*.

The proprietor of the Cascade Estate, Seychelles Islands, thus describes the method of preparing vanilla beans on that plantation.

A successful result depends on the pods being picked at the right stage of maturity more than on anything else—that is, when they are ripe and just before they begin to split. An unripe pod will never prepare well and is always inclined to become mouldy; split or over-ripe pods have lost much of their value.

A pod in condition to be picked has lost to a great extent its shiny green colour, and has become duller, with an almost silvery appearance. The longitudinal lines along which it will eventually split, if felt, are distinctly marked. The tip is light in colour or even yellowish, and comes away fairly evenly from the stalk when broken off. Pods in a bunch seldom ripen simultaneously, so they must be carefully watched.

When brought in the pods are sorted into five qualities: (1) over 6 inches long; (2) over 4 inches long; (3) under 4 inches long; (4) split; (5) unripe, broken, etc.

A cauldron of water is heated to 87°C. (189°F.); the pods are placed in an openwork basket and dipped for ten seconds, withdrawn, and allowed to drain for about five seconds; dipped again for ten seconds, withdrawn and drained as before; dipped again for about five seconds, or until their colour has changed to a dark-green. Large pods require a longer third dipping than small ones. After being scalded the pods are wrapped in woollen blankets and left in a warm, dry place for twelve hours, when they have taken on a blackish hue.

They are then placed in openwork trays in a hot room, on one thickness of blanket, and covered by another; the temperature of the hot room should be about 90°F., not over. In about ten days the largest pods will have become wrinkled, the smaller ones before that. When in this stage they can be removed to a cool drying room, where they are placed on trays, uncovered, heaped on each other to a depth of 3 inches, and turned about every day. The more slowly vanilla is dried the better. In about ten days for small pods, dry ones may be looked for; these must be taken out and stored in a dry place, in well-closed wooden boxes. Examine thoroughly from time to time, and take out all that show signs of mould; this appears mostly at the stalk end. A dry pod should have a silky feeling, the wrinkles must be soft, there must be no hard centres, and it should be possible to tie the pod in a soft, loose knot without its breaking. Absolute cleanliness must be observed all through the preparation, and those who handle vanilla must wash their hands before touching it.

When sufficiently dried, the pods should be put into a vessel containing water at a temperature of about 80° to 90° F., and stirred about with the hands for five minutes, then taken out and placed in trays or on a blanket in the sun, where they soon dry. The pods must now be measured (quarter-inch differences are sufficient) in the middle only. Tin boxes are used in Seychelles, 13 inches long, 9 inches broad and 6 inches deep, a lining of parchment paper being placed in each. The vanilla must be packed fairly loosely and the lid secured by solder.

The process is difficult to describe. If vanilla is to be produced in any large quantity, a man should be sent to the Seychelles to learn about it. The season of preparation is from May to September.

Exports from Dominica.—An official statement of the imports and exports of Dominica during 1911 has just been issued. Among other matters, this shows that the principal agricultural and forest products and manufactures of the island were exported as follows: lime juice, concentrated, 131,506 gallons valued at £23,014; cacao, 10,055 cwt. valued at £21,703; citrate of lime, 5,926 cwt. valued at £19,259; limes, 36,520 barrels valued at £14,608; lime juice, raw, 311,377 gallons valued at £10,379; lime oil, distilled, 5,472 gallons valued at £3,283; lime oil, écuelled, 892 gallons, valued at £2,118; oranges, 1,803 barrels valued at £1,156; lime juice cordial, 10,650 gallons valued at £954; coco-nuts, 402,622 valued at £839; bay leaves, 590 cwt. valued at £634; hardwood, 31,272 feet valued at £293; limes, pickled, 711 barrels valued at £267.

A LITTLE-KNOWN OIL-YIELDING PLANT.

A common weed in the West Indies is the Lord Lavington or wild hops, as it is sometimes called; the botanical name is *Hyptis capitata*. It is a herbaceous plant which is often seen growing in waste lands and bearing its flowers in globular heads, on the parts of the stem whence the branches spring. This plant is closely related to the mosquito bush (*Ocimum micranthum*), indigenous to the West Indies, and to sweet basil (*O. Basilicum*). In the same family of plants there are also included such well known forms as rosemary, lavender, Salvia, thyme and mint.

It is not intended, however, to make *H. capitata* the subject of this article, but to draw attention to another species of Hyptis, namely, *H. spicigera*, which is native to the West Indies but not as commonly found as the species just mentioned. A special account of this plant, in relation to its existence in French West Africa as on oil-seed bearing species, is given in *L'Agriculture Pratique des Pays Chauds* for February 1912, p. 163, and this is employed as the source of the following information.

Hyptis spicigera is known in parts of French West Africa as Benefing, which means black sesame. Like *H capitata*, it is an annual herbaceous plant; it is distinguished from it in several ways, however, notably by the facts that the flowers are borne in terminal spikes instead of in heads, and that the leaves are narrower, being more nearly lance-shaped than those of the latter. The seed is about $\frac{1}{25}$-inch in length. Its colour is that of dark tobacco, and it bears a small white spot in the form of a V, at one end. The method of obtaining the seed is by threshing, as for sesame (see *Agricultural News*, Vol. XI, p. 101).

The Director of the Official Laboratory for Technical Investigations of Oil-yielding Materials, at Marseilles (M. E. Milliau), had occasion to study a sample of the seed which was shown among the exhibits from French West Africa at the Universal Exhibition of 1900. When these seeds were treated with carbon bisulphide in a continuous extraction apparatus, they yielded 37·32 per cent. of an oil having a yellow amber colour. This was of average fluidity, and possessed an odour very closely resembling that of linseed oil. A comparison of the two oils gave the following particulars, among others, the order being—oil from Hyptis, and linseed oil: specific gravity, 943·6 and 932 5; saturation, 17·3 and 17·9; iodine value, 171 and 153 to 162; molecular weight of the fatty acids, 209 and 280·5; drying power, 17·7 and 15.

It is pointed out in the article that the iodine value of the Hyptis oil is the highest known, and suggests the possession of a very strong drying power—an indication which receives support from the figures just given.

In giving general conclusions concerning this oil, M. Milliau states that Hyptis oil contains too high a proportion of liquid fatty acids for it to be utilized advantageously in cases where stearine is employed; its drying power adds to this disadvantage. It could only be used to a small extent in soap-making for, like all drying oils, it yields a soap which does not keep well; trial has shown that the soap made from it decomposes partially, after being exposed eight days to light and air: it becomes yellow and exhales a strong smell of linseed oil. In the varnish and painting industries, on the contrary, the drying power of this oil makes it of particular advantage.

A subsequent examination by another investigator of seeds from a different source, showed that they contained the following: moisture 7·12, fatty matter 27·00, and nitrogenous matter 25·50 per cent. The cake left after the extraction of the oil is rich enough in nitrogen to be usefully employed in agriculture. It will be noticed that this analysis gives a much lower percentage of fatty matter than the former; it is however sufficiently high to admit of the industrial employment of the seed. As is suggested in the article, it appears that this discrepancy between the analyses can hardly be explained otherwise than on the assumption that there exist several varieties of *H. spicigera*, having seeds of very different composition. The choice of the best kinds for propagation would be an easy matter.

The conclusion of the article is concerned with suggestions for the exploitation of *Hyptis spicigera* as an oil-seed yielding plant in parts of French West Africa.

CAMPHOR FROM DRIED CAMPHOR LEAVES.

Articles have appeared in this journal from time to time (see *Agricultural News*, Vol. XI, p. 93) dealing with the yield of camphor from leaves and twigs. The account below, of the returns obtained by drying the leaves previous to distillation, is taken from the *Semi-Annual Report* of Schimmel & Co., dated April 1912:—

In our Report of October 1910 (p. 27) we discussed a paper by Lommel on the preparation of camphor at Amani. A second paper from the same author* contains some interesting data on the distillation of dried camphor leaves, of which a synopsis is given below. The author first deals with the distillation of leaves which had been spread out for drying in a small cinchona plantation shortly before the setting in of the rains, but which were not yet quite dry. The camphor yield from these leaves was too small to make it worth while estimating it, and the experiment was set down as a failure. For a subsequent distilling experiment a plantation was subjected to moderate cutting, when a quantity of dry fallen leaves was found on the ground between rows of plants. These were first distilled and only yielded 0·06 per cent. of crude camphor and 0·19 per cent. of camphor oil, showing that they had lost almost the whole of their volatile constituents during the long time they had been lying on the ground drying, exposed to the alternating effects of rain and sun.

Next the green leaves were dried on previously cleaned ground under the shade of cultivated cinchona trees. In the course of about a fortnight they were dry enough to be readily stripped from the branches and, collected in sacks, they were carried to the still. This experiment gave a thoroughly satisfactory result, the yield being 1·55 per cent. of crude camphor, and 0·49 per cent. of camphor oil. The result would certainly have been better still, but that on one occasion, in the course of the distilling process, the condensing water became heated, and a not inconsiderable quantity of camphor was thereby lost.

In view of the fact that present experience of the effects of cutting upon the growth of the trees shows it to be a pretty well established fact that it is possible to cut the trees twice a year, it is reasonable to expect a five-year old plantation to yield about 8,400 lb. of dry leaves per acre. This would be equivalent to an output per acre of about 325 lb. of camphor, and about 103 lb. of camphor oil.

**Der Pflanzer, Zeitschrift fur Land- und Forstwirtschaft in Deutsch-Ostafrica*, 7 (1911), 441.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date July 2, with reference to the sales of West Indian Sea Island cotton:—

There is an extremely limited demand for West Indian Sea Island cotton and the sales comprise about 50 bales, including a few Barbados at 20*d.* and a few superfine St. Vincent at 30*d.* and Stains at 8½*d.*

Spinners find difficulty in finding a market for their finest qualities of yarn, such as is made from West Indian, and they are therefore turning their machinery on to Sakellarides cotton and making a cheaper class of yarn in order to keep their machinery going.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending June 29, is as follows:—

During the past fortnight there has been a very limited demand, resulting in sales of only 21 bales Fully Fine to Extra Fine for export on private terms. The Factors are anxious to dispose of some of the Crop Lots, of which the unsold stock largely consists, and are willing to make some concessions in price, but the spinners do not seem interested even at the decline quoted. We renew our quotations, which in the absence of demand are only nominal:—

We quote, viz:—

Extra Fine	30c. to 32c.	= 16¾*d.* to 17¾*d.*	c.i.f., & 5 per cent.
Fully Fine	28c.	= 15¾*d.*	" " " "
Fine	26c.	= 14¾*d.*	" " " "
Fully Fine to Extra Fine, off in preparation	25c.	= 14¼*d.*	" " " "

At the one hundredth meeting of the Council of the British Cotton Growing Association, held on June 11, it was stated that the purchases of cotton in Lagos to the end of May amounted to 7,637 bales, as compared with 4,624 bales for the same period last year, and 4,327 bales for 1910; it was suggested that the increase is largely due to the action of the Association in increasing the buying price of seed-cotton, last year, and the satisfactory results have led to the decision to guarantee the minimum buying price for the coming season.

In consequence of the continued unsuccessful results with cotton-growing in the Northern Territories of the Gold Coast, the Colonial Office has informed the Governor that the Association does not consider it worth while to continue the work, and has asked him for an immediate report on the subject. As regards Uganda, cotton was still being bought in large quantities, and a record shipment of 2,900 bales of cotton and 750 tons of cotton seed has been consigned recently from Mombasa by one steamer.

THE RUBBER OUTPUT OF MALAYA.

The following information is taken from an article by an authoritative correspondent (Mr. C. C. Mallet) in the *Straits Times* for March 21. The statistics are stated to have been compiled from details supplied by the Government surveys, by the Planters' Association of Malaya, as well as those obtained from other sources. The list of the estimated plantings in the Malay Peninsula is as follows:—

Year planted.	Acreage planted during the year.	Estimated total acreage at the end of each year.
Between 1876 and 1898 say	50	50
1898	500	550
1899	1,000	1,550
1900	1,450	3,000
1901	4,000	4,000
1902	8,000	15,000
1903	10,000	25,000
1904	14,000	39,000
1905	35,000	74,000
1906	48,000	122,000
1907	93,000	215,000
1908	48,000	263,000
1909	61,000	324,000
1910	113,000	437,000
1911	63,000	500,000

The estimated average yields per acre for all Malaya, from acreages of different ages, is assumed to approximate to the following:—

Age of trees, years.	Yield per acre, lb.
4	60
5	125
6	200
7	250
8	300
9	325
10	350

Older trees will not be considered as yielding more than this, as most of them are either cut to pieces by early experiments in tapping, or else being rested from recent overtapping.

On this basis, the output for Malaya for 1911 may be estimated as follows:—

No. of acres in tapping.	Age of trees, years.	Estimated yield per acre, in lb.	Estimated total output, in lb.
50	35-14 say	1,000	50,000
500	13	350	175,000
1,000	12	350	350,000
1,400	11	350	507,000
4,000	10	350	1,400,000
8,000	9	325	2,600,000
10,000	8	300	3,000,000
14,000	7	250	3,500,000
35,000	6	200	7,000,000
48,000	5	125	6,000,000
93,000	4	60	5,580,000
215,000			30,162,000

The actual crop for 1911 was only 23,400,000 ℔., however, largely owing to the tremendous drought of March to May 1911, but also because of the fact that the bulk of the 1906-7 plantations were somewhat neglected during 1908-9, and only produced a small portion of the theoretical yield, the total year's crop being about 6,000,000 ℔. short of the theoretical estimate. This was, however, anticipated largely, and my estimate for the Peninsula, made in January 1911, amounted to 12,000 tons, or 26,880,000 ℔. which could have reasonably been expected but for the drought, which threw all calculations out.

The theoretical estimate for the year 1912 is: —

No. of acres in tapping.	Age of trees, years.	Estimated yield per acre, in ℔.	Estimated total output, in ℔.
50	36-15	1,000	50,000
500	14	350	175,000
1,000	13	350	350,000
1,450	12	350	507,000
4,000	11	350	1,400,000
8,000	10	350	2,800,000
10,000	9	325	3,250,000
14,000	8	300	4,200,000
35,000	7	250	8,750,000
48,000	6	200	9,600,000
93,000	5	125	11,625,000
48,000	4	60	2,880,000
263,000			45,587,000

This is equal to an output for the present year of 20,350 tons.

This crop is not, however, likely to be realized, as a good deal of the older rubber is being rested from recent over tapping, and the younger rubber is in many places still backward from neglect, from which it is however rapidly recovering since the properties were properly financed by the capital raised during the boom.

A WORK DEALING WITH VEGETABLE OILS.

An article in *La Chronique Coloniale et Financière* for May 5, 1912, signalizes the publication of parts 27-30 of the *Handbuch der Pharmakognosie*, of Professor A. Tschirch, dealing entirely with the study of fatty matters, among which the vegetable oils naturally possess the greatest importance.

In a short review, the article states that it is not possible to give a full account of the way in which the material of the work has been dealt with by Professor Tschirch. It may be said, however, that those living in the colonies, whether planters, business men or manufacturers, will find in these well illustrated portions of the work, clear information on the fatty matters, of tropical or sub-tropical origin, that are derived from the following plants (to quote the chief among them): cotton, the ground nut, sesame, the castor oil plant, the coco-nut palm, the West African oil palm (*Elaeis guineensis*) and cacao.

Each product receives attention in a chapter to itself, in which is presented a large number of references.

The article states, finally, that the handbook is a work that ought to be possessed by all who are interested in any way in commercial products, and particularly by those who are engaged in commercial matters connected with the colonies.

THE AVAILABILITY OF ROCK PHOSPHATE.

An account of work that has been conducted for the purpose of finding the effect of organic matter, in the shape of composts and manures, on the availability of rock phosphate, is contained in Research Bulletin No. 20 of the University of Wisconsin Agricultural Experiment Station. The following information is taken from a summary which appears at the end of that publication.

Experiments in the laboratory indicate that the organic matter that was composted with raw phosphate exerted only a slight solvent action; this was to be expected, as carbon dioxide is the only free acid that is formed, and further the amount of the solvent action is limited by the quantity of phosphate which the water containing carbon dioxide can hold in solution.

In small experiments, the dissolved phosphate and carbonates are not removed from the place where they are formed, so that the dissolving action reaches a stage at which no more carbon dioxide goes into solution and acts as a solvent. Under field conditions, however, the movements of soil water and the absorption of food by crops cause removal of the dissolved substances, so that the action of the carbon dioxide as a solvent is greatly increased. It is thus seen that the experiments in the laboratory failed to imitate field conditions with respect to a most important circumstance.

When rock phosphate is mixed with manure it immediately becomes less soluble in 0·2 per cent. citric acid solution, so that it must be concluded that the availability of phosphates as measured by such a solvent is entirely different from the availability as indicated by a growing crop. In relation to the growing crop, again, the availability is not only influenced by the solubility of the raw phosphate in weak solvents, but also to a large extent by the thoroughness with which it is distributed throughout the soil.

It seems that, when the material is thoroughly mixed with the soil, some plants can obtain a sufficient supply of phosphate from the insoluble material, probably through the dissolving action of the carbon dioxide given off by the roots.

When manure is added to a soil, the amount of carbon dioxide produced is greatly increased, so that there is an enhanced solvent action on the phosphate which the soil may contain. This consideration leads to the suggestion of the usefulness of mixing raw phosphate with manure, when applying it to soil. On the other hand, the addition of this material to a tight clay soil containing little organic matter may cause the phosphate to become confined to areas from which its subsequent distribution may be very slow.

Consideration of the whole question leads to the conclusion that the use of organic matter in connexion with raw phosphate increases the availability. This result is brought about through the facts that: (1) the phosphate is mixed more thoroughly with the soil; (2) the formation of carbon dioxide, which leads to greater solution, is increased because of the favourable conditions that exist for the chemical and biological processes that give rise to it; and (3) the action of the carbon dioxide results ultimately in a finer and more uniform distribution of the phosphate through the soil.

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

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this issue completes a review of certain Theories Concerning Soil Fertility. The theories specially dealt with, were put forward in an article in the last number of the *Agricultural News*, and the purpose of this is to present a criticism of those theories.

Page 229 contains an account of a little-known oil-yielding plant that exists in the West Indies. The matter may become of greater interest at some future time.

The subject of the availability of rock phosphate receives attention on page 231. The effect of mixing this with natural manures and compost is dealt with more particularly.

On page 234, the Insect Notes contain interesting articles on A New Pest of Cowpeas, The Cane Fly in Martinique, as well as a note on The Brown Hard-back. The pest mentioned in the first of these articles was observed originally by the Entomologist to this Department, on cowpeas, in Barbados.

Page 235 contains an article describing experiments with Funtumia rubber, carried out in Southern Nigeria.

The Fungus Notes in this issue are contained on page 238. They deal with a bud disease of the coconut palm in Mexico, which is attributed to *Pythium palmivorum*, the fungus that has been proved to cause a similar disease of palms in India.

Oil from the Guayule Rubber Plant.

As is well known, this plant (*Parthenium argentatum*) has attained much importance in Mexico, where it is native, as a source of rubber chiefly for the United States. It has been brought to notice lately as a plant that is capable of yielding oil.

The Semi-Annual Report of Messrs. Schimmel & Co., dated April 1912, states that the plant contains, in addition to rubber, about 0·5 per cent. of essential oil, calculated on the dry material.

The oil that was examined was prepared from material grown in Mexico, and dried quite shortly before it was shipped. The yield was about 0·15 per cent. of a greenish-yellow, faintly leavo-rotatory oil consisting entirely of hydrocarbons; the small yield of oil is stated to be due to the fact that no suitable distilling plant for work on a large scale was available for use.

Material that had been stored for some time was also subjected to distillation; this yielded an oil rich in oxygen, which when distilled left a residue of about 50 per cent. resin.

It is stated that the oil of *P. argentatum* possesses a marked similarity to oil of German chamomile, but as is stated by Messrs. Schimmel they differ completely in their chemical constitution.

Nature Teaching and Hygiene in British Guiana Schools.

The report of the Inspector of Schools, British Guiana, for 1911-12, indicates that interest continues to be maintained in the subject of nature knowledge, but that a large amount of work remains to be done before the teaching attains a satisfactory standard. The usefulness to teachers of the publication *Nature Teaching* is emphasized, and it is stated that this book should be employed by every teacher, 'who is at all desirous of learning how to put before his class in the simplest possible language and in a perfectly clear and intelligent manner the elementary principles of Nature Knowledge.' Stress is also laid upon the use of the simple experiments that are described in the book. It is further advised that the pupils should be made more commonly to describe and illustrate with drawings the experiments conducted by the teacher.

As regards elementary hygiene, the fault continues to exist by which pupils are taught rather to repeat the text of the pamphlets used by the teachers than to understand the principles and practice of hygiene. As in the case of nature study, more experiments are wanted; this section of the report concludes, however, in the following way: 'I am afraid it is only too true that a great many teachers all over the country are not sufficiently enthusiastic to give a moment's thought to any lesson on the time table, be it hygiene, or any other subject, before reaching school for their day's work.'

Experiments on Chlorosis.

Chlorosis is a condition in plants in which for some reason or other the green colouring matter is either partially or entirely absent. An investigation for the purpose of obtaining information concerning the causes of chlorosis is described in the *Comptes Rendus de l' Académie des Sciences* (Paris) 1911, p. 902. In this, experiments were conducted in which maize was grown in nutrient solutions, some of which were complete and some incomplete, the omissions from the latter consisting of such constituents as manganese, iron, sulphur, silicon, lime and chlorine.

The absence of sulphur and iron resulted in interference with development, and chlorosis: the effect of the absence of the sulphur was shown more quickly than that from the want of iron. Observations on the development and constituents of the leaves showed that the cause of chlorosis is, as was to be expected, interference with nutrition. The condition could always be corrected perfectly by supplying the plant with the element that was wanting. The green colour could also be restored by pouring dilute ammonium sulphate on the leaves.

Chlorosis was not found to be caused by the absence of chlorine, magnesium or silicon.

The Victoria Museum, Dominica.

The first annual report of the Directors of this institution was gazetted on May 31, 1912. It shows firstly, that the arrangements for starting the Meseum were made in February 1910, and that Messrs. H. A. A. Nicholls, C.M.G., M.D., F.L.S., J. Jones (Curator of the Botanical Gardens), and E. A. Agar, F.E.S., were appointed by His Honour the Administrator as a Board of Directors of the museum

The museum was opened to the public on October 23, 1911, and it was decided that it should be opened on alternate mornings and afternoons to the general public, and at other times for the accommodation of visitors to the island.

Among those, others than the members of the Board, who are mentioned as having given assistance in connexion with the museum, have been Mr. Hugh Scott, B.A., F.E.S., of the Museum of Zoology of the University of Cambridge, Dr. D. Thaly and Mr. P. W. Jarvis.

The present contents of the museum, according to the details given in the report, consist mainly of specimens of insects, especially Lepidoptera and Coleoptera; corals and land shells; samples of the agricultural products of the island: polished specimens illustrative of the timber resources of Dominica; and a collection of Carib stone implements. Efforts to add to these are being continued, while the economic section is in the charge of the Botanical Department.

The general public has showed interest in the collections, many specimens among which have been provided by school children. When the museum was opened it contained 1,271 specimens; at the time of reporting the number had reached 1,501.

Black Blight in Grenada.

At a meeting of the Agricultural Board of Grenada held in March last, the Superintendent of Agriculture was asked to explain the reasons for the reduction to £50 of the amount on the Departmental Estimates for experimentation in connexion with black blight. It was stated in reply that such excellent results had been obtained through the use of imported parasitic fungi that a very small part of the sum of £100 that had been voted previously was actually spent. It was therefore considered that half that sum would be ample for the work of the coming year.

This fact forms a very effective illustration of the usefulness, under certain conditions, of parasitic fungi in combating the scale insects that are followed by black blight. The matter is dealt with at some length in the last *Annual Report* (1910-11) on the Grenada Botanic Station.

At the meeting mentioned it was decided ultimately that the sum of £50 should stand, and that this would be sufficient to provide, as well, a certain amount that might be expended in trials of treatment for the coco-nut palm bud rot.

Rubber-Growing in Sumatra.

The growing of rubber in plantations has become one of the most important industries in Sumatra, and is regarded as being of particular usefulness with respect to the development of the east coast of the island. According to a recent report by the British Vice-Consul at Medan, dealing with the conditions on this coast, about five-eighths of the capital invested in rubber is British. Better means of communication are required, however, for successful exploitation. The activity of the different companies interested in the matter varies, but preparations are being made by several of them to plant considerable areas in rubber.

It is not possible to obtain reliable statistics as to the amount of capital invested in the industry, and the area under plantation rubber. Returns are available, however, which go to show that about 130,000 acres of rubber had been planted up to the end of last year; of this, more than 125,000 acres was under *Hevea brasiliensis*. At the end of the time mentioned, it was estimated that there were fifty British rubber companies working in Sumatra, with an issued capital of approximately £5,000,000, and a nominal capital of about £6,200,000. An estimate gives the capital invested by countries other than Great Britain, in rubber-growing in East Sumatra, as the following: Dutch £3,000,000, German £80,000. Belgian £62,000, and Swedish £20,000.

The number of companies that were producing rubber at the time of reporting was about thirty, but most of these have only commenced tapping recently, and on a very small scale. Further estimates show that the export of plantation rubber from the East Coast of Sumatra during 1911 was about 677 tons; of this about 550 tons was sent to London.

INSECT NOTES.

A NEW PEST OF COWPEAS.

In October 1911, officers of the Imperial Department of Agriculture discovered the larvae of a lepidopterous insect causing a considerable amount of injury to cowpeas growing in a field on an estate near Bridgetown, Barbados.

The injury resulted from the attacks of these larvae on the flower buds, leaf buds and young pods. From the condition in the field at the time when this injury was first noted, it seemed that the first attacks were on the buds, the attacks on the pods only occurring at a much later time.

The effect of a general attack on the buds would be to produce a condition such as existed in this field, where the plants though advanced in age had made very little growth of vine, and as a result the surface of the field was not more than half covered, although it would appear that the growth of the vines should have completely covered the ground.

As the cowpeas were grown principally for a green dressing, it may be taken that the crop was not more than 50 per cent. of what it should have been, and probably this condition was largely, if not entirely, attributable to this insect.

The loss caused by the injury to the pods is also severe, for not only is the amount of the vine greatly reduced, thus lessening the number of pods, but many of the pods which are developed, are damaged to such an extent as to be practically worthless.

On the occasion of one visit to the fields, the manager seemed to attribute the condition to drought rather than to insect attack.

Specimens of the moth were reared from larvae and sent to Dr. L. O. Howard, Chief of the Bureau of Entomology, United States Department of Agriculture, Washington, through whose courtesy the insect has been studied by Dr. H. G. Dyar, who will describe it as *Ballovia cistipennis*, creating a new genus, and a new species.

The full-grown larva of this species measures about $\frac{3}{5}$-inch in length, and is of a pea-green colour until it is just about to enter the ground to pupate. The pupal stage extends over a period of fourteen to seventeen days.

The moth measures about $\frac{7}{8}$-inch across the outspread wings, and about $\frac{1}{2}$-inch in length when the wings are closed.

The general colour of the forewings is a pale grey above, and a silvery grey below, while that of the hind wings is a translucent white with pale honey-yellow veins. A striking characteristic is a large dark spot in the basal half of the forewing.

This insect is capable of becoming a serious pest and it may easily be realized that methods for its control can only be devised by experiment.

An insect causing similar injury to the horse bean (*Canavalia ensiformis*) occurs in St. Kitts, but up to the present time the adult has not been obtained.

THE CANE FLY IN MARTINIQUE.

The *Bulletin of the Bureau of Agricultural Intelligence and of Plant Diseases* for April 1912 (3rd year, No. 4) reviews at page 1074 a paper entitled La Maladie de la Canne à Sucre à la Martinique, by Eugene Bassières, which was published in *Sucrerie Indigène et Coloniale*, Paris, January 9, 1912.

It appears from the review that, at the end of 1910, 37 acres of cane were observed to be suffering from attacks of an insect not previously known there. This proved to be *Delphax saccharivora*, Westwood, the cane fly which appears occasionally in Barbados and other islands.

The author considers the development of the fly in Martinique to be favoured by three causes: the carelessness of the cultivators, who neglected the control of the pest on its first appearance; the custom of using large quantities of mineral fertilizers and scarcely ever employing farmyard manure; and finally, the almost complete absence of insectivorous birds in the sugar-cane plantations.

M. Bassières advises the following method of control:—

(1) When the large or small canes are badly attacked it is necessary, as far as possible, to burn the infected zones. The canes could then be sent to the mill without further trouble.

(2) In the case of tall canes, which have suffered less severely and can thus, without much loss, be allowed to grow till the usual time of harvest, it is sufficient to cut them as soon as possible after burning.

In the meantime, and in inaccessible places, a partial burning will be advisable, and also the collection of the eggs of the insect, etc.

(3) Young canes, intended to be cut in 1913, and which are, so far, not irremediably affected, should be treated with an insecticide.

For this purpose, the writer recommends various emulsions: with petroleum and soap bases according to the American station and Hubbard-Riley formulae; with a basis of petroleum and hot milk of lime; bases of soft soap, tobacco juice, sodium carbonate and alcohol; of soft soap and spirits of turpentine; of soft soap and commercial ammonia.

The preparations of petroleum and of ammonia seem to be the most efficacious against the majority of the insects belonging to the same family as Delphax.

The Brown Hard-back.—The occurrence of the brown hard-back (*Phytalus smithi*, Arrow.) in Barbados and Mauritius, was mentioned in the Insect Notes in the *Agricultural News* of March 16 last (see Vol. XI, p. 90).

In a letter to the Imperial Commissioner of Agriculture, under date of July 5, 1912, the Superintendent of the Local Department of Agriculture, Barbados, announces that the Assistant Superintendent has discovered that the larva of *Phytalus smithi* is parasitized by a black wasp, which has been identified through the courtesy of Mr. Guy A. K. Marshall, Scientific Secretary of the Entomological Research Committee, as *Tiphia parallela*, Smith.

The information is of considerable interest, and if it can be shown that *Tiphia parallela* is largely responsible for the fact that *Phytalus smithi* occurs in only small numbers in Barbados, is likely to prove of the greatest benefit in those places where, as in Mauritius, the brown hard-back is abundant and its larvae are serious pests as grubs in the soil, attacking the roots of sugar-cane and other crops.

FUNTUMIA RUBBER IN SOUTHERN NIGERIA.

The following interesting extracts are taken from a report by the Provincial Forest Officer, Central Province, Southern Nigeria, on the tapping of Funtumia rubber in Benin City Communal Plantations, in 1910.

The plantations are formed by the village people under the supervision and encouragement of the Forest Staff. It has been, and is still, the practice each year for the Forest Staff to collect seed from the forest, take it to the villages and make nurseries with the help of the village people. Later in the year the Forest Staff supervises the planting out into the plantations, the labour for all operations being supplied by the villages and utilized under the direction of the Forest Staff. In each village there are one or more 'Ogas' or headman who are told off to look after the plantations, and whose duty it is to see that they are kept weeded, etc. These Ogas are usually exempted from other work.

TAPPING. Tapping was commenced on June 8, the greater part of May having been taken up in building a drying shed at Benin City for the reception of the rubber when it came in from the plantations. The trees were tapped on the full herring-bone system, to a height of 10 feet, and halfway round the tree.

COAGULATION. This was done by boiling, as it was thought unwise to introduce acids or chemicals of any description for the purpose. My opinion is that all the operations should be done in a way that the natives can easily imitate. It was a matter of some experiment before we arrived at the correct quantity of water to use, when cooking, to prevent burning; but it was eventually gauged to a nicety, and I think I may say that after the first month there was not a single buscuit spoiled by burning, whereas at first quite 50 per cent. were burned.

The boiling was done in enamel-lined saucepans holding about 3 pints, putting in about 1½ pints of water to a quarter of a pint of latex; the water was brought to boiling point before the latex was put in. It was found necessary to get the proportion of water to latex fairly correct as too little water results in burning, whilst too much causes the whole thing to overflow and thus waste the rubber. During the coagulation the rubber is kept off the sides of the vessel with a clean stick, and the mass is cooked until the remaining liquid becomes quite clear.

A point worth mentioning here is that fresh latex, that is, that just taken from the trees cannot be cooked satisfactorily. It is impossible to get the water clear, and in the efforts to do so the rubber becomes over cooked and too tough to roll out. If taken out whilst still soft enough to roll there is necessarily a large amount of rubber left behind in the water, and this of course is wasted. On the other hand, if the latex is allowed to stand for twelve hours, the water is cleared without excessive cooking; the rubber is in a pliant state capable of easy rolling, and there is no waste. Evidently some mechanical change takes place in the latex whilst standing, which makes the globules cohere more readily.

After cooking, the rubber is thrown on to a table or other flat surface and rolled out into thin biscuits with a wooden roller. The side of a box and a bottle answer the purpose quite well, in the absence of more convenient apparatus.

After cooking, which in each case was done in the plantation, the rubber was brought into Benin City and washed. It was found necessary to wash it for a whole day in the same way that one washes a photographic plate, in order thoroughly to get rid of the serum. After washing it was placed in the specially built rubber-drying shed.

This building is 54 feet long by 20 feet wide, and is constructed of squared timber and corrugated iron, the sides being made to open for ventilation. Internally it is fitted with a series of wire netting shelves to receive the rubber biscuits, it being found impracticable to handle them.

It takes a long time to dry the rubber thoroughly, and it is doubtful if it is possible to bring it to the requisite state of dryness during the wet season without the aid of artificial drying apparatus. During last season small fires were kept going in the shed most of the time, but even then the June rubber was not considered sufficiently dry to sell before October, and the whole was not ready for shipment until December.

There is one interesting point in connexion with the drying of rubber which I should like to mention, and that is the cause of tackiness. As is well known by anyone who has had to do with rubber (Funtumia rubber at any rate), it frequently happens that some of the biscuits become tacky; that is to say, they become sticky on the outside, and the whole mass gradually becomes converted into a gum-like substance which sticks to everything and cannot be got rid of. This occurred with several of our biscuits last year, and for a long time I was at a loss to account for it. I found on experiment that it was only on the outside of the shed, where the rubber was exposed to the morning or afternoon sun, that the tackiness occurred. This, of course, would have been noticed before had it not been for the fact that the biscuits were constantly turned to accelerate drying, and in the operation the positions were altered.

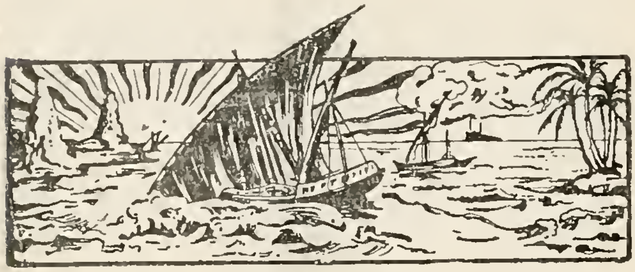
After this discovery I erected palm leaf shades on either side of the shed, and since then there has heen no tacky rubber

RESULTS. The season's operations comprised the tapping and thinning of eighty-four plantations, the total number of trees tapped, that is trees 18 inches in girth and over, being 4,706, yielding 413 lb. 12 oz of dry rubber. The total number of trees tapped to exhaustion and cut out was 28,815, yielding 608 lb. 4 oz. of dry rubber. The total yield of dry rubber was 1,022 lb. The loss of weight in drying was 37·7 per cent. The average yield per tree of tapped trees, that is 18 inches in girth and upwards, was 1·4 oz. The average yield per tree of thinned trees, that is tapped to exhaustion, was 0·3 oz.

The rubber was sold by Messrs. Figgis & Co. in London, in March. It was put up in three lots and realized the following prices, finest plantation Para at the same date fetching 6*s.* 11*d.* per lb.: lot 1, 470 lb., 6*s.* 6*d.* per lb.; lot 2, 466 lb., 6*s.* 1½*d.*, and lot 3, 60 lb., 5*s.* 6*d.* per lb. This is an average of nearly 6*s.* 1*d.* per lb.

Lot 2 was composed of slightly thicker biscuits than lot 1, whilst lot 3, was partly composed of the tacky rubber previously mentioned.

The gross sum realized was £302 12*s.* 9*d.*, whilst brokerage and other charges amounted to £5 11*s.* 7*d.*, making a net result of £297 1*s.* 2*d.*



GLEANINGS.

It is reported from Nevis that about 300 acres of cotton were planted in the island during last month. Germiuation had been fair, but at the time of reporting the seedlings were suffering much from drought.

Information received from the Agricultural Superintendent, St. Vincent, states that the sales of selected and disinfected cotton seed to small growers, from the Central Cotton Ginnery, for the present season, have amounted to about 7,000 ℔..

The distribution from the St. Lucia Botanic Station during the month of June included the following plants: limes 5,600, cacao 300, budded oranges 6, grafted mangoes 4, nutmegs 56, ornamental plants 474. There were also sent out 183 packets of seeds.

Details supplied from the Dominica Botanic Station show that the distribution from that Station during June included the following plants: limes 6,025, cacao 300, grafted cacao 30, budded grape fruit 20, grafted mangoes 6, miscellaneous 18. The total distribution for the month comprised 6,399 plants.

In the *Experiment Station Record*, Vol. XXVI, p. 559, issued May 7, 1912, mention is made of an instance of parasitism of a mosquito by a midge. The midge, which is a small Chironomid fly, was observed with its proboscis inserted into a mosquito (*Myzomyia rossii*), from which it was apparently sucking blood.

A copy has been received of a new monthly publication entitled *Revue Economique Internationale*, which contains several useful articles dealing in a general way with the exploitation of plants, notably of those used in rubber production. The office from which the journal is issued is situated at 4 Rue du Parlement, Brussels.

We are asked to say that Lady Hooker will be grateful if any of her friends who possess letters written by her late husband, Sir Joseph Hooker, will lend them to her for the purposes of a biography which Messrs. Smith, Elder & Co. will publish. The letters, which should be forwarded to Lady Hooker at The Camp, Sunningdale, will be carefully returned. (*Nature*, June 13, 1912.)

The announcement is made that a new work entitled Coco-nuts, The Consols of the East, will be ready shortly. The authors of this are H. Hamel Smith, the editor of *Tropical Life*, and F. A. G. Pape, F.R.G.S. It is to deal with the cultivation of coco-nuts and the utilization of the by-products of the plant, and will be fully illustrated. The price of the work will be 11*s*., post free.

An estimate of the cotton crop of German East Africa, contained in the *Börsen Zeitung* (Berlin), of May 3, gives the cotton crop of German East Africa for the present season as 5,000 bales (of 550 ℔.), and that of Togoland as 2,500 bales; the value of this cotton will be about £150,000. It is expected that the production will increase further in 1912-13, for the amount of seed that is being sown has almost doubled.

The President of the Board of Trade has appointed Mr. C. Hamilton Wickes, at present His Majesty's Trade Commissioner for Australia, to be His Majesty's Trade Commissioner for Canada, in place of Mr. Richard Grigg, who has resigned on acceptance of an important appointment under the Dominion Government. Mr. Hamilton Wickes will take up his duties in Canada early in the autumn of this year. (*The Board of Trade Journal*, May 23, 1912.)

According to the Annual Report of the Durban Chamber of Commerce for 1911, the Natal sugar industry made considerable progress during last year. The crop of that year yielded 92,000 tons of sugar as compared with 82,000 tons in 1910, the increase being partly due to the erection of improved machinery, and partly to the greater acreage. The estimate is made that the crop of 1912 will produce 112,000 tons: this will be sufficient to supply nearly all the needs of South Africa as far as sugar is concerned.

The *Government Gazette* of the territory of Papua for May 1, 1912, signalizes the discovery of petroleum on the Vailala River, in Papua, by a report by the Assistant Government Geologist of New South Wales of an investigation of the supposed indications of the occurrence of oil that was made in the first months of this year. The original discoveries which led to the prediction of the existence of oil took place in September 1911. The same issue of the Gazette contains a despatch regarding the procedure to be adopted in regard to petroleum leases in Papua.

Dealing with part of the Dutch West Indies, *Diplomatic and Consular Reports*, No. 4879 Annual Series gives the following information: 'The cultivation of cotton has been favourably reported upon in the Island of St. Eustatius. Complaints continue to come in regarding the bad conditions prevailing in the harbour of Willemstad. The Budget provides for the enlargement on a small scale of the St. Anne Bay. Further measures were made dependent upon the findings of a committee constituted to inquire into the possible results which the opening of the Panama Canal might have upon the Netherlands and her colonies.'

STUDENTS' CORNER.

JULY.

Third Period.

Seasonal Notes.

During the present quarter, lime-planting will be proceeded with, the preparations for this having been made previously. What are those preparations, and why are they made? An early opportunity should be taken for the setting out of the plants, in order that they may be given time to become well established before the dry weather commences. State what happens to the parts of a lime plant that are below ground, after it has been transplanted. Where there is a good rainfall, particularly where this is likely to be excessive, a method of planting may be employed which does not entail any preliminary preparations in the first half of the year. In this method, after the rows have been lined out, an area of 4 to 5 square feet is forked around each of the stakes showing the positions of the plants, and the soil is drawn up to form a slight mound. On the middle of each mound, a lime plant is placed and the roots spread out; the latter are then covered with soil from the outer part of the mound. The purpose of this procedure is to ensure that the plants will be growing well above the general surface of the soil in the plantation; it has the further useful effect of assisting drainage to a great extent—an important matter where the rainfall is large. In cases where the drainage is insufficient, what is likely to happen to (1) the soil, (2) the plant? State broadly how the nature of the bacterial action is likely to be changed in soils when the excess of water that falls as rain is unable to flow away freely. With reference to the method of lime-planting just described, the circular areas that are clear, round the plants, can easily be kept free from weeds, and those growing between them may be cutlassed occasionally.

The distance for planting limes varies with different circumstances, one of these being the kind of soil in which they are to grow. Discuss the conditions that decide the distance from one another at which the plants have to be placed, and give reasons for the plan that is followed, in this respect, under circumstances with which you have practical acquaintance.

In lime plantations, where it is considered advisable or necessary to thin the plants, the present season is the best for the purpose, as the rainfall will cause growth to be made, on the part of the plants that are allowed to remain, that will cause the intervening spaces to be covered up quickly. One effect of heavy rains may be to cause the drains to become blocked up; care should be taken that they are kept open continually.

Where manures have been applied, and where the drainage has been improved, in lime cultivations, any resulting improvement in the growth of the plants will be shown most plainly at the present time of the year. Further, it is at this time that careful note should be made of the progress and growth of the trees, and where any individual plants or groups of plants do not show a sufficient amount of development, a careful enquiry should be made into the conditions of such plants, in order to discover if the circumstance that is unfavourable consists in the state of the soil or in the presence of disease. Give an account of any diseases of lime plants of which you have knowledge, and state what should be done in cases where diseases are thought to be doing harm.

Questions for Candidates.

Preliminary Questions.

(1) State what substances or classes of substances generally go to make up a soil.

(2) How may the agriculturist cause nitrogen to be added to the soil?

(3) What precautions are employed in transplanting plants?

Intermediate Questions.

(1) From what sources may the phosphates in a soil be derived?

(2) Describe the ways in which nitrogen is added to soils, directly and indirectly.

(3) Why is the root system of plants often reduced, before they are transplanted?

Final Questions.

(1) How do phosphates become available in soils?

(2) Give the general principles of the manufacture of manures containing nitrogen derived from the air.

(3) State why plants are transplanted, dealing (1) with practical considerations, (2) the effect on the plant itself.

The Porto Rico University Agricultural College.—An announcement has been received that the Agricultural College of the University of Porto Rico will begin work in September in a building specially erected for it at Mayaguez. There will be no fees for tuition, and books will be provided free; there are no expenses except living expenses. A complete equipment will be available, including all apparatus for the study of agricultural subjects, and what is as important, there will be a full and competent teaching faculty. A limited number of scholarships is to be granted, giving the holder a monthly allowance; details concerning these may be obtained by application to the Dean. The lengths of the courses that may be taken are four years, five years and one year; it is intended also to give short courses of one week.

The plan to be followed is that, during the first two years the courses of study will be alike for all, and planned in order to give a general education in certain languages, mathematics and science. By this means an opportunity will be afforded to a student to choose effectively his course of further study, or to elect to carry his efforts to some other centre of instruction.

A certain amount of work has been done already, for since January, what are termed Agricultural Institutes have been held throughout the island, and will continue until the end of this month. It is stated that these have been attended by hundreds of teachers, who have received practical instruction in agriculture and have become interested in the work.

The Board of Trade Journal for May 2, 1912, shows that the quantity of rubber exported from Para, Manaos, Iquitos, and Itacoatiara for the first quarter of this year was 30,256,521 ℔. In the first quarter of 1911 the shipments amounted to 22,415,868 ℔.

FUNGUS NOTES.

A BUD DISEASE OF THE COCO-NUT PALM IN MEXICO.

The important bud rot disease of coco-nuts has occupied considerable attention of late, and the recent work of Johnston attributing it to *Bacillus coli* was reviewed in the *Agricultural News*, Vol. XI, pp. 94 and 110. This work was done on the form of the disease that occurs in the West Indian Islands, and does not necessarily apply to all such diseases. In the *Agricultural News*, Vol. X, pp. 14 and 30, some account was given of a bud rot of palms in India attributed by Butler to *Pythium palmivorum*, and it was stated that one of the species occasionally subject to this disease was the coco-nut. In the English section of the *Review of Tropical Agriculture*, Vol. II, p. 295, appears an article by Olssen-Seffer on a bud rot of coco-nut palms in Mexico, particularly prevalent on the east coast. This disease the writer attributes to *Pythium palmivorum*, the cause of the Indian disease already referred to; as will be seen from the account which follows, the Mexican disease differs somewhat in its symptoms from the accounts given of the West Indian disease, particularly in the appearance of brown stained spots on the bole of the tree, in the exudation of gum from these spots, and in the fact that the outer leaves appear to decay first and not the central spike. Olssen-Seffer's account is as follows:—

'As far back as 1898 a disease similar in its effects to the destructive "bud rot" disease of cocoanut palms in the West Indies, was known on the eastern coast (of Mexico), killing out the cocoanuts in many districts.

'*Bud rot due to a fungus.* The parasite which is responsible for the disease is a fungus (*Pythium palmivorum*, Butl.), which gains entrance through the leaf sheaths which closely encircle the green tops of the stem below the point where the expanded leaves open out into the spreading head. Its principal characters of importance—from the point of view of treatment—are that it only emerges from the tissues of the leaf sheaths, to form spores in the inner layers of sheaths, and that hence in the early stages before the dead stalks drop off, it is not exposed to conveyance by the wind. Furthermore, on account probably of the sugary nature of the palm saps, its track is rapidly followed by hosts of putrefying organisms which not only lead to the putrid heart rot of dead trees, but also rapidly destroy by "poisoning" the parasite itself with the probable exception of its durable spores

'The spores of the parasite are of two kinds: a temporary form suited for very rapid propagation limited in time and space and quite ephemeral, and a lasting or durable form whose structure shows it to be well capable of withstanding adverse circumstances and probably of living many months.

'The full history of the latter is not yet known but it is the probable agent of *extensive* as opposite to *intensive* infection. It is possibly capable of surviving even the putrefaction of the bud which the rest of the fungus cannot do, and after exposure by complete rotting of the "cabbage" may be conveyed to fresh trees and secure their infection. Water is necessary for the germination of the spores, but rain drops or the film of dew in cold weather is sufficient. Cases of infection are rare in the dry season, and take place chiefly in the cold weather (when there is much fog and dew), and to some extent during the rains. The conditions necessary for the spread of disease are (1) the exposure of the diseased inner leaf sheaths to the air (with some animal bird or insect capable of conveying infective matter); (2) the prevalence of moist or foggy weather or copious dew, to allow of germination of the spores.

'I find (1) the first symptom visible is a slight brown discoloration on the back of the centre rib of the heart limb; (2) as each limb appears it is more and more discoloured; (3) a brown stain appears in spots upon the bole of the trees; (4) later a clear gum appears in great gouts and hardens on each discoloured spot on the bole; (5) all the outer limbs of the tree begin to drop down; (6) the young blossoms of the trees show signs of brown decay; (7) the whole spike of heart leaves leans over and finally drops right out of the tree; (8) the tree is dead.

'I have observed the following also: (1) the trees appear to die in patches of three or four, (2) the trees never die on a hillside: (3) the land where they die has always been of a yellowish clay.

'*The treatment recommended.* The first circumstance can be prevented by destroying all diseased heads in the early stages, before the "cabbage" falls apart, the second seems at present beyond human control, except that poison can be applied to the seat of new infection; on these considerations the treatment is based. I am confident that the burning of diseased tops, thoroughly carried out, will in itself be sufficient to check the disease.'

THE PASTEURIZATION OF MILK.

MEANING OF THE TERM 'PASTEURIZATION'. Pasteurization as applied to milk is the process of heating for a short or long period as the different methods demand at temperatures usually between 140° and 185° F. The process must be followed by rapid cooling. The term originated from the experiments of Pasteur, in France, from 1860 to 1864, on the 'diseases' of wine, in which he found that the heating for a few moments at a temperature of 122° to 140° F. was sufficient to prevent abnormal fermentations and souring in the wine. A little later Pasteur found that by a similar heating beer could be preserved from souring. The application of the process gave rise to the term Pasteurization.

VALUE OF PASTEURIZATION. The value of pasteurization from a sanitary standpoint is of the greatest importance when market milk is under consideration.

In the first place, the pasteurization of milk, when the process is properly performed, affords protection from pathogenic organisms. Such disease-producing bacteria as *Bacillus tuberculosis*, *B. typhi*, *B. diphtheriae*, and the dysentery bacillus, are destroyed, or at least have lost their ability to produce disease, when heated at 140° F. for twenty minutes or more. Although the infective agent in scarlet fever is unknown, epidemics of the disease have been traced to milk supplies, and in such cases pasteurization has been resorted to as a means of safeguarding the public, with apparently satisfactory results.

In the second place, pasteurization causes a reduction of the infantile death rate due to the ordinary intestinal disturbances. Numerous experiments definitely prove the value of pasteurization in this connexion. While it has not been possible to isolate any special organisms which act as the causative agents in the common infantile intestinal troubles other than the one producing dysentery, it seems that high bacterial numbers in the milk consumed are associated with such diseases.

In the third place, pasteurization is of value from a commercial standpoint in so far as it increases the keeping quality of the milk and prevents financial losses caused by souring.

Commercial pasteurization as practised at the present time with reasonable care destroys about 99 per cent. of the bacteria, but it does not prevent the ultimate souring of milk, although it does delay the process.

QUALITY OF THE MILK TO BE PASTEURIZED Only clean milk should be pasteurized, and it should never be pasteurized more than once. Dirty milk containing many millions of bacteria per cubic centimetre is not fit for consumption, and should be condemned. Pasteurization should not be resorted to in order to make dirty milk sweet long enough to be sold or simply to pass legal regulations, but should be used only to make clean milk a safe milk.

METHODS OF PASTEURIZATION. Milk is pasteurized by two processes, one known as the 'flash' or 'continuous' process, in which the flowing milk is heated to the required temperature and held there from thirty seconds to one minute. The other is known as the 'holder' or 'holding' process, and sometimes the term 'held pasteurization' is applied. By the latter method the milk is held for approximately thirty minutes at the temperature desired. (From Circular 184, of the Bureau of Animal Industry of the United States Department of Agriculture; issued April 23, 1912.)

AGRICULTURE IN ST. VINCENT, 1910-11.

It is pleasing to record a further increase in the amount of land under cultivation in cotton, as also a slightly improved yield of lint as compared with that of the two preceding years. So long as the average value of this product remains at 18*d.* per lb. of lint, it must constitute the staple crop of the Colony, although arrowroot at its present minimum price of 3*d.* per lb. should prove a stout competitor for the honourable place. While arrowroot can be grown on any land where cotton is cultivable, on the contrary, cotton cannot be raised on all lands where arrowroot can be cultivated; in fact its area of production is limited to the coastal lands. Thus it is unlikely that the one crop will ever be entirely forsaken for the other.

In the St. Vincent Grenadines, notably Union, Canouan, and Mayreau, the common Marie Galante type of cotton is grown. It is cultivated as a perennial, and produces a short coarse, lint valued usually at from 8*d.* to 9*d.* per lb. The exports of this cotton during the past six years amounted in the aggregate to 166,576 lb. weight, valued at £7,039. In several of the other islets, Bequia, Mustique, Battowia, and Balliceaux, the cultivation of Sea Island cotton has been taken up exclusively, and with very satisfactory results.

The table given below shows the area planted in Sea Island cotton, together with the yield of lint and the average per acre during the past six years.

Crop year.	Acreage planted.	Weight of lint in lb.	Yield of lint per acre, in lb.
1905-6	790	137,460	174
1906-7	1,533	286,275*	175
1907-8	3,250*	432,000	135
1908-9	3,000	372,000	124
1909-10	2,528	356,139	141
1910-11	3,587	561,526	156

Arrowroot in export value reached a figure of £30,089 as compared with £31,792 in the preceding year. This crop is again becoming a source of attention to growers inside the Colony and of commercial attraction to buyers outside the Colony. The Arrowroot Growers' and Exporters' Association commenced their operations on December 1, 1910, and their method of working would indicate great beneficial results to the industry. In support of this it may be stated that whilst on December 1, 1910, the price of ordinary manufacturing arrowroot stood at $1\frac{7}{8}d.$ to $1\frac{15}{16}d.$ per lb, at date of writing the quotation for that article is $3\frac{1}{4}d.$ to $3\frac{1}{2}d.$ per lb. It is also to be noticed that stocks on hand are considerably lower than for a number of years gone by.

Sugar continues to be grown chiefly in the Carib country estates, but the exportation figures indicate no increase in quantity. The only noticeable feature with regard to this crop is the increase in the amount of export of crystallized sugar, showing a corresponding decrease in the export of muscovado sugar.

The cultivation of cacao raises no enthusiasm in St. Vincent, and it seems conclusive that only certain favoured localities and spots are suitable for its growth. The export value figures are practically the same as in last year—£4,132 for the year under review as compared with £4,088 in 1909-10.

During the last four months of the year under review there was a marked decrease in the number of deaths among stock from anthrax. This is due to the stringent and efficient measures of vaccination and burial of carcasses which have been continuously carried out since that disease evinced its presence in the Colony in malignant form. Since April 1, 1911, up to the time of writing (ten months) only one case of death from anthrax has been discovered by the Government Veterinary Surgeon and that death took place in July. Thus seven months have elapsed without a single death amongst stock from the dread disease. Human anthrax has not been known in the Colony for seven years. The time has come when the neighbouring colonies may well agree to recognize St. Vincent as free from disease and accept stock from here, under certificate from the Government Veterinary Surgeon that they have been exported from a locality non-infected with anthrax and that the forage accompanying such stock has likewise come from a non-infected area. During the year an Ordinance has been passed making provision for compulsory vaccination of stock in areas where the disease may become epizootic. (*Colonial Reports*—Annual, No. 712.)

* These figures are given incorrectly; they should be 268,275 and 3,200.—Ed., *A.N.*

THE MULBERRY AND THE WEST INDIES.

The revived interest in the possibility of carrying on a silk-raising industry in the West Indies has led to the question as to the suitability of the white mulberry (*Morus alba*) for growing in this part of the world. In relation to this question, seeds of this plant have been distributed by the Commissioner of Agriculture among the Botanic Stations in the Windward and Leeward Islands, in order that trials may be made.

In acknowledging the receipt of some of these seeds, Mr. J. Jones, Curator of the Botanic Station, Dominica, states that on his arrival in that island, in 1892, he found *Morus alba* established at the Station for the purpose of raising silkworms: nothing, however, resulted from the attempts that were made at the time, though this does not mean that future work may not be successful.

The further interesting fact is mentioned by Mr. Jones, that a strong plant of *Morus alba* still remains in the collection at the station, from which seeds could be obtained from time to time; and it is indicated further that the existence of the plant in the gardens for a period of over twenty years shows that the white mulberry is well suited to the conditions under which it has grown in Dominica.

MARKET REPORTS.

London.—The West India Committee Circular, July 2, 1912; Messrs. E. A. De Pass & Co., June 21, 1912.

Arrowroot—$3\frac{5}{8}d.$ to $4\frac{3}{4}d.$
Balata—Sheet, 3/8; block, 2/7½ per lb.
Beeswax—No quotations.
Cacao—Trinidad, 61/- to 80/- per cwt.; Grenada, 60/- to 66/-; Jamaica, 54/- to 61/-.
Coffee—Jamaica, 70/- to 80/- per cwt.
Copra—West Indian, £26 10*s.* to £26 15*s.* per ton.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 20*d.* to 30*d.*
Fruit—No quotations.
Fustic—No quotations.
Ginger—49/- to 65/- per cwt.
Isinglass—No quotations.
Honey—No quotation.
Lime Juice—Raw, 2/; concentrated, £18 12*s.* 6*d.* to £19; otto of limes (hand pressed), no quotations.
Logwood—No quotations.
Mace—2*s.* to 2*s.* 9*d.*
Nutmegs—5*d.* to 1*s.*
Pimento—Common, $2\frac{1}{2}d.$; fair, $2\frac{9}{16}d.$; good, $2\frac{5}{8}d.$; per lb.
Rubber—Para, fine hard, 4/8½; fine soft, 4/2; Castilloa, 4/2 per lb.
Rum—Jamaica, 2/- to 6/-.
Sugar—Crystals, 16/- to 18/6; Muscovado, 13/6 to 16/-; Syrup, no quotations; Molasses, no quotations.

New York.—Messrs. Gillespie Bros. & Co., June 28, 1912.

Cacao—Caracas, 14¼c. to 15½c.; Grenada, 13⅞c. to 14⅛c.; Trinidad, 14c. to 14½c. per lb.; Jamaica, 11¼c. to 12¼c.
Coco-nuts—Jamaica, select, $23·00 to $25·00; culls, $13·00 to $14·00; Trinidad, select, $22·00 to $24·00; culls, $13·00 to $14·00 per M.
Coffee—Jamaica, 14½c. to 16¾c. per lb.
Ginger—8¾c. to 11c. per lb.
Goat Skins—Jamaica, 50c.; Antigua and Barbados, 43c. to 45c.; St. Thomas and St. Kitts, 41c. to 42c. per lb.
Grape-Fruit—Jamaica, $6·00 to $7·00.
Limes—$5·50 to $6·00.
Mace—No quotations.
Nutmegs—110's, 13c. to 13¼c.
Oranges—Jamaica, $1·75 per box.
Pimento—3*d.* per lb.
Sugar—Centrifugals, 96°, 3·86c. per lb.; Muscovados, 89°, 3·36c.; Molasses, 89°, 3·11c. per lb., all duty paid

Trinidad.—Messrs. Gordon, Grant & Co., July 8, 1912.

Cacao—Venezuelan, $16·50 per fanega; Trinidad, $15·00 to $15·75.
Coco-nut Oil—85c. per Imperial gallon.
Coffee—Venezuelan, 16½c. per lb.
Copra—$4·50 per 100 lb.
Dhal—No quotations.
Onions—$2·50 to $3·50 per 100 lb.
Peas, Split—$7·25 to $7·50 per bag.
Potatoes—English, $1·50 to $2·75 per 100 lb.
Rice—Yellow, $4·80 to $4·90; White, $6·25 to $6·35 per bag.
Sugar—American crushed, no quotations

Barbados.—Messrs. James A. Lynch & Co., Ltd., July 13, 1912; Messrs. T. S. Garraway & Co., July 15, 1912; Messrs. Leacock & Co., June 21, 1912.

Arrowroot—$7·00 per 100 lb.
Cacao—$13·00 to $13·50 per 100 lb.
Cocoa-nuts—$16·00.
Hay—$1·80 to $2·00 per 100 lb.
Manures—Nitrate of soda, $65·00; Cacao manure, $45·00 to $48·00; Sulphate of ammonia, $80·00 per ton.
Molasses—No quotations.
Onions—$1·00 to $2·75 per 100 lb.
Peas, Split—$7·00 per bag of 210 lb.; Canada $3·00 to $5·40 per bag of 120 lb.
Potatoes—Nova Scotia, $4·50 per 160 lb.
Rice—Ballam, $5·10 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
Sugar—American granulated, $5·00 per 100 lb.

British Guiana.—Messrs. Wieting & Richter, July 8, 1912; Messrs. Sandbach, Parker & Co., July 6, 1912.

Articles.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	——	——
Balata—Venezuela block	No quotation	Prohibited
Demerara sheet	70c. per lb.	——
Cacao—Native	14c. per lb.	14c. per lb.
Cassava—	$1·32.	No quotation
Cassava Starch—	$7·50	No quotation
Coco-nuts—	$16 to $20 per M.	$10 to $16 per M., peeled and selected
Coffee—Creole	19c. per lb.	18c. per lb.
Jamaica and Rio	20c. per lb.	21c.
Liberian	15c. per lb.	15c. per lb.
Dhal—	$5·00 per bag of 168 lb.	——
Green Dhal	——	——
Eddoes—	$2·40	——
Molasses—Yellow	None	——
Onions—Teneriffe	——	——
Madeira	5c. per lb.	——
Peas—Split	$6·75 to $7·00 per bag (210 lb.)	$7·15 per bag (210 lb.)
Marseilles	——	No quotation
Plantains—	16c. to 48c.	——
Potatoes—Nova Scotia	——	$4·00
Lisbon	$2 75 to $3·00	No quotation
Potatoes–Sweet, B'bados	$3·36 per bag	——
Rice—Ballam	No quotation	——
Creole	$6·00	$6·00
Tannias—	$3·24	——
Yams—White	$2·64	——
Buck	$3·24	——
Sugar—Dark crystals	$2·75 to $2·80	$2·75 to $2·90
Yellow	$3·40 to $3·50	$3·50
White	$4·00	——
Molasses	$2·60 to $2·80	——
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$3·75 to $6·00 per M.	$4·00 to $6·00 per M.
„ Cordwood	$1·80 to $2·00 per ton	No quotation.

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CONTENTS

Hurricanes.

THE last occasion on which information regarding hurricanes was published in the *Agricultural News* was that of the issue of July 10, 1909. With the present approach of the hurricane season, a convenient opportunity is afforded for dealing again with the subject, so that readers may be reminded of what is the true nature of hurricanes and of the signs by which observers may be led to expect their approach.

A hurricane is a cyclonic storm; that is to say a storm in which the wind swings round in a circle, or more correctly in a spiral, while the whole system moves along more slowly. The origin of such storms is near the Equator, and they result from a great uprush of air which causes more air to flow in from every side to take its place. The effect is that the movement of the wind becomes circular; an interesting analogy is afforded by the eddying of water running out of a hole in the bottom of a basin—only that in this case the causative movement of the fluid is downward instead of upward. North of the Equator, this circular movement is always in a direction opposite to that normally taken by the hands of a watch, because as was discovered by Ferrel, the rotation of the earth causes all moving bodies in the northern hemisphere to swerve a little to the right, and this movement of all the particles causes a general counter-clockwise motion. In the southern hemisphere, the swerve is to the left, and thus in cyclones there the wind travels with the hands of a watch.

Experience has shown that, while Trinidad and Grenada are not likely to be visited by a hurricane, St. Vincent and Barbados are much more subject to such disturbances, or at least to the high winds that occur toward the outer limit of the storm area. This circumstance is easily understood when it is realized that the storms, arising as has been said near the Equator, travel in the lower latitudes westward to northwestward. Later, when they reach a latitude near that of the Bahamas, their movement has become northerly and they continue to follow the curved path until in high latitudes they are travelling in a north-easterly direction, thus making their way, with much reduced strength, across the Atlantic Ocean. The actual origin of storms arising during the hurricane season is in a region in mid-ocean, ten to eleven degrees north of the Equator. The rate of travel of a storm along its course, that is its rate of translation, is ten to fifteen miles an hour, in these latitudes. The velocity of the wind in the spiral track, as far as it has been recorded in the West Indies, is known to have reached 120 miles an hour—a speed which means that the pressure of the wind is more than seventy pounds on every square inch of any flat surface that may be directly opposed to it. As the wind is blowing in a circle around a centre at which there is an uprush of air, this violence is not shown at this centre, which is therefore a region of calm—usually called the 'eye' of the cyclone.

In the former article dealing with the subject in this journal, an account was given of the premonitory symptoms of a hurricane, largely taken from the United States Pilot Chart, and it will be convenient to reproduce this here:—

> Before a hurricane, the barometer is somewhat higher than usual, with cool, very clear, pleasant weather; there is a long low swell from the direction of the distant storm; the sky is covered with a quantity of light feathery cirrus clouds (mare's tails) radiating from a point on the horizon, where a whitish arc indicates the bearing of the centre. If the cirrus plumes are faint and opalescent in tint, fading gradually behind a slowly thickening haze or veil, the approaching storm is an old one, of large area. If of snowy whiteness, projected against a clear blue sky, it is a young cyclone of small area, but great intensity. Great activity of movement of the upper clouds while the storm is still distant indicates that the hurricane is of great violence.
>
> As the storm approaches, the following unmistakable signs display themselves; the barometer falls rapidly; halos are seen around the sun and moon; the ocean swell increases: the weather becomes hot, moist and oppressive, with light variable winds; deep-red and violet tints appear at dawn and sunset, tints which assume a coppery glare of ominous aspect; a heavy mountainous cloudbank on the distant horizon indicates the position of the approaching storm; the barometer falls more rapidly; and finally, if the observations are made on or near the storm track in the West Indies, the wind begins to blow in a direction between the north-east and north-west, soon rising to hurricane force, increasing till the central calm passes, then breaking out with violence from the south to south-east.

A knowledge of the nature and behaviour of hurricane storms is of the greatest importance to the navigator, for it enables him to ascertain his position in relation to the track that the storm will follow, and to direct his course in such a way as to avoid the path of the hurricane. In these latitudes, where the storm moves along in an almost easterly direction, with the wind blowing in a circle running from the north to the west, from the west to the south, from the south to the east, and from the east to the north again, it is evident that the dangerous positions are situated in the northern half of the storm, or dangerous semicircle as it is called, for here the wind is from the east and blowing toward the front of the storm. In the navigable semicircle, or southern half, the direction of the wind is from the west and toward the rear of the area of the disturbance. These circumstances, together with the fact that in the West Indies, the track of such storms is usually from the south-east to the north-west, make the useful statement possible that, on the occasion of a hurricane, as soon as the wind has any point of south in it, the time of danger has passed.

Other indications useful to those encountering hurricanes on land can be made from what has been said. In any part of the storm area, if an observer faces the wind, the storm centre is on his right; and if the direction of the wind remains constant, and there is an increase in violence accompanied by a falling barometer, it means that he is directly in the track of the hurricane. His experience in such a case will be that these latter conditions will be emphasized until the centre or eye of the cyclone arrives, when there will be a short calm, followed by a change of the wind to exactly the opposite direction and a return of the stormy conditions, usually with increased violence.

Where the centre of the storm passes to the north of the observer, the wind changes steadily from the north to north-west and west, falling ultimately in the south-west; where it passes on his south side, the wind moves in the same steady way from north-north-east to east, finally ceasing in a direction near south-east.

These matters show firstly what signs of weather are indicative of the approach of a cyclonic storm. They also warn those who are in the direct track of the storm against concluding that a sudden calm indicates its end. Lastly, they enable those situated in any area that it may pass over to judge with certainty when the danger has passed, so that they may relax the precautions that they have taken to avoid damage to life and property.

SUGAR INDUSTRY.

THE SUGAR INDUSTRY IN INDIA.

The importance of the sugar industry to India, and the critical position in which it is finding itself to-day, merit special mention. In consequence of the situation, more or less serious, which has arisen, the Board of Agriculture was called together in November last, some three months before due date, principally on this account, in order to advise the Government on the policy it should adopt in regard to sugar. Although the meeting was held at a time not strictly coming within the period of this Annual Report, it is, I think, permissible, owing to the importance of the subject, to refer to it here. As I pointed out in my opening address to the Board: 'there are certain ominous signs in the condition of India's sugar trade which we cannot afford to ignore. With increased facilities for cheap ocean traffic to and from all parts of the world, and with the easy means of transit within herself brought about by her network of railways, India has been deprived of the natural barriers which formerly protected her primitive industries, and consequently her sugar markets have been invaded by cheap white sugar from abroad. The imports of this white sugar have risen in the past twenty years from 80,000 to 700,000 tons per annum. It is not only displacing the existing indigenous white sugar, but owing to its cheapness the consumption of extra quantities of white sugar is encouraged, especially where the influence of Western civilization is being most felt, and it is being mixed with molasses and "gur" and retailed as "gur". It is thus undermining the foundations of the gur industry as well as of the indigenous refined product. The effect has been to cause a decline in the area under cane and a decrease in the number of sugar mills and refineries in the more important sugar tracts of India.' As the result of the evidence placed before the Board and the discussion which took place, the following points were agreed to in a series of resolutions: (1) that owing to its threatened position the sugar industry deserved the assistance of Government; (2) that the appointment of a Sugar Engineer was necessary; (3) that sugar stations should be located in sugar tracts; (4) that an acclimatization and cane-breeding station should be established for the production of high quality canes; (5) that facilities should be afforded to capitalists for the acquisition of land and the erection of central factories, and assistance should be given by subsidy or otherwise to pioneer factories.

The appointment of a Sugar Engineer has already been carried out, and he has been placed under the Director of Agriculture in the United Provinces, where half the sugar of India is produced and the industry is vital to the welfare of the agricultural population. The establishment of a cane-breeding station is under the consideration of the Government of India, and the location of sugar stations in sugar tracts will doubtless receive the attention of Local Governments. It is too soon to report on the facilities it will be possible to afford to capitalists for central and pioneer factories, but the matter is being enquired into and there seems little reason to doubt but that there exists great scope for the successful introduction of the centralized sugar factory system. It is perhaps not generally known that there are factories in both North and South India, working in recent years upon this system, that have demonstrated the possibility of making white sugar direct from the cane at a profit to both the sugar factory and the grower, with sugar selling at the minimum market price. And further, as indicated by the evidence placed before the Board, there are large areas of waste land available to capitalists capable of producing large crops of cane and waiting the erection of factories on the centralized system. Thus, if the salvation of the Indian sugar industry lies in the adoption of this system, as there appears very good grounds for believing, there would not only seem no reason to doubt but that the whole of the foreign sugar now imported into India could be made in this country, but there would even seem to be room for imagining the possibility of an export trade to foreign countries. These considerations appear to be warranted by the evidence submitted to the Board. It only remains for those interested to avail themselves of the information thus afforded. The Agricultural Departments throughout India have undertaken to do all they can to assist in the introduction of better canes and better methods of cultivation, and if the establishment of a cane-breeding station, as recommended by the Board, is carried out, the production of cane will have been placed on a higher plane, and with the spread of the central factory system there is ground for predicting the possibility of India soon being abreast of other countries in its methods of sugar production. In anticipation of the assistance that will be required, the Assistant Inspector-General of Agriculture in India has been entrusted with the task of starting experiments on sugar plantations for the introduction of high quality canes and improved methods of cultivation, and his services are available for the purpose. (*Report on the Progress of Agriculture in India*, 1910-11.)

An article in the *Journal d' Agriculture Tropicale* for April 1912 refers to the fact that the suggestion has been made, in Indo-China, that *Eichornea crassipes*, which has increased to a harmful extent in the waterways of that country, shall be utilized for the production of fibre. The leaves of luc-binh, as the plant is called in Annam, have been successfully treated in a slightly modified Duchemin decorticator, and from the fibres obtained and dried in the shade, rice bags have been made. Drying in the sun is unsuccessful, as fermentation takes place, and the fibres lose all their strength.

FRUITS AND FRUIT TREES.

DRIED MANGO

An observer in North Queensland thus describes a method of drying mangoes, that is carried out successfully in that part of Australia. The description appears in the *Queensland Agricultural Journal* for February 1912:—

The mango is picked just before turning colour. On being peeled, the flesh is found to be firm and a pale-yellow colour. This is cut off with a large knife in chips or small slices some 2 inches in length, 1 inch or so wide, and perhaps ½-inch thick. These slices are laid in the sun to dry, and become dry enough to store in three or four days. Sheets of galvanized iron (roofing) were used with sheets of paper laid on them. Cloth was not found satisfactory, and the paper could not be dispensed with, as the acid juice of the fruit turned the product a dark colour if in direct contact with the iron. I observed various stages of drying, but was unable to see any one batch through from peeling and paring to packing. I was, however, informed, that if laid out in full sunlight in the day, and covered at night, it is dry enough to pack in three or four days. One turning is required. The fully dried 'chips' are of a very pale-yellow or brownish-white colour, and if only cut into similar shapes could hardly be distinguished in appearance from the best dried apples. Sometimes when half-dried the chips are threaded on to strings or hemp twine for convenience, as is done with apple chips in some countries and with meat in others, as such strings are more easily exposed to the sun and air, as well as brought under cover again than are trays. I have even seen these strings, 5 or 6 yards in length, draped over the clothes lines for final drying.

These chips when thoroughly dry, are stored in air-tight receptacles, and may be packed quite tightly in them. Large glass jars and wide-mouthed bottles are used, but the best receptacles are the large earthenware jars in which the Chinese import liquor, preserves, or sauces. Hermetical sealing is very necessary, and is generally done with ordinary beeswax.

In this manner the mango keeps perfectly, and apparently indefinitely, without any preservative whatever.

When cooked, the dried fruit darkens in colour a little, and is not so decided in flavour as is the typical fresh mango—in fact, to one who did not know what it was, it tastes somewhat like a mixture of dried apples and apricots. It makes excellent tarts and pies, and could equally be used for jams or chutneys.

COCO-NUTS IN ZANZIBAR.

According to a correspondent of the *Madras Mail*, great attention is being bestowed nowadays in several coco-nut growing countries, to the various improved methods employed in the cultivation and preparation of coco-nut products for market. In this connexion it is interesting to learn that an official from the Zanzibar Protectorate, which is now distinct and separate from the Government of East Africa, has just visited Southern India with the object of securing, as free or unindentured emigrants, twelve families who are wanted in the Protectorate to help carry out the local Government's endeavours to improve the standard of coco-nut cultivation, which is apparently not very high. The idea would appear to be the gradual conversion of mixed gardens of cloves and coco-nuts into exclusively coco-nut gardens, and should this be realized, Zanzibar may cease to be the world's largest supplier of cloves; its gardens have hitherto produced about four-fifths of the clove crops of the world. Doubtless, the authorities of the Protectorate realize that coco-nuts will in the future serve as a better foundation of prosperity than spices, of which latter, however, the clove is not the only one largely raised in Zanzibar, pepper, cinnamon and other descriptions being also considerably produced and exported, in addition to which gum copal and rubber represent fairly important items in the list of exports. The terms offered to the dozen families were particularly attractive. For the first year after arrival they will be permitted to cultivate where they like in the coco-nut and clove areas, while in the rice area each family will be given an area not exceeding 3 acres rent free.

After the first year special land purchase facilities will be afforded, and for the next three years the work these emigrants will be required to do will be the conversion of mixed cloves and coco-nut gardens into purely coco-nut gardens, and we note that each family is required to take its own native hand implements. (From *Tropical Life*, June 1912, p. 107.)

AGRICULTURAL EXPERIMENTS IN GUADELOUPE.

The Director of the Experimental Garden at Pointe-a-Pitre has issued recently a report on the work done in the Garden during the past year. This is reviewed in an article in the *Journal d'Agriculture Tropicale* for March 1912, from which the following information has been taken.

Trials have been made with several kinds of coffee, including *Coffea stenophylla*, *C. Canephora*, *C. liberica*, and Abyssinian coffee. Among these, the Liberian coffee appears alone to be suitable for cultivation; the others have shown themselves inferior to the universally appreciated indigenous coffee, called Petit Café. The cultivation of cacao has been extended as far as possible, but no new varieties have been tried; those which have been distributed in the past are to be found in the island, but are only taken up on a small scale.

The cultivation of the lime appears to have received a great impulse; numerous plants and seeds have been distributed, and it is likely that its culture will be remunerative, as a hectare is capable of producing, at the end of five years, a gross return of 1,000 francs per annum (nearly £16 per acre), and it is held that the crop doubles itself toward the seventh or eighth year. The lime plant, almost wild in Guadeloupe, grows well and yields an abundance of fruit.

Experiments have been conducted with rubber plants of various kinds, and it appears that Ficus will prove to be most suitable for the island: it grows vigorously in all the soils, and is resistant to drought. Castilloa possesses a rapid growth: a plant two years old, at the Experimental Garden, is already 13 feet high and 10 inches at the base. The same success has not been obtained with *Manihot Glaziovii*; the brittleness of the wood causes it to show little or no resistance to wind, several specimens have died after being tapped; the clay soils of the island are not well suited to it. The several Funtumia plants that have received attention have possessed a slow development, which gives little encouragement, at the commencement. Hevea has also been tried, but the insignificant germination of the seeds, which as is known easily perish, has not permitted a sufficient trial to be made with this species.

Lastly, *Euphorbia Intisy*, tried mostly as a curiosity, has grown easily and well. None of these plants have been tapped methodically—some of them not at all—and it is not possible to form any opinion as to which of them is most suited for rubber culture in Guadeloupe.

Attempts at afforestation with valuable species of trees have been carried out with mahogany (*Swietenia Mahagoni*), Guaiacum (*Guaiacum officinale*) and courbaril, the West Indian locust or algaroba (*Hymenaea Courbaril*), the rapid destruction of which necessitates planting on a large scale. Trees of mahogany sixteen years old exist already, which are large enough to be cut; this is a matter for encouragement. Venezuelan kapok has developed rapidly, and there is much hope of its success; it has not met with a very enthusiastic reception from planters, probably because they are unaware of the value of the product in the European market. With regard to textiles, properly described, mention may be made of trials with Furcraea and with *Sansevieria zeylanica*. Regret is expressed in the article reviewing the report that these two kinds have been chosen in preference to sisal hemp, as Furcraea yields a less valued article, and as the market for Sansevieria is still insufficiently established. It may be said, nevertheless, that Furcraea does not seem to be likely to suffer great harm from disease, for it already grows very well in all parts of the island.

In concluding the review, it is stated that the Experimental Garden at Guadeloupe has given during the year proofs of the existence of an activity which will enable it to obtain results of the greatest interest for the French Antilles, and satisfaction is expressed that an attempt is being made to follow the advance that has already been shown by the English islands of the Antilles.

ABSORPTION AND EXCRETION BY PLANT ROOTS IN CULTURE SOLUTIONS.

Unpublished work that was carried out by the United States Department of Agriculture several years ago for the purpose of investigating the changes that take place in culture solutions in which seedlings of the white lupine (*Lupinus albus*) are grown, by ascertaining the change in the ability of the solutions to conduct water (their conductivity), has suggested work in the same direction that is described in *Bulletin* No 231 of the Bureau of Plant Industry of that department, issued at the beginning of this year.

The results of the old work, which are mentioned in the bulletin quoted, indicated that lupine roots, when grown in distilled water, excrete electrolytes which make the water so used better able to serve as a medium for growing a second set of seedlings. It may be mentioned that electrolytes are salts which dissolve in water to form solutions in which the constituents can be broken up in a definite way by passing an electric current. In such solutions the conductivity is proportional to the amount of electrolytes present, so that it was suggested for the new work described in the Bulletin that this method of ascertaining the amount of electrolytes present should be employed.

In the investigations, Canadian field peas were grown in extremely dilute solutions of calcium and magnesium nitrates. A summary that is given, of the conclusions reached as a result of the experiments, shows that among the first of these was the fact of the existence of a concentration for each salt or mixture of salts at which the latter are absorbed and excreted by the roots of peas at the same rate. Further, if the solution has a concentration less than this amount, more of the salts is excreted from the roots than is absorbed; on the other hand, with a more concentrated solution, there is more absorption than excretion.

The definite concentration at which absorption and excretion proceed at the same rate is referred to shortly as equilibrium concentration, and a further result shows that the action of the roots on solutions stronger than equilibrium concentration may be to make them much weaker than this concentration. Proceeding, the interesting result was reached that the extent to which the concentration may be brought by the roots beneath equilibrium concentration depends upon the ratio of the magnesium to the calcium in the solution. From a quantitative point of view, it was found that the greatest absorption took place when the weights of calcium and magnesium present were in proportion to their molecular weights.

Turning now to the effect of the solutions on the growth of the pea roots, the experiments show that their development was good when the ratio of magnesium to calcium was 9 to 1; that is to say, under conditions in which the concentration of the solutions was so great that if magnesium salts had been present alone the growth of lateral roots would have been prevented. If, however, the solutions are so dilute that the amount of magnesium in them alone would not prevent such growth, the ratio just mentioned is nearer 99 to 1.

THE SELLING OF BRITISH WEST INDIAN COTTON.

The Commissioner of Agriculture has received an official letter from Mr. J. A. Hutton, Chairman of the British Cotton Growing Association, dealing with cotton-growing generally in the West Indies, with the request that the contents shall be made as public as possible, in an effort to remove some of the misunderstanding that appears to exist as to the objects and policy of the Association. It commences by making reference to complaints that have been received by the Association, from planters in the West Indies, as to delays and difficulties that have taken place in the selling of their cotton; it states also that Mr J. W McConnel had reported dissatisfaction in the matter, saying that there seems to be a suspicion that the Association is neglecting the interests of the planters and giving chief attention to those of the spinners.

Mr. Hutton states very strongly that, although there may be some grounds for complaint, there is not the least foundation for the suspicion. He refers to the great difficulties that exist in the Association's work of cotton-buying, and states: 'It is quite impossible for anyone except those in daily contact with the work to realize the amount of time and labour which Mr. Wolstenholme has devoted to this work. I can assure you he has most generously and ungrudgingly given up time which should have been devoted to his own business, and I have not the least hesitation in saying that his firm have suffered considerably from what he has done for West Indian planters and for the Association.'

Mr. Hutton goes on to refer to the work of the Association, and its duty to help the planters, in view of the conviction that the future of fine spinning in Lancashire will be made more difficult if cotton-growing fails in the West Indies. The circumstances make it essential that the Association should practically ensure that the cotton is sold to the very best advantage. It has been felt, however, that something more than mere assurances on the part of the Association would be required by planters, so that a Special Committee was appointed, consisting of the Executive Committee of the British Cotton Growing Association, together with Messrs. Lawrence, Marsland, Oliver and Wolstenholme, to consider the whole question. This committee has now discussed the matter most fully, and further Mr. Hutton himself and Mr. Wolstenholme have consulted at length with Mr. Dixon and Mr. McConnel of the Fine Spinners' Association, so that the subject has received the largest consideration.

It is recognized fully by the users of cotton that the interests of the spinners and planters are identical, for the former have need of the cotton and are willing to pay a price for it (as far as the laws of supply and demand will allow) which will induce the planter to continue and extend cultivation. This aspect of the matter receives additional importance in view of the probable eventual destruction of the United States Sea Island cotton industry through the spread of the boll weevil.

Mr. Hutton gives attention to suggestions that have been made to curtail the cotton area in the West Indies because of the present lowering of the demand through a change in fashion, and because of competition by Sakellarides cotton. This matter has been most fully gone into, and the Association is convinced that the special excellence of quality of most West Indian cotton makes it certain that every pound of the first class quality will be absorbed by the market. 'We are convinced after the fullest consideration that it would be the greatest mistake in the world for the planters to reduce their acreage at the present moment.' There is now the closest and heartiest co-operation between the Association (as representing the planters) and the larger users, who realize: 'that they must help the planters as far as possible.' Mr. Hutton suggests, however, very definitely that the planter, in forwarding his cotton should assist in this co-operation by advising the Association whether he prefers a quick sale even at slightly reduced prices, or the holding of the cotton, at the discretion of the Association, for higher prices.

The co-operation of cotton planters in the West Indies is asked for emphatically by Mr. Hutton, and he requests that one feature of this should consist in advising the Association, as early in each season as possible, as to the probable size of the crop—not only as to the quantity likely to be produced in the whole of the West Indies, but as to the amount to be grown in each island, and even further, the probable production of each of the larger estates. This information would put the Association in a much better position to place the whole of the crop to the best advantage.

Mr. Hutton concludes by asking that any cotton planter who is dissatisfied with what the British Cotton Growing Association has done, or may do, or who has any grievance whatever, will communicate directly with the Association, when he may be assured that everything will be done to assist him. At the same time, considering the existence of unreasonable complaints, any planter who is dissatisfied, when the Association has done what is possible for him, is asked to transfer his business to those whom he thinks may serve him better.

In commenting on this letter, it may be said that the question appears to have arisen in a large degree through the number of complaints that were made to Mr. McConnel by cotton planters during his recent visit to the West Indies as a delegate of the Association to the recent Agricultural Conference. It is only natural that, when they have such an opportunity as was provided to bring forward their grievances and to make a move for higher prices in the future, cotton planters should do so. It should be remembered, however, that the mention of complaints alone, without any attention to the more attractive side of the picture and to the benefits that have been received, is bound to cause those who hear such complaints to go away with an exaggerated idea of their relative importance and to conclude that the matter consists of nothing but subjects that are crying for redress. The actual position is quite otherwise, for though matters for dissatisfaction exist, that should be easy of remedy, it might be remembered that the West Indian Sea Island cotton industry has received from the beginning advantages experienced by very few other industries—the advantage that it found an open market ready for it, from the first, and the advantage that it was fostered by those who were in possession of skilled knowledge that they were willing to apply in order to save the producers every difficulty in the favourable disposal of their commodity.

THE WASTE IN COTTON-SPINNING, THROUGH IRREGULARITY OF STAPLE.

Through the courtesy of Mr. J. W. McConnel, of the Fine Cotton Spinners' and Doublers' Association, who was one of the representatives of the British Cotton Growing Association at the Agricultural Conference held recently in Trinidad, there has been received a memorandum dealing with the length of staple in West Indian cotton. Copies of this memorandum have been also furnished by Mr McConnel to the Agricultural Departments in St. Vincent, Montserrat, Antigua and St. Kitts.

Mr. McConnel has provided this valuable memorandum on account of the circumstance that, during his visit to the West Indies, he was asked several times what degree of irregularity in length of staple is compatible with the use of fine cotton in spinning; that is to say, information was required as to the limit to which spinners are obliged to take out the cotton on account of its shortness, in lint of any given staple.

It was felt by Mr. McConnel that some sort of an answer to the question was due to those who are trying to judge scientifically the suitability of cotton when it is grown for use in a fine spinning mill. In consequence, on his return to England, he explained the matter to the manager of the card room in one of the most important mills using West Indian cotton; and finally asked him to ascertain from examination, as well as he could, the answers to the following questions:—

(1) What are the percentages of various lengths of staple in raw cotton after ginning?

(2) What are the percentages of the various lengths of staple in the combed sliver after having been passed through the drawing frame?

(3) What are the percentages of various lengths of staple in the waste taken out in the four processes of scutching*, carding, and first, and second combing?

The cotton used in all cases for the tests consisted of West Indian cotton of the best type usual in the West Indies, but not the very fine St. Vincent cotton; and was judged in the raw state to have a staple of $1\frac{7}{8}$ inch. Mr. McConnel states that the examination was made with great care and intelligence, and gave the results presented in the following table, in which S and D stand for Short and Dirt, respectively:

	2"	$1\frac{7}{8}$"	$1\frac{3}{4}$"	$1\frac{5}{8}$"	$1\frac{3}{8}$"	$1\frac{3}{8}$"	S.	D.	Percentage.
Raw cotton		25	20	20	17	8	5	5	100
Clean cotton	1·6	22·4	19·2	16	3·2	1·6			64
Scutching waste								3	3
Card waste				6·6			3·6		10·2
1st combing					10·4		6·9		17·3
2nd ,,							5·5		5·5
Total	1·6	22·4	19·2	22·6	13·6	1·6	16·0	3·0	100·0

As Mr. McConnel points out in forwarding the results, the investigation was remarkably interesting, and the correspondence between the percentages in the raw cotton, and the totals of clean cotton and waste, is remarkably close. He points out further that there was no chance of manipulating the figures so as to obtain this correspondence, as the reduction of the different percentages to a common basis, and the addition of these, were performed by himself from the figures supplied.

The hope is expressed by Mr. McConnel that the results will be of some assistance to those in charge of the experiment stations in the West Indies; it must be remembered, however, that they can only be considered to be approximately correct, as this is the first occasion on which such an examination has been made. He points out that the wastes, when taken out, are all very irregular, particularly in the earlier processes, and that the large proportion of the good cotton still contained in the carding waste arises from the kind of appliances that are used for removing the waste from the machine. A curious feature is that the waste taken out in the second combing is shorter and poorer than that in the first, but observant spinners have always noticed this fact. The second combing is given with the object chiefly of removing 'neps'; and as has been stated by Mr. McConnel on several occasions, it is probable that the weak fibres in the cotton are continually breaking up into short lengths while going through the spinning mill.

The whole matter is summed up at the conclusion of the memorandum in the following words: 'Broadly speaking it seems that the answer to the original question should be that with cotton named $1\frac{7}{8}$ inch, the presence of $1\frac{3}{4}$ inch staple may be readily accepted and even of $1\frac{5}{8}$ inch, but anything shorter than this has to be almost entirely removed before the cotton can be spun.'

With this memorandum, there were presented by Mr. McConnel, on behalf of the Fine Cotton Spinners' and Doublers' Association, to this Department and the Agricultural Departments in St. Vincent, Montserrat and Antigua, cases containing firstly specimens of combed cotton, showing neps, yarn and rovings, the last being slightly twisted bundles of carded fibre; the specimens are mounted between glass plates. The main part of the cases is taken up by samples of the cotton that would be eventually worked up into yarn, and of the part rejected. The former consists of samples of ginned raw cotton, card sliver (loose, untwisted fibres) and flat strips, first comber sliver, and second comber sliver. Lastly, the samples showing the part rejected are comprised of droppings (containing chiefly sand and dust), under fly and cylinder strip, first comber waste and second comber waste. With respect to these samples, a matter of chief interest is that, in the combed cotton showing neps, these are still to be seen although the lint had been passed not only twice but three times, through the comber.

*Scutching means beating the cotton, in bulk, before it is carded; that is, before the fibres are first opened out. The other terms are explained below.—Ed., *A. N.*

EDITORIAL NOTICES.

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NOTES AND COMMENTS.

Contents of Present Issue.

In this number the editorial gives an account of Hurricanes, dealing more particularly with their origin, their indications, and the signs which may be employed in avoiding them and in determining when the danger due to them is past.

An account of the state of the sugar industry in India is given on page 243.

Page 245 presents an interesting description of work of agricultural experimentation that is being carried on in Guadeloupe. It shows that much attention is being given to the culture of citrus plants in that island.

A description of the results that have been obtained in a recent investigation relating to absorption and excretion by roots in culture solutions is presented on page 245.

Page 247 is taken up mostly by an account of very useful work that has been conducted recently in England in relation to the determination of the waste that takes place in cotton-spinning through the irregularity of the staple of the cotton that is used.

The Insect Notes in this issue, on page 250, are concerned with an account of twig girdlers and of means for the natural control of citrus mealy-bug.

Past attention has been afforded in this journal to the employment of sulphur as a manure. The subject receives further enlightenment in an article on page 251.

Legumes in Orchards.

The question of a cover crop for use in orchards has received much consideration from experimenters, and the following experience in regard to the sword bean (*Canavalia gladiata*), with reference to the matter, which is described in the Annual Report of the Porto Rico Agricultural Experiment Station for 1910, is of interest.

A number of leguminous plants was tried for the purpose, and the best success was obtained with the plant mentioned. This grew quickly, soon completely covering the ground and keeping down all grass and weeds. It showed particular usefulness on lands likely to suffer from washing.

A disadvantage in such use of the plant was found to be its natural tendency to climb over the trees.

The Influence of Soil Moisture on Nitrification.

The *Journal of Agriculture* of Victoria for May 1912, p. 275 contains an account of an investigation by J. W. Paterson, B.Sc., Ph.D., Experimentalist, and P. R. Scott, Chemist, to the Victoria Department of Agriculture, dealing with the effect on nitrification of varying the amount of moisture in the soil.

It was found that nitrification is inactive in the soils investigated while they still contain about three times as much moisture as they possess when in an average air-dried condition. Comparing sand with clay, less water is required to start nitrification, at the lower limits of moisture, in the former than in the latter. At the higher limits of moisture, nitrification is stopped by less water in sand than in clay.

It is probable that the best amount of water for nitrification varies for different soils, and has the higher value for clay. Nevertheless, for both sand and clay it ranges between 14 and 18 per cent. of the weight of dry soil.

An increase of the water content above this optimum amount is more harmful than an equal decrease below it.

A result of practical value is that, if the working in dry weather of land that is resting (fallow) helps to keep water in the surface soil, this water may have much use in relation to the production of nitrates for the following crop.

The nitrate supply for a crop may have been reduced by the previous crop in two ways: by actual consumption of the nitrates that were present, and by drying the soil to such an extent that little nitrification takes place in the time between the occupation of the soil by the two crops.

Another indication of practical value was received to the effect that the moisture requirements that were found for nitrification suggest that good results might be obtained by the single flooding of fallow land in dry seasons.

The Citrus Chamber of Sicily.

It is stated in *Diplomatic and Consular Reports* No. 4871 Annual Series, that at the time of issue it was not possible to review the Annual Report of the Camera Agrumaria of Sicily, for the season ending November 30, 1911, as this was still in course of preparation and not available for furnishing facts before its publication.

It is concluded, however, that the accumulated stock of 5,504 metric tons of citrate of lime existing on November 30, 1910, must have been reduced, for the exports of citrate of lime during 1911 amounted to 8,148 metric tons, or nearly 30 per cent. more than in 1910; while the published exports of lemons during 1911 were little more than those of the previous year. It is considered that the prospects for the present year are normally good.

The Typhoid Bacillus and the House-fly.

The *Experiment Station Record*, Vol. XXVI, p. 251 (issued March 20, 1912), quotes from a paper that appears in the *Journal of Hygiene* (Cambridge), 1911, p. 333, showing the results of experiments that indicated that, although the larvae of the house-fly were fed liberally with matter containing typhoid bacilli, there were no signs of the presence of *Bacillus typhosus* in the pupae or the perfect insect reared from the larvae, as long as the original eggs were not disinfected. If on the other hand, the ova were disinfected, pure growths of the typhoid bacillus could be obtained from both larvae and pupae; so far, imagines had not been examined in regard to the matter.

The result of the investigation is expressed in the paper as follows: 'From the practical point of view the main conclusion to be drawn from the experiments detailed in this communication is that the typhoid bacillus can lead only a very precarious existence in the interior of larvae or pupae which possess, at least in so far as these investigations warrant, a well-defined bacterial flora of their own. Even under the highly artificial conditions of the final series of experiments, it was not possible to decide whether the *B. typhosus* though recoverable from the pupa was really actively multiplying in the pupal interior or gradually dying out. There was some indication that the latter was the case, as the typhoid colonies recovered from the pupa in the one successful instance were extremely few in number, while the larvae which had been feeding on *B. typhosus* contained enormous numbers as evidenced both by cultural and microscopical examination.'

This note may be read in connexion with an article entitled the House-fly and Man, in the *Agricultural News* of October 14, 1911, in which emphasis is laid upon the importance of reducing as much as possible the number of places in which the conditions exist that are favourable for the breeding of the fly. With reference to the matter generally, it must be remembered that although many dangerous germs may not survive easily in the intestines of the fly, they may be readily carried in dirt on its 'feet'.

School Gardens in British Guiana.

A review of the present position regarding school gardens in British Guiana is contained in the Report of the Inspector of Schools for 1911-12. It is stated that the best success is obtained where the teacher shows an active interest in the garden, and it is agreed that every school would be the better for a garden, not necessarily for obtaining a Government grant, but a garden of flowers and shrubs possibly, kept in proper order by the teachers and pupils themselves.

The statement is made that there are about 100 gardens attached to aided schools in British Guiana, and it is thought that all of these are doing a certain amount of good, at least during some parts of the year. Much difficulty has arisen, however, from the unusually long dry season, especially where it was far from easy to obtain water.

It has not been found that the making of notes by the children on their work has been successful, because of the lack of proper knowledge of what should be entered in the note-book, and of the use of anything that may have been written. It is therefore suggested that it may be sufficient, for many years to come, for the teachers to employ, instead, the writing of simple compositions on the work done in the garden, particularly respecting operations that require careful manipulation and close observation.

Euphorbias Yielding Rubber.

An abstract in the *India-rubber Journal* for June 15, 1912 mentions *E. Tirucalli*, *E. lactiflua*, *E. fulva*, *E. elastica*, *E. antiquorum* and *E. Cattimandoo* as some of the chief Euphorbias which are exploited or mentioned for their latices. Of these *E. lactiflua*, from Chili, gives a latex with the highest caoutchouc content, reckoned on the dry substance; this was from 3.9 to 5 per cent. The caoutchouc content of the latex of *E. Tirucalli* has been found to be 4 per cent., of that of *E. antiquorum* 5.5 per cent. and of that of *E. elastica* 32 per cent: it is probable however that the last mentioned plant may not be actually a Euphorbia. Of these three species, the first comes from East Africa, the second from India and other countries, and the third from Madagascar.

Like that of *E. elastica*, the latex of *E. fulva* contains much rubber as compared with the content in Euphorbia latices, in general, but it is to be noted that the species has been renamed *Euphorbodendron fulvum*.

As is stated, the amount of resin in Euphorbia rubber is always a high multiple of the amount of rubber. This is so in the case of the latex from *E. Tirucalli*, which is used for varnishes.

Information regarding these and other Euphorbias was given in the *Agricultural News*, Vol. IX, pp. 41, 76, 109, 180, 232 and 396.

INSECT NOTES.

AN ACCOUNT OF TWIG GIRDLERS.

In a recent number of *Science* (Vol. XXXV, May 3, 1912, p. 714) a meeting of the St Louis Academy of Science is reported. Among the papers presented was one entitled A Grove of Deformed Trees, by Dr. J. R. Terry.

Since information concerning the insect mentioned as causing the injury which resulted in the deformities of the trees is likely to be of interest to readers of the *Agricultural News*, the account of the paper as given in *Science* is reprinted herewith.

'A grove of four or five hundred small persimmon trees in St. Louis County has suffered from the ravages of a beetle which has been identified as *Oncideres cingulata*. Limbs varying in diameter from 5 to 15 mm. are girdled, and the ends fall to the ground. All the trees, old and young, have been attacked. The girdling is done in the fall, mainly in September and October. During this time the larger trees present scores of branches bearing dead leaves, and the ground is strewn with fallen branches often laden with fruit. There is no tree in the grove that does not present a crooked trunk and limbs. The deformities in some cases are extreme. Most of the trees are as a consequence dwarfed, although able to make some advance in growth. Some trees only a metre and a half tall bore fruit in 1911.

'A few beetles have been observed working. The cut was begun on the upper side of the branch and was made 3-4 mm. wide and about 3 mm. deep. Most of the limbs fall, probably within a few days after the girdling. A small proportion remains throughout the following winter. On every severed branch, near the distal ends of the twigs, one or more small deep excoriations of the bark were found. That the beetle makes similar abrasions of the bark of twigs of the honey locust is known from observation of Oncideres in captivity. Limbs recovered from the ground in winter in some cases presented no evidence of the propagation of the beetle, whereas in others more or less of the wood had been destroyed under the bark along one side of the branch extended from the distal end proximally. The cavity never quite reached the proximal severed end. Larvae, which are now being studied, were discovered in some of the tunnels.'

In the genus Oncideres are to be found species of long-horned insects which are known as girdlers. Dr. Sharp, in the Cambridge Natural History (Insects, Part II, p. 286) states the characteristic habit of the genus in the following words:—

'The species of the American genus Oncideres are called girdlers because the parent beetle, after laying an egg in a small branch, girdles this round with a deep incision, so that the portion containing the larva sooner or later falls to the ground.'

In certain of the West Indian islands the genus is represented by *Oncideres amputator*, Fabr., which in St. Lucia is reported as attacking pois doux (*Inga laurina*), and in St. Vincent, *Inga dulcis*, West Indian ebony (*Albizzia Lebbek*) and cacao. Many persons in the West Indies believe that the girdling or pruning of twigs of trees is done by the Hercules beetle which, they say, clasps the two great horns, one projecting from the head and one from the thorax, around a twig and then by means of the wings swings round and round the twig until it is cut off by the action of the horns.

An examination of the horns of the Hercules beetle will suggest at once the difficulty which the insect would have in cutting off a twig with such smooth-surfaced instruments. It is more probable that all the pruning of trees in the West Indies which has been ascribed to the Hercules beetle has been done by the girdler, *O. amputator*, or by a similar insect with like habits.

The Hercules beetle is one of the largest of beetles, measuring 6 or 7 inches in length, including the horns, which project forward one above the other; the lower one from the head has an upward curve; the upper one from the thorax has a downward curve. The inner surfaces of these curves are lined with short bristles, brown to reddish in colour. The girdler is a much smaller insect, only about ¾-inch in length and narrow in proportion. The ground colour is dark brown, almost black; the surface is overlaid with fine greyish scales, among which are scattered small patches of reddish or orange-coloured scales. The antennae are long and slender, the head is broad and pointed downwards, the thorax has a small projection on each side, and the shoulders or bases of the wing covers are pronounced.

NATURAL CONTROL OF THE CITRUS MEALY-BUG IN CALIFORNIA.

In an article published in the *Monthly Bulletin of the California State Commission of Horticulture* for May, 1912, Mr. A. S. Hoyt, Deputy Quarantine Officer, at Los Angeles, discusses the degree of control which has been attained over the citrus mealy-bug, *Pseudococcus citri*, in one district in San Diego, California.

In this district there are certain citrus groves which for nine years have not been sprayed or fumigated, entire dependence, having been placed on the action of natural enemies for the control of the pest. During this time these estates have principally had to contend with the citrus mealy-bug, and the chief insect natural enemies have been two lady-birds which in both larval and adult stages prey upon the mealy-bug in all its stages of development

These lady-birds are *Cryptolaemus montrouzieri* and *Cryptogonus orbiculus*, the former of the two being considered the more important.

At the time of the introduction of these two lady-birds the mealy-bugs were very abundant, and consequently the predaceous insects made a remarkably rapid increase as a direct result of an abundant food-supply. After the mealy-bugs had been almost entirely destroyed by the lady-birds, these beneficial insects died from want of food. Then a very different aspect of the case presented itself: the mealy-bugs developed rapidly—much more rapidly in fact than the lady-birds—until after a certain time the beneficial insects again became most numerous and assumed control.

Thus through the whole period of nine years, there have been periods of abundance of mealy-bug, when the lady-birds were few in number, succeeded by periods of abundance of lady-birds and a decreasing number of mealy-bugs.

The writer of the article states that in groves where this method has been followed exclusively, trees and fruit have been, at times at least, covered by black blight and there has been a loss of fruit bearing wood in the interior of the trees.

In the concluding paragraph, the writer gives it as his opinion that the best way to ensure clean fruit and healthy trees, and at the same time to employ as far as possible predaceous insects, is to spray for mealy-bug only such trees as are badly infested and in which the lady-birds have failed to subdue the pests, leaving to the care of these insects the trees in which they are actively at work and making every attempt to foster these beneficial insects and promote their work.

SULPHUR AS A MANURE.

The following article describing investigations regarding this subject appeared in the *Gardeners' Chronicle* for June 15, 1912. It may be read with interest in connexion with the articles on the supply of sulphur to cultivated crops, and on soil sterilization, in the *Agricultural News*, Vols. X. p. 241 and IX. pp. 17 and 33.

Experiments made by M. E. Boullanger, reported in the *Comptes Rendus* of the French Academy of Science and summarized in *Die Gartenwelt* (XVI, 17, p. 228), tend to show that the application of small quantities of flowers of sulphur to the soil results in a very considerable increase in the crop grown on that soil. As a result of the addition of flowers of sulphur at the rate of 7 decigrams to 30 kilograms of soil, M. Boullanger claims that the plants experimented with—beet, beans, celery, potatoes, spinach and others gave a higher yield of produce than the control plants grown in unsulphured soil.

Nor is that all: according to M. Boullanger's experiments the yield from the soil treated with sulphur, but otherwise unmanured, was actually greater than that from soil which received a complete manure. When both complete manure and sulphur were added the best results of all were obtained. One example will suffice to show the extent to which sulphuring the soil increased its fertility. The numbers to be given represent the results (in grams) in the case of celery:—

No manure.	Sulphur only.	Complete manure.	Complete manure and sulphur.
360	635	398	676

The increase of yield in the case of the soil treated with sulphur is indeed remarkable, and if further experiment confirms M. Boullanger's conclusions we shall have to add flowers of sulphur to the list of artificial fertilizers indispensable to the garden.

Apart from the practical aspect of the discovery—which, we repeat, yet awaits full confirmation—the question arises as to the mode of action of sulphur in enhancing soil fertility. M. Boullanger has himself supplied the clue to the answer to the question. By means of a series of experiments involving the use of sulphured and unsulphured soils, he was able to demonstrate that sulphur produced its stimulating effect on plant growth only in soil which was not heat sterilized. When soil to which sulphur had been added was sterilized by heat it gave no larger crop than that yielded by unsterilized, unsulphured soil. The yields obtained in these experiments were, in round numbers:—

Not sterilized soil	...	15 grams.
Sulphured, not sterilized soil	...	25 ,,
Sterilized soil	...	15 ,,
Sulphured and sterilized soil	...	16 ,,

Whence it is to be concluded that the beneficent effect of the sulphur is due to its action on some of the living constituents of the soil, possibly on certain races of soil bacteria. The experiments, especially when considered in conjunction with those of other observers, open a promising field for further investigation.

THE PRESERVATION OF LARGE TREES.

The information below is presented in the *Monthly Bulletin of the State Commission on Horticulture*, California, for June 1912. It has relation more particularly to methods for preserving large trees growing in streets for an ornamental purpose:—

As regards damaged trees, if the wound is fresh and the wood only slightly injured, prompt aid may heal it in one year. All ragged tears must be cut smooth, the wound then painted with Bordeaux mixture or carbolineum, and completely covered with a tree wax or putty made of 1 part of coal tar and 4 parts of ground slate. If trees have been badly neglected, large limbs broken off, the wounds not properly treated, the stubs of large limbs or branches left instead of smooth cuts to the trunks or limbs, and rot has set in, then the stubs must be cut smooth to the trunks or limbs, all decay chiselled out, and the cavities filled with concrete made of 1 part Portland cement and 2 or 3 parts of sharp, coarse sand or fine rubble.

Street shade trees often have large, old wounds near the ground. In such cases the exposed wood should be thoroughly examined, for sometimes a hard shell harbours entirely dry, rotten wood beneath it. All unsound wood should be chiselled out; this often leaves nothing but an outer shell of sap-wood and bark. If the tree is old and large and the whole inner root rotted away, it is best to drive three 1-inch iron pipes inside the cavity of the tree well into the ground—say 3 feet deep—and fill the hole with a strong concrete of 1 part of Portland cement and 5 or 6 parts of coarse rubble. After this has set it should be smoothed off with a finer concrete of 2 parts of sand and 1 part of cement.

If the tree is vigorous enough to callous over in a few years, the concrete should only come even with the cambium layer. Where the tree is old, and the wound very large—say half the circumference of the tree then the concrete can be placed to conform with the outside curve of the trunk, but the edge must be looked after every year and chiselled away if the growing rim of the tree wound presses too hard against it. All injuries will try to heal over, even though very slowly

Every wound or cavity should be painted or sprayed with a strong Bordeaux mixture or carbolic acid emulsion before being filled with concrete. The filling should be painted the colour of the tree bark. Large cavities often take a ton, or even several tons, of concrete.

This work pays well, especially along streets where a lost tree is so difficult to replace, and where symmetry counts for so much. Many trees suffer when comparatively young from the decay of the heart or pith wood near the foot, and this decay slowly affects the adjoining wood layers, and will sooner or later show on the outside. As soon as this defect is known, an opening should be made into the tree so as to work out all decayed wood and replace it with concrete.

A note in the *Louisiana Planter* for July 6, 1912, states that the imports of sugar into the United States from foreign countries, and including the Philippines, for the ten months ending April 30, amounted to 1,611,000 short tons, valued at over 92 million dollars. The similar export for the preceding period was 1,483,000 short tons, value 73 million dollars. During the first of the periods mentioned, Cuba, the largest supplier, sent to the United States 1,200,000 short tons value 71 million dollars.

GLEANINGS.

Official returns show that the amount of rubber exported from Ceylon during the nine months July to March 1911-12 was 7,961,778 lb. The quantity for the preceding similar period was 4,201,232 lb. For March 1912 the shipments amounted to 1,012,167 lb. as compared with 604,016 lb. in March 1911.

A table in *Diplomatic and Consular Reports*, No. 4874 Annual Series, shows that the value of the chief exports from St. Michael's, Azores, during 1911, was as follows: pineapples £120,015, sugar £89,000, beans £67,793, maize £66,869, alcohol £36,823, tobacco and cigars £13,091.

Information concerning the work of the St. Vincent Agricultural Department during June last contains the interesting fact that thirty 6-lb. lots of cotton seed from plants showing a considerable amount of resistance to angular spot were sent out to estates and to certain small land owners, for trials in separate plots.

An account of agricultural work received from the Virgin Islands shows that, during June, His Honour the Commissioner paid a visit to Jost van Dykes and gave an address at a meeting of small holders. An address was also given on the occassion by the Agricultural Instructor, who had accompanied His Honour.

From the *Proceedings of the Agricultural and Commercial Society* of Trinidad and Tobago for May 1912, it is gathered that the total shipments of cacao from Trinidad for the month amounted to 2,404,239 lb. During the previous four months there were shipped 30,702,105 lb., making a total for the year, to the end of May, of 33,106,344 lb. of cacao.

The *Government Gazette* of the Federated Malay States for April 1912, publishes a table showing that the exports of rubber during the first three months of the present year amounted to 8,535,926 lb., as compared with 4,736,238 lb. in the similar period of 1911. The shipments in March 1912 were 3,089,583 lb.; in March 1911 they were 1,916,219 lb.

In *The Board of Trade Journal* for June 6, 1912, it is stated that, according to official statistics published recently, the total area under sugar beet in Russia for the present year is 1,719,268 acres; this is a decrease of 59,861 acres from the area of 1911. In this year, 548,100 acres is owned by factories—an increase on the area held in this way during last season.

During their recent visit to St Kitts, in June, the Entomologist and Mycologist of the Department addressed a meeting of the Agricultural and Commercial Society of that island on the subject of sugar-cane pests and diseases. It is reported that the visit of these officers has proved to be of great use in directing the attention of planters in St Kitts to pests and diseases in general.

A report on the trade of Korea during 1911 has been drawn up by H.M. Consul-General at Seoul, which shows that satisfactory progress is being made with cotton-growing in that country, and that there is every indication that it will increase. Estimates of the area under cultivation and the output during 1911 give these as 125,000 acres and 33,940,000 lb. This indicates rapid increase, for the shipments in 1910 were 17,333,000 lb.

An announcement in *Tropical Life* for June 1912 shows that the prize of £50, offered jointly by Messrs. J. H. de Bussy of Amsterdam, by the leading cacao manufacturers in England, Germany and America, and by that paper itself, for the best essay on the fermentation of cacao, has been awarded for the essay, written in collaboration, by Mr. G. S. Hudson and Dr. Lucius Nicholls of St. Lucia. No second prize was awarded, on account of the absence of scientific details from the other essays.

According to the Uganda *Official Gazette* for May 15, 1912, the amount of ginned cotton exported in the period April 1, 1911 to March 31, 1912 was 2,963 tons valued at £184,638; the unginned cotton shipped during the same period was 2,105 tons value £42,755 The similar amounts and values for the previous like period in 1910-11 were 1,634 tons and £120,664, and 2,513 tons and £44,748. For the purpose of calculation, the percentage of lint may be taken as 33 3.

A useful hint in connexion with the taking of megass samples is given in the *American Sugar Industry* for June 1912. This is to the effect that the addition of 15 or 20 c.c. of formaldehyde solution, shaken up in the cans containing the megass about one and a half to two hours after commencing the sampling, will prevent fermentation of any kind. Any subsequent samples thrown into the tin remain in an atmosphere containing formaldehyde vapours, which prevent bacterial action.

The *Proceedings of the Agricultural Society of Trinidad and Tobago* for June 1912 makes mention of a shipment of palms supplied by the Trinidad Botanical Department, which reached Sweden, by parcel post, in good order. The method of packing was devised by Mr. H. Caracciolo of the St. Joseph's nurseries, Trinidad. The result was obtained by using a specially made crate, in which the plants were placed with the roots washed clean and covered with slightly damped moss, and then wrapped in oiled paper. The crate itself was covered with oiled paper and then with light canvas.

STUDENTS' CORNER.

AUGUST.

FIRST PERIOD.

Seasonal Notes.

For the greater part, the lack of rainfall has interfered with cotton-planting, so that there has been delay in the establishment of the crop. State what experience you have had where fields have received a second planting because there was not sufficient rain to cause the seeds to sprout that were put in at first. How much seed is required for an acre of cotton, under favourable circumstances? What are the additional expenses incurred on a small estate through having to put in cotton seed a second time?

How may cotton seed be selected for planting, in a simple way? State the chief objects of such selection. What treatment should cotton seed receive before it is sown? It is well known that no more than one plant should be allowed eventually to grow in each hole; why is this? What rules would you observe in giving instructions for the thinning out of plants in a cotton field?

Why is the early planting of cotton insisted upon, in the West Indies? It should be remembered that the importance of such early planting has its effect in causing an early previous opportunity to be taken of removing and destroying the old cotton plants of the former crop.

What pest is most likely to be found on young cotton, and how would you deal with outbreaks of this pest? In what way does the pest cause changes that interfere with the normal life-processes of the plant?

With proper rainfall, the present time falls within the period for the planting of provision crops such as yams, sweet potatoes and cassava. The reports issued by the various agricultural departments should be consulted in order that information may be obtained as to the best varieties of these plants, and trials should be made of the varieties. In the case of the most valuable kinds, it would be useful to establish, if possible, nurseries for the provision of planting material.

Discuss the advantages and otherwise of growing sweet potatoes in rotation with sugar-cane. By what diseases are the provision crops mentioned above likely to be attacked?

Give a careful account of the way in which the ground is prepared for the planting of such provision crops as have come within the scope of your experience. Supply details as to the amount of planting material that is required for one acre in each case, and of the expenses of the planting.

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) Give a list of the insect pests of the sugar-cane, of which you have knowledge.

(2) What are the reasons for destroying all old cotton plants at the end of the season?

(3) Write a list of the advantages that may be gained by growing crops in rotation.

INTERMEDIATE QUESTIONS.

(1) Describe the life-history of the moth borer of the sugar-cane, and suggest methods for its control.

(2) Mention any advantages that are incurred in the complete destruction of the plants at the end of a cotton-growing season?

(3) How is the rotation of crops connected with the control of disease?

FINAL QUESTIONS.

(1) Discuss the question as to whether the moth borer assists in the spread of fungus diseases.

(2) Write an account of what you know concerning the pests that are kept in check by the seasonal destruction of old cotton.

(3) Mention any reasons for growing different varieties of sugar-cane on the same land, in rotation.

NAMES AND KINDS OF RUBBER.

There are many systems of classification which are adopted in a study of caoutchouc-yielding plants. One of the most popular is that according to habit; in this three groups are distinguished, viz., trees, climbers and shrubs. In the tree forms we have *Ficus elastica* in the Malay Archipelago, which grows to an enormous height. We have Castilloa, a handsome tree characterized by very rapid growth in the first four or five years, common in Central America and Mexico There is the genus Manihot in North Brazil and Bahia, which provides a well-branched tree. In Africa the genus Funtumia is responsible for many trees, and in Brazil Hevea is predominant. Hevea and Ficus are large forest types, the smallest are probably Funtumia and Manihot, Castilloa coming midway between these groups. Among the climbers we have the Landolphia vines of Africa and Madagascar, the genus Forsteronia in the West Indies, and Parameria in the Middle East. The first-mentioned genus is, of course, the most important among the vines; it is exclusively African, and is responsible for rubber of high quality. Among the shrubs there is really only one example, *Parthenium argentatum*, the Guayule shrub so well known as a source of useful rubber.

Another useful system of classification is that according to the part of the plant which yields the rubber. Under this heading there are three groups: (1) stem, (2) root, and (3) the whole plant. Among stem rubber one can include arborescent forms such as Hevea and Manihot, and climbers as Landolphia and Parameria. Among the root rubber we have Clitandra, Carpodinus, and many other African genera, from which rubber is obtained by macerating the bulbous roots and extracting with water. The whole plant may yield rubber, as in the case of the Guayule shrub where the whole structure is uprooted and subjected to maceration. Perhaps one might also include Palaquium, since it gives gutta not only from the stems, but also from its leaves.

It is singular that there are many instances of trade names being associated with the produce from one species only. For instance, fine hard Para we know always comes from *Hevea brasiliensis*; Rambong from *Ficus elastica*; Ceara from *Manihot Glaziorii*, etc. etc. On the other hand, there are many instances of trade names being applied to produce derived from quite a number of species, and in the last category we find the same species may provide different-named rubbers in different parts of the world. The best example of the last group is probably to be found in the produce from *Landolphia Heudelotii*, this species providing Soudan niggers, Gambia balls, Massai, and many other grades known as niggers, twists, and flats. (The *India rubber Journal*, June 8, 1912.)

ARTIFICIAL COPRA-DRYING.

With a loss of several million pesos annually, by reason of the crude and unsatisfactory methods used for drying copra in the Philippine islands, the introduction and use of an improved copra drier becomes a question of great economic importance. The original plans for an apparatus to use steam heat were furnished about one year ago by Mr. O. W. Barrett, Chief of the Division of Experiment Stations. but the details of construction have been worked out by Mr. Z. K. Miller, Machinery Expert of the Bureau of Agriculture. Unfortunately, Mr. Miller did not have time to make any preliminary tests of the drier at the Pandacan repair shops of the Bureau, but it was decided to exhibit the original apparatus at the exposition held recently, and to try it there on the grounds, instead of delaying its introduction to the public any longer. It is believed to be the first machine of this type. When perfected, it may meet the requirements of the Philippine copra industry and thus help to raise the standard of that product in the Orient.

This drier is 5·64 metres long by 91 cm. wide, 3 metres high at the front and 2·44 metres high at the rear end. Its sides are constructed of angle iron frames for the sections into which are riveted two sheets of plain galvanized iron with 3-mm. asbestos millboard between. The tracks for the trays are set on an incline of 61 cm. to 46 cm. There are three rows of these trays with a 51-cm. space between the rows. Each row holds four trays, or a total of twelve trays for the drier. The trays, which are 91 cm. by 1·37 metres, and 1 dm. deep, are constructed of wire and angle iron with the bottoms made of bamboo slats set 6 mm. apart. Each tray has a capacity of about 160 nuts. The trays are fitted with trunk rollers and can be easily handled by two labourers. The incline is such that very little effort is required to push the trays when they are loaded. Each track has an entrance door and a discharge door 91 by 28 cm. in size. There are also three doors of the same dimensions on the top of the drier, to carry off the moisture, while fresh air is admitted at the bottom below the coils. The coils located at the bottom of the drier, contain 1,219·20 square metres of heating surface, which will maintain an even temperature between 150° and 180°and will dry the copra in fifteen hours.

There are three methods of handling the raw material in connexion with this type of drying apparatus:—

(1) The Birchfield method which obviates the necessity of husking the nuts—that is, the entire nut is chopped in halves by means of a heavy broad axe, the halves being immediately placed either in the sun on a concrete or hard earth patio, or placed directly in the trays of the drier where after two or three hours the meat may be readily removed and then replaced to complete the drying process, the refuse husk and shell being thrown aside for fuel.

(2) The husked nuts are broken in halves, and the shells are either set out to dry in the sun so that the meat can be removed after about one day of good weather, or else put directly into the trays of the drier and treated as by the first method.

(3) The meat from whatever process, at any stage of dryness, is put into the trays without considering the previous operations and kept there until the attendant in charge pronounces the drying complete. With the latter method of procedure the capacity of a drier of this size is estimated to be about 3,000 nuts in twenty-four hours.

The principal advantage in the use of the steam drier is that it is practically impossible to burn the material during the drying. though of course, the time required for turning out a copra which will endure storage in the bodega for several months is considerably longer in the case of an apparatus like this than with a hot-air, or rotary oven, type—makers of some machines of the latter type claiming to be able to turn out thoroughly dried copra in 'two to three hours'.

This drier will be taken to the Pandacan repair shops of the Bureau of Agriculture where exhaustive tests and experiments with it will be carried on for several months, until accurate information has been obtained as to the most economical method of drying copra The information thus obtained will then be published. (From the *Philippine Agricultural Review*, Vol. V, p. 204).

WEST INDIAN COTTON.

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

Since our last report, about 250 bags of West Indian Sea Island cotton have been sold, which include about 200 St. Vincent at 19*d.* to 21*d.* and 50 Stains at 8½*d.* to 10*d.*

Spinners still hold supplies for their requirements for some months to come, and require concessions of several pence per pound if they put the cotton into stock.

We understand that the Carolina Sea Island crop is likely to be a full one, and no doubt will be better in quality than in last season. Sakellarides Egyptian has been planted 50 per cent in excess of last year.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending June 29, is as follows:—

During the past fortnight there has been a very limited demand, resulting in sales of only 21 bales Fully Fine to Extra Fine for export on private terms. The Factors are anxious to dispose of some of the Crop Lots, of which the unsold stock largely consists, and are willing to make some concessions in price, but the spinners do not seem interested even at the decline quoted. We renew our quotations, which in the absence of demand are only nominal:—

We quote, viz:—

Extra Fine	30c. to 32c.	= 16¾*d.* to 17¾*d.*	c.i.f., & 5 per cent.
Fully Fine	28c.	= 15¾*d.*	,, ,, ,, ,,
Fine	26c.	= 14¾*d.*	,, ,, ,, ,,
Fully Fine to Extra Fine, off in preparation	25c.	= 14¼*d.*	,, ,, ,, ,,

Clavija Ornata.—Seeds of this interesting ornamental plant have been received by the Commissioner of Agriculture, through the courtesy of Mr. W. G. Freeman, B.Sc., Assistant Director of Agricultore and Government Botanist, Trinidad, and are being distributed to several of the Botanic Stations in the Lesser Antilles. The plant itself belongs to a family (Myrsinaceae) that is somewhat nearly related to that containing the primrose, on the one hand, and to that containing the sapodilla, on the other; the members of the family are nearly all tropical or sub-tropical plants. A characteristic of the genus Clavija is that the plants forming its species are palm-like in habit; as in the case of those of cacao and the carambola (*Averrhoa Carambola*), flowers are borne on the old wood

The native home of *C. ornata* is the Guianas aud Brazil. Its palm-like appearance arises from the fact that the leaves, which often exceed a foot in length, are borne at the top of the straight, unbranched stem. The staminate and pistillate flowers are bright orange-red in colour, and are found on separate plants; the former are specially noted for the strong scent of raspberries that they exhale.

INFLUENCE OF LIGHT ON GERMINATION.

The following is part of an abstract appearing in the *Journal of the Board of Agriculture*, for June 1912, p. 231, of a paper appearing in *Praktische Blätter für Pflanzenbau und -schutz*, dealing with investigations concerning the influence of light and temperature on the germination of seeds:—

Investigations carried out at the Institute at Munich have shown that different seeds are differently affected by light; thus fresh seeds of *Nigella sativa* did not germinate in a seed bed open to the light, but when placed in the dark the whole of the seeds germinated after ten days. The seeds of many Liliaceae were found to behave similarly, though here the action of light depended on the temperature, germination being seriously hindered by the light only in temperatures above 68°F.

On the other hand, about 200 species including *Veronica officinalis* could not be germinated in the dark; when brought suddenly into the light, however, after being kept for three years in the dark, they were found to germinate in a very short time. In many cases only a small amount of light was necessary for germination. Lights of different colour were noticed to act in different ways. A blue light was found to act in the same way as darkness, and had the additional effect of preventing the growth of harmful fungi and bacteria: 100 seeds of Tofieldia were kept for four years under a blue light and not one died. Germination ensued immediately on changing the blue to a red or white light. On the other hand, a blue light seemed to favour germination in the case of seeds which germinate in the dark, while red was unfavourable.

The sudden appearance of large numbers of some varieties of weeds in fields seems to be explained by the fact that in many cases germination is more complete and rapid where seeds have been kept for a considerable time in an unfavourable environment, and then brought suddenly into a favourable one. Thus it was found that seeds of *Digitalis purpurea* took eight months for the whole to germinate in the light in the ordinary way; but where they had been kept in the dark for three years the whole germinated in ten days after the admission of feeble light. Species of Veronica behaved similarly. Allowed to germinate in the ordinary way in the light, only 50 per cent. germinated in three years, but when kept in the dark for some time and then suddenly placed in the light, the whole of the seeds germinated. In the case of *Verbascum nigrum*, seeds kept in the light for three years germinated to the extent of 21 per cent., while 75 per cent. germinated where the seeds had been kept in the dark for three years and then placed in the light.

A noticeable point in connexion with these experiments was the different behaviour of different species of the same family, and it is evident that seeds are able to adapt themselves to varying conditions of climate, soil and light.

At a meeting of the Lawes Agricultural Trust Committee held on June 25, Dr. E. J. Russell, at present Goldsmith's Company's assistant for soil investigations, was appointed Director of the Rothamsted Experimental Station in succession to Mr. A. D. Hall, F.R.S. (*Nature*, July 14, 1912.)

WEST INDIAN PRODUCTS.

DRUGS AND SPICES ON THE LONDON MARKET.

Mr. J. R. Jackson, A.L.S., has forwarded the following report on the London drug and spice market, for the month of June 1912:—

The continuation of the strike of the Union transport workers at the docks, which has been going on for some weeks, with more or less intensity, accompanied with violent attacks on non-union men, has had a very serious effect on trade in general, so serious indeed was the outlook in the middle and latter part of June that the usual fortnightly drug and weekly spice auctions were suspended, and at the time of writing this report, up to the last day of the month, business is still very limited, in consequence of the lack of labour for the removal and distribution of goods from the ships, and the wharves, except by non-union men, who work at considerable peril of attack by union labourers. In consequence of these troubles our report this month will be very meagre.

GINGER.

At the first auction on the 5th June the offerings consisted of small cut Calicut, Rough Cochin and Japanese, all of which were bought in at the following prices respectively: 67*s*., 42*s*, and 32*s* 6*d*.. A week later it was reported that sales of Sierra Leone had been effected at 25*s*. 6*d*. to 26*s*. At auction on the 26th, 168 bags of small limed Japan sold without reserve at 28*s*. to 28*s*. 6*d*. per cwt. Nutmegs, mace, pimento and arrowroot have been quite of a neglected character, what has been offered being for the most part bought in.

SARSAPARILLA.

In the matter of this drug, in the early part of the month it was reported that about 80 bales had arrived, consisting of Grey Jamaica, native Jamaica, and Mexican, but on account of the transport strike no delivery had been effected, and it was not until the 27th of June that the auctions were resumed, when 6 bales of grey Jamaica, and 32 bales of native Jamaica were offered: of the former the whole was disposed of at steady rates, while of the latter 20 bales changed hands at full rates, fair to good red fetching 1*s*. 2*d*. to 1*s*. 4*d*., fair palish red 1*s*. 1*d*., dull red and yellow mixed 11*d*., and common yellow and grey mixed 9*d*. per ℔.

LIME JUICE AND TAMARINDS.

It was reported in the early part of the month that the prices quoted for lime juice were more or less nominal, though nothing was being offered in the open market, about 50 packages being at the time held up by the strike. At the end of the month West Indian tamarinds were selling at 15*s*. 9*d*. per cwt. and East Indian at 12*s*.

MARKET REPORTS.

London.—The West India Committee Circular, July 16, 1912; Messrs. E. A. De Pass & Co., July 5, 1912.

Arrowroot—3⅝*d.* to 4¾*d.*
Balata—Sheet, 3/8; block, 2/6½ per lb.
Beeswax—No quotations.
Cacao—Trinidad, 68/- to 85/- per cwt.; Grenada, 63/- to 70/-; Jamaica, 59/- to 68/-.
Coffee—Jamaica, 69/- to 79/- per cwt.
Copra—West Indian, £26 10*s.* per ton.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 19*d.* to 21*d.*
Fruit—No quotations.
Fustic—No quotations.
Ginger—49/- to 65/- per cwt.
Isinglass—No quotations.
Honey—No quotation.
Lime Juice—Raw, 1/10 to 2/5; concentrated, £18 12*s.* 6*d.* to £19; otto of limes (hand pressed), 7/-.
Logwood—No quotations.
Mace—1*s.* 11*d.* to 2*s.* 8*d.*
Nutmegs—5*d.* to 1*s.*
Pimento—Common, 2$\frac{7}{16}$*d.*; fair, 2½*d.*; good, 2⅝*d.*; per lb.
Rubber—Para, fine hard, 4/10; fine soft, 4/4; Castilloa, 4/6 per lb.
Rum—Jamaica, 2/- to 6/-
Sugar—Crystals, 16/- to 18/6; Muscovado, 13/6 to 16/-; Syrup, 14/6 to 15/6; Molasses, no quotations.

New York.—Messrs. Gillespie Bros. & Co., July 12, 1912.

Cacao—Caracas, 14½c. to 15½c.; Grenada, 14c. to 14½c.; Trinidad, 14c. to 14½c. per lb.; Jamaica, 11½c. to 12½c.
Coco-nuts—Jamaica, select, \$22·00 to \$23·00; culls, \$13·00 to \$14·00; Trinidad, select, \$22·00 to \$23·00; culls, \$13·00 to \$14·00 per M.
Coffee—Jamaica, 14¼c. to 16¾c. per lb.
Ginger—8¾c. to 11½c. per lb.
Goat Skins—Jamaica, 50c.; Antigua and Barbados, 45c. to 48c.; St. Thomas and St. Kitts, 43c. to 44c. per lb.
Grape-Fruit—Jamaica, \$4·50 to \$5·00.
Limes—\$2·50 to \$6·00.
Mace—No quotations.
Nutmegs—110's, 12¼c. to 12½c.
Oranges—Jamaica, \$2·00 to \$2·25 per box.
Pimento—2⅝*d.* per lb.
Sugar—Centrifugals, 96°, 3·77c. per lb.; Muscovados, 89°, 3·27c.; Molasses, 89° 3·02c. per lb., all duty paid

Trinidad,—Messrs. Gordon, Grant & Co., July 22, 1912.

Cacao—Venezuelan, \$16·00 to \$16·25 per fanega; Trinidad, \$15·50 to \$16·00.
Coco-nut Oil—90c. per Imperial gallon
Coffee—Venezuelan, 17c. per lb.
Copra—\$4·50 per 100 lb.
Dhal—\$5·50.
Onions—\$2·50 to \$3·50 per 100 lb.
Peas, Split—\$7·25 to \$7·50 per bag.
Potatoes—English, \$3·00 to \$3·25 per 100 lb.
Rice—Yellow, \$4·80 to \$4·90; White, \$6·25 to \$6·35 per bag.
Sugar—American crushed, no quotations

Barbados,—Messrs. James A. Lynch & Co., Ltd., July 27, 1912; Messrs. T. S. Garraway & Co., July 29, 1912; Messrs. Leacock & Co., July 19, 1912.

Arrowroot—\$7·00 per 100 lb.
Cacao—\$12·00 to \$13·50 per 100 lb.
Cocoa-nuts—\$16·00.
Hay—\$1·70 to \$1·80 per 100 lb.
Manures—Nitrate of soda, \$65·00; Cacao manure, \$45·00 to \$48·00; Sulphate of ammonia, \$80·00 per ton.
Molasses—No quotations.
Onions—\$2·25 to \$2·75 per 100 lb.
Peas, Split—\$6·80 to \$7·00 per bag of 210 lb.; Canada, \$3·00 to \$5·40 per bag of 120 lb.
Potatoes—Nova Scotia, \$3·00 to \$6·00 per 160 lb.
Rice—Ballam, \$5·20 to \$5·30 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
Sugar—American granulated, \$5·00 per 100 lb.

British Guiana.—Messrs. Wieting & Richter, July 20, 1912; Messrs. Sandbach, Parker & Co., July 19, 1912.

Articles.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	—	—
Balata—Venezuela block	No quotation	Prohibited
Demerara sheet	70c. per lb.	—
Cacao—Native	14c. per lb.	14c. per lb.
Cassava—	\$1·20.	No quotation
Cassava Starch—	\$7·50	No quotation
Coco-nuts—	\$16 to \$20 per M.	\$10 to \$16 per M., peeled and selected
Coffee—Creole	19c. per lb.	18c. per lb.
Jamaica and Rio	20c. per lb.	21c.
Liberian	15c. per lb.	15c. per lb.
Dhal—	\$5·50 per bag of 168 lb.	\$5·50 to \$5·75
Green Dhal	\$5·50	—
Eddoes—	\$2·40	—
Molasses—Yellow	None	—
Onions—Teneriffe	—	—
Madeira	5c. per lb.	5c. to 6c
Peas—Split	\$6·75 to \$7·00 per bag (210 lb.)	\$7·15 per bag (210 lb.)
Marseilles	—	No quotation
Plantains—	16c. to 48c.	—
Potatoes—Nova Scotia	—	\$2·50
Lisbon	\$2 25 to \$2·75	No quotation
Potatoes-Sweet, B'bados	\$3·60 per bag	—
Rice—Ballam	No quotation	—
Creole	\$6·00	\$6 00
Tannias—	\$3·24	—
Yams—White	\$2·64	—
Buck	\$4·24	—
Sugar—Dark crystals	\$2·80 to \$2·90	\$2·75 to \$2·90
Yellow	\$3·40 to \$3·50	\$3·50
White	\$4·00	—
Molasses	\$2·60 to \$2·80	—
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	\$3·75 to \$6·00 per M.	\$4·00 to \$6·00 per M.
,, Cordwood	\$1·80 to \$2·00 per ton	No quotation.

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CONTENTS

The Causes of Fertility in Pastures.

A STUDY of the conditions which may cause an area of pasture land to show fertility and the power to fatten animals grazing upon it, while a neighbouring area, subjected to similar circumstances, is greatly inferior to it, is given in a recent article* which presents an account of valuable investigations that have been carried out on pastures in marsh land, in the south-east of England. Although the conditions of the experimentation are greatly different from those obtaining in the West Indies, certain matters regarding the work are of significance with respect to the subject of pasturage in general, and are suggestive in relation to similar observations that may be conducted in other places.

The areas upon which the experimenters worked contained, as has been indicated, fields having a reputation for fattening animals well, which were contiguous to fields that were only capable of keeping the animals in a growing condition; the former are well referred to as 'fatting' fields, and the latter as 'non-fatting' fields. Work had already been done on soils, in the south-east of England, representing rich and poor pastures; but as the chemical and mechanical analyses did not show any corresponding differences between the soils, it was decided to give the matter a more thorough investigation. With this object, the fatting and the poor fields were chosen where they adjoined closely, and a portion of each pasture was railed off, from which the grass was cut from time to time for the purposes of observation, this observation consisting in weighing the grass and analysing it both botanically and chemically. Soil samples were also taken to the depth at which standing water was found, and chemical and mechanical analyses of these were made. Other samples, obtained by boring, formed material for the determination of the water-content. Further, the depth of the water table, the level of the water in the adjoining ditches and the temperature of the soil were noted regularly.

Dealing definitely with some of the results, observations were made to determine the floral type; that is

* A. D. Hall, M.A., F.R.S., and E. J. Russell, D.Sc., in the *Journal of Agricultural Science*, June 1912, page 339.

to say the proportions which the different kinds of plants bear to one another in the various areas. These were remarkable in showing that the floral type in rich and poor fields was very similar, some of the plants agreeing in their proportions, on the fatting and non-fatting fields, within the limits of experimental error. There were no differences that would explain the superiority of the herbage from the fatting field: 'It is clear then that the value of the pasture is not determined by the floral type of the herbage.' When, however, the plants on the two kinds of land were considered, it was found that they made better cover in the good fields and that the turf was more 'springy'; but the most notable difference was the leafiness and breadth of the leaves in the former case, with the much smaller tendency to form flowering heads. This was in contradistinction to the 'stemmy' nature of the herbage in the poorer fields, together with its fewer leaves and its earlier and abundant flowering. These matters constitute the chief difference in the herbage in the two kinds of fields, which as may have been concluded, is independent of the floral type. Two other differences were also observed: the fatting field contained more clover—a leguminous plant—than the non-fatting field, while in the latter the herbage tended to become more quickly dried up in summer.

Soil analysis showed no significant differences between the two kinds, though it is noted that, as the analyses were made upon samples representing the average of layers a foot thick, the presence of a thin parting of pure clay, which might seriously interfere with the movement of water in the soil, would be overlooked. Determination of the water-content of the soils gave no marked difference, though it seemed that the soil of the fatting field was rather moister than that in the other, while it dried up more quickly, possibly because of the greater transpiration of the better plants upon it. The question of temperature is not of importance in this consideration of the work; it is of interest however that the soil of the fatting field was slightly warmer than that of the non-fatting field, while the daily range of temperature was smaller in the former case. The similarity of results in the various cases just mentioned is repeated in the chemical analysis, which gave virtually identical figures in the two instances; there was however a little more nitrogen, and especially a little more phosphoric acid, in the soil of the good field, though that of the poor field contained quantities that would ordinarily be regarded as large. 'Thus as regards the mechanical and chemical composition, temperature and moisture determinations, little can be found to discriminate between the two soils, and though some of the factors of production are slightly better in the good soil the differences seem too small to be significant.'

The results obtained in this way suggested that the soils should be subjected to more detailed methods of observation, and the consequence was that the differences obtained were more pronounced. Analysis of the soils from time to time during the season showed that in the early part of it there were larger amounts of nitrate and ammonia in the soil of the fatting field, though this difference disappeared with the advance in the season. Further, direct experiment indicated that nitrates were produced more quickly in this field than in the non-fatting field. Though the determinations were only very approximate, they were conclusive in showing that the greater production of grass in the better field was a consequence of the increased food-supply, although there was no effect in the direction of altering the floral type. A last circumstance that bears relation to the matter consisted in the fact that the organic matter in the soil was found to decompose more quickly in the better areas.

Observations of the water-level in the borings and ditches showed that, while the fatting field was slightly higher than the non-fatting field, as the season advanced the water-level fell, the fall being most rapid in the fatting field, the ultimate consequence being that the soil in this field tended always to be a little drier than that in the other, for there was always a greater distance between the surface and standing water. It was observed further that rain-water sinking into the soil of the fatting field ran away more quickly and thoroughly than was the case in the poorer soil.

Similar results to all those that have been mentioned above were obtained in other cases, though in one instance the water-level in the poorer field was actually lower than in that where the soil was better. Reference to all the experiments results in showing that, in a broad manner, the differences found may be of considerable significance, but cannot be expressed in any general way; that indications existed that the citric acid method for measuring available phosphoric acid is not applicable to pasture soils; and lastly that the greater content of nitrates and ammonia in the early part of the year in the better soils probably accounts for their production of the superior herbage, the causative difference being possibly the nature of the organic matter in the soil.

Interesting general conclusions were obtained in regard to the floral type of the soils It seems that this is influenced to a greater extent by the local climate, situation and management than by the soil itself: the last may, however, become a dominant factor under the influence of the kind of management, which itself is a potent cause in determining the floral type that may obtain. Turning from this to the consideration of the relation between the habit of growth of the plants, their chemical composition and their feeding value, it was found that the variations in the last of these could not be explained by those in the composition, though certain constant differences were observed, particularly the fact that the herbage from the better fields was almost invariably richer in nitrogen—a matter that may be expected from the higher nitrate content of the soil. Determinations of the proportion of nitrogen in the herbage that could be dissolved by the action of pepsin also showed small differences, for there was always a larger total amount of digestible nitrogen in that from the better fields. It was noticed that there was invariably a larger proportion of manganese oxide in the poorer herbage, and this was almost always the case in the less productive soil, but present knowledge of the part taken by manganese in plant and animal life does not permit it to be stated if this fact possesses any significance. It is concluded from the whole matter that the method of food analysis, as this is carried out ordinarily, fails to indicate the value of grasses as food.

It is evident that, under the conditions described, the feeding value of pasture grass is determined rather by the habit of growth than by the floral type, the latter being decided by surrounding circumstances rather than by the food-supply, while the habit of growth is influenced by factors that are more difficult to ascertain; under the conditions of the investigation, the most important of these factors seem to be the ease of decomposition of the organic matter and therefore the rate of formation of nitrates and ammonia, the supply of phosphate being also important. This leads to the conclusion that floral type and habit of growth are independent,so that where attempts are being made to improve a pasture, it must be determined, first, which of these is the cause of its infertility. Lastly, the ordinary methods of investigation are inadequate for ascertaining the value of pastures, while it seems likely that the best herbage will grow on soils in which the texture is best, and therefore the power to drain, as well as to hold water is well marked; though with regard to this matter, soil analysis does not give as definite indications for pasture land as for arable land.

CEMENT FOR CAVITIES IN TREES.

The subject of the preservation of trees received attention in an article on page 251 of the last number of the *Agricultural News*. The additional information given below is taken from the *Garden and Field* for May 1912.

It is only recently that very much attention has been given to the filling of cavities in trees This is now being done quite extensively, and better work is being accomplished in this line than heretofore.

The question has often been asked whether it is worth while to dig out a decayed cavity of a tree and fill it with cement or some similar substance. We are free to confess that we have never had an opportunity to examine many trees which have been filled for any length of time, especially when the filling was well done, and therefore have not sufficient data to ascertain whether this method of treating trees always prevents further decay. Until we have an opportunity to examine carefully specimens that have been filled for many years, we cannot be absolutely sure whether the types of filling now in vogue are successful in preventing further decay.

We have observed sections of large trees which have been filled for a few years, which showed that decay was not arrested completely, but it is hardly fair to assume that the trees we examined represented the best workmanship in this direction. We believe, however, that if a rotten cavity is thoroughly cleaned out and properly filled, the life of a tree can be greatly extended, and that it is possible to prevent further decay of such cavities. The best method, however, of treating tree cavities may not as yet have been discovered. We believe that it is the best plan to make all cavities wider at the centre than at the exterior surface, so that the filling substance will be wedged in, as it were, and have no opportunity to fall out or become displaced.

Of course, cavities after being thoroughly cleaned are treated with some antiseptic, such as corrosive sublimate, creasote, or paint Creasote possesses more penetrating power than a watery solution of corrosive sublimate, and probably for this reason it is more effectual in reaching portions of the mycelium of the fungi which might be still remaining in the wood near the chiselled surface. Probably formalin at the rate of 2 to 4 parts of formalin to 100 parts of water, as well as many other substances, can be used to advantage, but the use of such disinfectants on trees is entirely in an experimental stage, and their value as antiseptics is problematical.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture left Barbados on July 30, by the S.S. 'Guiana', on an official visit to the Northern Islands. It was intended that Dr. Watts should spend some time in St. Kitts and Dominica, and return to Barbados by the S.S. 'Oruro' on August 21.

FRUITS AND FRUIT TREES.

THE BUDDING OF THE SOURSOP AND RELATED PLANTS.

A method for the vegetative propagation of the soursop (*Anona muricata*), and related plants of which the best known are the sugar-apple (*A. squamosa*), the custard-apple (*A. reticulata*), and the cherimoyer (*A. Cherimolia*), is thus described in the *Philippine Agricultural Review* for June 1912.

GENERAL REMARKS. Experiments in budding the cultivated anonas on the mamon [pond-apple—*Anona glabra*] were started by the writer in August 1904, when a few cherimoyer buds were inserted on mamon stock. The work was successful and the following year the custard-apple and soursop were also successfully budded on the same stock, and various methods of grafting and budding were experimented with extensively.

The following species have been successfully budded: On the mamon, the cherimoyer, the custard apple, the soursop, and the biriba [*Rollinia orthopetala*]; on the custard-apple, the cherimoyer and soursop; and on the sugar apple, the cherimoyer. As new species are introduced into cultivation the list of species of Anona and Rollinia that can be budded reciprocally will no doubt be greatly extended.

GROWING THE STOCK PLANTS. The seed should be washed and all pulp removed, which is most conveniently done in a coarse-meshed sieve that allows the water and pulp to pass through freely. After drying, store the seed in a cool, dry place and plant as soon as convenient.

Sow the seed thinly in a flat or shallow box, well drained by the use of coal ashes, potsherds, or broken rocks, or in a seed bed, and cover them with not more than 12 mm. [½-inch] of soil. The germinating medium should contain but little, if any, clay, a light soil, rich in humus, being preferable. After germination the plants should be kept rather dry until transplanted. Remove the young plants from the seed bed and set them out in a bed or frame as soon as from two to four true leaves have appeared, by using a pointed stick or dibber, setting the plants 13 cm. [5 inches] apart each way. At the same time cut off the tap root to encourage a better lateral root system. With proper care the young plants make a rapid growth and in a few weeks are ready to be transplanted to the nursery. Perform this work preferably on a cloudy day or late in the afternoon after first having pruned off about two-thirds of the foliage and the tender growth, and after having pruned the tap root to within 12 to 15 cm. [5 to 6 inches] in length. Unless rains render this unnecessary, always water the plants thoroughly before and after transplanting.

BUDDING. The results obtained in the experiments conducted by the writer in south Florida indicate that in the nursery the method of shield budding is preferable to any other method of propagation, the success with which this method was attended in experimental work covering several hundred plants having been all that could be desired

The plants may be budded at any time of the year provided the sap is flowing freely, but under ordinary conditions it is well to perform the budding as early in the spring as possible in order to give the buds the benefit of the entire season's growth. The last year's growth after the leaves have been shed is the best bud wood material, though older wood may be utilized if scions are scarce. The bark of the anonas is thick and the callusing rapid, and in order to enable the buds to sprout and to prevent them from being smothered by the callus, the buds should, therefore, be cut large with an ample wood shield. The soft wood of the anonas renders this easy of accomplishment. On account of the thickness of the bark it is well—not to say necessary—to make a sloping cut in the bark below the horizontal cut in order to facilitate the insertion of the bud without injury. While other material such as raffia and cotton twine may be used, waxed tape, covering up the entire wound, is the most preferable for tying. After ten or twelve days the buds should be examined, and if a union has been formed, the buds should be unwrapped to below the leaf bud and the stock lopped. All adventitious sprouts should be removed with a sharp knife every ten days to assist in the prompt forcing out of the buds before they are callused over. If the budded plants are well cared for they will be ready for planting in the orchard eight months after the insertion of the bud.

COMPARATIVE VALUE OF DIFFERENT SPECIES AS STOCKS. The value of the different species of anonaceous plants as stocks depends largely upon their adaptability to the land and the climatic conditions in which they are grown, and this must be worked out locally. The longevity of the trees of a species should also be considered in the selection of stocks, other qualifications being equal. The vegetative propagation of these plants is so recent that no comparative experiments of the suitability of a certain species as a stock for another have been made.

The most vigorous and as far as is known perhaps the most long-lived species of all the anonas is the mamon, and while the natural habitat of this species is low and marshy land, seven years' experience in south Florida seems to indicate that it makes a good stock on well-drained land; it has a well-developed root system, and transplants well.

Perhaps the next species in point of vigour is the custard-apple. This species succeeds on well drained land and seems to be particularly well adapted to land with a scarcity of soil and where the precipitation is not over abundant. It has a strong tap root but is rather deficient in laterals; however this can be corrected by judicious root pruning. The longevity of the tree makes it a fairly satisfactory stock from this point of view.

The sugar-apple grows well on drained land and succeeds on land having scanty soil. It is less long-lived than any of the species under discussion and of less vigorous growth, and would thus appear to be the least desirable stock to use where the other species succeed equally well. Its root system is weaker than that of any of the other species, and like its congener it may be transplanted without difficulty.

The soursop is of good vigour and rapid growth and has a better developed root system than any of its congeners, and succeeds well on any well-drained, moderately rich soil.

Judging from the ease with which three-year-old mamons have been cleft- and side-grafted by the writer, this method should prove very successful in the working over of old seedling trees. Where for some reason the grafts fail, the sprouts that issue from the trunk may readily be shield budded and the plant treated as already described under the paragraph on budding.

The World's Production of Vanilla, 1911-12.

As a supplement to recent articles dealing with vanilla, in the *Agricultural News*, Vols. IX, pp. 295 and 319, and XI, p. 148, the following has been taken from information supplied by Mr. J. R. Jackson, A.L.S.:—

'With regard to the world's production in the 1911 12 season the quantity is estimated at 590 tons made up as follows: Bourbon 65 tons, Seychelles 13 tons, Comoro and Mayotte 70, Madagascar 60, Nossi Bé 10, Mauritius, Java, Fiji and Ceylon 15, Guadeloupe and Martinique 16, Mexico 145, Tahiti 195 tons.

'It is stated in a recent number of the *Chemist and Druggist*: "the total yield shows very satisfactory dimensions, notwithstanding the shrinkage in the Seychelles and Tahiti returns, but as twice in succession no stocks of consequence were left to be carried forward into a new season, the market maintained its high level subject, of course, to the inevitable fluctuations which a passing shortage or accumulation of large arrivals of immature parcels or occasional ulterior motives of speculators, must produce."

'Of course it must be borne in mind that the market value depends on the kind cultivated, and the quality aimed at should approach that of the Bourbon or Seychelles varieties.'

THE BULLETIN OF THE IMPERIAL INSTITUTE.

The following prospectus of the new issue of the *Bulletin of the Imperial Institute* has been received from the Director of the Institute, and is published here for general information. It may be stated that an article from the first number of the new issue was partly reproduced on page 199 of this volume of the *Agricultural News*, and that similar use has often been made of past volumes of a publication that always contains much that is of interest to those concerned in agricultural development, particularly in the tropics.

This Bulletin was first published in 1903. It appears quarterly and contains: reports on investigations conducted in the Scientific and Technical Department of the Imperial Institute; articles and notes dealing with mineral and vegetable economic products; and a quarterly summary of information on recent progress in agriculture and the development of natural resources.

Until this year the Bulletin has been published by the Imperial Institute, but owing to the increased demand for it, its publication has now been undertaken by Mr. John Murray, 50a, Albermarle Street, London, W., and the first number of the new series has appeared.

The principal contents of this first number are as follows:—

Rubber resources of Uganda; some cotton soils of the Nyasaland and Uganda Protectorates; kola nuts from British West Africa; coca leaves from Ceylon and the Federated Malay States; aromatic grass oils, Part III: Hibiscus fibres from the Northern Territories, Gold Coast; timbers from Uganda; sumach from Cyprus; economic products from Mauritius; the coco nut and its commercial uses, Part I; cultivation, preparation and utilization of hemp and hemp seed (*Cannabis sativa*); cultivation and preparation of ginger; agricultural work in Seychelles; candelilla wax; sisal hemp in Quilimane; New Zealand hemp; iron ore from Trinidad; copper-mercury ore from Queensland; native labour regulations in Mozambique.

The second number, now in the press, will have the following principal contents:—

Tobacco industry of Ceylon; some new gutta-yielding plants from the Gold Coast; *Ficus elastica* rubber from Southern Nigeria; balata rubber (*Ficus Vogelii*) from Southern Nigeria; the rubber of *Cryptostegia grandiflora*; silk from India; cotton and sisal hemp from Papua (British New Guinea); fibres from India; utilization of *Caesalpinia digyna*; oil seeds of *Telfairia pedata*; Lophira oil seeds from West Africa; oils and oil seeds from Hong Kong; West African cacao; the cultivation of cigar tobacco with special reference to Java; the coco-nut and its commercial uses, Part II; shea nuts and shea butter; rubber-tapping experiments in Southern Nigeria; economic developments in the Belgian Congo; West Indian satinwood; oil of 'Nepal camphor wood'; citronella grass; *Mesembrianthemum Maloni* roots from the Transvaal; Rubber Exhibition in Java; cultivation of fibres in Java; 'Root cotton'; Perilla seed and oil.

The annual subscription to the Bulletin is 10*s*. 6*d*., or 11*s*. post free; single numbers may be purchased at 2*s*. 6*d*. each, or 2*s*. 9*d* post free. Subscriptions may be paid through any bookseller, or if no bookseller is available, they may be sent direct to Mr. John Murray, 50a, Albemarle Street, London, W.

WEST INDIAN COTTON.

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

Since our last report, about 250 bales of West Indian Sea Island cotton have been sold, nearly entirely composed of St. Vincent at prices ranging from 18*d.* to 21*d.*, the remainder being accounted for with a few Barbados 21*d.* to 22*d.*, St. Lucia at 14½*d.*, and stains at 9*d.* to 10*d.*

The stock is large and the demand for extra fine yarns is very limited; spinners are disinclined to purchase until they can obtain sales of extra fine lace yarn and form an idea as to what the New Crop Carolina Sea Island will sell at. This crop begins to arrive in about October. As they have to buy to stock, they are only prepared to do so at about 3*d* per lb. below recent current prices.

COTTON-GROWING IN HAWAII.

The position as regards cotton-growing in Hawaii is thus summarized in Press Bulletin No. 34, issued by the Hawaiian Agricultural Experiment Station on May 2, 1912:—

Cotton culture in some parts of Hawaii has been abandoned. In some locations this result was brought about because of the damage done by the boll worm: in other regions because they had conditions ill-suited to the best growth of the crop.

A good quality of cotton in paying quantities can be produced under certain conditions.

On the lower elevations, with a moderate supply of moisture, with absence of, or protection from wind, with a good supply of heat, and in fields that can be given horse cultivation—a good profit can be made in growing cotton even under boll worm conditions.

Because of the boll worm, Sea Island cotton should be grown as an annual, and also only where there is no difficulty in securing a stand.

In drier locations, Caravonica will be likely to be the better variety and should be grown only as a perennial. Good yields will be obtained from this variety in the first year only where the very best conditions of heat and moisture exist. It requires an occasional pruning, which should be given usually prior to the rainy season. Under certain conditions, two prunings can be given and two crops obtained, and where this is possible greater immuuity from the boll worm will result.

Careful handling of the staple is necessary at all times.

A more uniform product can be secured by propagating with buds or cuttings, but only through the seeds is any improvement possible. To secure this, hybridization must be prevented or controlled; all inferior plants or those having undesirable qualities must be destroyed; and seed must be selected only from those which have desirable characters.

In determining what is suitable environment for cotton in the islands, we find that location evidently has far more influence than the character of the soil. Any soil will grow cotton (some, however, require fertilization, and in some perhaps the water might be too brackish), but some locations preclude any possible chance of profit.

Cotton-growing in Portuguese East Africa. The only serious attempt at cotton-growing in Portuguese East Africa was commenced last year by a large Portuguese land company on the island of Bompono, in the Zambesi. H. M. Consul at Lorenzo Marquez (Mr. R. C. F. Maugham) writes that the variety chosen was American long-staple upland, grown from Nyasaland seed. The area planted was 120 acres, and the resulting crop of 200 bales of ginned cotton was valued in the United Kingdom at 7*d.* to 8*d.* per lb. as regards the best parcels, and from 5½*d.* to 6*d.* for the middling. It is stated that the best quality predominated. This year it is intended to plant out 1,000 acres in the same locality, and the outcome of this second experiment is awaited with much interest. (The *Textile Mercury*, May 25, 1912.)

Cotton in Siam.—It was thought at one time that cotton might be profitably grown in Southern Siam, but recent experiments are not very encouraging. A Japanese syndicate was formed with the object of cultivating cotton, but its operations have not been successful, and the local exhibits at the recent exhibition of agriculture and commerce in Bangkok were pronounced to be generally poor. Mr. Acting-Consul Crosby, in his report on the trade of Bangkok, seems to think that the introducion of superior varieties from other countries may be productive of good results, but the high cost of labour is a severe handicap to planters. Experiments have been tried with Egyptian cotton, but the results have not been very satisfactory, the staple turning out little better than that of local varieties. It may be noted that of the imports of cotton goods, the United Kingdom and Singapore contributed, last year, 36 and 35 per cent., respectively. (The *Journal of the Royal Society of Arts*, May 31, 1912.)

AN INDIAN FODDER PLANT.

A publication which is entitled *Fodder Crops of the Punjab*, but does not give indication of its origin, has been received lately. From this the following information is taken concerning *guár*, or the cluster bean (*Cyamopsis psoraloides*), which is a bushy leguminous plant bearing hairy pods in clusters. This plant is under trial at some of the West Indian Botanic Stations, as a green manure, seeds having been distributed to them by the Imperial Commissioner of Agriculture. (See *Agricultural News*, Vol. X, pp. 277 and 293.)

It is an important fodder crop in the districts of the Punjab formerly included in the United Provinces. It is suited to light sandy soil, and is usually sown alone, but is sometimes mixed with bájra [*Pennisetum typhoideum*]. It is considered to be a good crop to follow cotton or *chari* [Guinea corn], because the leaves appear to act as manure on the soil and to prepare it for a subsequent *rabi* [dry weather crop] (*Hissar Gazetteer*), page 170). No doubt, like other leguminous crops, it feeds the soil with nitrogen. The grain is very rich in albuminoids, the chemical composition being:—

	Per cent.
Water	11·8
Albuminoids	29·8
Starch	46·2
Oil	1·4
Fibre	7·7
Ash	3·1

But it is considered coarse and produces flatulence, and grain and leaves and stalk are given to the bullocks. The grain is either boiled or coarsely ground and given dry. The dry straw is useless, but the green plant is cut and chopped up and given to bullocks. The broken pods, called *Palosi*, left on the threshing floor, make good fodder.

After gram, *guár* is the most important pulse in Rohtak, Gurgaon and Delhi.

International Rubber Congress and Exhibition, 1914.—A circular has been issued drawing attention to the fact that an International Rubber Congress and Exhibition will be held at Batavia in April 1914.

The Congress and Exhibition will be organized by the Netherlands Indies Agriculture Syndicate ('Nederlandsch-Indisch Landbouw-Syndicaat'), which also brought about the very successful Fibre Congress and Exhibition at Sourabaya in 1911. Both Congress and Exhibition have the support of the Government of the Netherlands East Indies and many influential persons, commercial bodies and estates.

His Excellency the Governor-General of the Netherlands East Indies has consented to become Honorary President of the Congress and Exhibition. A complete detailed programme of the Congress and the Exhibition will shortly be published and distributed on a large scale in all countries of the world.

At this moment we can, however, state that both the Congress and the Exhibition will deal with all matters concerning rubber production and the preparation of the crude product, in the broadest sense of the word, and that the production and preparation of balata, Jelutong, and gutta-percha will also be given attention. (The *India Rubber Journal*, May 25, 1912.)

ST. KITTS AND THE CANADIAN NATIONAL EXHIBITION.

Information has been received from Mr. F. R. Shepherd, Honorary Secretary of the St. Kitts Permanent Exhibition Committee, to the effect that the exhibits from St. Kitts-Nevis for the Canadian National Exhibition to be held in Toronto, were forwarded by the S.S. 'Oruro' on July 18.

They are ninety-three in number, and consist of samples of sugars (crystals and muscovado), molasses, cotton and seed-cotton cotton, seed, cotton seed meal, cotton seed oil, meals and starches, lime juice, pickles in brine, cured cacao, cassareep, coco-nut oil, and a good collection of preserves made from local fruit.

Besides these, there were forwarded as decorative material bunches of coco-nuts, specimens of the Turk's Cap cactus (*Melocactus communis*) and palms. It was hoped to forward samples of sugar cane by the next steamer. Views of the islands were included in the shape of a framed collection of post cards, made by Mr. A. M. Losada.

Camphor in India's Wettest District.—The following is reproduced from the *Statesman* of April 19, 1912, in the May number of the *Tropical Agriculturist*. It is of interest in relation to former articles, dealing with camphor, in the *Agricultural News* (see page 229 of this volume):—

'The camphor trees planted in the Government Farm at Wahjian below the plateau of Cherrapunji, have now reached a stage fit for cutting for distribution, and experiments were started in May last. A small still, modelled on those used in Ceylon, was constructed at a cost of Rs. 80. In the first trial distillation, 35 lb. of twigs and leaves yielded $1\frac{3}{4}$ oz. of crude camphor. Of experiments in propagating the camphor trees by root cuttings and layerings, out of thirty root cuttings put down at the commencement of the rains, twenty have succeeded, and out of fifty layers ten have proved successful.'

Care in Storing Calcium Cyanamide.—The Board of Agriculture and Fisheries desire to draw the attention of agriculturists to the need for precaution in storing calcium cyanamide on farms. Calcium cyanamide contains calcium carbide in varying proportions, and the latter gives rise to an explosive gas, acetylene. Experiments carried out by the Board of Trade showed that, in the case of the particular samples investigated, 1 ton of calcium cyanamide in dry air rendered 3·6 cubic feet, or in moist air 6·1 cubic feet of air, explosive in twenty-four hours. From this it appears that there is some possibility of danger in storing the calcium cyanamide in damp, unventilated sheds, cellars, etc., and dry, well ventilated conditions should prevail in places selected for the storage of this manure. If the material is actually wetted when in store it becomes a source of considerable danger. Further, it is most important that the cyanamide should be kept dry in view of the fact that moisture may induce chemical changes which would probably cause the material to deteriorate in value as a manure. (The *Journal of the Board of Agriculture*, July 1912.)

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

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this issue is entitled The Causes of Fertility in Pastures. It gives a description of interesting and suggestive work regarding pastures that has been carried out recently in England.

Attention is drawn to the account of the new issue of the *Bulletin of the Imperial Institute,* which appears on page 261.

The Insect Notes, on page 266, consist of a short article and two notes on subjects of interest. These deal with the cotton worm in the United States, a weevil enemy of Caravonica cotton, and the destruction of lawns by caterpillars.

Page 267 is taken up by an abstract of an article in which the subject of ventilation is considered in an original and interesting manner.

A short account of some of the subjects that will be considered by the Agricultural Section at the next meeting of the British Association is presented on page 269. It will be remembered that the occasion of that meeting will be the first at which agriculture is to be taken as a separate section.

On page 270, the Fungus Notes comprise an illustrated article presenting some miscellaneous information regarding plant diseases.

A short article giving results obtained with Funtumia in Dominica will be found on page 271.

The Exploitation of Ramie.

A note of some interest in relation to the employment of ramie fibre in the manufacture of incandescent gas-mantles is published in the *Journal of the Royal Society of Arts,* for July 5. For reasons probably connected with its high absorptive properties, ramie answers admirably for the purpose mentioned. As a single pound of ramie yarn is computed to make five or six gross of mantles, it is obvious that the aggregate weight of raw material required to satisfy the lighting industry is relatively small. Even in this field, however, ramie is said to have a more or less serious rival in moulded mantles made by dissolving and precipitating cellulose in a manner akin to that by which artificial silk is made.

It does not appear that ramie is brought into large use for other purposes, and there seem at present to be few prospects of its successful employment in other directions: 'apart from a limited range of uses ramie remains easily the most consistent disappointment in the whole family of textile fibres. More money has been sunk in its development to less purpose than in anything that has engaged English attention. According to estimates, which nobody contradicts, some thirty millions have been lost in ramie by planters and manufacturers during fifty years. One German undertaking succeeding where virtually everyone else has failed, pays good and regular dividends out of ramie manufacture, but otherwise, the industrial history is a story of unrelieved disaster.'

Increased Seed Germination by Using Sulphuric Acid.

Interesting information is contained in Bulletin 312 of the Agricultural Experiment Station, Cornell University, in which the claim to have 'discovered' the method of improving the germination of seeds by the use of strong sulphuric acid is made by one of the authors. The experiments described were carried out chiefly with seeds of leguminous plants that are themselves of no direct interest in the West Indies, as well as with cotton seed: the treatment consisted in immersing the seed in concentrated sulphuric acid (of specific gravity 1·84) for a few minutes. The method of using the sulphuric acid was to pour on to the seed a quantity of it equal to about five or six times the volume of the seed; after the mixture had been stirred thoroughly so that all the seeds became completely covered with acid, water was allowed to run into the vessel, at the end of a time depending on the kind of seed, and the contents were poured quickly into a strainer and washed with running water for five minutes, or until the seed was entirely free from acid. It was found that the seed may be planted immediately or allowed to dry before being planted; the former process is the better one in the case of small lots of seed.

In trials of the effects of storage on the treated seed, it was found that, at the end of four months, the germination was generally the same as that obtained when the seeds were tested immediately after treatment. When this was employed for seeds that were already old, there was very little improvement in germination.

Care is required in washing the seed for the purpose of removing the acid, as the seed coat is easily injured in this part of the process. Washing should not to be continued for a longer time than is necessary for the complete removal of the acid: this is especially true when the treatment has been continued long.

The special interest of the matter exists in relation to the fact that, as strong sulphuric acid has been used on the large scale in the United States for delinting cotton seed, it is important to know what effect the treatment has in relation to the germination of the seed. It will be sufficient to state the conclusion of the matter shortly. When cotton is delinted in this way, the rate of germination is increased, the seed may be separated more easily into light and heavy seed, the possibility is brought about of using more improved machinery in planting, and lastly it is probable that any anthracnose spores on the seed are killed in the process. Further, it appears that the conditions which cause acceleration of germination are maintained when the seed is dried and stored after treatment.

A Machine for Separating Coir.

In the *Agricultural News*, Vol. XI, p. 68, an account was given of the way in which the fibre of the coco-nut (coir) is separated from the husk in Ceylon. According to the *Philippine Agricultural Review* for May 1912, several machines have been invented for the purpose, many of which are unsatisfactory. It gives a description, however, of one of the machines which is stated to be the best: this is made by Messrs. Larmuth & Co., Manchester, England.

It consists actually of a series of machines driven from one source of energy, and designed to deal with every process—from the crushing of the partially soaked husks to the final processes of weaving coir mattings and making cordage.

Described briefly, the apparatus is arranged as follows. The husks are split into four parts, each of which is fed separately to the crusher, where the fibre is loosened from the cellular tissue that holds it together. The husks that have been through the crusher are held against the first scutch wheel, the two halves of each piece being cleaned separately, and each piece being passed through the wheel two to four times. The succeeding stage is similar to the last, a wheel provided with finer teeth, called the second scutch wheel, being employed.

The fibre then reaches the first card, where it is cleaned and straightened, and then further cleaned by passing through a machine consisting of a revolving drum, where dust and other foreign matter are eliminated. The preparation of the fibre for its final treatment is conducted in a second card, and after this it is ready to pass into the spinning and weaving machinery, where it is made into the article for which it is intended.

It may be stated that a description of the machines made by this firm is given in *Coco-nuts, The Consols of the East*, by H. H. Smith and F. A. G. Page, just issued.

Soil Bacteria and Evaporation.

The results of experiments regarding this matter are presented in Research Bulletin No. 23 of the Wisconsin Agricultural Experiment Station. In summarizing the information given, the necessity is stated for caution in interpreting the results, for the conditions prevailing in the experiments could only imitate approximately those obtaining in the field. They seem to be sufficient to show that the movement of soil water is not only dependent on gravitation surface tension, capillarity, temperature and viscosity, and on the chemical and physical composition of the soil, but upon the life-processes that are taking place in it.

Bacterial activities cause changes in the quantity and quality of the substances dissolved in the soil water, and these changes help to alter the distribution of the water in the soil.

This alteration in distribution is brought about chiefly by changes in the surface tension of the soil moisture, owing to bacterial activity, and the water moves from places of lower tension to those of higher tension, in accordance with the tendency to distribute itself uniformly throughout the soil. If in the upper layers of the soil, soluble substances are being produced, the surface tension of the water there is increased, and water will travel upwards; if on the other hand, substances are produced which cause a reduction of surface tension (such as those originating in the decomposition of certain proteids or carbonaceous materials), they have the effect of bringing about a movement of water away from the upper layers of the soil.

Another factor which undoubtedly increases the surface tension is the production of carbon dioxide by bacteria; this dissolves in the water and increases its ability to dissolve other (mineral) substances, so that the surface tension is increased.

The broad conclusion of the matter is presented in the Bulletin as follows: 'In general then, it would appear from the experiments that the soil bacteria and their activities are factors which must be considered when discussing the movement of soil water: not so much because of the cells themselves as because of the by-products which they form and the subsequent influence of the same upon such factors as surface tension, capillarity, viscosity, etc. of the soil moisture. The biological feature of the soil apparently forms an important contributory factor in determining the movement of soil water.'

INSECT NOTES.

THE COTTON WORM IN THE UNITED STATES IN 1911.

In a recent number of the *Agricultural News* (see Vol. X, p. 378) reference was made to a general outbreak of the cotton worm (*Alabama argillacea*) in the cotton-growing districts of the United States. It was mentioned that Mr. W. D. Hunter, who is in charge of the southern field crop insect investigations of the Bureau of Entomology of the United States Department of Agriculture, was endeavouring to account for the unusual occurrence of this insect on the theory that it had invaded the Southern States by migration from Mexico and perhaps also from the West Indies.

At a meeting of the American Association of Economic Entomologists at Washington, D.C., in December last, Mr. Hunter read a paper on the Outbreak of *Alabama argillacea* in 1911, which has been published in the *Journal of Economic Entomology*, Vol. V, p. 123. The following items are abstracted from Mr. Hunter's paper and the report of the discussion which followed its reading.

For nearly a quarter of a century there has been no serious outbreak of the cotton worm in the cotton belt of the United States until 1911, and as a result many planters were not familiar with this insect. The reserve stocks of Paris green and other arsenicals throughout the South had become much reduced, and when the outbreak of the cotton worm became general the demand for arsenicals became very great, many of the larger factories in different parts of the country running night and day.

The earliest seasonal record for this insect in 1911 was received from Brownsville, Texas, which is on the Mexican border, and at two near-by points in Mexico. As early as June 10, the greater number of cotton fields in this district were almost entirely stripped of their foliage. In Louisiana and Mississippi, defoliation of cotton fields began to be reported about the middle of July. In the eastern part of the cotton belt, this condition was observed in August and September.

It is concluded that the outbreak of 1911 started from two infestations, one apparently unimportant, in the eastern part of the cotton belt, another of greater importance in southern Texas, which began in Mexico, but it does not seem that the occurrence of the cotton worm throughout the cotton belt could be explained on the theory that these two infestations had spread and eventually coalesced. At widely separated points extending far to the north of the latitude in which this insect breeds, large swarms of cotton moths appeared almost simultaneously between September 19 and October 29. It is stated that the occurrence of these enormous numbers of moths toward the end of the season and the rapid increase of the caterpillar shortly before that time were due to invasion of moths from South America through Mexico or over the Gulf of Mexico.

Rather complete and full records exist of the depredations of the cotton worm from 1793 to 1881. These contrast strongly with the meagre accounts of this insect in more recent years, when by the use of arsenical insecticides and changed plantation methods the effects of cotton worm attacks have been much modified.

In 1846 the theory was advanced that severe attacks of the cotton worm occurred once in twenty-one years. The records show that in the years 1783, 1804, 1825, 1846, 1868, 1890, and 1911 there have been severe and general outbreaks of this insect, while in other years the attacks have often been severe in localities but not general throughout the cotton belt, with the exception of one that occurred in 1872-3. Two of the periods indicated by the figures given are of twenty-two years while the others, it will be observed, are of twenty-one years each.

Another point of interest which was brought out in the discussion of Mr. Hunter's paper had to do with the food plant of the cotton worm, and its native home. So far as is known at the present time, the only food plant of the cotton worm is cotton, and it is not believed that this insect can live and go through its developmental changes to maturity on any other plant. It is known that the native home of the cotton worm is somewhere south of the United States, probably South America, and it seems to be the opinion among those entomologists who have studied the subject that this insect is incapable of passing the winter in the United States. In that case it is necessary that an invasion of moths should take place each year before any caterpillars can appear in the cotton fields

This being so, may it not happen that the severe outbreaks of cotton worm in the Lesser Antilles follow invasion of the moths from South America?

These invasions are probably not from the same sources as those in the United States which cause the first attacks there, since in these islands the cotton worm is seldom if ever to be seen in the field in numbers before the last week in September. This date would, however, coincide closely with that at which the great flights of moths were recorded in 1911.

If, on the other hand, the severe outbreaks of cotton worm in these islands, in certain years, are to be accounted for by invasions of moths, it is difficult to understand why the island of St. Vincent should have escaped and not have experienced a single attack during the past ten years, when in the Grenadines, St. Lucia, and Barbados there have been, during this time, several seasons in which this pest has been present in enormous numbers.

A Weevil Enemy of Caravonica Cotton.—According to the *Experiment Station Record* (Vol. XXVI, No. 4, March 1912) a weevil has attacked Caravonica cotton in Morogoro, German East Africa. The habits of this weevil and the injury caused by it are similar to those caused in the United States by the Mexican cotton boll weevil (*Anthonomus grandis*).

The description of this pest, which appeared in *Pflanzer*, 7 (1911) No. 514, p. 18, was by H. Morstatt.

Caterpillars Eating the Grass of Lawns.—Mr. J. C. Moore, Agricultural Superintendent, St. Lucia, in a letter to the Imperial Commissioner of Agriculture, states that caterpillars have done considerable damage by feeding upon the grass of the lawns at the Botanic Gardens. Specimens of the caterpillars, and of the moths bred from them, have been forwarded for identification.

Mr. Moore finds that a spray of Paris green in water kills the caterpillars, and does not burn the grass much.

This insect is similar to, if not identical with, a small moth of the family Pyralidae, reported by Mr. Patterson as doing similar damage at the Agricultural School in St. Vincent.

In St. Vincent, the grass-eating caterpillars were extensively parasitized by *Spilochalcis femoratus*.

SOME CONSIDERATIONS REGARDING VENTILATION.

The subject of ventilation is treated in an original manner in a paper read recently before the Royal Society of Arts, the authors being Leonard Hill, M.B., F.R.S., and Martin Flack, M.A., M.B., B.Ch. It was printed, with the discussion, in the *Journal of the Royal Society of Arts* for February 9, 1912.

The paper commences by pointing out that, though the good effects following efficient ventilation and open-air treatment are generally attributed to the chemical purity of the air, they are due really to the: 'movement, coolness, relative humidity of the air, and to the ceaseless variation of these qualities.' The ventilating engineer and the heating engineer have sought to make conditions more comfortable, the first by the supply of chemically pure air, the second by heating the air to a uniform temperature; whereas their real aim should be to provide air: 'which is cool, of proper relative humidity, and which moves so as to vary the cutaneous state of the body.'

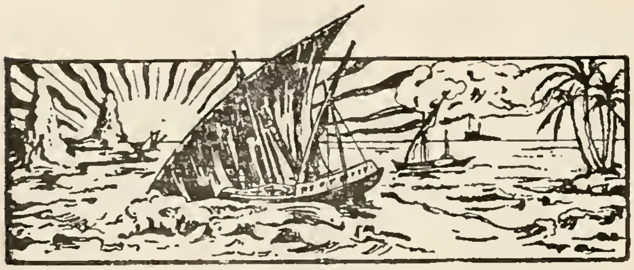
In considering the chemical purity of the air, three matters may be kept in view: the concentration of carbon dioxide, the concentration of oxygen, and the supposed exhalation of organic poison in the breath. As regards the first, from the fact that the percentage of carbon dioxide in the air of factories must be kept exceedingly low, it is the general idea that the presence of the gas in any proportion greater than that percentage causes the air to be poisonous. Actually, the truth of the matter is quite otherwise, and this is easy to see when it is considered that the percentage of carbon dioxide in the air of the lungs is always about five—a percentage very much higher than the amount that it is not legally permissible to exceed. It follows that it is impossible for a person to breathe more carbon dioxide than is good for him, even in the worst ventilated room. Examples are given, further, to show that in nature the movements of animals, and the postures in which they rest, are governed by considerations of warmth and moisture of the air, and not by the circumstance of the percentage of carbon dioxide that it contains. Evidence in the same direction is also adduced from the fact that workers in breweries, divers in diving dresses, and those who work in compressed air caissons, where the percentage of carbon dioxide is always comparatively high, do not suffer from this condition. 'It results, then, from what we have said, that concentrations of carbon dioxide, such as occur in the most crowded and worst ventilated rooms, are of no account.'

It is convenient now to discuss ventilation in regard to the percentage of oxygen in the air. As is stated in the paper, the oxygen in the worst ventilated school-room, place of worship, or theatre, is never lessened by more than 1 per cent. of an atmosphere. Attention is drawn, again, to the circumstance that the concentration of oxygen in mountain health resorts, and in the towns on the high plateaux of the Andes, is reduced to a much greater amount than this, and yet the visitors and inhabitants do not suffer in any way from this cause. Further, experiments have been made in which persons have been confined in an air-tight chamber in which the oxygen was gradually reduced to about 16 per cent., and there was 3½ per cent of carbon dioxide present, when no discomfort was suffered by them although the proportion of oxygen in the air was too low to enable them to light a match and smoke a cigarette. Investigations of the kind have shown that it is only when the oxygen is reduced below a pressure of 11 to 15 per cent. of an atmosphere that signs of its want appear. 'A diminution of 1 per cent. of an atmosphere has not the slightest effect on our health or comfort.'

As it is must be concluded that ventilation is required neither to take away carbon dioxide nor to restore oxygen, the third of the causes mentioned above, of discomfort in crowded places, has been adduced, namely the presence of organic chemical poisons that have come from the human breath—poisons whose presence is said to be proved by the existence of the smell or 'fugg' in such places. In actual circumstances, those inside the room, helping to make the 'fugg', are unaffected by it, while it is only those who enter from outside who are likely to remark it. Examples are given which show decisively that, in general, the dislike of a smell arises rather from its unaccustomed nature than from any poisonous quality. In a more exact way, the supposed existence of organic chemical poisons in expired air is based upon experiments of Brown-Sequard and d'Arsonval, who injected into guinea pigs and rabbits either water condensed from the breath or water that had been used several times to wash out the windpipes of dogs; when the animals showed signs of illness, collapse and death. Other investigators, among whom are those possessing the best methods of work, have not confirmed these results. It seems that the injected water contained traces of the proteins of the saliva, so that an anaphylactic shock was produced in the animals after a second injection; this means that the animals had become sensitised by the first injection, and were therefore poisoned by the subsequent injection of the proteid, which was foreign to them, in the saliva. Confirmation of the supposed poisonous nature of breath has been alleged to have been obtained by the injection into a mouse of 1 or 2 c.c. of condensation water obtained by breathing through a cooled flask. As the mouse weighed about 13 grams, this was equivalent to injecting about 9 pints of water into a man weighing just over 140 lb., so that small wonder may be felt that the animal became ill. The experiment with the mouse is discredited further by the fact that the same symptoms may be produced by injecting a similar quantity of pure water alone. 'Such experiments are ridiculous, and deserve not a moment's attention.' After dealing further with the matter, the authors proceed to say: 'After studying the literature on this subject we are convinced that there is no positive evidence which demonstrates the poisonous nature of the condensation water obtained from the breath. We go further and say there is at present no trustworthy evidence of the existence of any such poison in the exhaled air.'

The real cause of discomfort in crowded rooms arises in the following way. The air actually in contact with the bodies of the persons in the room is confined by the clothes and becomes almost as warm as the body, and saturated with moisture, so that perspiration, wetness and flushing of the skin, and a rise of its temperature, are brought about. Under the conditions, the blood is kept near the outside of the body, and does not pass in proper proportion through the brain and internal organs. On the other hand, the feelings of discomfort and fatigue do not arise if this 'blanket of stationary wet air' is prevented from forming by causing a proper amount of movement of the air, by fans or otherwise.

The paper presents an account of many interesting observations in support of the supposition that discomfort is caused by excessive heat and humidity of the air, and not by excess of carbon dioxide or want of oxygen, and concludes by making valuable suggestions as to the use of ozone for improving conditions where there is not free natural movement of the air.



GLEANINGS.

A report from Nevis shows that welcome rains fell during the early part of last month, and that there has been much improvement in the condition of the crops. Cotton-planting had been carried on vigorously, and good stands had been obtained, but want of rain was indicated at the end of the month.

Statistics supplied by the Malay States Information Agency show that the export of plantation rubber from the Federated Malay States for last June was 2,305,915 ℔. The total shipments for the first six months of this year amount to 15,382,265 ℔.; in the corresponding period of last year they were 8,349,397 ℔.

A note in the *Journal d'Agriculture Tropicale* for March 1912 mentions a wax that is obtained from a kind of banana plant growing in Java. In preparing this the leaves are scraped, and the scrapings are thrown into boiling water. The wax has a melting point of 79° to 80 C.: its specific gravity varies from 0·963 to 0·970. It is insoluble in alcohol, but dissolves in boiling turpentine.

A total of 10,885 plants was distributed from the St. Lucia Botanic Station during July. These included limes 10,350, cacao 350, oranges 20 and mangoes 12, and there were in addition 41 packets of miscellaneous seeds and 1½ ℔. of papaw seeds, the distribution of the last being in connexion with the late increase of interest in the production of papaïn, in the West Indies.

Information received from St. Kitts shows that the reaping of the sugar-cane crop of last season is almost complete on the estates sending cane to the Basseterre sugar factory; an output of about 3,800 tons was expected. In the northern districts the reaping was not as advanced, but better returns were being obtained. There had been no increase in the incidence of rind fungus.

Among laws of agricultural interest that have been enacted in Jamaica during the present year, there are included Laws 6, 11, and 17. These are entitled, in order, A Law for the Encouragement of Agricultural Loan Societies, A Law to prescribe a Measure to be used in the purchase of Citrus Fruits by Licensed Produce Dealers and A Law to prevent the Introduction and Spread of Plant Disease.

The *Philippines Free Press* of March 30 presents an account of a modern sugar factory giving a daily output of about 14,000 ℔. of 96° crystals that has been erected recently at Talisay, Negros Island. It is proposed to erect one three times as large at Bago. There has also been built a modern mill at San José, in the island of Mindoro. It may be mentioned that an account of the sugar industry of Negros was given in the *West Indian Bulletin*, Vol. XI, p. 207.

According to *Diplomatic and Consular Reports*, No. 4875 Annual Series, the crop of Tonka beans (*Dipteryx odorata*) in Venezuela for 1911 was relatively small, and it is expected that the return for the present year will be somewhat low, as well. Prices are therefore very high, the quotation being about £1 5*s*. per ℔. It is expected, however, that next year will be productive, for by that time the trees will have had an opportunity to have recovered from the exhaustive crop of 1909, which was very large.

During last month, the Agricultural Superintendent, St. Vincent, paid a visit to Arnos Vale estate in that island in company with the Government Veterinary Surgeon, in an endeavour to determine the plant or plants that had apparently caused recently the poisoning of horses and donkeys on the estate. It is of interest, in relation to articles and notes that have appeared in the *Agricultural News*, Vols VIII, pp. 222, 261, 363 and 415, and IX, p. 124, that no plant was found to which suspicion may be attached, except the wild ipecacuanha (*Asclepias curassavica*).

It is believed that, in the neighbourhood of Quilimane, Portuguese East Africa, no less than 2 million coco-nut palms are possessed by three large agricultural associations, and one-fifth of these are now coming into bearing. According to *The Board of Trade Journal* for May 23, 1912, it is expected that the export of copra from the Port of Quilimane should reach an annual value of at least £100,000 in the next few years. It seems that, as regards East Africa, the latitude of the mouth of the Zambesi is the most southerly limit for productive coco-nut growing.

A note on the first meeting of the British Imperial Council of Commerce was given on page 296 of the last volume of the *Agricultural News*. At the Eighth Congress of Chambers of Commerce of the Empire, held recently, the following resolution was adopted: 'That this Congress welcomes the establishment of the British Imperial Council of Commerce representing the Chambers of Commerce and Boards of Trade of the Empire as being a permanent link between such bodies, and as a means of giving greater effect to the resolutions of successive Congresses.'

As was stated in the *Agricultural News*, Vol XI, p 183, the champak tree (*Michelia Champaca*) is growing in the St. Vincent Botanic Garden. With regard to this interesting plant, the *Bulletin of the Imperial Institute*, Vol. X, p 148, presents a note on work that has shown the necessity, when it is intended to obtain the oil, of distilling the flowers immediately after gathering; on standing, they rapidly became dark coloured, possibly owing to the action of an oxidase, and less fragrant. The original paper forming the subject of this note appeared in the *Philippine Journal of Science*, 1911, A, p. 332, and this contained particulars of the cultivation, growth and dimensions of the champak.

STUDENTS' CORNER.

AUGUST.

SECOND PERIOD.

Seasonal Notes.

Where green dressings are employed in lime and cacao cultivations, they should be sown during the present quarter, as soon as sufficient rain has fallen to bring about the germination of the seed; this early planting will ensure their quick growth, so that they will be able to 'smother' the weeds that would come up otherwise in their place.

Mention the advantages, and any disadvantages, in connexion with the employment of green dressings, under conditions with which you are familiar. State what plants you have found most useful under those conditions, giving reasons why they have proved themselves the most useful.

In lime plantations, scale insects are generally seen to be plentiful at the end of the dry season. They tend, however, to disappear with the advent of the rains. What is the reason for this disappearance? Give an account of any observations that you may have conducted for the purpose of observing the cause. How may what you describe be employed in practical agriculture as a means for controlling scale insects? Do you know of any animal parasites that are effective in reducing the numbers of these insects, as well as of insects related to them?

Where it is intended to extend cacao or lime cultivation, the new plants should be put in at an early date in order that they may become properly established before the dry season sets in. Describe what happens in the case of a plant which has commenced the renewal of root growth under favourable conditions of rainfall, when there follows a cessation of these conditions for some time.

At the present time, lime plantations in which the trees have reached maturity should be free from weeds and should have commenced to bear ripe fruits. Preparation will have been made for crushing, where lime juice and citrate of lime are produced. In the manufacture of these, it may be possible to obtain interesting results in connexion with the relation between the yield of lime oil and of raw juice, and the state of maturity of the fruit that was employed. Where trees in different areas show great variation in vigour of growth and freedom from disease, an opportunity may be given for finding any connexion that exists between the state of the trees and the yield of the products that are obtained finally from them. In such work, a knowledge of the way to determine the percentage of citric acid in the juice is of the greatest assistance toward obtaining useful results.

In cacao cultivations, a constant watch should be kept as regards the state of health of the trees, and the observations will be employed chiefly in regard to the possible spread of canker and new outbreaks of root disease.

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) Why is it necessary to drain the soil?
(2) Why is the soil turned over from time to time?
(3) Give a list of the ways in which plants may be reproduced vegetatively.

INTERMEDIATE QUESTIONS.

(1) State shortly the results of draining a soil, dealing with the effects in the soil alone.

(2) What benefits arise from forking the soil? What is the best time of the year for forking, under the conditions in which you are gaining your experience?

(3) What is likely to be the effect when a plant is propagated vegetatively for a long period of time?

FINAL QUESTIONS.

(1) Give a description of a system of drainage to be employed on a hillside, under stated conditions

(2) What circumstances, other than the time of removal of crops, decide when the land should be forked or ploughed?

(3) It is often stated that uniform plants are always obtained by continued vegetative reproduction. Criticise this statement.

AGRICULTURE AND THE BRITISH ASSOCIATION, 1912.

The first meeting of the new section of the British Association—Section M (Agriculture)—promises to be of very special interest and importance to the great industry which it is designed to help by the promotion of science in this direction. The district round Dundee is famous for more than one branch of farming, which has been carried to a high degree of perfection, and the following programme shows that the local interests have been made a special feature. On Thursday, September 5, the presidential address will be given by Mr. T. H. Middleton. The remainder of the day will be devoted to papers dealing with milk. On Friday, September 6, Mr. R. H. Rew of the Board of Agriculture will read a paper on the sources of the nation's food supply, and Major P. G. Craigie, C.B., will contribute a paper on Scottish agricultural production—half a century's changes. A paper will also be contributed by Professor J. Wilson, on a consideration of the profits realized from the usual field crops, more especially from temporary pasture. The remainder of the day will be devoted to two special papers on the agriculture of the district. On Monday, September 9, a joint meeting will be held with the Meteorological Department of Section A, the subject being the connexion between meteorology and agriculture. Dr. W. N. Shaw, F.R.S., will read a paper on the practice of cultivation in relation to our knowledge of climate and weather, and Mr. A. Watt, Secretary of the Scottish Meteorological Society, will open the discussion. Other general papers on this day will deal with the action of quicklime on soil, studies on nitrogen fixation, the rate of evolution of hydrocyanic acid from linseed, the influence of origin and topography on grass lands, and the problem of disease resistence. On Tuesday, September 10, will be held a joint meeting with Section I (Physiology) on the important subject of nutrition. The discussion will be opened by Professor F. G. Hopkins, F.R.S., and continued by Professor Leon Asher (Berne), Dr. E. P. Cathcart, Dr. C. Crowther, Dr. Leonard Hill, and Dr. Martin Flack, Professor J. J. R. Macleod (United States of America), and Professor T. B. Wood. This is the first time within recent years—if not the first time at all—when the practical feeder and the physiologist have met, and when the stores of knowledge and experience of the practical man have been drawn upon by the man of science. (*Nature*, July 11, 1912.)

FUNGUS NOTES.

MISCELLANEOUS INFORMATION.

In the following article a few miscellaneous points of interest will be dealt with relating to the occurrence of different species of fungi in the islands.

ENTOMOGENOUS FUNGI In a communication recently received from the Agricultural Superintendent in St. Lucia it is stated that the white-headed fungus (*Ophionectria coccicola*) parasitic upon scale insects was particularly prevalent in the southern district of that island during the month of July, so much so that its presence caused some alarm until its usefulness was indicated It is perhaps hardly necessary to point out that this fungus has never been known to cause any damage to plants and that its activities are entirely confined to the insects upon which it lives. In other parts of the island, particularly in the northern district, it was entirely absent. It has been established artificially at the Experiment Station and upon a neighbouring estate, and since this is so, it would appear that the fungus might also be introduced into other districts where it is not at present found. The Assistant Agricultural Superintendent has provided the information that artificial inoculation is greatly assisted if the inoculated trees are sprayed with water every morning and evening for a week after the infected leaves have been tied in, more especially in dry weather. The presence of the fungus would appear from the information given to be largely dependent on the moisture conditions, since the rainfall at the southern end of the island is usually higher than at the north. Generally speaking, however, the conditions in St. Lucia are very favourable to the development of the fungus parasites of scale insects. Besides the white-headed fungus (*Ophionectria coccicola*) and the three other species of scale insect parasites that have been known to be present for some time, there are also two species of Aschersonia. One is *A. turbinata*, that lives probably upon the mango shield scale (*Coccus mangiferae*). It was referred to in the *Agricultural News*, Vol. X, p. 190, under the name *Hypocrella oxyspora*, but according to information received from Mr. Petch, the Government Mycologist in Ceylon, this name is incorrect. The other species is as yet unidentified, but it was found to attack a species of Coccus on rose apple (*Eugenia Jambos*) growing by the roadside in the Forestière district. It appeared to attack also specimens of the glassy star scale (*Vinsonia stellifera*), which was common on the leaves of the plant, but this was not actually the case.

RED RUST OF LIME LEAVES. Some specimens of lime leaves have recently been received from St. Lucia which showed peculiar raised rusty-brown patches on their upper, and occasionally on their lower, surfaces. The patches varied in size from 1 to 5 mm., and on examination with a hand lens were seen to be covered with fine red hairs, each of which terminated in a small round knob. The patches are caused by the flat plates of an alga belonging to the genus Cephaleuros. This minute plant, although it is provided with chlorophyll and can obtain its own carbon-supply, is undoubtedly parasitic upon the leaves, but the injury it inflicts is confined to the tissues immediately below it and it probably does not interfere with the normal functions of the leaves sufficiently to cause any serious damage. In the cells forming the terminal knobs that arise from the surface of the plate, motile zoospores are produced, which are liberated and germinate when the surfaces of the leaves are moist, and thus produce new algal plates. The same or a similar species has been previously recorded upon different kinds of Citrus in Grenada. The record is of interest because an allied species (*Cephaleuros mycoidea*) is responsible for the 'red rust' of tea bushes in India. There, the alga occurs on the leaves and young twigs, on the latter of which it forms bright-red patches that cause the serious injury to the bushes. The presence of the alga on the leaves is not of any great importance. As far as is known at present, the local species has not been observed to attack Citrus twigs, and is probably of but little economic importance.

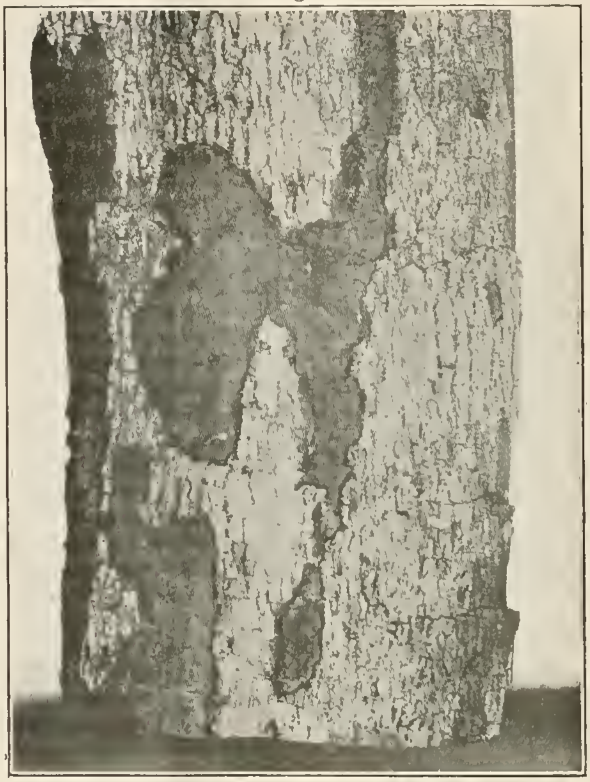


Fig. 7. Eutypa Caulivora on Hevea.

BLACK ROOT DISEASE. It has recently been determined that *Rosellinia bunodes*, the fungus causing black root disease of limes, cacao, and pois doux (*Inga laurina*) in Dominica, occurs in Grenada, where it was first found on Castilloa plants. It has been recorded in the same island on the pigeon pea and more recently on young camphor plants. The species of Rosellinia responsible for cacao root disease in St. Lucia is different from *R. bunodes*, as the perithecia are much larger and are, moreover, smooth and dark-brown rather than black. The identity of the St. Lucia species is at present undetermined, as none of the perithecia examined were mature and no spores have been found in them. A new host plant, the horse bean (*Canavalia ensiformis*) has been lately recorded for this parasite. It would appear from the number and varied nature of the plants that have been found to be attacked that almost any plant whose roots were in contact with infected material might succumb to this disease. An outline of the treatment to be given in cases of this and similar diseases has already appeared in the *Agricultural News*, Vol. XI, p. 190, and experiments are in progress to test some other methods.

EUTYPE ERUMPENS. This fungus has been responsible for the death of evergreen trees (*Ficus* spp.) in Trinidad, Barbados, and recently Grenada. As the trees die, large black patches of a hard, charcoal-like substance burst through the bark on the trunk, main branches and exposed portions of the roots. (See *Agricultural News*, Vol. VIII, p 62.) These patches may be as much as 6 inches or more in diameter. Fig. 7 shows similar patches formed by *E. caulivora* on the stem of a Hevea rubber tree, in the Straits; it is reproduced from the *Kew Bulletin*, 1910, p. 251.

Inside the black crust are numerous small perithecia provided with long necks that open on to its surface. Large numbers of unicellular smoky spores are formed in the perithecia and are extruded through the necks. The fungus is probably a wound parasite. It does not kill the tree rapidly; and as it is entirely confined to the inner tissues, its presence is not apparent until the hard, black plates are formed as the tree is dead or dying. Probably if dying limbs were removed from evergreen trees as they make their appearance, some trees might be saved, but where infection is in the trunk itself, perhaps near the ground level, nothing much can be done. Dead trees should be removed and burned as soon as the black plates appear. Besides evergreens, nutmegs and cacao are sometimes attacked, while the fungus can apparently live as a saprophyte on dead stumps, for a species—probably this—was found in St. Lucia on the stumps of a cacao tree killed by root disease.

FUNTUMIA IN DOMINICA.

A communication has been received from the Curator of the Botanic Gardens, Dominica, which presents the results of the tapping of eight-year-old trees of *Funtumia elastica* on two estates in Dominica, during the second week in April 1911.

In one case, there were sixteen trees with an average measurement at the base of 22·3 inches, and at 3 feet from the ground of 19·7 inches, which yielded 17 oz. of cured rubber. In the other case, the number of trees was eight, with a base measurement of 24 inches, and 3 feet from the ground of 21·8 inches; these yielded 9 oz. of cured rubber. It is seen that in each case the yield obtained was slightly over 1 oz. per tree.

The methods employed were thoroughly to tap the trees on the herring-bone system, and to coagulate the latex by boiling. In a subsequent tapping conducted fourteen weeks later, a very small amount of latex wasobtained.

A sample of rubber prepared from *F. elastica* in Dominica has been analyzed at the Government Laboratory, Antigua, and gave the following results:—

	Sample as received, per cent.	Dry rubber, per cent.
Moisture	5·6	0·0
Caoutchouc	82·3	87·2
Resin	11·7	12·4
Protein	0·4	0·4
Insoluble matter	0·0	0·0
Ash	0·5	0·5

The report on the product stated: 'the rubber was very elastic and tenacious, and free from tackiness. When dried it showed a good light-brown colour.'

TURMERIC.

This plant [*Curcuma longa*] which is indigenous to many hot countries, is in general cultivation throughout the Eastern Tropics, and is in large use by the natives of the islands of the Pacific. The virtue of the plant, for all the various purposes to which its product is put, lies in the mature tubers. These vary a good deal in size as well as form, according to species, the prevailing shape being oblong; but in colour they are all more or less of a grey or greenish-yellow externally, and of an orange yellow inside.

The chief use, probably, to which this product is put in the economy of the arts is as a condiment and a colouring matter in culinary preparations. Its use as an ingredient of curry powder is well known, and to the presence of turmeric is probably due much of the wholesomeness of curries. Its remaining uses are in the manufacture of yellow varnishes, and, in the form of turmeric paper, as a chemical test for the presence of alkalis, which change its yellow colour to a reddish-brown.

The cultivation of turmeric is as simple as, and much resembles, that of ginger. It likes a rich and light soil, and is planted, in the form of fragments of the roots, in rows 1 foot or more apart. Others plant in beds 3 feet wide, with furrows intervening 12 to 18 inches apart, or in drills 8 inches apart. After the land is well prepared by digging, a layer of fresh vegetable or animal manure is laid on the surface, and the 'roots' then dibbled in. When the plants are about 8 inches high they should be earthed up to keep the young formed tubers well covered, and they then require little further attention until fit for harvesting in the cold season. The tubers mature in about six months; but are fit for use, fresh, in three months or less.

An acre properly cultivated will yield about 2,000 lb. of fresh roots. The tubers should be dug as soon as the stems fade. They are prepared for market by drying in the sun, being previously scalded to assist in destroying their vitality. (The *Queensland Agricultural Journal*, June 1912.)

During 1911, interesting experiments were carried out at the Nantwich and Acton Grammar School with the object of ascertaining if seed for sowing could be made distasteful to birds. For the purpose, rye seed was treated in the following different ways: (1) rubbed in red lead; (2) soaked in a 10-per cent. solution of bluestone (copper sulphate); (3) soaked in kerosene. Other seed received no treatment, and was left as a control. After the seeds were sown, part of each lot was protected from birds by means of black thread. In the result, it was shown that the treatment afforded little or no protection, for the rye under the black thread came up well, whereas few plants were obtained where no threads were used. Another test, employing oats soaked in bitter aloes had already shown that this treatment is useless for the purpose.

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR, July 30, 1912; Messrs. E. A. DE PASS & Co., July 19, 1912.

ARROWROOT—$3\frac{11}{16}d.$ to $4\frac{3}{4}d.$
BALATA—Sheet, 3/7½; block, 2/5 per lb.
BEESWAX—No quotations.
CACAO—Trinidad, 68/- to 85/- per cwt.; Grenada, 61/- to 68/-; Jamaica, 59/- to 68/-.
COFFEE—Jamaica, 69/- to 79/- per cwt.
COPRA—West Indian, £26 5s. per ton.
COTTON—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 14¼d. to 22d.
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—49/- to 65/- per cwt.
ISINGLASS—No quotations.
HONEY—25/- to 34/-
LIME JUICE—Raw, 1/11 to 2/1; concentrated, £18 12s. 6d. to £19; otto of limes (hand pressed), 7/6.
LOGWOOD—No quotations.
MACE—5d. to 1s.
NUTMEGS—5d. to 1s.
PIMENTO—Common, $2\frac{7}{16}d.$; fair, 2½d.; good, $2\frac{5}{8}d.$; per lb.
RUBBER—Para, fine hard, 4/11½; fine soft, 4/6; Castilloa, 4/2 per lb.
RUM—Jamaica, 2/- to 6/-.
SUGAR—Crystals, 16/6 to 18/6; Muscovado, 12/- to 15/-; Syrup, no quotations; Molasses, no quotations.

New York.—Messrs. GILLESPIE BROS. & Co., July 26, 1912.

CACAO—Caracas, 14½c. to 15⅛c.; Grenada, 14⅝c. Trinidad, 14c. to 14½c. per lb.; Jamaica, 11½c. to 13c.
COCO-NUTS—Jamaica, select, \$22·00 to \$23·00; culls, \$13·00 to \$14·00; Trinidad, select, \$22·00 to \$23·00; culls, \$13·00 to \$14·00 per M.
COFFEE—Jamaica, 14¼c. to 16¾c. per lb.
GINGER—8¾c. to 11½c. per lb.
GOAT SKINS—Jamaica, 50c.; Antigua and Barbados, 45c. to 48c.; St. Thomas and St. Kitts, 33c. to 44c. per lb.
GRAPE-FRUIT—Jamaica, \$3·50 to \$5·00.
LIMES—\$2·00 to \$6·12½.
MACE—No quotations.
NUTMEGS—110's, 12¼c. to 12½c.
ORANGES—Jamaica, \$1·75 to \$2·50 per box.
PIMENTO—2⅝d. per lb.
SUGAR—Centrifugals, 96°, 4·05c. per lb.; Muscovados, 89°, 3·55c.; Molasses, 89°, 3·30c. per lb., all duty paid.

Trinidad.—Messrs. GORDON, GRANT & Co., August 5, 1912.

CACAO—Venezuelan, \$16·00 per fanega; Trinidad, \$15·00 to \$15·50.
COCO-NUT OIL—88c. per Imperial gallon
COFFEE—Venezuelan, 17½c. per lb.
COPRA—\$4·50 per 100 lb.
DHAL—\$5·50.
ONIONS—\$2·00 to \$2·50 per 100 lb.
PEAS, SPLIT—\$7·25 to \$7·50 per bag.
POTATOES—English, \$2·75 to \$3·00 per 100 lb.
RICE—Yellow, \$4·80 to \$5·00; White, \$6·25 to \$6·35 per bag.
SUGAR—American crushed, no quotations.

Barbados.—Messrs. JAMES A. LYNCH & Co., Ltd., August 10 1912; Messrs. T. S. GARRAWAY & Co., August 12, 1912; Messrs. LEACOCK & Co., August 2, 1912.

ARROWROOT—\$7·00 per 100 lb.
CACAO—\$12·00 to \$13·50 per 100 lb.
COCO-NUTS—\$20·00.
HAY—\$1·70 to \$1·80 per 100 lb.
MANURES—Nitrate of soda, \$65·00; Cacao manure, \$45·00 to \$48·00; Sulphate of ammonia, \$80·00 per ton.
MOLASSES—No quotations.
ONIONS—\$2·25 to \$2·75 per 100 lb.
PEAS, SPLIT—\$6·90 to \$7·00 per bag of 210 lb.; Canada, \$3·00 to \$5·30 per bag of 120 lb.
POTATOES—Nova Scotia, \$4·50 per 160 lb.
RICE—Ballam, \$5·20 to \$5·30 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
SUGAR—American granulated, \$5·00 per 100 lb.

British Guiana.—Messrs. WIETING & RICHTER, August 3, 1912; Messrs. SANDBACH, PARKER & Co., August 2, 1912.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	—	—
BALATA—Venezuela block	No quotation	Prohibited
Demerara sheet	76c. to 77c. per lb.	—
CACAO—Native	14c. per lb.	14c. per lb.
CASSAVA—	\$1·20.	No quotation
CASSAVA STARCH—	\$7·50	No quotation
COCO-NUTS—	\$16 to \$20 per M.	\$10 to \$16 per M., peeled and selected
COFFEE—Creole	18c. per lb.	19c. per lb.
Jamaica and Rio	21c. per lb.	21c.
Liberian	15c. per lb.	15c. per lb.
DHAL—	\$6·00 per bag of 168 lb.	\$6·00 to \$5·75
Green Dhal	\$5·50	—
EDDOES—	\$2·40	—
MOLASSES—Yellow	None	—
ONIONS—Teneriffe	—	—
Madeira	5c. per lb.	5c. to 6c.
PEAS—Split	\$6·75 to \$7·00 per bag (210 lb.)	\$7·15 per bag (210 lb.)
Marseilles	—	No quotation
PLANTAINS—	16c. to 48c.	—
POTATOES—Nova Scotia	—	\$2·50
Lisbon	\$2·25 to \$2·75	No quotation
POTATOES—Sweet, B'bados	\$3·60 per bag	—
RICE—Ballam	No quotation	—
Creole	\$6·00	\$6·00 to \$6·25
TANNIAS—	\$3·24	—
YAMS—White	\$2·64	—
Buck	\$4·24	—
SUGAR—Dark crystals	\$3·25 to \$3·40	\$3·25
Yellow	\$4·20 to \$4·25	\$3·00
White	\$4·00	—
Molasses	\$2·80	—
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	No quotation.

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AGRICULTURAL NEWS.

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

VOL. XI No. 270. BARBADOS, AUGUST 31, 1912. PRICE 1*d*.

CONTENTS.

The Stimulation of Plant Growth.

IT is usual to regard the function of manures as consisting in the direct provision of food to the plant: the agriculturist employs them because he considers that they supply substances required by the plant, in which the soil is lacking either on account of its peculiar nature or because the amount of those substances has been lessened by the growing of previous crops. Though the subject requires much further investigation, there appears to be little doubt that this is the right view of one of the functions of manures: an account that gives the chief observations and arguments that are in favour of this view has appeared previously,* and may be consulted if a summary of these is desired.

The question has been raised, however, as to the extent to which manures may simply stimulate the growth of plants: that is to say it has been asked if manures are capable of causing changes to take place in plants, which result in increased growth, without necessarily acting as providers of food. Investigations† have been undertaken recently that appear to constitute a preliminary step in obtaining an answer to the question, and it is the purpose of this article to give a general account of the work and of the conclusions to which it has led.

It has often been noticed that certain leaves, such as those of the cherry laurel (*Prunus Laurocerasus*)—a plant indigenous in Europe and Asia, although they do not possess any perceptible odour, under ordinary conditions, emit the vapour of oil of bitter almonds, as well as prussic acid, when they are crushed; the most delicate tests for this acid do not indicate its presence when the leaf is allowed to remain whole, in ordinary air. The same result as that obtained by crushing may be brought about in other ways, such as subjecting the leaf to the vapour of chloroform and many other volatile organic substances, including hydrocarbons, alcohols, ethers and essential oils; non-volatile substances, too, produce the effect, and the less soluble among them do this more readily

* *Agricultural News*, July 6 and 20, 1912, pp. 209 and 225.

† Professor Henry E. Armstrong, F.R.S., in the *Journal of the Royal Horticultural Society*, Vol. XXXVIII, p. 17 (July 1912).

than those that dissolve easily: 'so that, speaking generally, it may be said that the substances which penetrate most readily into the leaf tissues and produce effects such as have been described are those which are least readily soluble in water.'

What has been said makes it evident that the prussic acid and the oil of bitter almonds do not exist in the leaf until the influences mentioned have been brought to bear. The actual process is that a substance (prunasin) belonging to the class of bodies called glucosides is caused to break up and, with the aid of water, to form those compounds, together with the sugar glucose. This decomposition is brought about by the action of an enzyme, or unorganized ferment, in the cell sap, which is probably, under ordinary conditions, separated from the glucoside by a membrane through which it cannot pass. The 'stimulus' for the decomposition caused by the substances mentioned would then consist in their power to enable the enzyme to pass through the membrane.

Other interesting observations connected with the matter have been the outcome of experimentation, but it will be sufficient here to allude to the work of Professor H. E. Armstrong and Dr. E. F. Armstrong, his son, which has shown that plants are provided with membranes which allow certain substances, including water, to pass, but are not permeable by other substances; it is because of the possession in their cells of such membranes that leaves do not lose any of their contents even when they are washed by the heaviest rains. It has been proposed to apply the term Hormone to all substances that can penetrate those membranes, or differential septa as they are called, and further, the theory has been put forth that such substances exercise their disturbing influence, in the cells into which they have penetrated, by permitting the enzymes already present to become active.

The affair derives its practical importance from the power of plants to employ, as food, compounds that they have already built up in their cells. It seems that stimulation is required for this, in order that the enzymes may be brought into action and cause the production of substances that are carried to other parts of the plant, where they are wanted for growth. In nature, it appears that ammonia is the most active stimulant, while carbon dioxide also acts as a hormone.

The matter to which all this consideration has led is the question whether the soil, or manures, contains substances which may bring about such actions in the roots of plants. It is well known that, while ammoniacal manures, including pen manure, form some of the best manures when they are employed carefully, their use in large quantities or in a concentrated form, as for horticultural purposes, may actually kill the plants that they are intended to benefit. This is quite in accordance with what should be the effect of ammonia if it acts as a hormone, for the stimulating action of these bodies is only exerted when they are present in an amount below a low maximum—above this maximum they are poisonous. Further, an explanation is indicated of one of the reasons for using well-rotted pen manure in preference to the fresh dung: in the latter, the early changes due to putrefaction cause the ammonia to be liberated so quickly that it is harmful.

Some explanation of the beneficial effects on plant growth by the partial sterilization of the soil* has been sought in the supposition that the process results in the production of hormones such as ammonia which subsequently exert their stimulating action on the plants raised in the soil; a similar explanation is adduced for the better germination shown by seeds sown in partly sterilized soil. In either case, if the soil is sterilized by heating it very strongly, growth is made slower, and germination retarded,† at first, suggesting that the hormones are present in poisonous proportions after the treatment, and that these proportions decrease gradually to those in which the action is stimulating.

These matters serve as an addition to the many illustrations of the fact that the investigation of the relationships between the soil and the plant is of much complexity. The continuation of the work in connexion with them will doubtless give results of practical value in enabling the agriculturist to know more accurately how he may give the plants in which he is interested the conditions that will lead to their most economical productivity.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture returned to Barbados, from Dominica, by the S.S. 'Oruro' on August 22, 1912. It is expected that Dr. Watts will leave Barbados on August 30, by the S.S. 'Oruro', for the purpose of making an official visit to St. Vincent, and that he will return to Barbados by the S.S. 'Ocamo' on September 14.

**Agricultural News*, Vol. IX, pp. 17 and 33.
†*Agricultural News*, Vol. VIII, p. 281.

SUGAR INDUSTRY.

THE COST OF GROWING SUGAR-CANE IN CUBA.

In response to the numerous enquiries received by the Cuban Department of Agriculture, relative to sugar lands in that island, their production and the cost of planting and cultivation, the Chief of the Bureau of Information of the Department has issued a bulletin which, although it bears date of March 19, has just been given out.

In this bulletin is a table showing the cost of preparing and cultivating one acre of cane land in Cuba, which is reproduced below:—

PREPARATION OF LAND.			
Clearing land for ploughing	from $1·50	to	$10·00
Cost of first ploughing	4·00	,,	6·20
Cost of second ploughing	2·70	,,	3·00
Cost of harrowing	1·00	,,	1·25
Marking and cleaning	1·25	,,	1·65
	$10·45		$22·10
COST OF PLANTING.			
Cost of seed cane	$4·00	to	$5·00
Cost of hauling	0·50	,,	0·70
Cutting in pieces	0·50	,,	0·80
Distribution of same	2·50	,,	3·50
Covering	3·00	,,	3·80
	$10 50		13·80
COST OF CULTIVATION.			
First cultivation	$4·00	to	$4·50
Second cultivation	2·75	,,	3·10
Third cultivation	1·60	,,	2·00
Three cleanings	2·20	,,	3·00
	$10·55		$12·60
CUTTING AND HAULING TO MILL.			
Cutting and loading	$12·75	to	$18·00
Hauling	9 00	,,	18·00
	$21·75		$36·00
Total	$53·25		$84·50

According to the bulletin, when replanting is necessary, the work can be done at an expense ranging from $15 to $20 per acre. With land producing 60,000 arrobas of cane (1 arroba is equivalent to 25 ℔.) per caballeria (1 caballeria equals 33⅓ acres) [about 20 tons per acre], the crop lasting six years without replanting, the results would be approximately as follows:—

Cost of making and harvesting first crop, per acre	$ 60·00
Cost of making and harvesting 5 subsequent crops at $40 per acre	$200·00
	$260·00
Yield of 6 years to grower, or 2,605·44 ℔. at $2·80 = $72·95 × 6	$437·70
Gain in 6 years	177·70

Caballerias of good, new land often produce 100,000 arrobas of cane, and sometimes will not require replanting for fifteen or twenty years. If irrigation is available, and intensive cultivation is employed, it is possible to raise the production to 160,000 or even to 200,000 arrobas of cane to the caballeria [about 54 to 70 tons per acre]. (The *American Sugar Industry*, June 1912.)

CHARACTERISTICS OF A HYBRID HEVEA.

In the *India Rubber World* for July 1, 1912, the Editor, Mr. H. C. Pearson, gives a description of a visit made by him to the Boston estate, in Trinidad, when the opportunity was taken to make an examination of the two types of Hevea that are growing on that estate; these types are said to occupy the ground on the estate in about equal proportions.

The hybrid Heveas are stated firstly to be of lusty growth, full-branched and densely leaved, the leaves being much broader towards the apex than those of *H. brasiliensis*; further, the bark is exceedingly thin, having a thickness of only about ⅛-inch, and the latex gives a rubber that is very short and much inferior to fine Para rubber. The flow of this latex is succeeded by the oozing of a very sticky, yellowish-green resin. Dealing again with the bark, the surface shows characteristic differences, that of the hybrid possessing many minute spines, while the bark of *H. brasiliensis* is almost smooth, with small vertical ridges. The colour of the bark is also a distinguishing feature, being dark-red in the hybrid, as compared with the silvery appearance of the true Para rubber tree.

Another difference is constituted in the fact that the hybrid plants possess a full crown of bright-green leaves at a time when the leaves are falling, or have fallen, from *H. brasiliensis*. A difference also exists in relation to the seeds, those of the hybrid being the larger, squarer and lighter, though the seeds of both kinds are coloured similarly.

At the time of the visit, seedlings were being grown by the Trinidad Department of Agriculture in order to ascertain further points of distinction between the two kinds. So far it has been noted that the first ordinary leaves of the true plant hang vertically, while those of the hybrid take up an almost horizontal position; it is probable, too, that the venation of the leaves shows characteristic differences.

Investigation has shown that it is likely that the hybrid is the result of crossing between *H. brasiliensis* and *H. confusa*, for the tree from which the original seeds were obtained is situated in the Botanic Gardens of Port-of-Spain, at no great distance from a well developed specimen of *H. confusa*.

It will be remembered that much of the above information has appeared already in the *Agricultural News* (see the issue for June 8, p. 184), having been obtained through the courtesy of Mr. H. C. Pearson.

FRUITS AND FRUIT TREES.

MAKING MODELS OF FRUITS.

A method of fruit-modelling is thus described in the Annual Report of the Hawaii Agricultural Experiment Station for 1910-11:—

Fruit-modelling as a means of record has been used to some degree in the study of mango varieties. Modelling has some advantages over photographing or verbal description as a permanent record. The method used was applied at the station first by the late Mr. F. N. Otremba, who was an expert in this line of work. The method, however, is so simple and convenient, that it does not require artistic talent to use it successfully. Other members of the staff have found it convenient, and it might be worth while here to record the method for the convenience of others who may wish to apply it.

The principle involved is simply to make a mould by pouring a medium of glue and gelatine about the fruit to be modelled. This when cold is cut open and the fruit removed, leaving the mould, into which plaster of Paris is placed in a liquid form and allowed to solidify, making the cast. The details are as follows

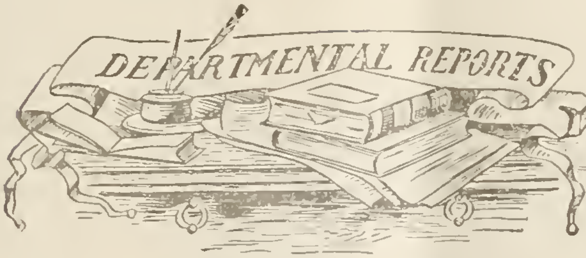
THE MOULD. This is formed of fish glue and gelatine. The glue should be reduced to the liquid form with water by being heated in a kettle surrounded by water and placed over a slow fire. When liquefied add the gelatine. About 1 lb. of gelatine to $2\frac{1}{2}$ lb. of glue has been satisfactory.

THE BOX OR CONTAINER. This may be made of wood, but we have found that for fruits of ordinary size a flower-pot can be used very conveniently and saves much trouble. If made of wood, the box must be held together by wire or twine so that it can readily be taken to pieces. A flower-pot has the advantage of being larger at the top than at the bottom, and therefore the mould can be removed without great difficulty. The inside of this container must be well coated with shellac and each time before the mould is made must be well oiled. A mixture of 50 per cent. olive oil and 50 per cent. kerosene is, perhaps, most satisfactory, but cotton seed or ordinary raw linseed oil would probably serve the purpose.

MAKING THE MOULD. Oil the fruit to be modelled and place it in the container, which should be large enough to allow an inch or more on each side of the fruit and between the fruit and the bottom. The fruit may usually be suspended from a small nail driven through a stick which rests upon the top of the pot and is tied down at the ends to the shoulder of the pot. This will prevent the fruit from rising to the surface when the glue is poured into the container. While the glue is warm, but not too hot, pour it into the container, distributing it on all sides so as not to crowd the fruit to one side. Allow it to remain so overnight In the morning remove the mass of glue from the container. With an oily knife cut one side of the mass from end to end as far as may be necessary. Gently release the fruit and remove it, leaving the mould empty. At the same time cut a small opening at the highest point to receive the plaster of Paris. Allow the mould to dry for half an hour and then apply to its interior, with a brush, a coating of about 10 per cent. formalin to harden the surface.

MAKING THE CAST After the formalin has evaporated, apply a coating of oil to the interior of the mould and also oil the interior of the container into which the mould must now be placed. It is sometimes necessary to tie the mould together before replacing it in the container. Take the required amount of plaster of Paris and add to it enough water to make a thick liquid. Mix this well so as to free it from all lumps and pour it into the mould through the opening made in the top. Shake the mould with a circular motion to force the plaster of Paris into all parts Allow it to stand for an hour or more when it will be sufficiently solidified to be removed. It may then be taken out with the same care with which the fruit was removed.

COLOURING THE CAST. If it is desired to have a reproduction of the colour of the fruit as well as the form, this may be done with water colours, but for this part of the work some familiarity with colour work will be necessary. Any slight imperfections must first be removed. Sometimes minute holes, which have failed to be filled with the plaster of Paris, are to be found. These may be filled by first dipping the cast in water and then painting it with a very dilute coat of plaster of Paris. These may not be filled by one or two coatings, but care must be taken not to alter the shape of the fruit. To prevent the colours from striking into the cast it is necessary to coat the latter with a very thin glue, applied with a brush; after this the colour may be applied.



BRITISH GUIANA: REPORT OF THE DEPARTMENT OF SCIENCE AND AGRICULTURE FOR THE YEAR 1910-11.

This contains the General Report on the Department of Science and Agriculture, the Report of the Government Analyst, the Report on the Botanic Gardens, the Report on the Board of Agriculture and the Report from the Government Veterinary Surgeon. At the commencement of the first of these, educational matters are dealt with, and with reference to science teaching at Queen's College, a favourable report has been obtained by the examiner appointed by the University of Cambridge, although it appears that much difficulty is experienced in the instruction of the lower forms. In the Cambridge Local Examinations held in July 1910, there were six candidates in senior chemistry and twelve in junior chemistry; of these one only in each division failed entirely, while both sections of the examination, practical and theoretical, were passed by at least half of the candidates. Proceeding, this part of the Report gives information concerning lectures to elementary teachers, model gardens and agricultural apprentices. With reference to the last, six boys were indentured as agricultural apprentices, and during the year two of these completed their course of instruction and very readily found employment as foremen in two rubber companies. It is stated that a weak point exists with reference to this scheme, owing to the lack of an officer whose time may be employed in giving systematic instruction.

Turning from these matters to work connected with agricultural investigation, it continues to be shown at the Issorora Station that Para rubber and Sapium possess the promise of former years, while Castilloa and Funtumia are practically failures, except in isolated instances. The superiority of Para rubber is repeated in the results that are being obtained at Plantation Christianburg, where Castilloa, Manihot and Funtumia do not succeed; while unsatisfactory results are being obtained with Sapium on the lighter soils, where Hevea is developing well. The tapping experiments with Sapium in the Bonasika Sapium Reserve have not given satisfactory results; it may be stated that these are referred to at length in the *Agricultural News*, Vol. X, p. 379. The Marlborough Agricultural Experiment Station is intended to serve the purposes of experiments with new crops and of demonstrations in good cultivation of those already existing in the district; it contains among other kinds of plants, different varieties of bananas, cacao, coco-nuts and coffee, as well as various citrus fruits, Para rubber, Sapium rubber, provision crops, and fallow and cover crops. At the Onderneeming School Farm, on which there is a fairly detailed report, satisfactory progress appears to have been made; at this place, Hevea is doing well, Sapium Jenmani progresses fairly, Funtumia makes little growth, and Castilloa is a failure. Efforts were made at this institution to encourage the lime industry in Essequibo, and over 6,000 plants were sold during the year, at practically nominal prices. Good progress is being made with fruit and other trees, and with balata. The Stock Farm continues to be conducted satisfactorily. A last matter of more special interest in this part of the report is concerned with the appointment of an Agricultural Instructor in Berbice, and with the suggestion to establish experimental and demonstration stations on the Berbice River.

The report of the Government Analyst commences by stating that during the year under review 5,455 samples were received at the Government Laboratory for examination: of these 4,464 were official samples. During the period, only one case of death by suspected poisoning was submitted for investigation at the Government Laboratory, and in this nothing injurious was detected. It is of interest, with respect to the very different experience in some parts of the West Indies, that heavy fines have been inflicted for adulterating milk, and this has caused that kind of fraud to be practised to a satisfactorily small extent. In another direction, action taken under the Customs Ordinance has practically caused the importation and sale of low grade butter and tobacco to cease.

The institutions receiving attention in the report on the Botanic Gardens include the Botanic Garden, Georgetown (Flower Garden), Government House Gardens, the Town Gardens, the Head Office Garden, the Public Gardens, Berbice, the old Military Burial Grounds and the Park Land: from the first of these, a large and useful plant distribution is shown to take place. This and the succeeding sections contain many interesting details concerning ornamental and useful plants. The total number of economic plants sold by the Department during the year was 91,116 as against 46,393 during the previous period—an increase which, as is claimed, indicates an enhanced activity in the Colony, in the planting of useful crops. Other interesting matters are presented, including a description of an unfavourable physiological condition of the sugar cane, a note on the distinction between *Hevea brasiliensis* and *H. confusa*, and particulars regarding a new species of Sapium; space does not permit however of their detailed treatment here. This part of the report concludes with information concerning the herbarium, the library, and meteorological observations.

Matters of more particularly local interest form the subject of the report of the Board of Agriculture, and the work of various committees is placed on record.

The report of the Government Veterinary Surgeon refers to the fact that the hygienic condition of the animals in the Colony has, according to police reports been most satisfactory; no cases of anthrax and only two of glanders were recorded. It is the opinion of that Officer, however, that outbreaks of anthrax occur from time to time, and that the true incidence of the disease is concealed. The importance of vaccination against the disease is emphasized, and warning is given concerning the danger that is incurred when the serum is administered by persons who have not had experience of its use—a danger that arises chiefly from the circumstance that the serum contains living anthrax bacilli, and must be kept under proper conditions lest its injection should cause death. With reference to tuberculosis in cattle, remarkable freedom from this disease is claimed for the animals in the Colony.

A report has been made by H.M. Vice Consul at Jaffa in which it is stated that the Jaffa orange exports of 1911-12, to Liverpool, have amounted to 638,904 cases, each containing about 150 fruits; this comprises about two thirds of the total shipments from Jaffa.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date August 13, with reference to the sales of West Indian Sea Island cotton :—

Since our last report an increased business has been done in West Indian Sea Island cotton at declining prices.

Between 600 and 700 bales have been sold, which include Barbados 17*d.* to 18*d.*, St. Croix 16*d.*, Antigua 15½*d.* to 16*d.*, Monsterrat 15½*d.*, Virgin Islands 16*d.*, and stains 9*d.* to 11*d.*

Spinners are indifferent buyers even at the reduced prices and holders of Carolina cotton are pressing sales in competition with West Indian.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending August 3, is as follows:—

The market has continued dull with no enquiry, the only sales being 72 bales Fully Fine to Extra Fine slightly off in preparation, for English account.

We repeat our last quotations, which are nominal, viz:—

Extra Fine	30c. to 32c.	= 16¾*d.* to 17¾*d.*	c.i.f., & 5 per cent.
Fully Fine	28c.	= 15¾*d.*	,, ,, ,, ,,
Fine	26c.	= 14¾*d.*	,, ,, ,, ,,
Fully Fine to Extra Fine, off in preparation	25c.	= 14¼*d.*	,, ,, ,, ,,

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Cotton-growing in Russia.—The cultivation of cotton in the Trans Caucasus is steadily assuming wider proportions, the conditions for its cultivation being favourable in the governments of Elizavetpol and some parts of the governments of Erivan and Baku It is estimated that close upon 76,688 acres were under cotton in the Batoum Consular district in 1911. With the strong desire now being shown by Russia to become independent in so far as the supplies of cotton for her manufacturing centres are concerned, the cultivation of cotton by all those willing to embark in the enterprise is being encouraged to the utmost. With the extention of the irrigation systems of the Caucasus now in progress, new lands will be placed at the disposal of would-be cotton growers, and the cultivation of cotton therefore promises soon to become more general than it has hitherto been. Under these conditions the area under cotton is sure to increase within the next few years, and although on a smaller scale, the Trans-Caucasus will become, after Russian Central Asia, the next important cotton-producing territory in the Russian Empire. (*The Board of Trade Journal*, April 11, 1912.)

POISONING BY COTTON SEED MEAL.

The following conclusions are reached at the end of an investigation of this matter which is described in Bulletin No. 134 of the Louisiana State University Agricultural Experiment Station. It may be said that the experiments were carried out with guinea pigs and rabbits—a fact that detracts from their practical value, though it is easy to understand why they were not made with the larger farm animals. It should also be mentioned that the results do not indicate that there is any danger (except possibly in the case of pigs and calves) in continuing to feed the larger animals in this way, in the West Indies. Further, the last conclusion, relating to pyrophosphoric acid and cotton seed meal poisoning has to do with the suggestion that has been made that the presence of this substance in cotton seed meal accounts for the harmful properties that are shown by it when the meal is fed to certain animals:—

While some of the results may seem conflicting, taken as a whole, we believe that several conclusions regarding cotton seed meal poisoning may be drawn. Briefly, the conclusions which we have arrived at during our study may be summed up as follows:—

Cotton seed and cotton seed meal do contain a toxic principle which is poisonous to certain animals.

Cotton seeds, itself, seems to be more toxic than the ordinary commercial cotton seed meal.

Different lots of cotton seed and cotton seed meal show a considerable variation in toxicity.

The toxicity of the cotton seed meal does not seem to be affected by the fungi which rot the cotton bolls and enter the cotton seed.

Cotton seeds from plants affected with the cotton wilt, or black root disease, are less toxic than cotton seed from healthy plants. This decrease in toxicity in this seed is not due to the premature ripening of the seed, because seed ripened on plants that had been cut down showed as much toxicity as seed from healthy, uninjured plants.

Heating cotton seed meal or cotton seed kernels for a long period at a high temperature decreases the toxicity to a considerable extent.

A very short heating of the cotton seed kernels, followed by an extraction of the oil, apparently does not decrease the toxicity. Another factor enters here, however, which must be considered. This heated meal is much more palatable than the raw kernels, and animals eat considerably more of it. Animals make better gains on this meal than on the kernels though they die as soon, or even sooner, than animals on the raw kernels.

The heating to which the kernels are subjected in the oil mill is probably sufficient in most cases to reduce the toxicity to some extent, though this reduction is usually not enough to remove all danger from feeding susceptible animals.

The careful fermentation of the kernels or meal seems to reduce the toxicity to a considerable extent

All the cotton varieties that were tested, that were grown on the same plot of ground during the same season, showed no difference in the toxicity

Sea Island seed obtained from Porto Rico was extremely toxic

We have no evidence whatever to show that pyrophosphoric acid has anything to do with cotton seed meal poisoning.

MANURIAL NITROGEN FROM THE ATMOSPHERE.

A paper on the manufacture of nitrates from the atmosphere was read by Mr. E. K. Scott before the Royal Society of Arts on May 15, 1912, Sir William Ramsay, K.C.B., F.R.S., being in the chair, and the following details are taken from the account presented in the Journal of that Society for May 17. The information that is of most interest in this place is that connected with the manufacture of calcium nitrate and calcium cyanamide, and it is to this that special attention will be given.

CALCIUM NITRATE. Before dealing with this, the paper presents a table showing that the production of sulphate of ammonia in England from the chief sources was, in 1906, 1909 and 1910, 289,391 tons, 349,143 and 367,587 tons. Another table shows that the exports of sodium nitrate from Chile increased from 935 tons in 1830 to 1,050,000 tons in 1890, with further progression from 1,970,000 tons in 1908 to 2,420,400 tons in 1911. A third table is reproduced below, which gives the present and future installations of the Norwegian Hydro-electric Nitrogen Co.:—

Year.	Horse power.	Name of Installation
1903	25	Experimental plant at Frognerkilen
1903	160	Experimental plant at Ankerlokken
1904	660	Arendal
1905	45,000	First Notodden (Svaelgfos)
1910	15,000	Second Notodden (Lienfos)
1912	140,000	First Rjukan Installation
1913	120,000	Second Rjukan Installation
1914	70,000	Vamma
1915	80,000	Matre
1916	70,000	Tyin

These are used for making calcium nitrate, or lime nitrogen; a further table gives a list of the plants for the manufacture of calcium cyanamide (in Europe, Japan and America).

A description follows of the Birkeland-Eyde furnace and its use in making calcium nitrate. As this was described at length in the *Agricultural News*, Vol. VIII, p. 325, it does require further consideration here An account is given of the Schonherr furnace, also for making calcium nitrate. In this, as it is installed at Christiansand, an electric arc 16 feet long is maintained in a long vertical iron tube, each furnace taking 600 horse-power; the arc is kept in the centre of the tube by blowing the air through with a whirling motion. The air receives a preliminary heating by the employment of the hot gases from the furnace; it is then rapidly cooled after becoming mixed with the highly heated nitric oxide formed, and the mixture leaves the top of the cooler with a temperature of about 1,200°C. At Christiansand, the plant is not actually being used for making calcium nitrate, but for obtaining sodium nitrite for employment in producing aniline dyes and similar substances.

After a statement of the theory of the fixation of nitrogen has been given, a detailed account is presented of the installation at Rjukanfos: it seems that the Birkeland-Eyde furnace is preferred to the Schonherr furnace as it is more compact and cheaper to build, the latter requiring to be built very high if is desired to increase its output.

The principle of the Pauling furnace depends upon the action of the horn break lightning arrester. In some installations it consists of two hollow iron electrodes arranged to form an open V, at the lowest point of which are two adjustable lighting knives. The effect of the heated air, of the presence of the magnetic field, and particularly of a blast of heated air that is provided, is that the arc runs to the upper part of the V, forming a triangular sheet of flame about a yard wide at the upper part of the V. In this apparatus, the cooling is effected by the action of cooled gas and air which is arranged to strike into the top of the arc flame. The article gives several examples of installations employing this type of furnace The acid solution obtained by the process contains 50 per cent. of nitric acid.

CALCIUM CYANAMIDE. After referring to the manner of discovery of calcium cyanamide, or nitrolim, the article describes its manufacture at the Odda works. Here, the calcium carbide employed is crushed and ground to powder which is filled into electric furnaces in which the temperature is raised to 800 to 1,000°C. The electric current is allowed to pass for twenty-five hours, while nitrogen is passed through the mass: at the end of thirty-five hours all the gas is absorbed. At Odda, 196 furnaces make about 30 tons of calcium cyanamide, containing 18 per cent. of nitrogen, in twenty-four hours. The product is crushed and ground fine, and packed in a paper-lined bag which is put into one or two jute bags, the latter being the case for export to tropical countries. Recent improvements at the Odda works have increased the output from 12,000 to 15,000 tons per annum. It should be noted that calcium cyanamide is not only used as a manure: very pure ammonium sulphate is obtained from it by treating it with superheated steam, and ammonium nitrate and dicyandiamide are made from it.

The chief interest of the electrical fixation of nitrogen is its employment for making artificial manures, as has been described. It also has other uses, chiefly in the direction of the manufacture of ammonium nitrate, dicyandiamide and nitric acid for use in connexion with explosives. The manufacture of the last product is likely to be of the greatest importance in view of its employment in making guncotton, dynamite and smokeless powders, and this matter is of special weight when it is considered that: 'A few rounds from a broadside of modern guns blows away into the air as much nitrogen as was used during the whole course of a war of the last century.'

After making reference to other matters of interest in connexion with the subject under discussion, the article before presenting its general conclusion gives attention to a proposal that is being made to utilize the water from irrigation dams, in India, for manufacturing manures; in this case, the manufacture could only continue for nine months in the year, as in the other three the water would be requred for irrigation, but this does not militate against the scheme, as the furnaces for the processes can be easily shut down and started at any time. In the scheme, it is proposed to use 30,000 h.p., which is expected to give 37,000 tons of calcium cyanamide, containing 18 to 20 per cent. of nitrogen, in the nine months.

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

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NOTES AND COMMENTS.

Contents of Present Issue.

In this number, the editorial is concerned with the subject of The Stimulation of Plant Growth, and gives consideration to the question as to whether manures, as well as certain substances in the soil, may act as stimuli for changes in the plant that will lead to increased nutrition and therefore quicker growth.

A review of the last Annual Report of the Department of Science and Agriculture, British Guiana, will be found on page 277.

Page 278 presents an account of investigations regarding the possible poisonous properties of cotton seed meal, under certain conditions. It will be seen that the conclusions reached do not indicate that there need be any alarm in regard to the employment of a product that is well established as a useful food for stock, in the West Indies.

The different systems for using atmospheric nitrogen in making artificial manures are described shortly on page 279.

The Insect Notes are illustrated, and appear on pages 282 and 283. They consist of the former of two articles describing a recent visit of the Entomologist of this Department to St. Kitts.

A recent publication dealing with the coco-nut is reviewed on page 286.

A note on the sapucaia nut is contained on page 287.

Chlorocodon Root Oil.

A note on *Chlorocodon Whiteii* in relation to its use as a fibre plant was given in the *Agricultural News*, Vol. X, p. 285.

The Semi-Annual Report of Schimmel & Co., dated April 1912, refers to the fact of the occurrence of this plant in German East Africa in the wild state, and says, on the authority of the Imperial Biological-Agricultural Institute of Amani, that it is cultivated by the planters for the sake of the hairs which cover the seed.

When the information was sent to Messrs. Schimmel, a sample of crystals was also despatched, which had been obtained by steam-distilling the green root from wild plants, the crystals being intended for comparison with those that had been prepared previously by that firm. The account of these is contained in the Semi-Annual Report dated October 1911, p. 33.

The two sets of crystals proved to be identical. The crude product, which was pink in colour, melted at about 35 C.; its recrystallization from water gave white crystals which, after being dried *in vacuo* over strong sulphuric acid, melted between 43 and 45 C., resembling the crystals similarly prepared previously. Further, no depression or melting point was shown by a mixture of the two samples of crystals.

Chlorocodon Whiteii may possibly prove to have a value in addition to that of its use as a fibre plant.

The Employment of Nitrates by Plants, for Nutrition.

Work on this subject receives short description in the *Experiment Station Record* for May 1912, p. 625. In the experiments, wheat seedlings were grown in light and darkness, in the absence of carbon dioxide, this gas being excluded in order to prevent the ordinary building up of plant food in the leaf from taking place. Calcium nitrate and other mineral salts were supplied to one lot of the plants: while the others were given the same mineral salts but no calcium nitrate or any form of salts containing nitrogen.

Where no nitrogen was supplied, the plants lost a part of the nitrogen that they contained originally; those to which nitrates had been available absorbed a large proportion of them, forming nitrogenous compounds, the process taking place equally well in darkness and in light.

The suggestion was obtained that amides are formed in plants not only by the breaking down of albuminoids but also in the building up of the complicated nitrogenous bodies (albuminoids or proteids) from nitrates; this was shown by the fact that the nitrogen contained in amides was found to increase most abundantly in the plants receiving nitrates.

The author considers that, in the formation of proteids from nitrates, in plants, there are two distinct stages: the change from the nitrates to amides, and the change from amides into proteids, or albuminoids; light was however found necessary for this transformation to take place.

Silkworm Industry, 1912.

The world's production of silk during the present year is likely to be very satisfactory, though it is estimated that the yields will be somewhat below those of 1911. It is stated in the *Bulletin of Agricultural Statistics* of the International Institute of Agriculture, Vol. III, No. 7. that in Austria and in France the harvests have been particularly good, but in Hungary the production has been somewhat limited owing to the spread of disease as the result of a wet season. The following figures, given in the above journal, represent the total production of cocoons in Europe, Asia and Africa: obtained in 1911, 140,626,109 kilos; estimated in 1912, 138,224,655 kilos. It is expected that the production in 1912 will be just under that of the previous year.

Pruning Sea Island Cotton.

The Annual Report of the Hawaii Agricultural Experiment Station for July 1, 1910 to July 30, 1911, issued April 9, 1912, to which reference has been made already in the *Agricultural News*, gives attention to the subject of the pruning of Sea Island cotton, which has received some investigation in Hawaii. It states that, after the plants had been pruned back to mere stumps, some high and some low, the new growth always started from near the ground, showing that if it is desired to grow Sea Island cotton as a perennial, low pruning should be practised: it is also necessary to plant it wider than usual (8 feet by 5 feet) to give sufficient room for cultivation and picking.

In the experiment that is described the plants, after being cut back in December, bloomed profusely in the spring, and it seemed that there would be a good crop; attacks of the boll worm and of mealy-bugs caused the bolls to be shed, however, and the latter pest infested the plants so severely in some cases that they had to be destroyed.

The only additional pruning that was practised was that a few of the plants were pinched back just before the bolls began to form; the result was that the plants that had been pinched back flowered much more profusely and somewhat earlier than those which had not been so treated. The first picking was made on June 15, 1911, and at that time the boll worm was present in great numbers.

Adsorption of Certain Substances by Starches.

Most porous bodies, like colloids, coagulated albumen, wood charcoal and starches, on account of their surface 'tension', possess the ability to take up certain substances in such a manner that the material taken up cannot be removed, even by most thorough washing. This phenomenon is called adsorption. An interesting account of investigations on the adsorptive power of different starches appears in the *Journal of the American Chemical Society*, Vol. XXXIII, No. 7, and since several of the starches examined were obtained through the Imperial Department of Agriculture, from the West Indies, a statement of the conclusions arrived at is likely to prove of interest.

The starches used in the investigation were cassava from St. Vincent and from St. Lucia; arrowroot from different estates in the West Indies—chiefly from St. Vincent; and potato, rice, and maize starches obtained in the United States.

The object of the experiments was to test the adsorption by starch of three substances, hydrochloric acid, sodium hydroxide, and sodium chloride.

The conclusions arrived at were as follows: (1) the adsorption of hydrochloric acid, sodium hydroxide and sodium chloride by starch, varies with different starches but not as much as would be expected considering the great differences in the size of the granules. (2) The adsorption is not regulated by the granule surface per unit of weight. (3) The amount of adsorption is much greater for sodium hydroxide than for either hydrochloric acid or sodium chloride. (4) In the case of starch-hydrochloric acid the ordinary adsorption rule is followed for solutions up to about 0.4 normal, except in the case of maize starch.

Changes in Plants Through Continued Vegetative Propagation.

The changes that take place in plants through continuous vegetative reproduction have often excited great interest: in the West Indies the matter has gained much importance particularly in relation to the sugar-cane which, especially with what are called the newer varieties, shows a tendency to degenerate after it has been raised from cuttings in the ordinary way for several seasons.

The matter has also been proved to be important in relation to fruit trees: the English physiologist Knight has shown conclusively that these change many of their characteristics when grafted repeatedly, the change often tending in the direction of degeneration. Such degeneration, with respect to another case, takes place with great rapidity in the potato, as is well known.

To pursue the subject, the *Bulletin of the Bureau of Agricultural Intelligence and of Plant Diseases*, for June 1912, contains a short abstract of a paper describing work in the vegetative reproduction of the chrysanthemum. In the investigation, a variety of this plant was grown for eighteen years, being reproduced by means of slips alone. The author's observations appear to show that a new variety inferior to the original was obtained, although the continued reproduction was made under constant conditions; further, it seems that the variation was progressive and not sudden. The latter circumstance affords an example which supports the theory of the existence of 'slow varieties' capable of yielding many new types—an idea originated and developed by Darwin and Lamarck.

INSECT NOTES.

REPORT ON A VISIT TO ST. KITTS.

PART I.

The Entomologist on the Staff of the Imperial Department of Agriculture recently visited the Leeward Islands for the purpose of investigating the occurrence of insect pests attacking sugar-cane. The primary object of the visit was to make a study of the conditions prevailing in the cane fields of a certain estate in St. Kitts where termites had occurred at intervals for several years in sufficient numbers to cause a considerable amount of damage.

The following notes are abstracted from a report on the visit to St. Kitts, which was prepared by the Entomologist and submitted to the Imperial Commissioner.

TERMITES. The attack of growing sugar-cane by termites in St. Kitts appears to be the only occurrence of this kind recorded. It often happens that cuttings used for planting are damaged in the field before the young shoots start, or about that time, but on this one estate in St. Kitts sugar cane plants which are reaching maturity, and approaching the season of ripening are attacked by these insects.

On this estate, in 1906, termites occurred in sufficient numbers to cause the loss of almost the entire crop over an area of several acres. In 1911-12 the attack was made in fields near those which suffered on the previous occasion, but the area involved was smaller than previously, and even on this many plants escaped.

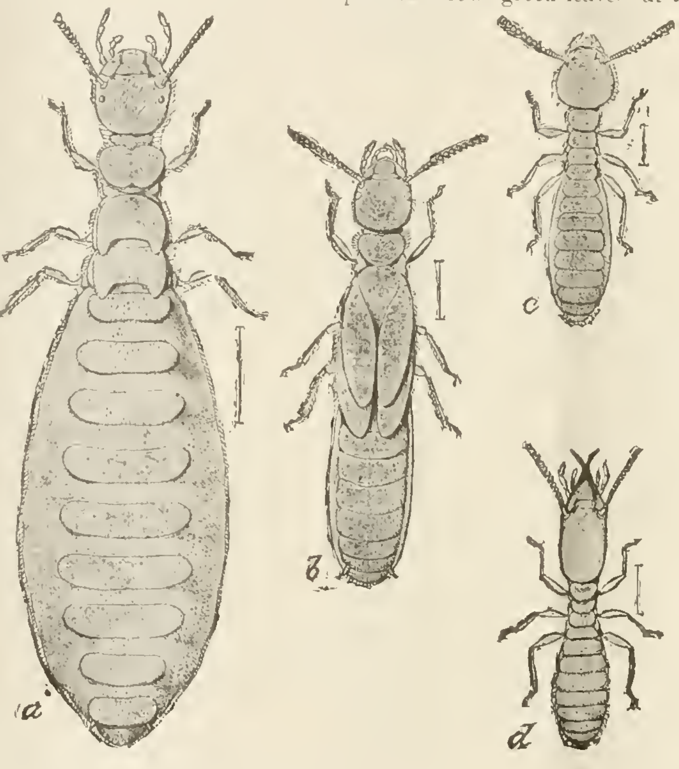

Fig. 8. The White Ant.
(a) queen; (b) nymph of winged female; (c) worker; (d) soldier. All enlarged. (From U.S. Dept. Agric.)

It is also to be noted that, while in the attack of 1906 (see *Agricultural News*, Vol. VI, p 58), the termites appeared to be the principal cause of injury in the infested fields, on this last occasion this was not the case—extreme drought, and a severe infestation of moth borer and root fungus appeared to have caused more injury than the attacks of the termites.

The fields which suffered severely in 1906 had since that time been planted for two or three years in cotton, and as a consequence the termites were greatly reduced in numbers. They did not occur to such an extent as to attract attention, and it was only by careful search that even a few stools of canes were found to be infested.

The species of termite concerned in this unusual attack on canes has not yet been determined, but it is suggested that it may prove to be *Termes flavipes*. This species appears to be a native of tropical America, extending its range as far north as Boston, Massachusetts and other localities in the same latitude. Although the insect has long been known to attack the timbers in buildings and other structures, it does not seem to have been recorded as a pest of growing plants. In spite of its general distribution throughout this part of the world, and the attention it has attracted, no nests of the species appear to have been discovered.

The termite attacks on growing canes generally begin above ground: apparently the insects often enter by means of a borer hole at about the time that the lowest internodes begin to ripen It often happens that the interior of the cane is eaten out completely, and this in the case of every cane in the stool, and of all the stools over a considerable area. Canes so attacked often remain green, or at least possess a few green leaves at the top, probably indicating that the termites have eaten out the cellular tissue containing the sugar, but have not entirely destroyed the vascular bundles on the presence of which the conduction of moisture depends.

The roots of the canes are also often completely eaten out, nothing being left except possibly the extreme outer layer of tissue, which the termites cover on the inside with a peculiar cement-like substance, and thus form their tunnels and galleries in the ground.

No definite nests of this insect have been found in the cane fields where these attacks occurred, but on the visit covered by the report under consideration, the Entomologist discovered an enlarged gallery in which there were several egg-laying females. These insects are not the true sexual females, but are the supplemental queens developed probably from the workers by special feeding in a manner similar to the production of a new queen in the hives of the honey bee.

The galleries in which these supplemental queens occurred contained no eggs, nor were any galleries found in which the very young larvae were being reared. The different castes or forms of this insect which were found in these fields were workers, soldiers, and winged forms—all of which occurred both in the tunnels in the ground, and within the tissues of the infested plants—and the supplemental queens which were only observed in underground galleries.

The galleries and tunnels of this insect have been found in the soil to a depth of 14 to 18 inches; those containing the egg-laying females were about 8 to 10 inches below the surface.

A similar attack by the same species of termite occurred in the grounds of the Head Office of the Imperial Department of Agriculture at Barbados during 1911-12. This was like that in St. Kitts, the only difference being that these canes were not grown under field conditions: a few canes were planted for experimental purposes in a small garden partly surrounded by buildings and fences in which this insect was known to occur.

The remedies suggested for the control of termites when they become pests in sugar cane fields are rotation of crops and thorough cultivation. Cotton does not appear to be attacked by termites, and the experience already gained in St. Kitts indicates that when the land has been devoted to cotton for two or three years, the numbers of the termites are reduced to such an extent that they will not cause appreciable damage for several years after it has been returned to canes.

Deep close ploughing of the land, with a complete removal of the old stumps as soon as the cane crop is harvested, followed by thorough tillage of the surface soil while the cotton is growing, would seem to be sufficient treatment for the eradication of termites in such fields. Of course no canes should be used for planting which contain termites.

The practice of covering the cane stumps with mould instead of taking them out—the general practice in St. Kitts—detracts greatly from the value of any rotation system, and it is probably not too much to say that wherever termites become a serious pest in sugar-cane fields it will be necessary to remove the stumps as soon as the canes are harvested.

In addition to termites, other insects were observed in the fields. A root borer and a small brown hardback were the new species studied; while the moth borer, weevil borer, shot borer, and grasshoppers were all observed and reported upon. There is, however, very little that is new to be stated with regard to these last-mentioned forms. The new insects are of considerable interest, and will form the subjects of the succeeding article.

AGRICULTURE IN CEYLON, 1910-11.

THE AGRICULTURAL SOCIETY. The Ceylon Agricultural Society has now a membership of 983.

Through the agency of the *Tropical Agriculturist and Magazine of the Ceylon Agricultural Society*, its smaller Sinhalese and Tamil monthly publications, and the dissemination of leaflets, the Society helps to keep the local agriculturist in touch with the progress of agriculture in all parts of the world, particularly in the tropical regions.

A number of small village shows was held during the eighteen months, in various parts of the island.

Demonstrations in the use of improved implements were continued, with the result that there is now a considerable demand for better class ploughs, etc. The dearth of buffaloes for mudding and ploughing, owing to the ravages of rinderpest in some parts of the island, has tended to quicken the interest of the paddy cultivator in more modern methods.

The Society has interested itself in the introduction of improved varieties of fruits and vegetables, has conducted experiments in the improvement of tobacco cultivation and curing, and has co-operated with the local agents of the British Cotton Growing Association to encourage the cultivation of cotton.

Good work is being done by a village Co-operative Credit Society and Agricultural Bank in the Central Province, and an Ordinance has recently been enacted to promote the formation of such societies.

POSITION OF AGRICULTURAL INDUSTRIES. The continued prosperity of the tea, coco-nut and rubber industries is sufficiently indicated by the figures already given under the head of Exports.

The position of cacao, cardamoms, citronella oil, and cinnamon has continued satisfactory.

The cultivation of cotton and tobacco for export purposes remains still in the experimental stage. That, with the reasonable capital expenditure and scientific methods of treatment both crops can be made to pay, there is little doubt. But so long as the older-established products continue to yield such handsome returns the inducement to pioneer in new ventures is not great.

Hitherto the native tobacco plantations of the Northern and Eastern Provinces and the Chilaw and Kandy Districts have contented themselves with supplying the local market, with the exception of a not inconsiderable export of Jaffna tobacco to Travancore. The Travancore authorities having recently imposed a limit on the import of this tobacco there is no room for expansion in this direction, and unless the native cultivator can be induced to set himself seriously to the improvement of the quality of tobacco produced, the prospects of the industry are not bright.

Paddy cultivation remains the principal occupation of the villager, but shows little sign of extension, while the quantity of rice imported for local consumption continues steadily to increase.

During the latter months of 1910 and the first half of 1911, a prolonged drought was experienced in most parts of the island. In many localities the tanks did not fill, and paddy cultivation was seriously affected. The same cause has in many cases interfered with the realization of the estimated yields of the staple export products.

The Botanic Gardens at Peradeniya have continued to render valuable assistance to the cultivator in all branches of agriculture, both directly and through the instrumentality of the Agricultural Society. From 1912 the staff of the Gardens will be merged in a regular Agricultural Department, the organization of which has received the sanction of the Secretary of State. The establishment of a school of agriculture, and the modification of the present system of education in vernacular schools with a view to the introduction of a training in agricultural pursuits, await the inauguration of the new Department. Meanwhile arrangements have been made for selected students from Ceylon to undergo a course of agricultural training at the Agricultural College at Poona, and the Government is offering sholarships for students who take up the course. (*Colonial Reports—*Annual, No. 716, July 1912.)

The Virgin Islands and the Canadian National Exhibition.—The Agricultural Instructor of the Virgin Islands, Mr. W. C. Fishlock, has given information concerning the representation of that Presidency at the above exhibition. He states that there were forwarded to St. Kitts, in time to meet the S.S. 'Oruro' on July 16, two cases of exhibits. These included: glass jars containing starch (arrowroot, cassava and tons-les mois), coffee and cacao; bottles of raw and concentrated lime juice, and bags of cotton.

Exhibits of fancy work, including a tea cloth, lace doilies and lace handkerchiefs were also sent.

GLEANINGS.

The *Revista Azucarera* for 1911-12 states that it is expected that from 20,000 to 25,000 tons of 96 sugar will be exported from Mexico to the United Kingdom during this year. In the season 1911, 158,627 tons of sugar, 83,348 tons of molasses and 49,107 tons of panela (a brown sugar) were produced in Mexico.

It is shown in *The Board of Trade Journal* for July 4, 1912, that the number of bales of cotton imported into the United Kingdom during the twenty-six weeks ended June 27 was 2,836,474, including 5,620 British West Indian, 5,213 British West African, 17,523 British East African, and 1,044 bales Foreign East African.

A copy of a bulletin on the condition of crops in Egypt on July 1, 1912, has been received from the Director-General of the Department of Agriculture. This shows that the condition of the cotton, sugar-cane and melon crops at that date was well above the average, while that of wheat and rice was somewhat below the average.

In the report of the Government Botanical Gardens, Saharanpur, India, for 1911-12, it is stated that the Jéquie Manicoba trees (*Manihot dichotoma*) in the gardens continue to make only slow progress, and it is concluded that the plant requires a more equable temperature and a somewhat moister atmosphere than those which obtain at Saharanpur.

According to the *Textile Mercury* for July 13, 1912, experiments have been made at Casablanca in cotton-growing, from seed obtained from Porto Rico. The experiment was only on a small scale, and the plants were watered by hand during the dry season Other trials were made at a place about 50 miles from Casablanca, but like the former were not on a scale sufficient to give useful results.

H.M Consul at Amsterdam states that a factory is being erected for the manufacture of artificial 'rubber' from fresh sea fish, the cost of this being only about one-sixth of that in the manufacture of natural rubber. The invention has been examined and reported upon by an English chemist, and his report may be seen by British firms at the Commercial Intelligence Branch of the Board of Trade, 73 Basinghall St., London, E.C.

An account of sisal-growing experiments that are being conducted in Curaçao has been given recently by the United States Consul. The results appear so far to be favourable: the plants have survived an abnormally dry period, and have given sisal of excellent quality. In consequence of the success, a company called the First Sisal Culture Co. of Curaçao, has been formed for the exploitation of the fibre in the island.

The *Agricultural News* of February 3, 1912, p. 41, contained a note on a suggestion that has been made to the effect that tobacco seed might be utilized as a source of oil: the seeds contain 15 per cent. of a drying oil. As is pointed out in the *Bulletin of the Imperial Institute* for April 1912, p. 153, the ordinary conditions of tobacco cultivation are not such as to produce tobacco seed in quantity, so that the suggestion does not appear to be practicable.

During the year 1910, tin and rubber were exported from Bolivia to the value of £5,160,000, the value of the rubber being £2,200,000. The total exports during that year reached the value of £6,000,000, the shipments of products other than tin and rubber being made up by silver (£420,000), bismuth, copper and other minerals, with a certain amount of coca and raw hides. (From *Diplomatic and Consular Reports*, No. 4888 Annual Series, July 1912.)

The results of inoculation experiments that have been carried out with horse beans in Germany are quoted in the *Experiment Station Record* for May 1912, p. 617, and it is stated that decided benefit was received from inoculation in all cases. The kinds of inoculation practised were seed inoculation with gelatine cultures, seed inoculation with soil cultures, and soil inoculation with soil cultures, on upland moor soil which had never grown horse beans; the best results were obtained from seed inoculation.

The *Bulletin of the Bureau of Agricultural Intelligence and of Plant Diseases* for June 1912, p. 1395, contains an account of a machine for raising water which is described under the name Hydropulsator. This is employed in the same way as the ordinary ram, but the two valves of this machine are replaced by a kind of turbine which revolves and closes alternately the discharge pipe and the outflow pipe. The apparatus can be made in large sizes, and does not require much head of water. It has proved itself already to be practicable, and observations are stated to have shown that it possesses an efficiency of 70 per cent.

The Board of Trade of St. John, New Brunswick, has issued a statement showing that the exports from that port by transatlantic steamers, for the six months November 1909 to May 1910, were valued at $24,030,007. In the fiscal year ending March 31, 1910, the values of the exports from the chief eastern ports of Canada were: from Montreal $77,501,549, from Halifax $11,595,755, from Quebec $5,751,375, and from St. John $24,988,519; as regards St. John, they were valued at $20,668,517 in the preceding similar period. The latter facts show that the trade of the port is making substantial increases and that future progress may be expected.

STUDENTS' CORNER.

SEPTEMBER.

First Period.

Seasonal Notes.

Interesting observations may be made by taking seeds at different stages of ripeness and testing their germinating power. In cases where seedlings are obtained, those from the partly mature and the mature seeds should be examined in order to determine which kind of seed produces the strongest plants. Seeds that will be found useful for the purpose described include those of annuals such as the pea and the tomato, and those of the commoner woody plants; in the case of the former, ready germination is obtained before the stage of ripeness is reached, whereas the seeds of many perennial plants require a period of rest before they will sprout. State the reason why partly matured seeds usually give rise to plants that are lacking in vitality. It must be remembered that this is not always the case, for the seeds of some plants, when the latter are over vigorous, give plants with increased fruitfulness when they are slightly immature; those of the tomato form an example of this kind. Experimentation with ripe seeds and those which have not quite reached maturity may show that the latter often germinate more quickly than the former.

State what effect the continual selection of immature seeds for planting may have in regard to changing some of the characters of a plant.

It is well known that all seeds, if they are kept long enough, lose their power to germinate, though the time required for this varies greatly in different cases. Examples of the longevity of certain seeds, notably those of the Leguminosae, have been given recently in the *Agricultural News*. Other information concerning the duration of the germinating power of some of the commoner seeds may be found in *The Vegetable Garden* (issued by Messrs. Vilmorin, Andrieux et Cie, Paris). Among such seeds those of the cucumber, endive, artichoke, some beans, beet, cabbage, carrot, egg-plant, ochroe, melon, pumpkin, squash and turnip, with others, are given as being capable of germinating even after as long a period as ten years has elapsed; this is, however, the extreme period for those seeds, and it must not be expected that any samples of seed of the kinds will necessarily contain individuals that will sprout after so long a time. As regards the percentage of germination that should be expected from good seeds of various sorts, a useful list is contained on page 20 of the last edition of *Nature Teaching*.

When it is intended to store most kinds of seeds, if they are wet for any cause, they should be carefully dried after being gathered, in order to prevent the growth of moulds that may destroy their vitality. The storage of oily seeds in bulk, in large quantities, requires care in order to prevent them from becoming heated.

Where seeds are stored, again, the moisture in the air and the temperature should be kept as uniform as possible. It is usually the case that seeds will remain useful for sowing for a longer time if they are put away in their natural covering: this is true of many grasses, including maize, the seeds of which are considered to retain their vitality best when they are allowed to remain on the cob, it is supposed, too, that the husking of the ear decreases the period of the retention of the germinating power of these seeds.

It is the usual circumstance that the most vigorous crops are obtained from seeds sown in the season in which the new crop is grown or in the preceding season: though in the case of crops raised for seed or for fruit the best returns may sometimes be obtained by using seed that has been kept for two or three years, examples of plants having seed with this characteristic being the cucumber and the melon.

Questions for Candidates.

Preliminary Questions.

(1) What are the chief uses of the bones in the bodies of mammals?

(2) Give a short account of the kinds of soil that you have examined.

(3) Supply information concerning the chief grasses with which you are acquainted.

Intermediate Questions.

(1) Compare the structure of the leg of the horse and of the ox.

(2) Discuss the ways in which the characters of a soil are influenced by the proportion of clay that it contains.

(3) State what plants that you know of, belonging to the grass family, are employed in providing food directly for man.

Final Questions.

(1) Show broadly how the structure of the animals used directly on an estate to provide energy is correlated with the purposes for which they are employed.

(2) Provide a general account of the way in which the kinds of crops grown in any particular area are influenced by the character of the soil.

(3) How would you proceed to convert to pasture land an area of land that had been used in cultivation for ordinary crops?

Trade and Agriculture of St. Helena, 1911.— EXPORTS. The total value of exports in 1911 amounted to £9,959 as against £9,324 in 1910. Specie shows a marked increase, being £7,800 as compared with £5,300 in the previous year.

AGRICULTURE. The year under review was, on the whole, a bad one for stock owners. The drought which prevailed for the first four months of the year resulted in cattle getting into low condition, and the period of heavy rain which followed found them in a condition least able to stand it. Again, the last four months of the year were exceptionally dry; this caused heavy losses amongst cattle. Both cattle and sheep were raised at large expense, chiefly by imported food, to supply the Naval Establishment at Ascension.

The potato crop was also adversely affected by the unfavourable weather. In some parts of the island potatoes remained in the ground for a long time, there not being enough moisture to bring them on. Consequently they suffered from rot, and potatoes became scarce and dear at times. Green vegetables did badly and were scarce, for the same reasons. Hay was also unsatisfactory, the crop being very short. In most lands grass was not worth cutting. (From *Colonial Reports*—Annual, No. 714, June 1912.)

OUR BOOK SHELF. NOTES and REVIEWS.

COCO-NUTS: THE CONSOLS OF THE EAST. By Harold Hamel Smith and F. A. G Pape, *John Bale, Sons & Danielsson, Ltd, London.* 11*s.* post free.

A notice of the publication of this book appeared in the *Agricultural News*, Vol. XI, p. 236, and recently a copy has been received from the authors.

The book aims at giving, as fully as its size will allow, a complete acconnt of the coco-nut palm, its cultivation, and the products to be obtained from it. It does not enter into full details on every point, but each is brought forward and full references are given which enable the reader to procure the details for himself. Each section of the book aims at being self-contained, so that the reading of many pages of familiar matter may be avoided. This course naturally leads to considerable repetition, but as the points repeated are all worthy of emphasis, their reiteration is perhaps advisable; nevertheless, there appear to be places where a closer confinement to the subject indicated at the commencement of the chapter would have been preferable. For example, under the title Cultivation in Malaya, among other matters, general discussions are given of prices, drying methods and planting distances, all of which should have been relegated to the sections of the book dealing more particularly with these points, where they are expected to appear.

After a foreward by Sir W. H. Lever, indicating the value of coco nut cultivations and putting forward a plea for Government assistance to intending planters, there is a preface by Mr. Hamel Smith in which the question of the establishment of one or more tropical agricultural colleges receives some consideration—a question engaging attention in several quarters at the present time. Then follows a useful introduction on health in the tropics, written by Mr. Pape and containing many valuable suggestions resulting from a long experience. The first three chapters deal adequately with the questions of the Cost of an Estate, Native Ownership and Husbandry, and Locality and Site. Chapter I contains carefully considered statistics, and provides a good conservative indication of the amount of capital that will be required for opening up an estate. Subsequent chapters deal with the position and prospects of coco-nut planting in various parts of the world. Among important matters dealt with is the nature of the catch crops that can be grown successfully in each locality, while the estate is coming into bearing, and the kinds of stock that may be raised afterwards. It is to be observed that no mention is made of Portuguese East Africa as a suitable country for coco-nut cultivation—an omission which will probably be repaired in future editions.

The next section of the book deals more particularly with the details of establishing an estate; separate chapters are devoted to Clearing and Preparing the Land, The Seed Nuts, Seed Beds and Nurseries, Laying out the Plantation, Lining and Holing. The authors call attention to the necessity of selecting good nuts for planting, and to the excellence of the nuts from San Blas, Panama, which may be obtained from Panama shippers or from certain firms in England.

The subject of Disease is well treated, and good references are given to original papers on it. Then follow sections on manuring, mulching and catch crops. Adequate emphasis is laid on the need of manuring and properly caring for the estate after it has become established; and light ploughing and harrowing are strongly advocated. The advisability of this last course may be open to question, but it would appear from experiments that the advantages outweigh the defects.

Subsequent chapters deal with the preparation of copra, oil, alcohol, and fibre from the nuts, and accounts of the most successful types of modern machinery for these purposes are given; much attention is paid to the extraction of oil from copra by means of liquid solvents, but perhaps the expression method has been rather neglected. The possibility of the preparation of products such as sugar, vinegar, and paper of a rough quality, is touched upon, and mention is made of the possible utilization of the water in the nuts for the manufacture of vinegar. These industries are not yet established, but it does appear that they may be of some importance in the future. In connexion with copra-drying and the preparation of fibre, it may be well to call attention to two articles in the *Agricultural News*, Vol. XI, pp. 254 and 265.

The book under review closes with notes on stump extraction and irrigation, and a chapter dealing with spraying machinery. In connexion with knapsack sprayers, it may be remarked that those of the type of the Alpha machine described on page 483 are much the best, as it is difficult in the tropics to induce a labourer to use a machine with which it is necessary to work the pump with one hand and direct the spray with the other. The book contains a useful index, and a good list of literature dealing with the coco-nut palm is placed at the beginning. It is well illustrated throughout.

The subject-matter of the book is excellent, as is naturally the case when it is borne in mind that the reports of well recognized authorities, only, have been consulted, and occasionally reproduced, in its construction. These reports, prepared during the last six years by men working on the spot, contain the most reliable information now available as to the best methods of cultivating the coco-nut palm. They emphasize the points made in the book as to the need for careful selection of seed nuts, their planting in nurseries, wide planting in the field, careful manuring and cultivation, and the use of good modern methods for obtaining the finished products. The subject-matter thus procured is, on the whole, well arranged and readable. One small blemish is noticeable in a tendency to misquote the names of papers consulted. This habit does not add to the readabilty of the book, and certainly is not conducive to ease of reference

Throughout the volume, a basis of forty-eight trees to the acre and forty nuts per tree per annum, is considered safe for reckoning profits; it is, if anything, somewhat low, but it probably represents a good all-round average. A well-merited censure of certain company prospectuses appears on page 56; advertisements of this nature, giving the mythical figures of 200 trees per acre and 200 nuts per tree, do more to harm the development of such an industry than can anything else.

In conclusion, it can be said that all coco-nut planters or intending planters should obtain this book, which will be found to be full of useful, practical, and thoroughly reliable information.

WEST INDIAN PRODUCTS.

DRUGS AND SPICES ON THE LONDON MARKET.

Mr. J. R. Jackson, A.L.S., has forwarded the following report on the London drug and spice market, for the month of July 1912:—

Though peace has been somewhat restored amongst the dock labourers, and large numbers of men have returned to work, it is estimated that some five or six weeks will elapse before trade assumes even its normal character, first on account of the large accumulation of goods on the quays, which have to be removed and properly stored, and next in consequence of the summer holidays which are supposed to empty London of its inhabitants at the end of July and throughout the month of August. It is anticipated, however, that after the holiday season there will be a complete revival of business in drugs and chemicals. In the matter of

GINGER

The market has been very quiet; at the first spice auction on the July 3, 526 bags and 37 cases of Cochin and Calicut were offered, and all bought in at prices varying from 42*s.* to 90*s.* per cwt.; 100 bags of Liberian were held at 30*s.*, and 140 bags of limed Japan also at 30*s.* A week later 489 bags of Cochin and Calicut were again offered, 20 of which sold at 65*s.*; 70 bags of brown rough Liberian sold without reserve at 27*s.* 6*d.*; 115 bags of Japan were also offered but found no buyers. On the 17th, 520 bags of Cochin and Calicut were brought forward, of which only 190 were sold, 45*s.* being paid for cut tips, 55*s.* for fair cuttings, and 40*s.* for small and medium washed. Bold cut Calicut was all bought in at 90*s.* to 92*s.* 6*d.* At the last auction on the 24th, none of the offerings found buyers.

NUTMEGS, MACE AND PIMENTO.

Nutmegs have maintained a quiet tone throughout the month. At the first auction the offerings consisted of 34 boxes of Singapore, all of which were bought in at 1*s.* for 65's and 7½*d.* for 80's. At the second sale on the 10th, 54 packages of West Indian were offered, part of which found buyers at 8*d.* for 68's, 6½*d.* to 7*d.* for 74's to 82's, 5¾*d.* for 95's, 5½*d.* to 6*d.* for 102's to 112's and 5¾*d.* for 118's. A week later, namely on the 17th, the very large supply of 360 packages of West Indian were offered, and all were disposed of at the following rates: 1*s.* for 54's, 5¾*d.* to 10*d.* for 63's to 73's, 5½*d.* to 6½*d.* for 78's to 87's, 6*d.* to 6½*d* for 100's to 110's and 6*d* for 140's. At the last sale on the 24th. 27 packages of West Indian were disposed of, 82's to 95's fetching 6*d.* to 6½*d.*, and 73 packages of Eastern partly sold at the following rates: 7*d.* to 7½*d.* for 63's to 70's and 5½*d.* to 6½*d.* for 100's to 105's.

Mace, at the first auction on the 3rd of the month, was represented by 31 packages of Eastern, none of which was sold. A week later 3 barrels of West Indian realized 2*s* 3*d.* per lb. for bright red broken and 1*s.* 10*d.* for dark inferior Two cases of Penang somewhat mouldy, and part wormy, sold at 2*s.* 3*d* per lb. At the auction on the 17th 133 packages of West Indian were offered, and sold at 2*s.* 3*d.* to 2s. 4*d.* per lb., good fetching 2*s.* 5*d.* to 2*s.* 6*d.* On the 24th 38 packages of Eastern were offered and partly sold at 2*s.* 6*d.* to 2*s.* 7*d.* per lb. Little has been done in pimento or arrowroot, of the first-named at auction on the 3rd of the month, some 71 bags were brought forward, and 40 sold at 2½*d.* per lb. At the first auction 10 half barrels of Bermuda arrowroot were offered and bought in, and on the 10th 18 cases of Natal were offered and all bought in.

SARSAPARILLA.

At the drug auction on the 11th no grey Jamaica was offered, the only kind being native Jamaica, of which 12 bales were offered, and 11 sold, yellow fetching 9*d.* yellow and reddish mixed 1*s.* and good red, part chumpy 1*s.* 2*d.* to 1*s.* 4*d* per lb. On the 25th the offerings were as follows:—grey Jamaica 20 bales and Lima-Jamaica 10 bales all of which were disposed of, 26 bales of native Jamaica were also brought forward and 21 sold. The grey Jamaica realized 2*s.* 3*d.* per lb. and the native Jamaica 1*s.* 3*d.* for good red, 1*s.* 1*d.* for fair red, 10½*d* for dull red mixed, and 9*d.* to 9¼*d.* for common yellow and grey mixed. The 10 bales of Lima-Jamaica, realized 1*s.* 9*d* to 1*s.* 10*d.* per lb. for fair, part slightly chumpy.

CASSIA FISTULA, LIME JUICE, TAMARINDS AND KOLA.

At the beginning of the month Cassia Fistula was in fair demand, the quotations for West Indian being 30*s.* and for East Indian 28*s.*

At the beginning of the month it was stated that fair quantities of lime juice had been placed on the market from stocks in London and Southampton and that the absence of real summer weather had much decreased its demand with a consequent drop in prices. Later on, owing to the strike, large quantities accumulated at the docks but were unobtainable. The prices quoted were from 2*s.* 3*d.* to 2*s.* 4½*d.* according to quality. Quite at the end of the month good pale raw Dominican was sold at 2*s.* per gallon.

In the middle of the month 29 packages of fair, but rather dry tamarinds from the West Indies were brought forward and held at 13*s*, and on the 25th, 13 packages from Montserrat were sold at from 13*s.* 3*d.* per cwt. in bond. There is a demand for Kola nuts, and good prices have been realized, some 20 packages were brought forward at auction on the 25th, amongst them some whole dried St. Lucia, which fetched 5*d.* per lb.

The Sapucaia Nut.—The tree (*Lecythis Zabucajo*) producing the sapucaia nut is a native of Guiana, Brazil and Venezuela, where it grows to a great size, and bears its seeds in a large, very hard fruit provided with a lid at the top, which, falling away when it is mature, lets the seeds escape. These are what are commonly known as the nuts; they may be obtained often in the fruit shops in England, where they are sometimes sold in preference to the Brazil nuts, which are borne by a plant (*Bertholletia excelsa*) belonging to the same Natural Order: as a matter of fact they possess a better flavour—sweet and somewhat resembling that of the almond —and are more easily digested than the Brazil nut. They yield an oil which, like that of the last-mentioned nut, is employed in South America as a food oil and for soap-making; it shares with this oil the disadvantage that it becomes rancid in a very short time.

By the courtesy of the Trinidad Department of Agriculture, plants of *Lecythis Zabucajo* have been supplied to the Dominica Botanic Garden, and that Department is co-operating further with the Commissioner of Agriculture by sending plants of the same kind to other Botanic Stations in the Lesser Antilles.

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR, August 13, 1912; Messrs. E. A. DE PASS & Co., August 2, 1912.

ARROWROOT—$3\frac{11}{16}d.$ to $4\frac{3}{4}d.$
BALATA—Sheet, 3/6; block, 2/$7\frac{1}{2}$ per lb.
BEESWAX—£8 12*s.* 6*d.*
CACAO—Trinidad, 68/- to 85/- per cwt.; Grenada, 61/- to 68/-; Jamaica, 58/- to 67/-.
COFFEE—Jamaica, 69/- to 76/- per cwt.
COPRA—West Indian, £26 10*s.* per ton.
COTTON—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, $15\frac{1}{4}d.$ to 18*d.*
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—48/- to 65/- per cwt.
ISINGLASS—No quotations.
HONEY—25/- to 32/-
LIME JUICE—Raw, 2/2; con centrated, £18 12*s.* 6*d.* to £19; otto of limes (hand pressed), 7/6.
LOGWOOD—No quotations.
MACE—2/3 to 2/6.
NUTMEGS—5*d.* to 11*d.*
PIMENTO—Common, $2\frac{1}{2}d.$; fair, $2\frac{9}{16}d.$; good, $2\frac{5}{8}d.$; per lb.
RUBBER—Para, fine hard, 5*s.*; fine soft, 4/$5\frac{1}{2}$; Castilloa, 4/5 per lb.
RUM—Jamaica, 2/- to 6/-.
SUGAR—Crystals, 16/6 to 18/9; Muscovado, 12/- to 15/-; Syrup, 13/- to 15/-; Molasses, no quotations.

New York.—Messrs GILLESPIE BROS. & Co., August 9, 1912.

CACAO—Caracas, $12\frac{3}{4}$c. to 13c.; Grenada, 14c. to $14\frac{5}{8}$c. Trinidad, 14c. to 16c. per lb.; Jamaica, $11\frac{1}{2}$c. to 13c.
COCO-NUTS—Jamaica, select, \$25·00 to \$26·00; culls, \$15·00; Trinidad, select, \$25·00 to \$26·00; culls, \$15·00 per M.
COFFEE—Jamaica, $14\frac{1}{4}$c. to $16\frac{3}{4}$c. per lb.
GINGER—$8\frac{3}{4}$c. to $11\frac{3}{4}$c. per lb.
GOAT SKINS—Jamaica, 50c.; Antigua and Barbados, 45c. to 46c.; St. Thomas and St. Kitts, 42c. to 44c. per lb.
GRAPE-FRUIT—Jamaica, \$2·75 to \$3·50.
LIMES—\$2·00 to \$2·25.
MACE—51c. to 54c. per lb.
NUTMEGS—110's, $13\frac{3}{4}$c. to 14c.
ORANGES—Jamaica, \$1·75 to \$2·25 per box.
PIMENTO—$5\frac{3}{4}$c. per lb.
SUGAR—Centrifugals, 96°, 4·05c. per lb.; Muscovados, 89°, 3·55c.; Molasses, 89°, 3·30c. per lb., all duty paid

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Trinidad,—Messrs. GORDON, GRANT & Co., August 19, 1912.

CACAO—Venezuelan, \$15·52 per fanega; Trinidad, \$14·75 to \$15·25.
COCO-NUT OIL—89c. per Imperial gallon.
COFFEE—Venezuelan, 18c. per lb.
COPRA—\$4·40 per 100 lb.
DHAL—\$5·25.
ONIONS—\$2·00 per 100 lb.
PEAS, SPLIT—\$7·00 per bag.
POTATOES—English, \$2·50 to \$3·00 per 100 lb.
RICE—Yellow, \$4·80 to \$5·00; White, \$6·25 to \$6·35 per bag.
SUGAR—American crushed, no quotations.

Barbados,—Messrs. JAMES A. LYNCH & Co., Ltd., August 24, 1912: Messrs. T. S. GARRAWAY & Co., August 26, 1912; Messrs. LEACOCK & Co., August 15, 1912

ARROWROOT—\$7·00 per 100 lb.
CACAO—\$13·00 to \$14·00 per 100 lb.
COCO-NUTS—\$20·00.
HAY—\$1·60 to \$1·80 per 100 lb.
MANURES—Nitrate of soda, \$65·00 to \$67·50; Cacao manure, \$45·00 to \$48·00; Sulphate of ammonia, \$80·00 to \$84·00 per ton.
MOLASSES—No quotations.
ONIONS—\$2·25 to \$3·00 per 100 lb.
PEAS, SPLIT—\$6·75 to \$6·90 per bag of 210 lb.; Canada, \$3·00 to \$5·30 per bag of 120 lb.
POTATOES—Nova Scotia, \$3·75 per 160 lb.
RICE—Ballam, \$5·20 to \$5·75 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
SUGAR—American granulated, \$5·00 per 100 lb.

British Guiana.—Messrs. WIETING & RICHTER, August 17, 1912; Messrs. SANDBACH, PARKER & Co., August 16, 1912.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	——	——
BALATA—Venezuela block	No quotation	Prohibited
Demerara sheet	76c. to 77c. per lb.	——
CACAO—Native	14c. per lb.	14c. to 15c. lb.
CASSAVA—	80c.	No quotation
CASSAVA STARCH—	\$7·50	No quotation
COCO-NUTS—	\$16 to \$20 per M.	\$10 to \$16 per M., peeled and selected
COFFEE—Creole	19c. per lb.	18c. per lb.
Jamaica and Rio	20c. per lb.	21c.
Liberian	15c. per lb.	15c. per lb.
DHAL—	\$5·00 per bag of 168 lb.	\$5·50 to \$5·75
Green Dhal	\$5·50	——
EDDOES—	\$1·32 to \$1·68	——
MOLASSES—Yellow	None	——
ONIONS—Teneriffe	——	
Madeira	5c. per lb.	5c. to $5\frac{1}{2}$c.
PEAS—Split	\$6·75 to \$7·00 per bag (210 lb.)	\$7·25 per bag (210 lb.)
Marseilles	——	No quotation
PLANTAINS—	16c. to 48c.	——
POTATOES—Nova Scotia	——	\$2·75
Lisbon	\$2·50 to \$2·75	No quotation
POTATOES-Sweet, B'bados	\$3·24 per bag	——
RICE—Ballam	No quotation	——
Creole	\$6·00	\$6·00 to \$6·25
TANNIAS—	\$3·12	——
YAMS—White	——	——
Buck	——	——
SUGAR—Dark crystals	\$3·25 to \$3·40	\$3·25
Yellow	\$4·20 to \$4·25	\$3·00
White		——
Molasses	\$2·80	——
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	No quotation.

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AGRICULTURAL NEWS

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

VOL. XI. No. 271. BARBADOS, SEPTEMBER 14, 1912. PRICE 1d.

CONTENTS

The Direct and Indirect Values of Scientific Work.

THE great improvement which has taken place in recent years in the application of scientific knowledge to the practical affairs of agriculture has exercised a most beneficial influence over the results obtained from the cultivation of crops and the rearing of stock. If the agricultural progress of the world during the past twenty-five years were to be carefully scanned, many instances would be found illustrating the value of the work of scientists when the results of such work were properly applied to the solution of existing problems. All branches of science would yield instances illustrating this point: but for the present purpose, a brief consideration of a few entomological problems will suffice.

From the instances given below it will be seen that the study of such problems often leads to the discovery of facts which have an importance greater than that of the original investigation, and extend much beyond the limits suggested by the problem under consideration.

The study of cattle ticks and Texas fever resulted in a knowledge of the dissemination of several diseases by insects and ticks; the attempts to control the San José scale brought about the production of a number of contact insecticides of greater efficiency than those previously known: the struggle against the gypsy moth caused the commercial production of arsenate of lead, and gave a stimulus formerly unknown to the attempts to import and establish natural enemies for the control of an introduced pest; while the steady warfare waged against the cotton boll weevil has produced favourable changes in agricultural practice, in the infested districts, in the matter of cultural methods, rotation, and diversification of crops.

The study of ticks in relation to fever in cattle has brought about an accumulation of knowledge of the most useful and varied kinds. In the first place, a study of the life-history of ticks, and of the disease known as Texas fever or tick fever, demonstrated the fact that the micro-organism causing the disease is transmitted to healthy animals by the bite of the tick, and it was further found that no other means of infection could be proved than the bite of ticks which had previously fed upon infested animals. This led to studies of ticks and biting insects which resulted in giving a knowledge of the manner of transmission of malaria, yellow fever, sleeping sickness and filaria—among the diseases of the human subject—and of several tick- and insect-borne diseases of domestic animals. This knowledge has had the effect of causing all biting and blood-sucking arthropods to be regarded with grave suspicion as to the part that they may play in the dissemination of disease.

Further study of the tick led to a knowledge of its life-history and habits, from which it appeared that the fully-gorged female ticks drop from the cattle in order to deposit their eggs on the ground, and that the young hatching from the eggs can live for only a certain time without food. This led to the adoption of a pasture rotation system, which consists of the practice of enclosing cattle on a certain area during the time when the adult ticks are dropping, and removing them to another, tick-free, area before the young are hatched; cattle are prevented from entering the pasture where the eggs are deposited, until the young should all have died for want of food. This, in general, is the practice by means of which large grazing areas have been rendered tick-free in certain of the Southern States, and in consequence fever-free. In this manner more than 100,000 square miles of territory formerly included in the tick-infested area is now declared tick-free, and the cattle industry of that region is thus relieved from a tax, imposed by parasites and disease, which was formerly very severe.

The benefit derived from the employment of insecticides in combating insect pests is incalculable. In many parts of the world certain crops are subject to attack by insects of different sorts, and in order that profitable returns may be obtained, it is necessary that the effects of insecticides of various kinds should be understood and the life-history of the insects known. The proper insecticide can be used so as to produce the greatest killing effect on the insect and the least injurious effect on the crop plant.

Not many years have elapsed since the use of insecticides was but little understood, and when there were but few well-known substances available for the purpose. At the present time there are several arsenical and other stomach poisons, prussic acid from potassium and sodium cyanides as a fumigant, and a great variety of contact spray materials including such substances as kerosene and other oils, soap, rosin, salt, sulphur and lime, the use of which is understood by planters and farmers in those localities where it is necessary.

The San José scale has been a serious pest on apple and other orchard crops in nearly all parts of the Temperate Zone, and it is due largely to the resistance of this insect to the ordinary spray washes that so much improvement in contact insecticides has been made in the past few years.

The gypsy moth is a European insect which during the past twenty-five years has been a most serious pest to orchards and woodland in the Eastern United States. When the attempt was made to control this pest by means of Paris green and London purple it was found that these insecticides were not efficient, for the foliage of the trees was injured by the poison even when used at strengths which were insufficient to kill the caterpillars of the moth. To meet the need for a more satisfactory poison, lead arsenate was prepared. This compound can be used in mixtures with water at strengths sufficient to kill any leaf-eating insect without injury to the foliage, and is thus one of the most useful arsenical insecticides for spraying plants, if not the most useful insecticide among these.

Another result of great value that has come about from the study of the gypsy moth problem is the stimulus that has been given to the interest in control by natural enemies; this method of control had been used previously, notably in Hawaii, California, and Australia, but probably nowhere on the same large scale. Parasitic and predatory insects from Europe and Asia, where the gypsy moth occurs, are transported in enormous quantities to Eastern Massachusetts, where they are carefully reared in the insectary, and colonized in the open. This work is still in an experimental stage, although it is being carried out on a large scale involving the expenditure of enormous sums of money.

The Mexican cotton boll weevil is one of the most serious pests of an agricultural crop known. Less than twenty years have elapsed since this insect spread from Mexico into the cotton fields of Southern Texas. During this period it has progressed steadily north and eastward, until it now occupies a large part of the cotton belt. No insecticides or remedial measures have sufficed to stop its progress: native parasites do not seriously reduce its numbers, and wherever it becomes established it greatly reduces the yield of cotton. As a result of careful study and investigation over a long series of years, it has been found that early planting of early-maturing varieties greatly reduces the liability of serious attack; while cultural methods such as wide planting, which allows the sun to penetrate to the ground between and under the plants, the early destruction of all cotton plants as soon as the crop is harvested, and also the complete removal and destruction by burning of all weeds, rubbish and cornstalks which would furnish hiding places in which the boll weevils might hibernate, still further reduce the severity of the attacks In addition, a system of rotation has been devised which is in use in many places, and this often results in a diversification of crops which is most beneficial. By these means, the Southern farmers are able to grow profitable crops of cotton in spite of a most serious pest, and they will ultimately gain an advantage as a result of the changes in method, that they are being forced to adopt, which will probably be greater than the losses which they at first experienced.

All these examples are of the greatest interest on account of their direct value. Some of them are useful, further, in that they serve to afford instances where, although the degree of success first anticipated has not been attained, the bold continuation of the work has proved to be of incomparable benefit and has often brought about salutary changes in methods which, probably, could not have been caused to accrue in any other way.

THE RELATION BETWEEN THE CRUSHING OF CANE AND THE VOLUME OF THE FIBRE.

A summary of the conclusions from an investigation of this matter is thus given in Bulletin No. 38, Agricultural and Chemical Series, Experiment Station of the Hawaiian Sugar Planters' Association, by Noël Deerr:—

(1) The amount of juice expressed from chopped cane subjected to a direct pressure increases with the degree of fineness of the material.

(2) After chopped cane has been pressed to a certain pressure, a further notable quantity of juice can be obtained by releasing the residue from pressure and pressing again.

(3) The pressure at which juice begins to flow from megass is not a measure of the pressure at which it has been pressed.

(4) With the pressure remaining constant, greater percentages of juice are obtained from chopped cane as the quantity of material under pressure decreases.

(5) With chopped cane the sum of the volumes of expressed juice and residue remains constant.

(6) At pressures up to 60 ℔. per square inch the volume of megass varies inversely as the 2·5th root of the pressure.

(7) At pressures from 500 ℔. per square inch to 12,000 ℔. per square inch the volume of megass varies inversely as the 5th root of the pressure.

(8) The quantity of juice obtained from chopped cane varies as the 12th root of the pressure.

(9) It is not to be supposed that the relations formulated in 6, 7 and 8 above are of the same degree of exactness as the $PV=C$ law for gases [the product of the pressure and the volume of a gas, at a given temperature, is a constant] or any fundamental physical law: actually the exponent in the equations increases as a function of the pressure; at the higher pressures the increase is however very slow, and the simpler expression may be used to develop a theory of the strains and stresses in the three-roller mill.

(10) The pressure exerted by the layer of megass in its passage between the top and front roller of a standard three-roller mill is small compared with that exerted in its passage between the top and back roller, and probably amounts to about one-fortieth, with settings such are in common use.

(11) The line of no side thrust in a three-roller mill of standard design is only a little deflected from the line joining the centres of the top and back rollers.

(12) From consideration of the equation $H^n P=C$ [where H is the height of the column of megass under pressure, n the number of mills and P the pressure], the pressure on the trash turner, the power therein absorbed, the pressure on the rollers, the power required to compress megass, etc., can be calculated either by analytical or by graphic methods. It is to be distinctly understood that all these calculations are relative and that the accuracy of the numerical results arrived at depends on the accurate determination of the value of $H^n P$ for one particular set of conditions; in other words, 'if the power required to compress t tons of fibre in one hour to a volume V is p, then the power required to compress t' tons of fibre in one hour to a volume V' is p' as deduced from consideration of the equation of $H^n P=C$.'

(13) It has been shown (in the preceding pages) that the pressure exerted by the megass in its passage between the top and front roller is very much less—probably about one fortieth—than than exerted in its passage between the top and back roller, that is to say, the strain in the conventional three-roller mill is symmetrical and as much metal is used in the feed side and in the front roller as in the delivery side and in the back roller The logical application of the experiments described here would indicate that the front roller be regarded solely as a feed roller and would point to a two-roller mill with a small feed roller as being the rational design for the later mills of a train.

In a two-roller mill, however, the pressure exerted by the layer of megass will not be in a vertical line, but following the construction given will pass through a point 0·810 inch from the line of nearest approach of the rollers: in a mill with rollers superimposed vertically there will then be a small side thrust, due to the slow recovery of megass after compression.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture left Barbados by the S.S. 'Oruro', on August 30, 1912, for the purpose of making an official visit to St. Vincent. Dr. Watts was expected to return to Barbados by the S.S. 'Ocamo', on September 14.

Mr. F. Birkinshaw, of Kew, has been appointed by the Secretary of State for the Colonies to the post of Assistant Agricultural Superintendent, St. Vincent. Mr. Birkinshaw arrived in St. Vincent, to take up the duties of his appointment, on August 28.

FRUITS AND FRUIT TREES.

A NEGLECTED CONSIDERATION IN CACAO CULTIVATION.

'The hygrometric state of the air is the most important factor making for success in a cacao plantation, although it has been the least considered up to the present.' This is the translation of a sentence appearing at the head of one of a series of articles dealing with African cacao that are being published in *L'Agriculture Pratique des Pays Chauds*, the special article employed in giving the following information being contained in the issue of that journal for May last.

As far as the knowledge of the writer is concerned, J. H. Hart was the first to point out that the humidity of the air plays a preponderating part in the growth of cacao, and he states that this opinion is finding confirmation continually in cacao-growing in Africa. Theoretically, the matter may be deduced from the examination of meteorological observations. On the Gold Coast, as in Nigeria, it is easy to remark the irregularity of the rainfall, and the considerable deviations in temperature which are the characteristics of the climate of both places, particularly as one approaches the north, towards the limit of the zone that can be cultivated. On the contrary, a remarkable constancy is noticed in the relative humidity of the atmosphere, and for the first time an enormous deviation, principally among the minima of the humidity, between the figures observed for the centres of cultivation of the Gold Coast and Gambaga, situated at the extreme north of the Colony, where as much rain falls as at Aburi, and where cacao cultivation cannot be carried out.

In practice, a large number of observations show that the cacao plant suffers very severly from the dryness of the air, and that much of the want of success in cultivating this plant arises from the little care taken by planters to provide in their plantations a sufficient degree of humidity. The chief matters to be considered are as follows:—

(a) Cacao plants in a plantation which readily resists dry weather, thanks to the permeability and the depth of the soil, suffer damage and lose their leaves immediately after the blowing of the Harmattan (a drying wind), which drives away the moist air and replaces it by that which is dry. The plantations situated in the northern parts of the belts of cultivation are particularly exposed to this wind. The Harmattan reaches many points, as far as the coast; this is the case every year at Aburi on account of its altitude. Cacao plants and heveas regularly lose their leaves at its first breath. At Lagos, on account of the considerable deforestation, the north-north east wind reaches as far as the lagoon, after having completely swept the centre of cultivation at Agege-Otta.

It is not necessary for the wind to be violent in order that it may produce its damaging effects; plantations sheltered by strips of forest through which it filters suffer decidedly from it, on account of the slow replacement of the air which a progressive fall of the state of humidity brings about. It is equally remarkable that at Oshogbo, where the dry season sometimes lasts from four to five months, cacao grows well, thanks to a remarkable constancy in the hygrometric state of the air.

(b) A plantation in which the trees are planted too widely, and where a complete cover has not been formed by the fourth or fifth year, is generally in danger and only gives small yields.

In felling the forest for clearing, the planter has removed the forest conditions near his plantation; that is to say, he has eliminated the regulating factor as regards temperature and the moisture of the atmosphere and the soil. His first care should be to replace the cover in a few years; the prosperity of a cacao cultivation is set at this price. If after the removal of the temporary shade—bananas in most cases—the soil of the plantation is exposed to the sun, the water vapour emitted by evaporation from the soil and by transpiration from the leaves is dissipated. The layer of air which bathes the cacao plants becomes exposed, through this cause, to sudden atmospheric changes which are inimical to the trees, and loses that moisture, which it is agreed, should be present in all well-conducted plantations of cacao.

(c) Verification of the facts is supplied by observing the conditions in the indigenous cacao plantations. In this consideration, those are not included where the trees are planted too thickly; but those, kept in good order, in which there are 360 to 640 plants to the acre. Under these conditions, the cover is sufficient without the assistance of shade trees; the air is generally cool and damp during the hottest time of the day. Such cultivations have been observed in the region of Agege; they showed good resistance to the Harmattan and were normally very productive. The leaves of the plants on the exterior acquire, besides, special characters under the influence of the sunlight and the wind; they become papery and harden rapidly, forming a kind of protecting mantle to the plantation. This, being sheltered on the side of the prevailing winds, develops with ease its young leaves and flowers.

The thickness of planting is a question in which other factors intervene as well, such being the nature of the soil and the exposure. But the maintenance of cover is, without doubt, the principal condition. A matter of interest is that the humidity of the air is at its maximum during the second half of the night, towards six o'clock in the morning; it is at its minimum, that is to say evaporation is greatest, between ten o'clock in the morning and four o'clock in the afternoon.

RUBBER EXPERIMENTS IN SOUTHERN NIGERIA.

A copy of a report of a visit by the Chief Conservator of Forests, Southern Nigeria, to the Mamu Reserve in the Western Province, has been received recently. This gives information concerning the results of wild and plantation rubber-tapping in that area, which may be compared with those obtained in the Benin City Communal Plantations (see *Agricultural News*, July 20, p. 235):—

FUNTUMIA ELASTICA. Tapping was started in the Reserves on May 1, and up to the end of June the results were as follows:—

	Plantation trees.	Wild trees.
Number tapped	1,954	354
Yield of rubber in biscuits	1,446	405
Yield of rubber by weight	114·6 ℔.	40·5 ℔.
Average yield per tree	0·93 oz.	1·8 oz.

The total yield of rubber up to the end of that period was 185 ℔. (this includes 30 ℔. still in the drying shed at Mamu) and the expenses of tapping amounted to £15 11*s.* 4*d.*, or at the rate of 1*s.* 8*d.* a pound—a not unsatisfactory figure but one capable of further reduction as the tappers become more expert. A further sum of £6 was spent in purchasing utensils, knives, etc., but this being of the nature of capital expenditure has not been included in the cost. With that sum added, the average cost per pound amounts to 2*s.* 4*d.* or £21 11*s.* 4*d.* in all.

If the rubber sells at 5*s.* per ℔., out here, the 185 ℔. will realize £46 5*s.*, and the net profit will be £24 13*s.* 8d., or at the rate of 2*s.* 8*d.* a pound.

The rubber was prepared in the same manner as in Benin, namely by the boiling method with subsequent smoking, and is of excellent quality. It should realize good prices at home. On the whole, it is better prepared than that shipped to England last year from the Benin Plantations.

Very little injury has been done to the trees that were tapped with the Christy knife, and cuts a month or so old at the time of my visit had nearly completely healed up. It also appears probable, though the experiments have not yet been concluded, that by using this knife the trees can be tapped two or three times in one year with but little diminution in yield as compared with the results of the first tapping.

An extraordinary feature of the Mamu trees is the fact that the weight of the biscuits prepared from their latices has been quite constant all through; ten biscuits weigh almost exactly 1℔.

Consignment after consignment has given the same figures. Of course these results are mainly due to the same percentage of water being used to dilute the latex before it is boiled, and to the same quantity of this diluted latex being used for the preparation of each biscuit; but even allowing for this, the results show an extraordinary constant proportion of rubber to latex, which appears to have been unaffected by the state of the weather at the time of tapping.

HEVEA BRASILIENSIS. The growth of this species is poor compared with results obtained in the moist districts close to the sea; it is also much exposed to damage from the large rodent known as the Cut Grass, and taking everything into consideration I think it will be unprofitable to continue the cultivation of this species at Mamu. The areas that would thus be set free could be planted up with teak and other valuable timber trees for which the soil is very suitable. I have accordingly issued instructions that no more Hevea is to be planted at Mamu.

LEMON GRASSES IN FIJI.

A grass has been identified at the Imperial Institute as *Cymbopogon coloratus*, Stapf. It does not appear to be one of the common sources of lemon grass oil, but information from the Imperial Institute shows that it may have a special value for scenting soap. The weight of grass distilled was 7,943 ℔., giving 28·63 ℔. of oil, or 0·36 per cent. Three separate distillations gave an average of 28·7 ℔. of oil per acre, per cutting.

The following experiment was conducted to determine the increase or otherwise of the oil content of the grass with the age of the plant: four plots of a uniform growth of grass were measured off, and after flowering the whole grass was cut short. When the grass was 1 foot high, plot A was cut and the oil obtained. The grass in the other plots was allowed to grow until it was 2 feet high. A second plot was now cut and the oil obtained; plot A being also cut and the oil distilled from its grass. These two plots were again cut when the grass in the other two was 3 feet high, and at the same time one of these new plots was cut. All the plots were cut again when the grass in the fourth plot was commencing to flower and was nearly 4 feet high. The complete results are given below:—

Oil in ℔. per acre, and percentage.

	A.		B.		C.		D.	
Cut at 1 foot	3·8	3·8	—	—	—	—	—	—
Cut at 2 feet	2·6	0·46	13·3	0·42	—	—	—	......
Cut at 3 feet	8·0	0·38	8·0	0·38	44·0	0·47	—	—
Cut when flowering	2·5	0·48	4·4	0·54	3·7	0·51	54·5	0·40
Total wt. ℔.	16·9		25·7		47·7		54·5	

It will be seen, therefore, that the best results seem to be obtained by cutting the grass mature, that is when about to flower. A lemon grass which is usually spoken of as indigenous was identified by the Bureau of Plant Industry, United States Department of Agriculture, as *Andropogon schoenanthus*. A cutting from the small number of stools of this grass available at the station gave 0·24 per cent. of oil. The cultivation is being extended. (From the Report on Agriculture in Fiji for 1911.)

WEST INDIAN COTTON.

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

A fair business has been done in West Indian Sea Island cotton during the past fortnight, at the reduced prices mentioned in our last report.

The bulk of the business was from 14*d.* to 16*d.*, with Stains 8½*d.* to 9½*d.* and odd lots of extra quality St. Vincent at higher prices.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending August 3, is, generally, as follows:—

The market has continued dull with no enquiry, the only sales being 72 bales Fully Fine to Extra Fine slightly off in preparation, for English account.

The Development of Cotton-growing in India.—On July 1, the Earl of Crewe, Secretary of State for India, received at the India Office a deputation of English and Indian members of the International Cotton Committee, the purpose of which was to urge the necessity for the development of cotton-growing in India. In introducing the deputation, Sir Charles Macara referred to the steady, increasing consumption of Indian cotton, outside of that country, and to the fact that circumstances make it easier to enlarge greatly the production of cotton in India than in any other country. Among the speakers was Mr. J. W. McConnel, who referred to what he had seen in the matters of cotton-growing and experimentation with the plant while on a visit to the West Indies (as a delegate to the Agricultural Conference of this year), speaking in favourable terms of the work of the Imperial Department of Agriculture, and of the local agricultural departments, and contrasting the comparatively large number of skilled investigators that are available for cotton experimentation, in these islands, with the number of Europeans in the Agricultural Department of the United Provinces of India that may be employed for the purpose.

After the Marquis of Crewe had replied sympathetically, stating that it was the desire of the Government of India to set aside an increasing amount of money, not only for cotton—the importance of which the Government recognized—but for the encouragement of agriculture generally, Sir Charles Macara thanked his Lordship on behalf of the deputation, which then withdrew.

COTTON-GROWING IN THE ANGLO-EGYPTIAN SUDAN.

In reviewing the Annual Report of the British Cotton Growing Association for 1911, in the *Agricultural News* of July 6, it was stated that the want of space forbade the treatment of certain matters that appeared in the report. These matters were concerned chiefly with cotton-growing in the Anglo-Egyptian Sudan; as however, the information in the report has been supplanted by the details in Pamphlet No. 49, issued by the British Cotton Growing Association in May 1912, the contents of this will receive attention instead.

This pamphlet deals with the recent visit of Mr. J. A. Hutton, the Chairman of the Association, to the Sudan, for the purpose of viewing the prospects of the extension of cotton-growing in that country. Mr Hutton gave a description of the journey made by him, together with other expert members of the Association, at its annual dinner on May 20. The account of the proceedings at the dinner is reprinted in the pamphlet from the *Manchester Guardian* for May 21. It is preceded by a copy of the following resolution that was passed at the annual meeting of the Association, held on the same day:—

'That the attention of His Majesty's Government be drawn to the dangerous position of the supply of the raw material of the Cotton Trade of this country, and to the exceptional opportunity offered in the Anglo-Egyptian Sudan for the extension of Cotton Growing on a large scale in the immediate future, and to the vital importance to Lancashire of the work being pushed on with all possible speed.

'That the Government be respectfully requested to make a grant-in-aid to the Government of the Sudan of the sum of £200,000, to be spent in experimental and research work for the advancement of Cotton growing in that country.

'That the Government be also respectfully requested to make arrangements for a loan of £1,000,000 to the Sudan Government for the construction of Irrigation and other works necessary for the rapid development of the Cotton-growing Districts of the Anglo-Egyptian Sudan.

'And that copies of this resolution be sent to the Prime Minister, the Chancellor of the Exchequer, the Secretary of State for Foreign Affairs, and Lord Kitchener of Khartoum.'

Returning to the subject of the journey, it was stated by Mr. Hutton, in acknowledging the toast of The Cotton Growing Expeditions, proposed by Lord Derby, the President of the Association, that the visit and the journey occupied the time between December 14, 1911 and February 23, 1912; during this period about 9,000 miles was travelled. In Egypt interviews took place with more than seventy-five persons including His Highness the Khedive and Lord Kitchener, the Agent-General. In the Sudan, there were almost as many interviews, and visits were paid to all the chief ginning factories and to almost every cotton plantation of any importance, so that a vast amount of information of future utility was obtained.

Proceeding, Mr. Hutton drew attention to the fact that the Anglo-Egyptian Sudan has an area of about 1,000,000 square miles, so that it is about one-half the size of India. Although the land was not all cultivable, a large extent of territory existed where cotton may be grown—enough to fill the requirements of the British Cotton Growing Association, in the special connexion, for the next fifty years. The climate of the southern part included an ample rainfall with a well-marked dry season; the rainfall decreased as one proceeded northward, but there was plenty of water available for irrigation. The soil was best in the southern part, and as far as labour is concerned, it was thought that there is an ample population for immediate requirements.

After referring to the excellent transport facilities that exist in the country, and the readiness that has been expressed by Sir Owen Philipps to co-operate with the Association in the matter, attention was drawn to the important circumstance that the Sudan is already a cotton-growing country (the exports exceed at present 20,000 bales a year), so that there is no need to carry out extensive experiments to show that cotton is a suitable crop, nor is special effort required to impress upon those interested that the latter is an actual fact.

The succeeding part of the address dealt with the conditions that exist in Tokar, Kassala, the Khartoum district and Gezira. With reference to all these places there were most encouraging signs that they can be made to produce large quantities of cotton of American type, the conditions being better in many respects than those in Uganda and in Nigeria. For raising cotton as a rain crop, it seemed that the rainfall is sufficient over at least 100,000 square miles. Cotton was already being grown in quantity as a rain crop, but it varies greatly in quality and is very dirty on account of the careless methods of picking.

The speaker expressed himself very favourably indeed as regards Gezira, which he described as a huge plain containing at least 5,000,000 acres of first class cotton soil, or an area as great as that of the Delta. He considered that the number of local cultivators existing at present is sufficient to take up all the land that can be brought under irrigation during probably the next ten years. The existing pumps could only irrigate about 2,000 acres; it was hoped that the whole of these will be cultivated in the next season. On a reasonable scale, however, to develop even a portion of the Gezira, the expenditure of £4,000,000 or £5,000,000 would be necessary; further than that, commercial development would require £2,000,000 to £3,000,000 additional capital. Mr. Hutton finally expressed his opinion that, if work is commenced at once, in a very few years' time the Gezira would produce 250,000 bales of cotton, or more.

The speaker concluded by dealing with several matters relating to the provision of capital for these purposes. He suggested that, while the capital for commerical development might be raised in other ways, the part needed for railways and irrigation work might be found by the British Government; at the same time the services of the Association would, in another way, be available for expert assistance and advice. The amounts of capital required would be very large: £8,000,000 for railways and irrigation work and £4,000,000 for commercial developments were suggested. This, however, would not be all required immediately, and Mr. Hutton made the further suggestion that the Association should ask the British Government to advance on loan to the Sudan Government, for the railways and cotton development, the sum of £1,000,000. Questions would be asked about the immediate expectations from extended cotton-growing in the Sudan, supposing that this capital was found. It seemed that favourable answers would be obtained, from the fact that results are likely to be larger and quicker in the Anglo-Egyptian Sudan than in any other part of the British Empire: in actuality an annual production of 250,000 bales of excellent cotton, in ten years from now, was forecasted by Mr. Hutton if the conditions are fulfilled. He concluded with the statement: 'After our investigations I and my colleagues are convinced that the Anglo-Egyptian Sudan offers one of the best cotton-growing propositions in the British Empire, and in the Gezira we have the very finest proposition in the whole of the world.'

Among the speakers who followed Mr. Hutton were Mr. J. W. McConnel and Mr. W. Marsland, who attended the recent Agricultural Conference as delegates of the British Cotton Growing Association. They both referred in appreciative terms to what they had seen during their visit to the West Indies.

COTTON SEED MEAL FOR MULES AND HORSES.

In the last number of the *Agricultural News*, an account was given of the results of an investigation of the harmful effects of cotton seed meal when it was fed to guinea pigs and rabbits. The following abstract of a description of a more practical trial of the food, carried out with mules and horses at the North Carolina Agricultural Experiment Station, appears in the *Bulletin of the Bureau of Agricultural Intelligence and of Plant Diseases*, June 1912, p. 1369:—

In order to ascertain the value of cotton seed meal as a feed for horses and mules, the author carried out, from 1908 to 1911, some feeding experiments on six mules at the North Carolina Agricultural Experiment Station, besides which he collected the experience of farmers who fed cotton seed meal to their work stock.

The feeding experiments were divided into four periods; in the first, the preliminary period, five mules were fed shelled corn and cotton seed meal, and only one was given shelled corn alone, as concentrated food. The roughage consisted, throughout the experiment, of corn stover and sometimes, exceptionally, of different kinds of hay.

In the three principal periods the ration of concentrateds fed to three of the mules was either shelled corn, ear corn, or corn and cob meal. The other three mules had the same concentrateds, but in smaller quantity, the difference being made up with wheat bran and cotton seed meal. All the animals under experiment worked.

The experiments showed that no inconvenience arose from the use of cotton seed meal in moderate quantities (about 10 per cent. by weight of the whole ration, or 1½ to 2 lb. per head per diem) and intimately mixed with bran or maize meal. When greater quantities of cotton seed meal was fed, the animals lost weight and their capacity for work was impaired. Besides, after a short time, they refused to eat it when it was given too liberally.

The experience of farmers who fed their horses and mules with cotton seed meal was, in the main, to the same effect. Some farmers stated that when the meal is fed in excess it causes weakness of the eyes and even blindness, but the author considers that if the meal is fed with judgment no trouble should arise.

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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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this issue treats of the Direct and Indirect Values of Scientific Work, the examples for illustration being mostly drawn from instances where the labours of investigators have been concerned with the life-history and control of insects and similar animals.

On page 292 an article is presented which deals with a consideration that is generally neglected in cacao cultivation, namely the humidity of the air in the plantation.

An account of a recent address on cotton-growing in the Anglo-Egyptian Sudan is presented on page 294.

The last issue of the *Agricultural News* contained an account of feeding experiments with cotton seed meal, employing guinea pigs and rabbits. Page 295 of this number gives a report of other, similar work, the animals in this case being mules and horses.

The Insect Notes, on page 298, contain the second and concluding part of a report on a visit to St. Kitts, by the Entomologist to the Imperial Department of Agriculture; this article is illustrated. They also comprise a note on *Zalophothrix mirum*, to the effect that this name for the insect is a synonym of *Lecaniobius cockerelli*, Ashmead.

A short article on page 299 deals with the representation of the Imperial Institute at the International Rubber Exhibition.

St. Vincent and Visitation by Hurricanes.

With reference to a statement that appeared recently in an editorial article on Hurricanes, in the *Agricultural News*, Vol. XI, p. 241, His Honour the Administrator of St. Vincent, the Hon. C. Gideon Murray, writes to point out that this may cause inaccurate and detrimental conclusions to be drawn regarding the liability of that island to be visited by hurricanes and high winds. The statement is as follows:—

'Experience has shown that while Trinidad and Grenada are not likely to be visited by a hurricane, St. Vincent and Barbados are much more subject to such disturbances, or at least to the high winds that occur towards the outer limit of the storm area.'

In his letter, His Honour proceeds to state: 'In these circumstances therefore I have taken the trouble to ascertain exactly how often St. Vincent has been visited by hurricanes during the past 100 years.

'From an investigation of the records of West Indian Hurricanes in the United States of America Department of Agriculture Weather Bureau, Bulletin H, a standard work on the subject, I find that a hurricane is stated to have occurred at St. Vincent on the 21st October, 1817, but this hurricane evidently was not serious as there do not appear to be any local records of damage done. In support of this I may say that while the hurricane of 1831 is fully described in a despatch to the Secretary of State from the Governor of the day there is no similar despatch to the Secretary of State on the subject of the alleged hurricane of 1817. In fact Sir Charles Brisbane, who had been away on leave, in a despatch dated the 17th December, 1817, states that on his return to assume the administration of the Colony he has found that during his absence "everything has been tranquil".

'On the 11th August, 1831, the Colony was visited by a severe hurricane. Not until 16th August, 1886, 55 years later, did she suffer again in this way, but this time the hurricane or cyclone as it was called, was confined to a limited area of the island, 5 miles broad. St. Vincent was again inflicted by a severe hurricane on the 11th September, 1898, since when she has been free of hurricanes.

'Thus in an hundred years St. Vincent has been the scene of one hurricane about which no information can be obtained locally so it cannot have been of a serious nature, two destructive hurricanes and one cyclone over a limited area; a record which I am sure will compare favourably with that of any of the other West Indian Islands excepting Trinidad and Grenada.'

Following this, His Honour adds that he does not question the contention that St. Vincent is much more subject than Trinidad and Grenada to the high winds that occur on the outer limit of the storm area, but draws attention to the fact that the mean track of recorded hurricanes is undoubtedly well to the East and North of the island. In support, further, of the opinion that St. Vincent is not specially subject to high winds, he adduces his own experience that, during three years' residence in the Colony, no high winds have been felt, and the circumstance that the absence of these is shown by the successful cultivation of cotton in the island, season after season.

Publications of the Imperial Department of Agriculture.

As has been advertised, the issue of the *West Indian Bulletin*, Vol. XII, No. 3, has been made. This contains the papers in full belonging to the sessions in which Cacao and Sugar were dealt with at the West Indian Agricultural Conference, 1912. A detailed list of these papers is as follows:—

Cacao: Methods of Spraying Cacao: Fungus Diseases of Cacao; Cacao Canker; A Possible Inference to be Drawn from the Studies on Cacao Canker; Insect Pests of Cacao; Manurial Enperiments on Cacao in Trinidad; A Description of the Barnard Cacao Polisher; The Structure and Pollination of the Cacao Flower. Sugar: Manurial Experiments on Sugar-cane in Trinidad and Tobago; A Comparison of some Seedling Sugar-canes with the Bourbon variety in Barbados; Bourbon and Seedling Canes; The Application of Mendelian Principles to Sugar-cane Breeding; The Study of Sugar-canes with a view to their Classification; A Quick Method for Estimating Moisture in Megass; The Sugar Industry in Antigua and St. Kitts-Nevis; and the Determination of the Water Content of Molasses.

The *West Indian Bulletin*, Vol. XII, No. 3, may be obtained from all agents for the sale of the publications of the Imperial Department of Agriculture: price 6*d*., post free 8*d*.

It may be stated, at this opportunity, that the usual issue has been made of the handbook published by the Department, called the West Indies in Canada, for distribution at the Canadian National Exhibition and to firms in Canada and New York that are interested in West Indian products, as well as to those who have advertised in the book.

Vol. XII, No. 4, of the *West Indian Bulletin*, dealing with papers on Plant Diseases and Pests, Coco-nut, Lime and Fruit, and Rice Industries, presented for the Agricultural Conference, will be published shortly.

School Gardens in Jamaica.

A copy of the Annual Report of the Education Department and of the Board of Education, Jamaica, for the year ended March 1911, has been received recently. This contains the following information regarding school gardens in the island:—

'The number of school gardens recognized by the Department at the end of the year under review was 377 as compared with 361 the previous year. And the expenditure under Article 112 was £746 in 1910-11 as compared with £509 1909-10. Mr. Murray, Intructor for School Gardens, reports having visited 145 of these school gardens and extracts from his report will be found along with those from the Inspectors' Reports. As in previous years prizes of £3 and £2 and two of £1 each were awarded to the best four gardens in each Inspector's district, on the Inspector's recommendation after consultation with Mr. Murray. Opportunities were again afforded to teachers to obtain seeds at cost price and cuttings and plants of many varieties gratuitously through the Agricultural Department, but the number of teachers who made use of these opportunities was only sixty-two as compared with sixty-one last year.

'In several districts the Agricultural Instructors have rendered very valuable assistance to the teachers in their school gardens and realize fully the important part this encouragement of agricultural interest amongst children may play in the development and success of their own work. This co-operation of the Agricultural Instructors is welcomed by the Department and I hope to see it more systematically organized in the future.'

It is added that considerable encouragement has been given to practical agricultural teaching in Jamaica under a recent amendment of the Code, the special grant for the work having been increased from a maximum of £5 to one of £6: and better provision has been made for supplying tools to small schools, and for fencing.

Treatment for Wood Preservation in India.

The antiseptic treatment of timber in India, with special reference to railway sleepers, is dealt with in an interesting and valuable manner in Vol. III, Part 2, of the *Indian Forest Records*, published during last March.

After a preliminary note on the antiseptic treatment of timber, the various methods for this treatment are grouped under two heads: the processes in which injection by hydrostatic or pneumatic agencies are employed, and those which involve the open tank or brush method of treatment.

The former of these processes employing injection—include: creasoting, the haskinizing or vulcanizing process, the boucherie process, the burnettizing process, which involves the use of zinc chloride, the gardenerizing process, the Riiping process and the cresol-calcium process (the last was described in the *Agricultural News*, Vol. IX, p. 137).

With reference to the open tank or brush method of treating timber, the employment of the following receives description: chloride of mercury (kyanizing process), saccharine solution (powellizing process), avenarius carbolineum, jodelite, atlas solution, solignum, green oil, microsol, bellit, cresol-calcium, cresoyle and other antiseptics. The last include include zinc chloride and sodium chloride, bellitol, hylinit, anthrol, afral, antiformine, antigermine, and lysol, as well as others.

The publication concludes with an account of proposals as to the way in which future investigation into the antiseptic treatment of wood for sleepers should be carried out.

INSECT NOTES.

REPORT ON A VISIT TO ST. KITTS.

PART II.

THE HARDBACK. The small brown hardback occurs in considerable numbers in cane fields and other cultivated land in certain districts in St. Kitts.

Fig. 9. Grub of Hardback.

This insect has been identified, through the courtesy of Mr. Guy A. K. Marshall, Scientific Secretary of the Entomological Research Committee, as *Lachnosterna patruelis*. The grubs of this species are of the typical form of the white grubs or hardback grubs, while the beetle is of the usual hardback form, but considerably smaller than the ordinary hardbacks.

The occurrence of these insects in abundance in the sugar-cane fields of St. Kitts is of interest in view of the importance of similar pests in other countries. In Mauritius, serious losses have been occasioned by the attacks of *Phytalus smithi* which is the same insect as that known in Barbados (see *Agricultural News*, Vol. XI, p. 90) as the brown hardback. In Porto Rico another species of Lachnosterna occurs as a pest of importance in sugar-cane fields; and in other countries related species of insects are attracting attention either because of the injury they are known to cause, or on account of what they are suspected of being capable of doing.

The brown hardback in Barbados is parasitized by a small black wasp which is probably responsible for keeping it in check. In St. Kitts a wasp related to the Barbados species was observed in the cane fields and a hardback grub was found with a larva of a hymenopterous insect attacking it. This is suspected to be a parasitism similar to that known to occur in Barbados, but the relation between the wasps observed in the fields and the parasitic grub attacking the hardback larva has not been proved.

THE ROOT BORER. The root borer discovered in the sugar-cane fields in St. Kitts appears to be of a different species from that which occurs in Barbados, but in its manner of attacking sugar-cane it is very similar, and the grub is much like the larva of *Diaprepes abbreviatus*.

Fig. 10. Eggs of Root Borer.

In several different localities these large weevil grubs were found tunnelling in the underground stem portion of the cane stool. The adult of the root borer is not known, but it is believed to be a greyish-brown weevil which was found in the soil near cane stools attacked by root borer. This weevil, which is of the same general shape as, and slightly smaller than, the root borer weevil in Barbados, is

Fig. 11. Root Borer, Grub (on left) and Perfect Insect (on right).

quite common in its occurrence in St. Kitts-Nevis, Antigua and Montserrat, where it is often to be found hiding amongst the leaves of such plants as castor and pigeon peas, which grow along the borders of cane fields. This adult insect has previously been known largely on account of its habit of feeding on the leaves of limes and other Citrus plants. If the connexion between this weevil and the root borer grub is definitely established, it may prove to be a more serious pest than has been suspected. The fact that these beetles are fairly abundant would indicate that their larvae must have some food plant other than sugar-cane, since, if this were the only food plant, the attacks would have been discovered before this time, while the relation between the weevil and the grub would have been sooner suspected.

Fig. 12. Damage Done to Sugar-cane by the Root Borer.

The methods of control suggested in the report for the root borer and the hardback grubs are the same as those suggested for the control of termites, which have been mentioned already.

Zalophothrix mirum.—Mr. J. C. Crawford, Assistant Curator, Division of Insects, United States National Museum, described and named *Zalophothrix mirum* when this useful parasite was found to be exerting a very material control over the black scale (*Saissetia nigra*) on cotton in Barbados.

In a note included in Descriptions of New Hymenoptera, No. 3 (*Proceedings of the United States National Museum*, Vol. 41, pp. 267-82), Mr. Crawford states that *Z. mirum* is a synonym of *Lecaniobius cockerelli*, Ashmead.

This insect will therefore be called by the latter name, in future, in the publications of this Department, the name being followed by the words 'Zalophothrix mirum' placed in square brackets.

Note.—The insect to which Figs. 10, 11 and 12 refer is the sugar-cane root borer found in Barbados (*Diaprepes abbreviatus*), and probably not that of St. Kitts which forms the subject of the article. [Ed., *A.N.*]

'BALATA' FROM NORTHERN NIGERIA.

The sample of this product received for examination at the Imperial Institute consisted of four large blocks of 'balata', which were very dirty externally and covered with mould. Internally the material varied in colour from white to pink, and contained a considerable amount of moisture and vegetable impurity. The 'balata' was rather tenacious, but deficient in elasticity, and was slightly sticky.

The results of an analysis of the specimen were as follows:—

	Per cent.
Loss on washing (moisture and impurities)	26·0
Composition of dry washed rubber:—	
Caoutchouc	49·2
Resin	47·7
Protein	2·4
Ash	0·7

The material was valued in Liverpool at 1*s*. 8*d*. per lb. (November 1911), the brokers stating that there is a good market for black 'balata' of this kind, and that consignments can be sold almost at any time. They added that it is preferable to export the balata in the form of blocks rather than to cut it into small pieces, as is sometimes done.

The balata as received contained a large quantity of moisture and impurities, losing as much as 26 per cent. on washing and drying. The appearance and physical properties of the material were greatly improved by its conversion into crêpe in the washing machine.

The results of the analysis show that the 'balata' is of very resinous composition, the dry material containing about equal proportions of caoutchouc and resin. The isolated caoutchouc was almost black, and exhibited very poor physical properties.

The 'balata' rubber from Northern Nigeria is usually stated to be derived from *Ficus Vogelii*, and the results of the analysis of this specimen agree generally with the figures previously obtained at the Imperial Institute for specimens of the product furnished by this tree in the Gambia and Gold Coast. (*Bulletin of the Imperial Institute*, Vol. X, p. 209.)

THE IMPERIAL INSTITUTE AND THE INTERNATIONAL RUBBER EXHIBITION.

An account of the exhibits to be sent to this exhibition by the Imperial Institute is contained in the *India Rubber World* for August 1, 1912:—

Great interest has been aroused by the announcement that the Directors of the Imperial Institute of London have consented to send to the Rubber Exposition, to be held in New York in September, an extremely fine collection of rubber grown in every British rubber-producing country, in charge of a special commission.

The object of this exhibit is to illustrate the rubber resources of the British Empire by means of specimens from the collections of the Imperial Institute. The exhibit includes (1) herbarium specimens of the principal rubber yielding plants and (2) representative samples of rubber from the following countries: India, Ceylon, Straits Settlements and Federated Malay States, British North Borneo, Papua, Fiji, Gambia, Sierra Leone, Gold Coast, Northern Nigeria, Southern Nigeria, Anglo-Egyptain Sudan, Uganda, East Africa Protectorate, Zanzibar, Nyasaland, Natal, Transvaal, Rhodesia, Seychelles, British Guiana, British Honduras, Jamaica, Trinidad, Dominica, St. Lucia, and the Bahamas.

The section devoted to each country will be provided with a descriptive label giving general information regarding the rubber-yielding plants which are indigenous to, or are being cultivated in, the country, and statistics of the rubber production during the last ten years.

The article includes further a list of the exhibits and their places of origin. This shows that they are as follows, as far as the British Possessions in tropical America are concerned: Trinidad, *Castilloa elastica* rubber—sheet, Para rubber—biscuits: St. Lucia, *Castilloa elastica* rubber—biscuits; Dominica, Para rubber—biscuits, *Ficus elastica* rubber—biscuits: Jamaica, *Forsteronia floribunda* rubber; British Guiana, *Sapium Jenmani* rubber—biscuits, lump, balls, *Mimusops globosa*—sheet balata: British Honduras, Castilloa rubber: Bahamas, *Cryptostegia grandiflora* rubber—biscuits.

'Root-Cotton.'—An interesting fibrous material occurring on the surface of the roots of a tree, *Fagara integrifolia*, has been described by S. Kusano in the *Journal of the College of Agriculture*, Tokio (1911, 4, 67). The plant belongs to the natural order Rutaceae, and is found commonly on the mountain slopes in Botel-tobago island, Formosa, and in the northern half of the Philippine Islands Archipelago. The fibre is produced in considerable quantities in the form of loose bundles, resembling masses of cotton, which can be readily removed with the fingers. It can be easily cleaned by washing with water and drying. The actual quantity present on any one root depends on its age, the layer attaining a thickness of as much as 2½ inches on old roots. The removal of the fibre does not appear to affect the functional activity of the roots. The individual fibres or filaments consist of rows of long, empty, thin-walled cells. The fibre, or 'root-cotton', is lustrous, of a pale straw colour, soft, exceedingly fine, and not very hygroscopic. It is so weak that when rubbed between the fingers it is reduced to a fine, waxy powder, and for this reason could not be used for spinning. A remarkable property of the fibre is that it is not wetted by water and will never sink, owing to the cell-wall being highly suberized and thus rendered impermeable. The product is developed in the cortex of the root by the cork-cambium, and is comparable with the ordinary corky layer produced on the bark of trees.

The root-cotton is used by the natives of Botel-tobago for caulking the seams of their boats, whilst the natives of Mindoro island employ it for stuffing pillows. It is suggested that the fibre might find an application for the latter purpose among civilized communities, and that if pressed into sheets it might serve as a substitute for plates or sheets of cork. It seems probable, however, that the value of the material for either of these purposes would be seriously limited by its weakness and the ease with which it is pulverized. (The *Bulletin of the Imperial Institute*, July 1912.)

GLEANINGS.

It is announced in *Nature* for August 1, 1912, that Mr. H. Maxwell Lefroy, sometime Entomologist to the Imperial Department of Agriculture, has been appointed Professor of Entomology at the Imperial College of Science and Technology.

Information has been received to the effect that the Fourth International Rubber and Allied Trades Exhibition will be held in London in June 1914. In the same year the First International Cotton, Fibre, Tropical Products and Allied Trades Exhibition will take place concurrently, but quite separately, in an adjoining building.

The distribution from the Antigua Botanic Station during last month included: limes 3,422, Eucalyptus 294, coco-nuts 273 and onion seed 105 lb. During the latter part of the month, about 17 acres of limes were planted in the island. The exports of cotton from Antigua during the season 1911-12 amounted to 70,209 lb.

A note in the supplement to the *Chamber of Commerce Journal* for July 1912 shows that the imports of arrowroot into the United Kingdom in 1911 were 30,849 cwt., valued at £35,581, of which 29,718 cwt., valued at £32,019, came from the British West Indies, and 1,024 cwt., valued at £3,254, from other British possessions.

The Federated Malay States *Government Gazette* of June 21, 1912, shows that the exports of rubber from the Federated Malay States during the first five months of the present year amounted to 13,076,350 lb., as compared with 7,119,643 lb. in the corresponding period of last year. The exports for May 1912, were 2,255,034 lb.; for May 1911 they were 1,147,488 lb.

According to the *Louisiana Planter* for August 10, 1912, 30,940 tons of sugar were taken by Canada from Java, in the period May 1, 1911 to March 31, 1912. There is a steady increase in the amount of sugar imported into Canada from Java, as is shown by the fact that in the similar period 1909-10 it was 18,304 tons, and in the similar period 1910-11 the quantity was 23,819 tons.

With reference to the information given concerning cotton production in Uganda, on p. 252 of the *Agricultural News* of August 3, 1912, the Uganda *Official Gazette* of June 15, 1912, gives a correction which shows that the figures for the returns of unginned cotton shipped in the period April 1, 1911 to March 31, 1912, should be 2,275 tons value £45,543, instead of 2,105 tons value £42,755.

Mr. William Hodgson, the manager of the Nismes estate, who is the proprietor of Plantation Noitgedacht, has despatched a quantity of biscuit rubber, grown upon his plantation, to New York for inclusion among the exhibits at the International Rubber Exposition to be held there next month. The rubber, which weighs 10 lb., is of excellent quality. (The *Demerara Daily Chronicle*, Mail Edition, August 16, 1912.)

H.M. Consul at Lourenço Marques, in reporting on the trade of Portuguese East Africa in 1911, mentions a valuable product which consists of the fruit of the mafureira tree (*Trichilia emetica*), the seed of which yields an oil. The tree is widespread in its distribution, but has not been much exploited; the exports of the seed in 1910 amounted to 1,367 tons value £7,658. It is stated that the seeds yield about 65·5 per cent. of an oil resembling cotton seed oil.

A report by the British Vice Consul at Santos shows that the exports of coffee from that port during 1911 were 8,719,742 bags—an increase of 1,885,030 bags over the shipments in 1910; at the same time prices were much higher during the first-mentioned period. The crop of 1911-12 is not expected to reach 10 million bags, on account of unfavourable weather; although the original estimates were much higher than that. An estimate of about 8 million bags is made for the 1912-13 crop.

The *Board of Trade Journal* for June 20, 1912, gives particulars of a patent material made in France and called 'bois armé'. This reinforced wood consists of layers of wood planed in small corrugations, a woven fibre being inserted between the layers and the whole firmly cemented together by means of waterproof glue. Great strength, combined with elasticity and lightness, is claimed for the material, which is said to be adapted for use in aeroplanes, poles for wireless telegraphy, ladders, and frames of motor cars and sledges.

There was launched recently, by Messrs. Alexander Steven & Sons, Ltd., Linthouse, Glasgow, the steamer Chagres, as an addition to the banana and passenger steamers of Messrs. Elder and Fyffe, Ltd., running between Liverpool and Bristol, and the West Indies and Central America. This is a twin-screw vessel of 5,000 tons, and as she is designed for carrying bananas, the principal feature is an insulated chamber of some 250,000 cubic feet in which the temperature is under absolute control. A special interest is that the vessel is the first of a new type of steamer intended to take the place of the boats of the late Imperial Direct Line.

STUDENTS' CORNER.

SEPTEMBER.

Second Period.

Seasonal Notes.

In view of the approaching examinations in practical agriculture, it may prove suggestive to Final Students, and others, to present in these columns a brief survey, from the economic aspect, of the more important matters relating to Estate Management, and to give references to articles and papers that have appeared from time to time in the publications of the Imperial Department of Agriculture.

It is not always recognized by the student that there are really two great divisions of science applied to agriculture—natural science which aims at the elucidation of physical, chemical, and biological problems connected with the soil, crops and estate animals, and economic science which concerns questions of capital and labour markets, methods of keeping accounts, agricultural law and similar matters. Broadly speaking, economics deal with the administrative and distributive activities in estate management; and although work of this nature constitutes mainly the duties of the attorney and manager, and a knowledge of it accumulates naturally in the course of business experience, it is nevertheless desirable for the overseer to obtain a grasp of the economic forces and principles underlying and surrounding the management of an estate in order that he may better appreciate the significance of its internal working.

It is not intended in these notes to adhere strictly to the syllabus of the Reading Courses for Overseers, though at the same time most of the points dealt with are closely connected with the requirements of the final examination In agricultural economics, land is the first consideration. The following are some of the factors which determine the value of an estate: natural fertility, weather conditions, contour, means of communication (both internal and external), proximity to shipping port, and labour conditions. Compare, in these respects, different estates with which you are acquainted. Consider carefully what is meant by the term 'fertility.' As regards land tenure, examine the question of renting as against ownership; what are the relative economic advantages and disadvantages? This leads to the subject of capital. Capital invested in an estate can be classed as (a) fixed (land, buildings, roads, drainage, irrigation, etc), and (b) circulating (machinery, implements, working animals, seeds, etc.). How would you proceed to determine, under your conditions of working, the average amount of capital invested per acre? In making inventories, a knowledge of cost prices and depreciation is required. It should be borne in mind that the value of stock to the owner is generally greater than the selling price. Consider any instance of over- and under-capitalization of which you have knowledge. Capital invested in a business is charged with interest, and the balance of the profit and loss account goes to the capital account and the resulting balance is then carried to the balance sheet as an asset. Cash receipts cannot be regarded as capital until the *total* cash receipts and total cash expenditures have been balanced. Many more points like these will occur to the student: for a full treatment of capital in relation to agriculture, see Estate Management, by Card, and text books on book keeping (agricultural).

Labour problems are frequently of a local nature. The modern tendency to employ labour saving devices should be noted. The modern production of agricultural machinery and implements is partly the outcome of rural depopulation. Explain this. The following references will be found of interest in connexion with labour: supply of labour, *Agricultural News*, Vol. IX, pp. 177 and 178; bonuses to labourers, Vol IX, p. 168; conditions of labour, Vol VII, pp. 25 and 376. The law of supply and demand is fundamental in agricultural economics, and in this connexion a knowledge of markets is of the first importance. It would not be in accordance with the purpose of these notes to discuss here the various market problems, but a perusal of the following literature will provide much interesting and useful information on the demand abroad for West Indian agricultural produce. Sales of West Indian Cotton, *West Indian Bulletin*, Vol. IV, p. 319; West Indian Food Supplies, *West Indian Bulletin*, Vol. I, p. 270: *Agricultural News*, Vol. VIII, p. 129; British West Indian Limes on the New York Market, *West Indian Bulletin*, Vol. XI, p. 153; the Cotton Market and Cotton Planting, *Agricultural News*, Vol. X, p 134; Cotton Spinning Statistics, *Agricultural News*, Vol. X, p. 390; Manchester Fruit Market, *Agricultural News*, Vol. X, p. 68; Sugar Trade of the United Kingdom, 1911, *Agricultural News*, Vol. XI, p. 115; Annual Report of the British Cotton Growing Association (1911), *Agricultural News*, Vol. XI, p. 214; Selling of West Indian Cotton, *Agricultural News*, Vol. XI, p. 246; Waste in Cotton-spinning, *Agricultural News*, Vol. XI, p. 247; Review of the Sugar Industry in the Leeward Islands, *West Indian Bulletin*, Vols. VI, p. 373; XII, p. 394 (and in other issues of this journal). Reference is made to papers on similar subjects, read at the last Agricultural Conference, that have appeared so far.

These notes on agricultural economics will be continued in future issues of the *Agricultural News* and some of the questions set will be based upon the notes given in the previous number, thus enabling the student to test his progress systematically.

Questions for Candidates.

Preliminary Questions.

(1) How would you conduct a test of seed germination?

(2) Describe the parts of which a leaf may be seen to be composed.

(3) State briefly how water moves in plants.

Intermediate Questions.

(1) Give an account of the uses of the leaf to the plant.

(2) State, as far as you can, what takes place inside a germinating seed.

(3) Define (a) capital, (b) cash, (c) petty cash, (d) depreciation, (e) compound interest, (f) discount, (g) personal account, (h) liability.

Final Questions.

(1) Give an account of the ways in which compounds useful to them may enter plants.

(2) Supply information concerning the markets for any two of the following products from the West Indies: (a) sugar, (b) cotton, (c) cacao, (d) limes.

(3) Write an essay (of about 500 words) on: 'The Value of Road, Railway and Telephonic Communication in West Indian Estate Management.'

USEFUL INFORMATION CONCERNING CAMPHOR.

The Department of Agriculture of the Federated Malay States has issued recently Bulletin No. 15, which deals with the cultivation and preparation of camphor in the Federated Malay States. The following information, of more immediate interest in the West Indies, is abstracted from parts of this bulletin.

VARIETIES OF CAMPHOR. In the East, two distinct kinds of camphor are known, that from the tree called *Cinnamomum Camphora* known as Chinese, Japanese, or Formosan camphor, and the product known as Borneo camphor, that is obtained from the plant *Dryobalanops aromatica*, which grows in Borneo, Sumatra and Malaya. The two products are distinct chemical compounds, but it is possible to prepare ordinary camphor from Borneo camphor. A third camphor is known, called Nagai camphor, which is yielded by *Blumea balsamifera*, a plant growing in Burma.

SUPPLY AND USES OF CAMPHOR. The exports of camphor from Japan in 1905, 1906 and 1907 were 1,350 tons value £261,756; 1,570 tons value £370,545; and 1,805 tons value £512,730; from China in 1905 and 1906, they were 320 tons value £59,840 and 882 tons value £222,264. Most of the Japanese camphor comes from Formosa; information concerning the production in this island was given on page 9 of the present volume of the *Agricultural News*.

About 70 per cent. of all the camphor obtained is used in the manufacture of celluloid, or xylonite; most of the remainder is employed for medicinal, pharmaceutical and sanitary purposes. An idea is prevalent that camphor is used largely in the manufacture of smokeless powders and explosives; only a small amount is at present actually employed in this way.

SYNTHESIS OF CAMPHOR. As is well known, synthetic camphor has been produced on a commercial scale, but it cannot compete successfully with natural camphor for any length of time. It is made from oil of turpentine, and its preparation in the countries where it used to be made—England and Germany—has probably ceased because of the fall in price of natural camphor since 1907. Its existence is useful, however, because it prevents any extensive inflation of the prices of the natural product.

DISTILLATION OF CAMPHOR IN JAPAN. The camphor is steam-distilled and the vapour condensed in a box, divided into compartments and placed upside down, in water, in a larger, shallower box. The sides of the inverted box extend above the bottom, and water is constantly allowed to run on to this box, keeping it cool and renewing the layer of water in the larger, shallower box which acts as a seal. A third box is inverted over the first, and is made in a similar way to condense any vapour that may escape; in both cases holes are made in opposite corners of the partitions in the boxes in order to cause the vapours to travel by a circuitous route. The crude camphor and oil are skimmed from the surface of the water or scraped from the sides of the condenser; separation of the two products is effected as far as possible by pressure.

CULTIVATION OF CAMPHOR. A method of cultivation recommended by the United States Agricultural Department was described on page 5 of this volume of the *Agricultural News*. In Malaya, before planting takes place, the seeds are soaked in lukewarm water for twenty-four hours, and the resulting seedlings transplanted when about a foot high, the tops being first cut off and the roots pruned. The transplanting is done during the wet season, and careful weeding is necessary. Well-prepared nursery beds are employed, and sand is added to the soil so that it may be sufficiently porous not to allow the seeds to rot during their long period of germination. So far, this method of propagation, as well as that from root cuttings, has not proved successful in Malaya, and it is considered at present that the best way to obtain a stock of plants is to import two-year-old seedlings from Japan, provided that the price of these is reasonable. Success has been obtained by using this method.

EXPERIMENTS IN DISTILLING CAMPHOR. In initial experiments, in Malaya, with material from Batu Tiga, Selangor, 26℔. of prunings, consisting of leaves 64·9 per cent. and small stems 35·1 per cent. was used. This gave, as the result of different distillations, 0·19℔. of distillate, the yield on the original material being 1·06 per cent.; the proportion of oil in the distillate was very small.

Subsequently, experiments were carried out on a commercial scale; a useful, detailed description of the apparatus employed is given in the bulletin. Separate distillations gave the following results:—

Weight of material.	Percentage of whole plant.	Yield of camphor and oil in oz.	Yield per cent.
12·5 ℔.	Leaves 7·5	2·00	1·00
30·0 „	Stems (under ½-inch diameter) 18·2	1·07	0·22
93·0 „	Woody stems (over ½-inch diameter) 56·3	9·08	0·61
29·5 „	Roots 18·0	5·07	1·10

The distillate from all parts except the roots consisted chiefly of solid camphor with very little oil. That from the roots was comprised entirely of an oil apparently quite distinct from that given by the other portion, and possessing what is described as a lemon-camphor odour. The results of the experiments are thus summarized in the bulletin:—

(1) A yield of about 1 per cent. of camphor and oil (consisting chiefly of camphor) may be obtained from prunings from five-year-old plants and probably from younger plants.

(2) The distillation period should not exceed three hours in the case of prunings, that is leaves and young branches.

(3) A much larger proportion of camphor is obtained from the leaves than from the branches, and the yield from small twigs is greater than that from older branches in trees of this age.

(4) Air-drying of the leaves has no detrimental effect on the yield, but loss would probably result if the leaves were exposed to direct tropical sunlight.

Further experiments were conducted during 1911-12, using a new condenser, the old one, which was a Liebig condenser with four tubes round which cold water circulated, having proved unsatisfactory, for reasons that are given. The new condenser was made of teak: it was replaced later by a metal condenser constructed of galvanized iron having the following dimensions: length 3 feet 10 inches, breadth 2 feet 4 inches, depth 1 foot 7 inches, extension of sides over bottom 4 inches, length of exit pipe 6½ inches, diameter of exit pipe 2 inches. This was placed in the shallow box used for the teak condenser, which was 4 feet long, 2 feet 6 inches broad and 1 foot 1 inch deep, the depth of water in it being 6 inches. This condenser was found to give excellent and constant results, the yields being considerably increased. Further, the camphor was 'of a beautiful white colour' and the camphor oil was pale-yellow. No corrosion took place during three months' use, and the joints, which were soldered, showed no signs of leakage. The matters thus described are of importance, as they show the way in which one of the chief difficulties connected with the distillation process, namely that of condensation, was solved.

In the trials with the metal condenser, 5,338 lb. of prunings were used; these gave, as a result of several distillations, a total yield of camphor and oils weighing 34·96 lb., or 0·66 per cent. on the weight of the original material.

Several other matters of importance are included in the Bulletin, which is usefully illustrated to show the construction of the apparatus employed for distillation on a commercial scale.

AGRICULTURE IN PORTO RICO, 1911.

Conditions were generally favourable. The acreage under cultivation has been extended, and greater attention is now given to methods, under the instruction of the experimental station at Rio Piedras. Gradually the old plough drawn by oxen is being replaced by the steam plough, preference being given to British make.

The acreage under cultivation in 1911 was as follows:—

	Acres.
Cane	183,223
Coffee	150,864
Tobacco	19,420
Pine-apples	1,720
Oranges	7,394
Coco-nuts	3,341
Minor fruits	115,576
Pasture	926,894
Miscellaneous	37,137
Timber brush	515,137
Marsh	28,798
Total	1,989,504

The following details are available concerning the live stock in the island:—

Cattle	171,880
Horses	34,171
Mules	2,717
Pigs	3,948
Sheep	2,644
Total	215,360

SUGAR. The exports of sugar during the year amounted to 323,000 tons, showing an advance of 13 per cent. over last year. The external sales aggregated 5,109,000, being an approximate average of £15 16s. per ton.

COFFEE. The quantity shipped was not so great as in 1910, but the value was greater and netted about £1,042,000.

CIGARS. This year's shipments reached 174,000,000, and about 102,000,000 were placed in the local market. Less than 25 per cent. of the tobacco produced is shipped in leaf. The total value of this industry amounted to £1,468,000.

FRUITS. Oranges, pine-apples and grape fruit are now staples in the market. The total value of shipments in 1911 reached £417,000.

Coco-nuts thriving nicely in sandy soil near the sea are not in the way of any other plant. They are receiving more attention every year. This year they contributed £52,000 to the income of the island. (From *Diplomatic and Consular Reports*, No. 4894 Annual Series, June 1912.)

A NEARLY SEEDLESS MANGO.

The following account of an almost seedless mango that has been given the name Oahu is contained in the Annual Report of the Hawaii Agricultural Experiment Station for 1911, issued in April last:—

HISTORY. A seedling tree about six or seven years of age bore fruit this year, and its characteristics have given justification for naming it Oahu. It is probably a cross between the Hawaiian sweet mango and the Crescent. Although the husk is present, the seed presents an undeveloped condition with often just the seed coat present. About 75 per cent. of this year's crop has had no viable seed.

The Oahu is valuable as a large, fine-appearing fruit of good quality. Its nearly seedless condition makes a thin husk with a large proportion of flesh. No mango weevil (*Cryptorhynchus mangiferae*) has been found within these mangoes, and it will be interesting to note what may be the result of the attack of this insect on a fruit which contains no seed upon which its larva may feed. The Oahu is also worthy of propagation as a basis for breeding toward complete seedlessness.

DESCRIPTION. Form oblong, heavily shouldered at the cavity end and tampering toward the apical end; size large, averaging in weight from 10 to 15 oz.; cavity shallow, flaring, irregular; stem slender; apex variable, ranging from a point to a depression; surface moderately smooth and undulating; colour pale-yellow with a reddish blush on the exposed side; dots numerous, small, yellow, depressed; bloom bluish-white, moderately abundant; skin moderately thick, tough, very tenacious; flesh thick, bright-yellow, juicy, with an abundance of fibre; seed dried up or represented by just the seed coat; flavour rich, moderately sweet, quality good. Season June to August at Honolulu, Hawaii.

This tree is of the average height and presents a broad, spreading habit.

The Chocho in Mexico.—The following note on the chocho, christophine, or chayote (see *Agricultural News*, Vol. XI, p. 203) as it is called in Mexico, appears in the *Journal of the Royal Society of Arts* for August 9, 1912; what is referred to there as a tuber is really a swollen root:—

'The chinchayote is the tuber of a gourd-like plant, grown in the State of Guadalajara, whose botanical name is *Sechium edule*. The year-old tubers are boiled and candied and are sold by street vendors, being very popular among labourers and children. The larger two-year-old tubers are sliced and fried for table use. The tubers yield an excellent starch, similar to arrowroot or sago. Above ground the chinchayote is similar to a gourd plant, with a smaller leaf, and the flower develops into a bulbous fruit covered with prickly spines called the chayote. The tubers are the part known as the chinchayote, and these resemble a sweet potato in shape, the colour under the skin being white. Each plant produces ten to thirty tubers, having a total weight of 5 to 30 lb., varying with age, as some plants are allowed to grow for two years, producing larger and more numerous tubers. For cultivation the chayotes are sprouted in a moist place, and then planted sometimes three plants together. The planting season, according to the American Consul at Guadalajara, is from February to April and the plant requires little attention thereafter. The chayotes or fruits are gathered in September or October, and the chinchayotes or tubers mature from October to December, being taken up when they reach the desired size. The shrubs are planted 7 to 10 feet apart, loose soil that has been used for other crops being the best.'

MARKET REPORTS.

London.—The West India Committee Circular August 27, 1912; Messrs. E. A. De Pass & Co., August 16, 1912.

Arrowroot—$3\frac{13}{16}d.$ to $4\frac{1}{4}d.$
Balata—Sheet, 3/7; block, 2/7 per lb.
Beeswax—No quotations
Cacao—Trinidad, 70/- to 85/- per cwt.; Grenada, 57/- to 64/-; Jamaica, 57/- to 66/-.
Coffee—Jamaica, 66/- to 70/- per cwt.
Copra—West Indian, £26 15s. per ton.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 14d. to 16d.
Fruit—No quotations.
Fustic—No quotations.
Ginger—49/- to 65/- per cwt.
Isinglass—No quotations.
Honey—No quotations.
Lime Juice—Raw, 1/- to 2/1; concentrated, £18 12s. 6d. to £18 17s. 6d.; otto of limes (hand pressed), 8/.
Logwood—No quotations.
Mace—2/1 to 2/6.
Nutmegs—6d. to 10d.
Pimento—Common, $2\frac{1}{16}d.$; fair, $2\frac{5}{8}d.$; good, $2\frac{11}{16}d.$; per lb.
Rubber—Para, fine hard, 5/$1\frac{1}{2}$; fine soft, 4/$9\frac{1}{2}$; Castilloa, 4/3 per lb.
Rum—Jamaica, 2/1 to 6/-.
Sugar—Crystals, 16/3 to 18/6; Muscovado, 11/6 to 14/6; Syrup, 9/3 to 14/3; Molasses, no quotations.

New York.—Messrs. Gillespie Bros. & Co., August 9, 1912.

Cacao—Caracas, $12\frac{3}{4}$c. to 13c.; Grenada, 14c. to $14\frac{1}{2}$c. Trinidad, 14c. to 16c. per lb.; Jamaica, $11\frac{1}{2}$c. to 13c.
Coco-nuts—Jamaica, select, \$25·00 to \$26·00; culls, \$15·00; Trinidad, select, \$25·00 to \$26·00; culls, \$15·00 per M.
Coffee—Jamaica, $14\frac{1}{4}$c. to $16\frac{3}{4}$c. per lb.
Ginger—$8\frac{3}{4}$c. to $11\frac{3}{4}$c. per lb.
Goat Skins—Jamaica, 50c.; Antigua and Barbados, 45c. to 46c.; St. Thomas and St. Kitts, 42c. to 44c. per lb.
Grape-Fruit—Jamaica, \$2·75 to \$3·50.
Limes—\$2·00 to \$2·25.
Mace—51c. to 54c. per lb.
Nutmegs—110's, $13\frac{3}{4}$c. to 14c.
Oranges—Jamaica, \$1·75 to \$2·25 per box.
Pimento—$5\frac{3}{4}$c. per lb.
Sugar—Centrifugals, 96°, 4·05c. per lb.; Muscovados, 89°, 3·55c.; Molasses, 89°, 3·30c. per lb., all duty paid

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Trinidad,—Messrs. Gordon, Grant & Co., September 2, 1912.

Cacao—Venezuelan, \$14·50 to \$14·80 per fanega; Trinidad, \$13 75 to \$14·50.
Coco-nut Oil—90c. per Imperial gallon.
Coffee—Venezuelan, 18c. per lb.
Copra—\$4·40 per 100 lb.
Dhal—\$5·00.
Onions—\$1·75 to \$2·00 per 100 lb.
Peas, Split—\$6·50 \$6·75 per bag.
Potatoes—English, \$2·25 to \$2·40 per 100 lb.
Rice—Yellow, \$4·80 to \$5·00; White, \$6·25 to \$6·35 per bag.
Sugar—American crushed, no quotations.

Barbados,—Messrs. James A. Lynch & Co., Ltd., September 7, 1912; Messrs. T. S. Garraway & Co., September 9, 1912; Messrs Leacock & Co., August 29, 1912.

Arrowroot—\$7·00 per 100 lb.
Cacao—\$13·00 to \$14·00 per 100 lb.
Coco-nuts—\$20·00.
Hay—\$1·60 to \$1·80 per 100 lb.
Manures—Nitrate of soda, \$65·00; Cacao manure, \$45·00 to \$48·00; Sulphate of ammonia, \$80 00 to \$85·00 per ton.
Molasses—No quotations.
Onions—\$2·50 to \$3·00 per 100 lb.
Peas, Split—\$6·50 to \$6·75 per bag of 210 lb.; Canada, \$3·00 to \$5·10 per bag of 120 lb.
Potatoes—Nova Scotia, \$2·20 to \$3·00 per 160 lb.
Rice—Ballam, \$5·20 to \$5·75 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
Sugar—American granulated, \$5·00 per 100 lb.

British Guiana.—Messrs. Wieting & Richter, August 31, 1912; Messrs. Sandbach, Parker & Co., August 16, 1912.

Articles.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	—	—
Balata—Venezuela block	No quotation	Prohibited
Demerara sheet	76c. to 77c. per lb.	—
Cacao—Native	15c. to 16c. per lb.	14c. to 15c. lb.
Cassava—	80c. to \$1·20	No quotation
Cassava Starch—	\$7·50 to \$8·00	No quotation
Coco-nuts—	\$16 to \$20 per M.	\$10 to \$16 per M., peeled and selected
Coffee—Creole	20c. per lb.	18c. per lb.
Jamaica and Rio	20c. per lb.	21c.
Liberian	16c. per lb.	15c. per lb.
Dhal—	\$5·00 per bag of 168 lb.	\$5·50 to \$5·75
Green Dhal	\$5·50	—
Eddoes—	\$1·00 to \$1·44	—
Molasses—Yellow	None	—
Onions—Teneriffe	—	—
Madeira	5c. per lb.	5c. to $5\frac{1}{2}$c.
Peas—Split	\$6·75 to \$7·00 per bag (210 lb.)	\$7·25 per bag (210 lb.)
Marseilles	—	No quotation
Plantains—	16c. to 48c.	—
Potatoes—Nova Scotia	—	\$2·75
Lisbon	\$2·75	No quotation
Potatoes–Sweet, B'bados	\$2·88 per bag	—
Rice—Ballam	No quotation	—
Creole	\$6·00	\$6·00 to \$6·25
Tannias—	\$1·80	—
Yams—White	—	—
Buck	\$4·00	—
Sugar—Dark crystals	\$3·25 to \$3·40	\$3·25
Yellow	\$4·00 to \$4·25	\$3·00
White	—	—
Molasses	\$2·80	—
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	No quotation.

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Manurial Experiments with Sugar-cane in the Leeward Islands,
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CONTENTS

Forests and Rainfall.

THE question of the possible direct effect of forests on climate and rainfall has received much consideration, and in order that some definite information regarding the matter may be obtained, a large number of observations are being made in different parts of the world. In a wider sense, it is recognized that the existence or planting of forests is not concerned merely with the problem of timber-supply, but that each possesses a large importance arising from the employment of forests as an aid in water conservation, and for the purpose of protecting certain localities, such as catchment areas for water-supply, from pollution or other harm. The relation of forests to water conservation gains an additional interest when it is viewed in the aspect of the suggestion, supported by some, that their presence increases precipitation.

A useful summary* of this part of the subject that has appeared recently, commences by drawing attention to the amount of investigation of the question of the influence of forests on rainfall that has been made in France, Germany and Austria, in the United States, and more recently in India, and points out that the literature of the subject is somewhat bewildering, both on account of its extent and of the divergent views of the different authorities. One manner of attacking the problem is the historical method. In this the state of an area of country as regards its forest cover is compared with the amount of rainfall over a period for which statistics are available, the latter being often, in the absence of reliable rainfall records, supplied by accounts of the condition over a long time of a stream or river which may be considered to be influenced by the forest in or near its basin. Among the objections to this method is the ignoring of effects due to secular climatic changes, and it is also open to the criticism that forests are known to assist in increasing the amount of water, available for streams, in ways other than that which supposes an increase in the rainfall.

Observations in India † have been considered to show that the presence of wooded areas has a beneficial

**Nature*, August 29, 1912, p. 662.
†*Agricultural News*, Vol. VIII, p. 24.

influence upon rainfall, an increase of eight to fifteen per cent. having been suggested. Results bearing the opposite interpretation have been obtained in the United States; some of them are presented in a paper‡ contained in a report to the United States House of Representatives on the influence of forests on climate and floods. The conclusions in the paper indicate that there is strong evidence for the inability of the removal of forests to influence rainfall: it is that the latter controls the rate of forest growth rather than that the amount of forest cover influences the rainfall: the conditions that affect rainfall exist at such an altitude as to prevent the way in which the land is covered locally from possessing any influence. Actual, careful observations show that there has been no noticeable change in the rainfall in the United States, during the time that such observations have been possible.

The advocates of the theory that forests induce rainfall try to find confirmation of their views in the results that have been obtained by making simultaneous observations, at stations called parallel stations, in a forest area and in the open surrounding country. In nearly every place where these observations have been carried out, a larger rainfall has been indicated on the land under forest; so that it is held that forests increase precipitation. If this conclusion could be proved definitely to be correct, the circumstance would be of the greatest importance, for it is easy to see that the effect would extend beyond the forest area because the wind would bear away the rain-carrying clouds that had been formed. The opponents of the theory do not agree that the observations have been interpreted correctly; experiments, they say, have demonstrated that gauges situated in the forest register a greater rainfall than those in the open because they are sheltered from the wind. Attempts to allow for this influence have been made, but the matter is so uncertain that those who hold the theory cannot be said to have made good their case. The subject will be seen to possess peculiar difficulty when it is realized that differences in height above ground of the gauges as well as in altitude above sea-level are easily capable of inducing differences in the measure of the rainfall that are far greater than those claimed for the influence of the forest.

It is thus evident that, at present, no definite conclusion can be reached concerning the possible influence of forests on rainfall. The review mentioned at the commencement of this article sums up the matter in the following way: 'Professor J. von Hann's opinion on the subject, in the latest edition of his *Handbuch der Klimatologie* is that the question cannot be definitely answered at present, but that the effect, if any, should be greater in the tropics than in higher latitudes. Dr. G. T. Walker, of the Meteorological Office, Simla, is of a similar opinion. He states that if forests have any influence at all on the rainfall, it is probably not greater in India than five per cent.'

The usefulness of forests in retarding the rate of travel to the sea of water falling as rain, and in improving conditions for plant growth, must not be forgotten in any case: and this consideration alone should prevent reckless deforestation and emphasize the importance of the replacement of forest cover.

‡*Agricultural News*, Vol. IX, p. 248.

SUGAR INDUSTRY.

SOME WEST INDIAN SUGAR-CANES IN INDIA.

The Annual Report of the Agricultural Stations in Eastern Bengal and Assam for the year ending June 30, 1911, shows that, among the sugar-canes grown at the Dacca Agricultural Station during that time there were included B.147, B.1753, B.376 and B.208. Among these it was thought that one or two, together with Striped Mauritius, would prove superior to the local cane on becoming accustomed to the changed conditions.

These canes were obtained from the Jorhat Agricultural Station, and mention is made in the report that they were under trial at this station; further, in describing their behaviour there, it is stated that they all, except B.208, showed resistance to red rot; it was decided however to continue experimentation with this cane. As regards the total yield of sugar from the canes that were grown successfully, Striped Mauritius attained the first place, followed by B.376 and B.147. It is stated that a high yield with a superior quality of juice are combined in these canes. The varieties Striped Tana and Kheri also showed a high yield of cane and juice, but the inferior quality of the latter caused the yield of sugar per acre to be low. In another experiment at this station, B.147, B.376 and Striped Mauritius again showed a striking superiority as regards quality of juice, the sucrose content and purity being high and the glucose ratio low. B.208 is reported as having had to be destroyed on account of disease in the previous year; it is stated however, in the experiment under discussion, to have given a juice of high quality in spite of the fact that it continued to be very susceptible to attacks by red rot. In making general remarks concerning the sugar-canes under trial at this station, the following statements occur: 'Two of the Barbados varieties, viz. B.147 and B.376, are exceedingly promising. Although not such high yielders as Striped Mauritius, they gave juices of very high quality.'

CONSIDERATIONS REGARDING NITROGEN FIXATION.

The fact that nitrogen from the atmosphere becomes fixed (that is united to other substances) in the soil, in the presence of air, by a group of organisms called Azotobacter has become a matter of common knowledge among agriculturists since its discovery by Beijerinck in 1901, and the group of organisms itself has received much investigation. The results of this work have, however, been conflicting, especially as regards the food requirements of the organisms, although it is generally agreed that these include some form of fermentable carbohydrate (a sugar) and a certain amount of phosphorus in a form in which it is available. A further investigation of these matters has been made in recent years at the University of Wisconsin Agricultural Experiment Station, the results of this being presented in Research Bulletin No. 12 of that station; and these form the subject of the present article.

Trials with different soils showed that the power of the Azotobacter in these to fix nitrogen varies greatly; in actual experiments the amount of nitrogen fixed, for every gram of mannite (a sugar) consumed, ranging from 0·15 to 14·47 mgr.

The best sugars to use for obtaining the greatest amount of fixation in impure cultures of the organism were found to be mannite and lactose (milk sugar): while maltose and sucrose (cane sugar) enabled the bacteria to fix only a comparatively small quantity of nitrogen. In pure cultures, the highest results were obtained with mannite and dextrin. The superiority of milk sugar in impure cultures was not maintained in those which were pure.

The activity, and therefore the efficiency, of Azotobacter was found to be increased when small quantities of the carbohydrates were used. This is important in regard to the fact that, where it is intended to inoculate soil with pure cultures, the organisms should be exhibiting the greatest activity that is possible.

In impure cultures, at any rate, dicalcium and tricalcium phosphate were found to produce better results, respecting nitrogen fixation, than monocalcium phosphate.

When the period of incubation of the organisms in a soil is unduly extended, losses take place of the nitrogen that has been fixed already, and it is evident that in such conditions the amount of nitrogen found is not a true indication of the amount actually fixed. Results obtained in the investigation under consideration indicated that the period of incubation for impure cultures should not exceed fourteen to eighteen days.

The presence of small quantities of calcium carbonate is sufficient for the fixation to take place. It was not found that there was a greater amount of nitrogen fixation when the quantity of that substance was increased.

Difficulty was met during the experimentation in obtaining a large growth of the organisms in liquid culture media. This was overcome by the employment of a sand slope of white quartz sand in the following way. The culture solution to the amount of 20 c.c. was placed in a conical flask of 150 c.c. capacity, and 10 grams of the quartz sand, previously washed, dried, screened and ignited, was added in such a way that its surface formed a slope going down into the culture medium. The enhanced supply of air caused the bacteria to form a profuse growth all over that surface. This method did not serve, however, when large quantities of the organisms were required for the purpose of determining their nitrogen content, as for this object pure Azotobacter cells free from all other solid matter were required. The means adopted finally comprised the use of 11-inch Petri dishes, containing the sterilized nutrient medium, on to which, when it had solidified, 5 to 10 c.c. of sterile salt solution, containing Azotobacter in uniform suspension, was poured.

It seems that the protein content of Azotobacter cells is influenced by the age of the culture in which they occur; in any case the results obtained were considerably lower than those found by other investigators, and it is suggested that the method of growing the organisms may possibly be a cause of the difference. Another condition influenced by the age of the culture was the phosphorus content of the cells.

Preparation of Tobacco by Electricity.—A short article in the *Journal d'Agriculture Tropicale* for June 1912 states that the journal *De Indische Merkuur* has recently given notice of the discovery by an engineer of Sourabaya of a new process for preparing tobacco: in place of submitting the leaves, for several weeks to the action of warm air, as is usual, they are exposed for twenty-four hours to the action of electricity. Unfortunately, nothing is said as to the way in which the operation is conducted nor concerning the manner of action of the electricity: whether there is an electrolytic action on the very damp leaves, or if the change comes about through discharges at high voltage or in any other way.

The matter of importance is, however, that this mode of working should not only greatly shorten the time required for the operation, but should bring under complete control the extent to which the colouring of the product takes place. It should be added that, according to the report, the results are yet far from being conclusive, but if they are eventually confirmed, the new manner of procedure will completely overthrow the ordinary methods for tobacco preparation that are employed up to the present in the many factories in Java, which, it is said, are eager to adopt its application. The journal mentioned first, above, states that return will be made to the subject when an opportunity has been given for obtaining additional information.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture returned to Barbados, from an official visit to St. Vincent, by the S.S. 'Ocamo', on September 14, 1912.

Mr. P. T. Saunders, Veterinary Officer on the Staff of the Imperial Department of Agriculture for the West Indies, returned to Barbados, from visits to St. Vincent and the Northern Islands, by the R.M.S. 'Thames', on September 18.

The exports of raw cotton from Shanghai fell from 1,482,299 cwt. in 1910 to 928,444 cwt. in 1911, a decrease of nearly 40 per cent., and business in raw cotton during the year was most unsatisfactory from the point of view of exporters to Japan. The chief reason was to be found in the destruction of an unusually large proportion of the crops by the abnormal summer rains; the difficulty of forwarding money to the producing centres owing to the position of the native banks, and the unprecedented fall in prices in the United states caused by the abundant crops in that country, were also important determining elements. (From *Diplomatic and Consular Reports*, No. 4966 Annual Series.)

FRUITS AND FRUIT TREES.

THE FEEDING AND MANURIAL VALUES OF LIME SKINS.

The following note on this matter has been received from Mr. H. A. Tempany, B.Sc., Superintendent of Agriculture for the Leeward Islands:—

The disposal of the expressed skins obtained in the extraction of lime juice by milling is a question of some interest to those engaged in the lime industry. In some cases, the lime skins are simply thrown away, but a far better practice is to utilize them either for feeding stock or for manurial purposes direct.

Cattle will eat lime skins readily, and they possess value both directly as a fodder and also as a relish to the ordinary rations of stock.

On certain estates in Dominica the practice exists of making a species of ensilage of lime skins; this appears to be a useful method of dealing with them, since the limes produced in excess of the requirements of the stock on an estate during crop time can be utilized for feeding purposes out of crop. When properly handled, lime skins do not appear to suffer any deterioration when treated in this way.

The following analytical data, obtained in the Government Laboratory for the Leeward Islands concerning two such samples of ensilage from estates in Dominica, are of some interest in view of the complete absence of published information of this character at the present time. The samples were obtained and forwarded by Mr. J. Jones, Curator of the Botanic Station, Dominica.

	Sample A.	Sample B.
Moisture	79·6	76·5
Nitrogen	0·293	0·246
Equivalent crude protein	1·83	1·54
Crude fibre	3·6	5·1
Extracted matter	—	1·9
Albuminoid nitrogen	0·114	—
True protein	0·712	—

In the case of neither sample was the ash determined. Other determinations tend to show, however, that the ash content of lime skins is in the region of 1 per cent.; assuming this value in the case of sample B, we arrive at an approximate value of 14·0 per cent. for the crude carbohydrate content and 12·2 for the albuminoid ratio on the crude protein.

From this it will be seen that the ensilages have a distinct feeding value, though they are somewhat deficient in proteins. Under the head Extracted Matter must be included the residues of the essential oil not expressed in the processes of écuelling and milling; it is to this and the residues of citric acid, included under the head crude carbohydrates, that the skins owe their value as a relish.

The following analysis of the manurial value of lime skins is reproduced from the Report on Sugar-cane experiments in the Leeward Islands for 1905-6.

Nitrogen.	Ammonia.	Phosphoric acid.	Potash.
0·314	0·381	0·006	0·148

From the above analysis it is calculated that lime skins are worth $0·95 per ton for manurial purposes.

ORANGE CULTIVATION IN DUTCH GUIANA.

In a note in *L'Agriculture Pratique des Pays Chauds* for May 1912, it is stated that the French Vice-Consul at Rotterdam has drawn attention to the importance that orange-growing is attaining in Dutch Guiana, and the suggestion is given that perhaps this importance merits the attention of planters in French Guiana.

The statement is made that, under the conditions, the establishment of a plantation giving useful results and consequently having an area of about 300 acres necessitates a capital amounting to something like £16,500, without taking account of the expenses for the construction of dwelling houses, store-houses and other necessary buildings. There would be a modification of this estimate where it is possible to acquire old plantations that are still productive.

In the seventh year the income should exceed the expenditure. The trees should produce, on an average, 300 fruits a year, although it is possible for this figure to be as high as 600, and even 1,000. The fruits, after deduction has been made for the expenses of plucking, packing and exportation should give a profit of about ½*d.* each. This return may be greatly increased in the case of oranges belonging to specially esteemed kinds; these should afford a profit about three times as large.

The trees bear fruits from the third year, from the fifth they each give fifty and from the sixth 150. At the age of ten years the trees yield 300 to 600 fruits, the oldest as has been indicated probably approaching 1,000. In ordinary cases eighty trees are planted to the acre.

The cultivation of oranges in Dutch Guiana has been taken up seriously, and the note concludes by repeating that the matter is of much interest for French Guiana although it may not be possible to profit from the example for several reasons, notably that of the very poor labour-supply.

ST. KITTS AGRICULTURAL AND COMMERCIAL SOCIETY.

A meeting of this society was held on August 10, 1912, at which there were present His Honour the Acting Administrator, Captain Roger, and Dr. Francis Watts, the Imperial Commissioner of Agriculture, who were welcomed at the opening of the meeting by the President of the Society, the Hon. S. L. Horsford. After suitable acknowledgment had been made by Captain Roger and Dr Watts, the latter referred to the proposal that had come before the meeting to appoint a Veterinary Surgeon in the Presidency, making suggestions in regard to the putting of the matter into the form of a definite undertaking, and saying that although he could not make the appointment he was willing to supply recommendations.

After some short discussion of the matter just mentioned, the Secretary read the report of Mr. H. A. Ballou, M.Sc., Entomologist to this Department, on his recent visit to St. Kitts-Nevis (this was summarized in the last two issues of the *Agricultural News*) After the report had been read it was decided that this, as well as the report on sugar-cane diseases in St. Kitts, by Mr. F. W. South, B.A., Mycologist to this Department, should be printed and circulated.

Dr. Watts next provided a review of the reports, giving the opinion that they are extremely valuable records. In the former there was much new and useful information regarding root borers and root trimmers. He referred to the root borer in Barbados (*Diaprepes abbreviatus*) which is not known in St. Kitts, and to the beetle the grub of which Mr. Ballou considers to be doing some damage to the roots of the sugar-cane in the latter island; this beetle was known in Montserrat, where it is found to eat the leaves of citrus plants, and had never before been connected with sugar cane. The Commissioner then made reference to the existence of another beetle both in Mauritius and Barbados, in the former as a pest, in the latter as an insect doing little harm.

Proceeding, Dr. Watts referred to Mr. South's report on cane disease in St. Kitts, stating that he thought the disease was the rind fungus, and that an abnormal season, over-ripeness of the canes, and constant cultivation of one variety on the same land, were probably responsible for the recent outbreak. The circumstances that more was known about the disease than formerly and that easily applicable remedies, such as the employment of new cane varieties and the cultivation of cotton, were near at hand, made it evident that there was no cause for alarm.

Dr. Watts also drew attention to the Pamphlet recently issued by the Imperial Department of Agriculture, treating of Insect Pests in the Lesser Antilles, by Mr. H. A. Ballou, M.Sc , which he thought should be in the hands of every planter.

The Commissioner of Agriculture then referred to the subject of the selling of West Indian cotton, bringing forward matters that were dealt with recently in an article on page 246 of the issue of the *Agricultural News*, for August 3, 1912. This, it will be remembered, contained several suggestions made by Mr. J. A. Hutton, Chairman of the British Cotton Growing Association. As regards types of cotton, advice was given by Dr. Watts that the selected kinds now grown in St. Kitts should continue to be planted. In relation to matters connected with this, he referred to a paper by Mr. J. W. McConnel on the different lengths of staple in a sample of lint (this paper was summarized on page 247 of the issue of the *Agricultural News* just mentioned).

Referring to silkworm culture, the speaker mentioned Mr. Maxwell Lefroy's recent paper on the subject, and stated further that, although it may not seem that the Eri silkworm industry will succeed in the West Indies, he was obtaining cocoons of this worm, which feeds on castor leaves; material for growing the mulberry silkworm would be obtained by him as soon as the mulberry trees introduced recently by the Imperial Department of Agriculture had been planted out and were available for feeding the worm. In any case there were many difficulties in the way of such work, and Mr. H. A. Ballou feared danger from the attacks of parasitic insects.

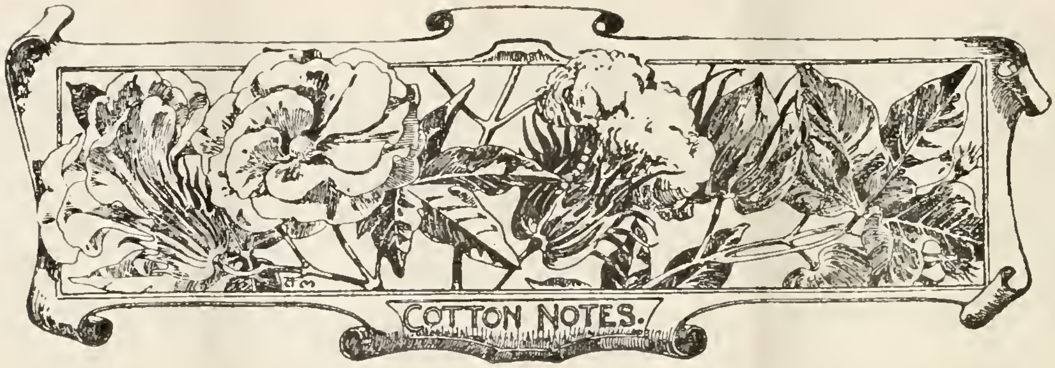
The subject of coco-nuts then received attention from Dr. Watts, who reviewed the general conditions as regards coco-nut cultivation and gave as an instance in a more particular way the useful progress that is being made at Pinneys Estate Nevis. The matter of disease was of the greatest importance, with respect to this crop, and a great increase of knowledge concerning this should be brought about by the harmonious co-operation of the different agricultural departments.

A vote of thanks, proposed by the President and seconded by Mr. J. R. Yearwood, was accorded to Dr. Watts for his interesting and instructive remarks, and after this had been acknowledged the meeting was adjourned.

Mangrove Bark.—The results of the examination of the barks of several species of mangrove from German East Africa are given in *Collegium* (1912, No. 504, p. 130). It is concluded that the tannin content of the bark is not influenced by the age or by the part of the tree from which it is stripped, or by the time of the year it is collected.

Tanning trials were also made, which showed that bark collected at the end of the year gives a leather which is of yellow-brown colour and does not redden on exposure to light. This improvement in colour is believed to be due to better drying of the bark at this season, and it is recommended that the bark should be collected only at the end of the year.

Trials on a small scale have been made recently in Queensland in the manufacture of cutch from mangrove bark, and the results show that, with proper care and with up-to date machinery, good quality cutch containing 60 per cent. of tannin can be obtained (*Journal of the Society of Chemical Industry*, 1912, 31, 212). It is estimated that, on a manufacturing scale, Queensland mangrove bark should yield about 50 per cent of cutch. (The *Bulletin of the Imperial Institute*, July 1912.)



WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date September 9, with reference to the sales of West Indian Sea Island cotton :—

Since our last report only about 50 bales of West Indian Sea Islands have been sold, chiefly 14*d.* to 15½*d.*, and a few stains at 9¼*d.*

Buyers are quite indifferent and will not operate until they can get some idea as to the prices at which American Sea Island cotton will open next month. Meanwhile, the fine spinning trade does not improve, and until it does so, many spinners are continuing to employ their machinery upon various descriptions of Egyptian cotton.

PROGRESS IN COTTON-GROWING IN UGANDA, 1911-12.

The cotton crop continued its rapid advance and there was a further large increase in the area planted.

The seed distributed to natives by the Government amounted to 207 tons as compared with 133 tons and 70 tons in the two preceding years. This increase in acreage cannot be very accurately estimated from the increase in seed distribution, as there is now much less waste of seed than in former years, and germination has always been so regular and satisfactory that the sowing per acre has been somewhat reduced also. No increase is probable or I think desirable during the coming season. The transport facilities have already been strained to their utmost to deal with the present output. In the out-districts cotton remains often for months awaiting transport. This will probably be remedied to a great extent in the near future by the setting up of ginneries in the up-country districts.

Although a check and possibly even a considerable set-back may be looked for in the immediate future, the Protectorate is still a very long way from reaching its limit as a cotton-producing country; apart from the increase that may be expected, when the transport facilities have been more fully developed, in the districts where the crop is already established, a large area of country suitable for cotton cultivation lies in districts which are only now being brought under Administration, and it will be many years before their agricultural possibilities can be fully realized.

Probably the most important part of the work, that this Department is at present engaged upon, is the improvement of the quality of Uganda cotton; the preliminary work has been done during the last three years, and provided that the present supervision of seed-supply is continued, a steady advance may be looked for.

The seed farms originally laid down with a view to supplying a high quality of seed were all abandoned, as they did not fulfil their object. A plant-breeding station has now been established on the shores of Lake Kioga and the Officer in-charge is confining his attention largely to seed selection with a view to improving both staple and yield. A pleasing feature is the increased productiveness of the newly introduced long stapled varieties, which without exception gave a much larger yield per acre during the past season than from the first sowing of the seed in the Protectorate.

The experiments with Egyptian cottons were not satisfactory and they are being abandoned with the exception perhaps of a few minor plant-breeding trials. Mit Afifi cotton gave a fair yield in the Bululu district but the staple was most inferior; Abassi on the other hand remained true to the Egyptian type as regards staple but gave poor returns. Neither of these varieties gave results that can compare in any way with the Allen and Sunflower varieties of upland cotton.

A few experimental plots of Caravonica cotton were planted in the Nile districts. (From the Annual Report of the Department of Agriculture, Uganda, for the year ending March 31, 1912.)

THE BRITISH COTTON GROWING ASSOCIATION.

The following account of a meeting of this association has just been received:—

The one hundred and third meeting of the Council of the British Cotton Growing Association was held at the Offices, 15 Cross Street, Manchester, on the 3rd instant. In the absence of the President (The Rt. Hon. The Earl of Derby, G.C.V.O.) the Chair was taken by Mr. J. Arthur Hutton.

SUDAN. A discussion took place as to the possibility of pushing on the development of this country as rapidly as possible, and it was suggested that a large deputation should be organized to urge the Imperial Government to provide the necessary capital for railways, irrigation works, etc., either by an actual loan or by guarantee. It was decided to defer the question until fuller information had been obtained as to what actual works the Sudan Government propose to construct in the immediate future.

WEST AFRICA. A report has been received from the Association's representative in Northern Nigeria, stating that the prospects continue very favourable and estimating the crop for next season at 6,000 bales.

The purchases for the present season to date amount to 2,264 bales as compared with about 500 bales for the whole of the previous season.

The purchases of cotton in Lagos to the end of July amount to 8,643 bales, as compared with 5,129 bales for the same period of last year, and 5,228 bales for 1910. The purchases for the month of August are not yet to hand.

NYASALAND. Owing to the absence of rains the crop on the Lower River has been a failure this season, but the reports of the crop in the highlands are most satisfactory, and owing to the increased acreage planted under cotton it is not anticipated that the total crop will fall short of that of the previous year.

UGANDA. Complaints have been received of the inward dues charged by the Uganda Government on machinery, buildings, ginning material, etc., imported into the country; the charge amounts to about 10 per cent., and the opinion was expressed that it was not a fair way of raising revenue to put a tax on machinery, etc., which would ultimately be the means of increasing the revenue of the country. Representations had been made to the Colonial Office, and it is understood that the Governor is considering proposals to reduce the road and wharfage dues on some classes of goods including building material, machinery, etc. It was reported that the Chairman (Mr. J. Arthur Hutton) had been invited to attend a meeting at the Colonial Office to consider the question of the expenditure of a portion of the Government Loan of £500,000, for the improvement of roads in the cotton-growing districts of Uganda.

A financial statement with which the account concludes shows that on September 5 the balance to be raised, to complete the authorized capital of the Association, was £23,127.

COTTON EXPORTS FROM THE WEST INDIES.

The following table gives the export of cotton from the West Indies for the quarter ending June 30, 1912:—

Origin.	No. of bales.	Weight, lb.	Estimated £.	value, s.	d.
Antigua	138	19,473	1,257	12	7
Barbados	295	149,626	11,221	19	0
Grenada	1,067	319,837	10,669	11	4
Montserrat	193	61,276	5,106	6	8
St. Kitts	206	78,369	5,061	6	6
Nevis	269	78,392	5,062	16	4
Anguilla	294	62,711	4,050	1	10
St. Vincent	655	223,448	15,933	16	2
Trinidad and Tobago	17	6,056	454	0	0
Virgin Islands	113	24,667	1,349	2	6
Jamaica	38	12,651	949	0	0
Total	3,285	1,036,509	61,115	12	11

All this cotton was sent to the United Kingdom. The cotton exported was Sea Island in all cases save the following (which are included in the figures given in the above table): 1,066 bales (319,587 lb.) valued at £10,652, 18*s.* Marie Galante from Grenada; 136 bales (46,822 lb.) valued at £1,950 18*s.* 4*d.* Marie Galante from St. Vincent and 40 bales (8,674 lb.) valued at £349 11*s.* 3*d.* native and stains from the Virgin Islands.

THE MALE BAMBOO.

The Commissioner of Agriculture has been informed recently by the Curator of the Botanic Gardens, Dominica (Mr. J. Jones), of the flowering of a clump of the so-called male bamboo (*Dendrocalamus strictus*) in the Gardens, as well as of that of a small clump in the grounds of Government House; the latter was propagated several years ago from a rhizome taken from the large plant in the Gardens mentioned.

The letter giving the information draws attention to the fact that the *Dictionary of the Economic Products of India* points out that the male bamboo sometimes produces flowers on one or two culms (stems) in the clump; sometimes, however, the entire clump produces seeds. It happens too, in India, that large areas of the plant will flower at about the same time. In any case, each culm dies after flowering, but the rhizomes may throw up weak shoots in the following year.

As is pointed out, the matter is of some interest, as bamboos flower but rarely in the West Indies. In this species, however, flowering only takes place when the plant is twenty-five to thirty years old, even in India. The age of the plants in the Dominica Botanic Gardens is said to be about thirty-eight years.

Further interest attaches to the incident from the fact that, while he was in Trinidad recently, the Commissioner of Agriculture was informed (June 25) by Mr. W. G. Freeman, the Assistant Director of Agriculture, that the male bamboo was flowering at the Royal Botanic Gardens in that island.

The main characteristic of the male bamboo is that the stem tends to become almost, or more rarely completely, solid instead of remaining hollow between the nodes like that of the ordinary bamboo. Turning to the publication mentioned above, it is found that the usual manner of artificial reproduction of the plant is by means of seeds and by rhizomes with rootlets and portions of the stems attached, and minute directions for this are given. The plant flourishes best in a rich, light soil, having good drainage and plenty of moisture.

It is stated, further, that the fibre from the stem is suitable for the manufacture of paper, for which purpose it is not employed, however, on account of its value. The siliceous matter (tabashir) found near the joints in this and most bamboos, as well as a decoction from the leaves, is used as medicine in India. 'The leaves are eaten by buffaloes and are fairly good fodder for horses. Duthie remarks that the foliage affords abundant fodder for elephants and Lisboa that the leaves are eaten by cattle. The seeds are eaten by men in times of famine.' The stem has many uses in India: it is employed for making spear handles, for all the requirements in building native houses, and for basket work. A demand has existed in England for the stems for employment as lance shafts and for use in making fishing rods, but information is not available as to if any want of the kind still exists.

Towards the end of the matter yielding this information, it is stated that the chief requisite in the bamboo needed for these purposes is that the stem should be almost or completely solid, and as the plants in different areas vary in this respect care would be required in selecting them. 'This fact suggests an enquiry that would seem worthy of the attention of persons who may have the opportunity of following it out, viz., as to the peculiar climate, soil, and exposure that is found to produce the more solid condition of stem. Possibly it may be found that, although belonging to the species *D. strictus*, there is a recognizable variety that possesses the desired property.'

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. XI. SATURDAY, SEPTEMBER 28, 1912. No. 272.

NOTES AND COMMENTS.

Contents of Present Issue.

In the present number, the editorial gives attention to the subject of Forests and Rainfall, with special reference to investigations that have been undertaken for the purpose of ascertaining if forests possess any influence on the rainfall in the areas near them.

A short article dealing with the behaviour of certain West Indian sugar-canes in India appears on page 306.

On page 307 a summary is given of work that has been undertaken for the purpose of obtaining information in certain definite directions concerning the fixation of nitrogen in the soil.

An interesting article on page 308 affords details concerning the feeding and manurial values of lime skins.

The recent flowering of the male bamboo in some parts of the West Indies has given rise to the account of this plant, on page 311.

Page 314 contains the Insect Notes of this issue, in which are included an article reviewing recent entomological work in Trinidad and a note on the brown hardback.

The Fungus Notes, on pages 318 and 319, present an account of investigations that appear to show that the crown gall of plants possesses some relationship to the cancer of animals.

Publications of the Imperial Department of Agriculture.

The issue of the handbook Insect Pests of the Lesser Antilles, by H. A. Ballou, M.Sc., Entomologist on the Staff of the Imperial Department of Agriculture, is now complete.

The purpose of this publication is to present, in a handy form, a popular illustrated account of the chief insect pests that are of economic importance in the Lesser Antilles. Following an introduction, the contents are collected and classified in a series of chapters bearing, in order, the following titles: Insects and Their Near Relations, Natural History of Insects Orders of Insects, Insect Pests of Crops, Insects which Attack Man, Insect Pests of Domestic Animals, Insects of the Household and Pests of Stored Products, The Control of Insects, Insects and Their Natural Enemies.

This information is contained in 210 pages, with a comprehensive index as a guide, and over 180 figures have been used in illustration.

The price of the handbook is 1*s.* 3*d*, from all agents for the sale of the publications of the Department; post free 1*s.* 7*d.*

As was announced in the last number of the *Agricultural News*, Vol. XII, No. 4, of the *West Indian Bulletin*, continuing the presentation of the papers prepared for the recent Agricultural Conference, is to be issued shortly. This is now being received from the printer. It deals with the section in which were included Plant Diseases and Pests, Coco-nut, Lime and Fruit, and Rice Industries, thus containing 182 pages of matter that should appeal to many varying interests. The titles of the papers are as follows:—

The Use of Entomogenous Fungi on Scale Insects in Barbados, Further Notes on the Fungus Parasites of Scale Insects, Report on the Prevalence of some Pests and Diseases in the West Indies, for 1910 and 1911, Bud Rot of the Cocoa-nut Palm, Cocoa-nut Palm Insects in Trinidad, Scale Insects and Their Insect Parasites, Some Fruit Diseases, Experiments in Lime Juice Concentration, Investigations on the Extraction of Lime Juice by Milling, Some Root Diseases of Permanent Crops in the West Indies, Notes on Expressed and Distilled West Indian Lime Oils, The Lime Industry in Antigua, The Acid Content of Lime Fruits, Observations on the Development of the West Indian Lime Fruit, Outline of Manurial Experiments on Cocoa-nuts in Trinidad and Tobago, The Bay Rum and Bay Oil Industries of St. Thomas and St. Jan, The Classification of Sweet Potatoes, Cassava Starch and Its Uses, The Water-supply of Antigua, Does the Sereh Disease Exist in the West Indies, More Especially in Trinidad? A Report on Observations on Scale Insects, The Cocoa-nut Industry in Antigua, Manurial Experiments with the Governor Banana in Trinidad, Artificial Cross Fertilization of the Mango, Rice Experiments in British Guiana. The number is completed by the inclusion of a plate to illustrate the paper entitled The Study of Sugar-cane Varieties with a View to their Classification, in Vol. XII, p. 378.

The *West Indian Bulletin*, Vol. XII, No. 4, will shortly be obtainable from the agents for the sale of the publications of the Department, price *6d.*: post free *9d.*

New Plants at the Grenada Botanic Station.

The Commissioner of Agriculture has recently obtained from Kew a collection of plants for the Grenada Botanic Station.

This collection comprises the following, in some cases there being included more than one plant of a species: Agave twenty species, Aloe nine, Cereus four, Cotyledon two, Crinum one, Dasylirion two, Dyckia two, Furcraea one, Gasteria three, Haworthia one, Kalanchoë two, Mammillaria one, Mesembryanthemum six, Opuntia eleven, Portulacaria one, Senecio one species. The collection comprises seventy-eight individual plants in all.

The Hibiscus in Hawaii.

In the Annual Report of the Hawaii Agricultural Experiment Station for 1911, p. 41, mention is made of the successful holding of an exhibition of Hibiscus in Hawaii, and methods are also given for the propagation of this useful ornamental plant. The first exhibition, held during the month of June 1911, is said to have astonished even those most familiar with these plants, by the number and beauty of the varieties which were brought together. The Hawaii Agricultural Experiment Station co-operated in this undertaking by exhibiting flowers; over 3,000 cuttings of different varieties have been sent out from the station. A method has been adopted in this propagation work by which the plants can be multiplied rapidly at a nominal expense. Beds of ordinary beach sand are prepared in the open; the cuttings are tied up in bundles of fifty or 100 and planted in the sand where they root rapidly. They are thus quickly put in, and can be speedily removed.

A Source of Food for Animals.

An account is given in *Mitteilungen der Deutschen Landwirtshafts-Gesellschaft*, XXVII, pp. 254 and 272, May 1912, of a product used for feeding animals, called Brotmehl.

The source of this product, which has originated in Charlottenburg, is the leavings from the table which, by order of the police are saved separately from the other household waste products. The leavings are collected by a company which deals with waste substances, freed from anything that they may contain that is not useful for food, ground after having been wetted, pressed and dried, and then mixed. The product has a light-brown colour and a pleasant smell; it is fed alone or mixed with molasses.

Analysis has shown that Brotmehl has a similar composition to wheat bran as regards nutritive substances; it possesses some objection in that its ash content is high. Trials in feeding cows on the product have proved successful.

Fruit-Selling by Measure in Jamaica.

Reference was made on page 268 of this volume of the *Agricultural News* to Law 11 of 1912, Jamaica, which is a Law to prescribe a measure to be used in the purchase of citrus fruit by licensed produce dealers. It is to be cited as the Sale of Citrus Fruit Law, 1912.

The law provides that all citrus fruit sold by measure to a licensed produce dealer shall be sold by a measure described in the schedule or by such other measure as the Governor, on the recommendation of the Jamaica Agricultural Society, may prescribe, the size and dimensions being those mentioned in the schedule. Provision is made, further, for punishment for offences under the Act.

By the term Licensed Produce Dealer is meant any person holding a current license under Law 31 of 1903 entitled The Produce Protection Law, 1903. The expression Citrus Fruit includes oranges, grape fruit, shaddocks, lemons and limes.

The schedule describes the package for the sale of the fruit as a box measuring on the inside 2 feet in length, 1 foot in breadth and 1 foot in depth, and usually known as the Florida standard orange box.

A Lecture on Tuberculosis among Stock.

At a special meeting of the Agricultural and Commercial Society of Antigua, held on August 23, a paper dealing with the results of tests for tuberculosis was read by Mr. P. T. Saunders, M.R.C.V.S., Veterinary Officer of the Imperial Department of Agriculture. Attention was drawn to the nature of the disease, its symptoms, and post mortem appearances, and the causal agent was described. The tuberculin test was also explained. The tests recently carried out were then analysed. The total number of animals tested was 162, and of these forty reacted to the test, giving a percentage of 24·7. Of the number tested, forty-three were working oxen, twenty-six bulls, sixty-six cows, seventeen heifers and ten steers. The oxen were affected to the extent of 41·9 per cent., the bulls 26·9 per cent., the cows 13·6 per cent., the heifers 17·6 per cent.; and the steers 30 per cent.

It was pointed out that the tests could not be considered as representing an average incidence of the disease, because many were suspected animals, but the seriousness of the disease was emphasized from the fact that of 137 animals not suspected, twenty-three, or 16·8 per cent., were found to be affected.

The means for suppression of the disease were finally dealt with and the generally accepted methods of eradication were outlined.

INSECT NOTES.

ENTOMOLOGY IN TRINIDAD.

At the meeting of the Board of Agriculture, Trinidad, in July last its Entomolgist presented a report covering his work during the time since the previous meeting. The report dealt principally with matters relating to the occurrence of the froghopper (*Tomaspis varia*, Fabr.) on a number of estates, and showed the difference in the abundance of this pest where different treatments had been applied. In those localities where the fields were burned after the canes had been cut and the surrounding traces were also burned, there were few froghoppers and only a small amount of spittle to be seen. In those fields which were burned over while the canes were still standing there were at the time of the report more froghoppers than under the preceding conditions. In those localities where no burning was done, that is where infested fields and traces had gone untreated, froghoppers were numerous, spittle masses were abundant and the canes were beginning to show signs of injury already.

The froghopper fungus (*Metarrhizium anisopliae*) appeared to be doing good work on the two estates where spores had been distributed in the previous year. The use of lime and sulphur applied dry was being tried as a remedy, but it was too early to say what the result of the trials would be.

The Mexican predaceous bug (Castolus) had been distributed to seven estates, where they had been observed since their liberation in the field. These insects seemed quite at home, and were found to be attacking the adult froghoppers.

Attacks of the cotton worms and the corn ear worm are recorded, and it was suggested that these insects could be killed by the use of arsenate of lead, applied either as a dust, or as a spray.

A note was also given on the use of formalin for the destruction of house-flies. The method suggested was as follows: 1 part of formalin in a mixture with 6 parts of condensed milk and water. This is exposed in saucers. A few pieces of bread are put into the mixture to provide places for the flies to alight and feed. This method is similar to that mentioned in the *Agricultural News*, Vol. XI, p. 58, where an account was given of the successful use of this method in South Carolina. In this latter instance formalin was used in water and in a mixture of milk and water. It is mentioned that in Port-of-Spain the principal breeding places for the house-fly are horse-manure heaps. Careful attention to the removal of their breeding places will have greater effect in reducing the numbers of these insects than any methods of killing or capturing the adult fly.

The Assistant Entomologist reported on the method of trapping the cacao beetle by means of pieces of thick bark from the trunks of the Chataigne Maron (*Pachira aquatica*) placed in the forks of the cacao tree or against its trunk. The eggs of the beetle are laid in these pieces of trap bark, which dries in a short time and causes the death of the eggs or of the young larvae which may have hatched from them. (See also *West Indian Bulletin*, Vol. XII, p. 311.)

At the meeting of the Board in August and September the froghopper situation was discussed at length, and at the close of the latter of these meetings a committee was appointed to investigate the whole matter of froghopper control in that island.

During the discussion of the question of the abundance of the froghopper a diversity of opinion was shown to be held by members of the Board. Certain influential planters maintained that no improvement was to be seen on those estates where the recommendations of the Board's officers had been carried out. The officers of the Board however showed that the introduced Mexican bug was actively engaged in destroying the froghoppers and that the fungus was more abundant where the spores had been distributed than in other localities. The long continued drought earlier in the year had helped to make the froghopper conditions very bad, but experiments and trials in methods of control were being continued.

The Director of Agriculture stated to the meeting that he was making trials of nitrolim, a nitrogenous manure which he hoped would prove of value as possessing certain insecticidal properties, which would be effective against the froghopper.

The result of the efforts in Trinidad to control the froghopper will be awaited with much interest in all sugar-producing countries where this pest is likely to occur. The experiments with the froghopper fungus and the Mexican predaceous bug as natural enemies of the froghopper are likely to have important results. The practice of clean cultivation, and the burning of trash and the grass on the traces, are also likely to result in definite improvement when they have been tried over a series of years on a fairly large scale.

The question as to whether the froghopper fungus will attack the Mexican bug and thus interfere with its predaceous activity is one that time alone will answer.

The Brown Hardback.—In a recent number of the *Agricultural News* (see Vol. XI, p. 298), mention was made of the brown hardback (*Phytalus smithi*, Arrow.) which has appeared in such extraordinary numbers in Mauritius. In the *Bulletin Agricole*, Mauritius, for May 1912, a brief account of the occurrence of this insect is given, with mention of the principal points in its life-history. This information is taken from a report submitted to the Government by M. D. d'Emmerez de Charmoy. It is shown that the life-cycle of this insect occupies a period of from 405 to 648 days, of which from 265 to 333 days are spent in the egg, larval and pupal stages.

As already stated in the *Agricultural News*, the total number of beetles collected in the campaign against this pest from August 1911 to April 1912 amounted to over 26 million. The greatest number captured in any one day, or rather night, was nearly three million, taken on December 14. In the report under consideration, the weights are given for these enormous numbers of insects. It appears that the total capture was equal to a weight of 15 metric tons, 800 kilos., or about 20 long tons. The weight of the insects captured on December 14 was 700 kilos., or about 1,540 lb.

Antigua at the Canadian National Exhibition.—Mr. H. A. Tempany, B.Sc., Superintendent of Agriculture for the Leeward Islands, has sent information to the effect that the material representing Antigua on the occasion of the present holding of this exhibition comprised eighty-nine separate exhibits, including samples of sugar, molasses, cotton, and lime juice and other minor products, together with native curios, picture post cards, and ornamental and decorative material. A small illustrated pamphlet, dealing with useful general matters relating to Antigua, was also issued by the Permanent Exhibition Committee for distribution at the exhibition.

TRADE AND AGRICULTURE OF CUBA 1910-11.

The following information concerning the agriculture and commerce of Cuba during the year ended June 30, 1911, is taken from *Diplomatic and Consular Reports*. No. 4905 Annual Series:—

The total trade of the Republic during the period under review amounted to £49,432,634, divided into imports £22,520,370 and exports £26,912,264, showing an increase of £969,120 in imports and a decrease of £3,095,861 in exports, or a decrease in the total trade of £2,126,741 as compared with the figures of the preceeding financial year. The decrease is accounted for by a diminution both in the size and value of the 1911 sugar crop.

The total production (including local consumptiou) of sugar in 1911 was 1,483,451 tons, as against 1,804,349 tons in 1910

The decrease in the value of the crop as compared with the preceding one was about £4,000.000, the quantity harvested being nearly 300,000 tons short of the estimate.

The area under sugar continues to increase under the stimulus given to the industry by the increased demand and consequent high prices of the past two or three years, and it is said that there are still 10,000 square miles of sugar land awaiting development.

The value of the tobacco exported in 1910-11 was £6,184,680; in 1909-10, it was £5,765,155.

The crop of 1910-11 again suffered severely from the cyclone, but was nevertheless larger than that of the previous year.

The export trade with the United Kingdom appears to be still suffering from the increase in the British duty. Exact figures of the exports to the United Kingdom are not yet available, but it is known that they show a slight increase over the figures of the previous year. The United Kingdom still remains Cuba's best customer for cigars.

FRUITS. No great progress can yet be recorded in the citrus fruit industry. It would appear that a success can at present only be made of this industry where the plantations are in a position to supply the local market.

The export trade in coco-nuts has been almost destroyed by a disease which has attacked the palms, and the number exported has fallen in three years from 10,000,000 to 4,000,000. A coco-nut oil mill at Baracoa which formerly worked day and night operates only two days a week. The Commission which has been considering the disease appears to be of opinion that nothing can uproot the disease except the destruction of all the infected palms. As it takes five years for a coco nut palm to come into bearing, the industry must for some time suffer eclipse.

The exportation of pine-apples in 1910-11 amounted to 989,883 crates, a decrease of about 350,000 crates as compared with the export in the previous year, the whole going to the United States.

COTTON. An interesting experiment has recently been made in growing cotton on tobacco lands in the Province of Pirar del Rio. So far 6 acres have been planted and the experiments have extended over three years.

The owners are now anxious to put the matter on a commercial basis, and if the industry can be made a success it would do much to relieve the prevalent distress in the western province.

SISAL. A factory has recently been established at Regla, near Havana, with a capital of £70,000 to work the sisal from its own plantation at Cardenas. The machinery has all been inported from the United States. It is said that 2,000,000 plants are now ready for cutting and that over 3,000 acres are ready for cultivation.

At Matanzas is situated the largest plant for working sisal in the West Indies, and there are 4,000 acres under cultivation in the immediate neighbourhood.

HONEY. A considerable amount of honey and beeswax is produced in the eastern part of the island. It is estimated that 250,000 gallons of honey (valued at £21,000) and 250,000 ℔. of wax (valued at £13,500) were exported in 1909-10. The honey is dark in colour but of good quality. Nearly the whole of the honey goes to the Netherlands, and the wax to Germany.

TIMBER Twelve million feet of spruce and 8,000,000 feet of white pine annually come to Havana, of which nearly all the spruce and much of the pine come from Canada. The import of Canadian lumber shows considerable prospect of increase.

Hardwoods—consisting almost entirely of mahogany—to the value af £71,500 were exported to the United Kingdom during the year under review.

COFFEE. Coffee, which was once Cuba's principal crop, is now so little cultivated that only enough is grown to fill one quarter of the local demand. Cuba takes practically the whole crop produced by Porto Rico, the duty of Porto Rican coffee being only 8½ cents per ℔. as against 11 cents on the product of other countries. The total amount imported in 1909-10 was 25,000,000 ℔.

Coffee is, nevertheless, a crop which would give good returns to the grower in Cuba, as the home-grown article retails at about 25 per cent. higher price than foreign coffee, and is produced at about 1,200 ℔. to the acre.

BRITISH GUIANA AND THE INTERNATIONAL RUBBER EXHIBITION.

In the last number of the *Agricultural News*, p. 299, an account was given of the representation of the Imperial Institute at the Third International Rubber Exhibition. At a meeting of the British Guiana Board of Agriculture, held on August 22, it was stated that the following samples from the Colony would be additionally included in the exhibit of that Institute:—

(1) Seven-pound sheet of balata from Messrs. Garnett & Co.

(2) Seven-pound sample of sheet balata from the Consolidated Rubber and Balata Company.

(3) Seven pounds of plantation Para biscuits from Mr. W. Hodgson, of Plantation Noitgedacht, Demerara River.

(4) Biscuits of plantation Para rubber from Messrs. Booker, Bros., McConnell & Co., Ltd., from Plantation Tuschen.

(5) Biscuits of plantation Para rubber from the Experiment Station of the Department of Science and Agriculture.

(6) Biscuits of Sapium rubber from Bonasika Government Reserve.

(7) Scrap cakes of Sapium rubber from David Young Rubber Estates, Ltd.

The Permanent Exhibitions Committee announced further that it was prepared to receive additional, suitable exhibits of rubber and balata, up to September 14.

GLEANINGS.

A report by H. M. Consul-General at Ispahan, Persia, shows that the cotton crop of that district is expected to be about 50,000 cwt. At the time of reporting about 11,600 cwt. remained over from the previous crop.

A note in the *Journal of the Royal Society of Arts* for August 16, 1912, states that, according to an Italian Consular Report from Batavia, the production of rice in Java, in 1910, was 4,932,554 long tons.

The *Börsen Zeitung*, Berlin, dated August 7, 1912, states that the prospects are good for the present season's cotton crop in Togoland. In 1911 the yield was 1,137,400 lb.; in the previous year it was 1,027,400 lb. It is expected that the former return will be exceeded.

It is announced by the Superintendent of Agriculture, Grenada, that several thousand lime seedlings are ready at the Botanic Station, for sale locally. Cane plants (of B. 147) to the number of 50,000 have also been imported by the Agricultural Department from Antigua, for sale in the island.

In order to save them from the torment of flies, a writer in the July number of *The Animals' Friend* suggests that when horses are 'summered' in pastures they should be turned out only at night, and kept in their stables during the daytime, or at any rate during the hotter hours. (*Nature*, August 22, 1912).

It was reported by the Agricultural Superintendent, St. Vincent, in August, that the cotton crop although in a backward state was making fair progress, and that the same may be said of other staple crops. Coco-nut planting was being continued on a large scale, but trouble was still being experienced from the white fly, in certain districts.

The plant distribution from the St. Lucia Botanic Station during last month included the following: limes 11,500, Liberian coffee 104, cacao 50, mangoes 9, nutmegs 7, decorative plants 41, various other plants 31, vegetable seeds, 107 packets, horse beans $3\frac{1}{4}$ gallons, papaw seeds 2 lb. The total distribution from this station reached 11,742 plants.

By the end of August, most of the cotton lands in Nevis had been planted, and the young crop was making good progress. It was expected that about 2,500 acres of land in the island would be planted this year, about 280 acres of which had been cleared specially for the purpose. Cotton-picking had begun during that month, and fairly good returns were being received, on estates where the seed was sown early.

The Agricultural Superintendent, St. Kitts, reported in August last that the young cotton in the island was growing well, and appeared to be healthy, in spite of the dry weather. Although there had been only moderate showers, there was every prospect for a good return from the crop; picking had begun in some of the earlier-planted fields. The cotton worm had appeared on some of the estates, but had done little damage, because the usual repressive means had immediately been taken.

The plant distribution from the Dominica Botanic Station during last month included the following: limes 8,781, cacao 300, vanilla 50, Para rubber 12, nutmegs 6, grafted mangoes 2, miscellaneous 37, the total being 9,188 plants: a large number of papaw seedlings, as well as several pounds of seed of this plant, were also sent out. The rainfall for the month was abnormally low, the precipitation being only 4·88 inches, while the average rainfall for August, for eighteen years, is 10·12 inches.

The announcement is made that the Cambridge University Press intends to publish a series of Cambridge Agricultural Monographs, dealing with agricultural subjects in a critical and impartial manner, and sufficiently detailed to be of use to all readers, but especially to those who have not access to a well-equipped reference library. The subjects that are proposed so far for treatment are: the strength of wheat flour, the constitution of the soil, disease resistance, inorganic plant poisons and stimulants, the chemical composition of cows' milk, nitrogen fixation by symbiotic processes, and poisonous plants. It is hoped to publish the first volume in the autumn of 1913.

An abstract in the *Experiment Station Record* for June 1912, p. 723, summarizes the results of experiments which were conducted in Utah with soils containing a high percentage of magnesium compounds. The investigation is stated to have shown quite clearly that the high proportion of magnesia is not poisonous to plants, either because the ratio of magnesia to lime is within 1 : 3, which in accordance with Loew's suggestion is favourable to growth, or because the calcium and magnesium are present in the form of a double carbonate, so that there is actually little magnesium carbonate free as such in the soil. The latter suggestion leads to the proposal to use magnesian limestone for correcting soil acidity. With further reference to the subject, the *Agricultural News* may be consulted as follows: Vols. IX, pp. 95 and 204; X, pp. 60 and 328; XI, p. 184.

STUDENTS' CORNER.

OCTOBER.

First Period.

Seasonal Notes.

It is well known that, in the case of two solutions of different strengths, separated by a suitable membrane, the pressure on one side of the membrane is greater than that on the other, the greater pressure being toward the stronger solution; the difference between the pressures is called the Osmotic Pressure. Its existence is often demonstrated by tying a membrane over the mouth of a small glass funnel, putting salt water into the vessel thus formed, and inverting the funnel with its mouth below the surface of a quantity of tap water; the greater pressure is exerted toward the salt water, so that water passes through the membrane into the salt water which consequently rises in the tube of the funnel. In another way, pieces of yam or potato, put into salt water, lose their stiffness, because water passes out of their cells; while on the other hand, if pieces of these plants (or similar material from other plants) are placed in water, they swell and become stiff, because the water has passed into the stronger solution in their cells and increased the internal pressure on the walls of these.

It must be remembered that, at the same time, substances in the stronger solution pass into the weaker. Apply these matters to living plants and state why the strength of the solutions in the cells of the roots of such plants does not become gradually so weak that it is no stronger than the soil solution in contact with them.

In considering the value of agriculture to mankind, it must be remembered that, while mining, manufacture and trade are necessary for the development of a country, the foundation of these is agriculture: without the production of crops and stock, civilization is at present impossible. The importance of agriculture to a growing country in which there is still much room for development is illustrated by reference to statistics concerning the United States of America. These show that, in the year 1899, the total capital invested in manufactures in that country was about ten billion dollars, while the total value of all farm property in that year was more than twice as much. The matter is further illustrated by the consideration that the total horse-power employed at the same period in factories is stated to be more than eleven million, while the total number of horses and mules on farms was over 18 million; this is of course only a rough manner of comparison. These figures help to demonstrate the preponderating share of agriculture under conditions of growth and progress.

The complexity of the matters that pertain to agriculture is indicated by the fact that chemistry, physics botany, geology, zoology, entomology (which may be considered as a branch of zoology), mycology (or the study of the fungi producing plant diseases), bacteriology and meteorology are all required in its study and practice. Again, the agriculturist, whether he is attending to the raising of crops or stock for commercial purposes, or making investigations and giving advice, has to pay attention, not only to the sciences that are the handmaidens of agriculture, but must possess knowledge of the subject as an art, and the ability to deal with it as a business. The interests of agriculture are complex: the position is summed up shortly in a text-book* issued in recent years: 'It [agriculture] involves more problems than any other occupation—unless it be housekeeping.'

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 food-stuffs.

(3) Discuss the usefulness of agricultural literature to the planter.

A Trial of Apterite.—At the request of the proprietors, some tests have been made at the Hawkesbury Agricultural College to ascertain the effect of this preparation upon eel worms in the soil. A piece of light sandy soil was selected for the trial. The rubbish and weeds were either burned or carted away, and the ground ploughed on October 6, 1911, and harrowed on the following day. It was then cultivated once a fortnight until December 18, when Apterite was sown by hand, and the ground ploughed 4 or 5 inches deep. The area had been divided into nine plots and applications were made at varying strengths, from 103 to 656 ℔. per acre. Untreated strips were left between the plots for observation purposes.

The ground was then harrowed and rolled, and on December 21 sown with Poona cowpeas. A few patches of green summer grass which were on the ground at ploughing time were harrowed out before sowing.

Half of the area was uniformly affected by eel worm to such an extent that very little seed was formed, and all the plants died before full maturity. The other half, with the exception of a small strip adjoining the damaged section, was only slightly affected. The only conclusion that can be drawn is that the application of 'Apterite' made no difference in the severity of the affection, and did not prevent the eel worms from attacking the plants (The *Agricultural Gazette of New South Wales*, July 1912.)

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* *Elements of Agriculture*, by G. T. Warren; Messrs. Macmillan & Co., Ltd.

FUNGUS NOTES.

CROWN GALL OF PLANTS AND ITS RELATION TO ANIMAL CANCER

In February 1911 there was issued Bulletin 213 of the Bureau of Plant Industry of the United States Department of Agriculture entitled Crown-Gall of Plants: Its cause and Remedy, by Erwin F. Smith, Nellie A. Brown, and C. O. Townsend, and in June of this year appeared Bulletin 255 of the same Bureau under the title The Structure and Development of Crown-Gall: A Plant Cancer, by Erwin F. Smith, Nellie A. Brown and Lucia McCulloch. The contents of these two bulletins are of very great interest, not only because they provide a clear proof of the cause of crown gall in plants—a disease that had baffled the numerous earlier attempts to discover its origin; but even more perhaps on account of the theory of the senior author that the structure and development of these galls is analogous to those of cancer growths in animals, and that the elucidation of the cause of the one may result in the discovery of a similar cause for the other and necessitate the acceptance as a fact of the now much discredited theory that animal cancer is due to a bacterial parasite.

Crown galls are hard or, more usually, fairly soft swellings of varying sizes and unlimited growth that occur on the crown, roots, stems and leaves of a comparatively large number of different plants mostly of importance as crops or ornamental plants. The duration of the galls depends somewhat upon whether they are hard or soft, as in the latter case they may be entered by saprophytes and secondary parasites which destroy them; the entrance of these organisms and of water is facilitated by the fact that the galls are usually not protected by a cork layer on the outside. Another disease often associated with the presence of galls is hairy root in which a large number of roots, usually fine and hairy but sometimes fleshy, arise at a small spot on an older root. The spot usually consists of a flat swelling similar in origin and appearance to a small gall. This disease has been shown by the workers mentioned to be due to an organism very similar to that causing crown gall, and capable of producing tumours only, when inoculated into plants. In one instance both tumours and hairy root resulted from separate inoculations with this organism on the same plant. Further evidence of the identity of the two diseases lies in the fact that occasionally hard galls are found in nature with a tuft of small roots attached to them. Hard and soft galls were at one time supposed to be different, but as the organisms causing them are almost identical, and as numerous transition forms between the two types of gall occur, they must now be regarded as identical and the difference in their appearance as due only to different rates of growth or to differences in the tissues originally infected. Thus hard and soft galls and hairy root are all to be regarded as of practically the same nature and of nearly identical origin.

Crown gall has been known in Europe on several plants for at least fifty years, and has usually been ascribed to frost or mechanical injuries. A few authors have attributed it to bacteria, but without sufficiently conclusive proof. It is particularly well-known on the grape, and occurs also on the rose, poplar and probably peach, as well as other plants. It has been recorded on the grape in Chile and Peru, for South America, and on a large number of hosts including the daisy, almond, peach, quince, apple, raspberry, blackberry, rose, grape, red clover, alfalfa, cotton, hop and sugar beet, all over North America, while a similar disease on poplar, willow, peach, apple and other trees is reported from South Africa. A disease that may well be the same has been found on roses in the West Indies.

The first results of the attempts made by Dr. Smith and his fellow workers to isolate a causative bacterium from gall tissues were all entirely of a negative nature, as of the numerous different organisms obtained, none would reproduce the disease when inoculated into healthy plant tissues. Finally, however, it was observed that in cultures from daisy tumours certain colonies developed some time after the others, not until five or six days had elapsed, and that when these colonies were isolated in pure cultures, the bacteria composing them did cause galls when inoculated into healthy daisy stems After this it was found that the same organism could give rise to galls on several other plants on which such swellings had been found in nature. The bacterium thus isolated was studied on various culture media, its staining reactions determined, and finally named *Bacterium tumefaciens.* Other very similar organisms were isolated from galls both hard and soft, on several different host plants, as well as from the swollen pad from which hairy roots arise.

These organisms all behaved in a more or less similar manner on the different culture media and all produced galls on the hosts similar to those from which they were isolated, as well as on a more or less wide range of other plants. Thus by inoculation, cross-inoculation and cultural methods it was established that crown galls and hairy root on a large number of different plants are due to different strains of the same bacterium or to a very closely related group of similar bacteria.

The organism is a wound parasite that lives in the soil, and in nature usually makes an entry through wounds on the roots or crown. The amount of damage caused by the galls varies on different hosts, but their presence often results in the gradual death of the plant, and usually causes stunting and barrenness even where death does not occur. The disease is very common on nursery stock, and it is by the distribution of infected plants that it is principally disseminated. Smith urges the careful control of such stock, and suggests that infected land should not be replanted with plants known to be susceptible to the disease. In hot houses it can be got rid of by heating the soil. Continued inoculation experiments showed that the bacteria lose their virulence when kept for some time—about two years in this case—in pure cultures, and that different strains isolated from different host species, and from the same host species at different times, vary very considerably in their virulence, some being apparently unable to reproduce the disease at all. Further, it appeared that a certain degree of immunity may be obtained in a strain of plants reproduced vegetatively when the strain is inoculated through several generations.

The primary tumours, such as are caused by inoculation, originate as a rule in young growing tissue, generally the cambium; they can only be successfully induced artificially by inoculation into young, vigorously-growing parts of the host. When formed in the stem they include in their substance elements of all or nearly all the usual tissues. These primary tumours form (root or tumour) strands that run through the normal tissues and may extend for some distance; these consist of undifferentiated young cells that can give rise to medullary rays, tracheids and sieve tubes, and their cells are rich in chloroplasts. These strands can become the origin of secondary tumours within the plant, often situated at some distance from the original gall.

A peculiar point about these secondary swellings is that, no matter in what part of the plant they form, they have the same structure as the part in which the primary tumour arose. Thus a secondary tumour in a leaf that has originated from a primary stem tumour shows a stem structure, not a leaf structure; while a primary tumour in a leaf does not possess a stem structure. These galls resemble animal cancers in their unlimited growth, in the fact that they contain the tissues proper to the organ in which they arise, and in the formation of secondary galls with the structure of the part in which the primary growth was formed. In animals the secondary tumours are not connected to the primary by definite strands, but are formed by the migration of a cell or cells of the primary tumour to another part of the body. This difference is probably due to the nature of the host and is not dependent upon any essential differences in the nature of the swellings themselves.

The causative bacteria inhabit the interiors of certain of the cells of the tumour often in small numbers only. They are not to be found in the intercellular spaces or in the interior of the vessels of the wood. Their presence stimulates the cells to rapid division, and by the growth of the tumour strands they are transferred to different parts of the host. They have been isolated in pure culture from the secondary as well as the primary tumours, and in one instance from a tumour strand. Inside the cells they are in an unhealthy condition, probably partly because of the accumulation around them of their own poisonous secretions which are very possibly also responsible for the stimulus causing the division of the cells of the host. When this division occurs, nuclear substances from the host cell nucleus are liberated into the protoplasm and these revive the activities of the bacteria. Their unhealthy condition in the host explains their originally slow growth on culture media, and may account for the difficulty of staining them there by the usual stains, though they stain readily when obtained from an artificial culture. Their few numbers and the difficulty of staining them, combined with their slow original growth on culture media inoculated with tumour tissue, accounts for the long time that their discovery has taken. Dr. Smith urges that possibly the same causes operate in the case of animal cancers and explain the general acceptance of the view that these diseases are not due to the presence of foreign organisms in the cell. He urges that the crown gall presents so close an analogy to animal cancer that it is only reasonable to believe that the latter may well be due to the presence in the proliferating animal cells, or in some of them, of a definite foreign organism probably a bacterium, but not necessarily the same as that found in crown gall.

WEST INDIAN PRODUCTS.

DRUGS AND SPICES ON THE LONDON MARKET

Mr. J. R. Jackson, A.L.S., has forwarded the following report on the London drug and spice market, for the month of August 1912:—

The month of August, notwithstanding that it is in the height of the holiday season, and usually a dull one for business in London, was an exception this year, a slight reaction having set in after the severe depression of the ten weeks strike of dock labourers, week by week things have been slowly shaping themselves into normal conditions and as the holidays end it is expected that there will be a satisfactory revival of trade in drugs and chemicals, many of which have, during the month under review advanced in prices.

The following details refer to the ordinary West India imports.

GINGER.

In consequence of the holidays there were no spice auctions held till the 14th of the month, when the offerings were small, with a very slow demand, 48*s.* to 49*s.* per cwt. was paid for eight barrels of good ordinary, but mouldy Jamaica, 445 bags of Cochin were offered and only 30 sold at 35*s.* per cwt. for washed slightly wormy. On the 28th some 906 bags of Cochin were brought forward, part of which sold at 30*s.* per cwt. for common wormy rough, a further 200 bags of washed rough wormy were disposed of at 33*s.* to 33*s.* 6*d.* per cwt.

NUTMEGS, MACE, PIMENTO AND ARROWROOT.

At the auction on the 14th, nutmegs were in good supply, as many as 650 packages of West Indian being offered and all sold at an advance of 1*s.* 4*d.* per lb. on previous rates, 61's to 71's fetching 7*d.* to 10*d.*, 72's to 82's 7*d.* to 7½*d.*, 84's to 94's 6½*d.* to 7½*d.*, 96's to 106's 6½*d.* to 7½*d.*, 121's to 131's 6*d.* to 7*d.*; 38 cases of Java limed were also offered and sold, 60's to 70's fetching 7½*d.* to 8*d*, 80's to 90's 6½*d.* to 7*d.*, and 100's 5¾*d.* A week later 52 bags of West Indian were offered and sold at the following rates:—66's to 76's, 7*d.* to 7½*d.*, 77's 7*d*, 101's to 114's 6½*d.* and 136's 6*d.* At the last auction on the 28th, 15 packages of West Indian were offered and all disposed of at similar rates. Mace was represented at auction on the 14th of the month by 253 packages of West Indian, the bulk of which sold at steady rates, 2*s.* 8*d.* to 2*s.* 9*d.* being paid for fine bold pale, 2*s.* 6*d.* for good pale reddish, 2*s.* 3*d.* to 2*s.* 5*d.* for fair to good palish, 2*s.* 1*d.* to 2*s.* 3*d.* for fair to good red, and 1*s.* 10*d.* to 2*s.* 1*d.* for broken. Pimento has been quiet throughout the month. On the 14th some 30 barrels of St. Vincent arrowroot were offered and sold at 3¼*d.* per lb.

SARSAPARILLA.

In consequence of the drug auctions not being resumed, on account of the holidays, till the 22nd of the month the offerings of sarsaparilla on that date were very large, grey Jamaica being represented by 60 bales of which 43 were sold, native Jamaica 29 bales and 26 sold, and Honduras 11 bales, none of which found buyers. Fair grey Jamaica fetched 2*s.* 3*d.* per lb., part rough 2*s.* 2*d.*, and 1*s.* 9*d.* to 1*s.* 11*d.* was paid for country damaged and mouldy, of the native Jamaica good red realized 1*s.* 3*d.*, dull to fair red 1*s.* to 1*s.* 2*d.* middling 11*d* and inferior mixed 8½*d.* to 9½*d.* per lb.

LIME JUICE, TAMARINDS AND KOLA.

At the first sale on the 14th, lime juice appeared after being held up by the strike to the extent of 300 packages from Dominica, 2*s.* to 2*s.* 1*d.* per gallon were the quoted prices for raw West Indian. A week later five puncheons of fair palish raw West Indian were disposed of at 1*s.* 6*d.* per gallon. At the end of the month good pale raw West Indian was quoted at 1*s.* 9*d.* per gallon, the demand for it had considerably lessened on account of the prevalence of cold and wet weather. At auction on the 22nd, three barrels of dry West Indian tamarinds were brought forward and reserved at 7*s.* per cwt. Fair quality, in bond was quoted at 12*s.* to 14*s.* At this auction 25 bags of fair dried kola from the West Indies were offered and bought in at 7*d.*

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR September 10, 1912; Messrs. E. A. DE PASS & Co., August 30, 1912.

ARROWROOT—$3\frac{7}{8}d.$ to $4\frac{3}{4}d.$
BALATA—Sheet, $3/6\frac{1}{2}$; block, 2/5 per lb.
BEESWAX—£7 15*s.*
CACAO—Trinidad, 70/- to 85/- per cwt.; Grenada, 57/- to 64/-; Jamaica, 56/- to 63/-.
COFFEE—Jamaica, 67/6 to 72/- per cwt.
COPRA—West Indian, £27 per ton.
COTTON—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 14*d.* to $15\frac{1}{2}d.$
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—49/- to 65/- per cwt.
ISINGLASS—No quotations.
HONEY—No quotations.
LIME JUICE—Raw, 1/6 to $1/10\frac{1}{2}$; concentrated, £18 12*s.* 6*d.* to £18 17*s.* 6*d.*; otto of limes (hand pressed), 7/6.
LOGWOOD—No quotations.
MACE—2/1 to 2/6.
NUTMEGS—6*d.* to 10*d.*
PIMENTO—Common, $2\frac{9}{16}d.$; fair, $2\frac{5}{8}d.$; good, $2\frac{11}{16}d.$; per lb.
RUBBER—Para, fine hard, $4/10\frac{1}{2}$ to $4/11\frac{1}{2}$.; fine soft, $4/9\frac{1}{2}$; Castilloa, 4/4 per lb.
RUM—Jamaica, 2/1 to 6/-.
SUGAR—Crystals, 16/- to 18/-; Muscovado, 11/- to 14/-; Syrup, no quotations; Molasses, no quotations.

New York.—Messrs. GILLESPIE BROS. & Co., September 6, 1912.

CACAO—Caracas, 14c. to $15\frac{1}{2}$c.; Grenada, $14\frac{1}{4}$c. to $14\frac{1}{2}$c. Trinidad, 14c. to 15c. per lb.; Jamaica, $11\frac{1}{2}$c. to 13c.
COCO-NUTS—Jamaica, select, \$30·00 to \$32·00; culls, \$17·00 to \$18·00; Trinidad, select, \$34·00 to \$35·00; culls, \$17·00 to \$18·00 per M.
COFFEE—Jamaica, $14\frac{3}{4}$c. to 17c. per lb.
GINGER—$8\frac{3}{4}$c. to $12\frac{1}{4}$c. per lb.
GOAT SKINS—Jamaica, 50c.; Antigua and Barbados, 45c. to 46c.; St. Thomas and St. Kitts, 42c. to 44c. per lb.
GRAPE-FRUIT—Jamaica, \$2·75 to \$3·25.
LIMES—\$4·00 to \$5·00.
MACE—No quotations.
NUTMEGS—110's, 15c.
ORANGES—Jamaica, \$1·75 to \$2·25 per box.
PIMENTO—$4\frac{1}{4}$c. per lb.
SUGAR—Centrifugals, 96°, 4·36c. per lb.; Muscovados, 89°, 3·86c.; Molasses, 89°, 3·61c. per lb., all duty paid

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Trinidad.—Messrs. GORDON, GRANT & Co., September 16, 1912.

CACAO—Venezuelan, \$14·00 per fanega; Trinidad, \$13·75 to \$14·50.
COCO-NUT OIL—\$1·04 per Imperial gallon.
COFFEE—Venezuelan, 18c. per lb.
COPRA—\$4·45 per 100 lb.
DHAL—\$5·00.
ONIONS—\$2·00 to \$2·25 per 100 lb.
PEAS, SPLIT—\$6·50 per bag.
POTATOES—English, \$1·75 to \$2·25 per 100 lb.
RICE—Yellow, \$5·00; White, \$6·25 to \$6·35 per bag.
SUGAR—American crushed, no quotations.

Barbados.—Messrs. JAMES A. LYNCH & Co., Ltd., September 21, 1912; Messrs. T. S. GARRAWAY & Co., September 23, 1912; Messrs. LEACOCK & Co., Sep- 12, 1912.

ARROWROOT—\$7·00 to \$7·25 per 100 lb.
CACAO—\$13·00 to \$14·00 per 100 lb.
COCO-NUTS—\$20·00.
HAY—\$1·60 to \$1·80 per 100 lb.
MANURES—Nitrate of soda, \$65·00; Cacao manure, \$45·00 to \$48·00; Sulphate of ammonia, \$80·00 to \$85·00 per ton.
MOLASSES—No quotations.
ONIONS—\$2·50 to \$3·00 per 100 lb.
PEAS, SPLIT—\$6·40 to \$6·75 per bag of 210 lb.; Canada, \$3·00 to \$5·00 per bag of 120 lb.
POTATOES—Nova Scotia, \$2·20 to \$3·00 per 160 lb.
RICE—Ballam, \$5·20 to \$5·70 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
SUGAR—American granulated, \$5·00 per 100 lb.

British Guiana.—Messrs. WIETING & RICHTER, September 14, 1912; Messrs. SANDBACH, PARKER & Co., September 13, 1912.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	—	—
BALATA—Venezuela block	No quotation	Prohibited
Demerara sheet	76c. to 77c. per lb.	—
CACAO—Native	15c. to 16c. per lb.	14c. to 15c. lb.
CASSAVA—	80c. to \$1·20	No quotation
CASSAVA STARCH—	\$7·50 to \$8·00	No quotation
COCO-NUTS—	\$16 to \$20 per M.	\$10 to \$16 per M., peeled and selected
COFFEE—Creole	20c. per lb.	18c. per lb.
Jamaica and Rio	20c. per lb.	20c. per lb.
Liberian	16c. per lb.	15c. per lb.
DHAL—	\$4·50 per bag of 168 lb.	\$4·50
Green Dhal	\$5·50	—
EDDOES—	\$1·00 to \$1·44	—
MOLASSES—Yellow	None	—
ONIONS—Teneriffe	—	—
Madeira	$4\frac{3}{4}$c. to 5c. per lb.	5c.
PEAS—Split	\$6·75 to \$7·00 per bag (210 lb.)	\$7·25 per bag (210 lb.)
Marseilles	—	No quotation
PLANTAINS—	16c. to 48c.	—
POTATOES—Nova Scotia	—	—
Lisbon	\$2·25	No quotation
POTATOES-Sweet, B'bados	\$2·88 per bag	—
RICE—Ballam	No quotation	—
Creole	\$6·00	\$6·00 to \$6·25
TANNIAS—	\$1·80	—
YAMS—White	—	—
Buck	\$4·00	—
SUGAR—Dark crystals	\$3·20 to \$3·40	\$3·45
Yellow	\$4·00 to \$4·25	\$3·90
White	—	—
Molasses	\$2·80	—
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	No quotation.

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CONTENTS.

The Practical Value of Soil Analysis.

WHEN soil analysis is mentioned, it is usually understood that an investigation and statement of the chemical and physical constitution of the soil are intended. In the part of the statement relating to the chemical investigation, first attention is paid to the content of the soil in more or less available compounds containing nitrogen, potash and phosphorus; while the information relating to the physical condition of the soil is concerned chiefly with the proportions that it contains of particles of different sizes, and with the quantities of these that, speaking broadly, are of a sandy or clayey nature. If all this information is properly understood and applied with a correct regard to its limitations, it is of the greatest use to the agriculturist. If it is thought to provide an absolute indication of the degree of fertility of the soil, and to show necessarily the plant food constituents that the soil lacks, its provision may be of little avail, and actually harmful.

A recent discussion* of the correctness of the view that the analysis of a soil gives a ready means of obtaining an indication of its fertility, and of determining its manurial requirements, deserves notice here in the light of conditions and experience in the West Indies. First attention may be directed to the question—'to what extent does an analysis of a soil give an indication of that soil's fertility?'

The fertility of a soil is measured by its power to grow crops, and this power is most obviously limited by its ability to supply the plant food requirements mentioned already. It is not sufficient, nevertheless, for the soil merely to contain these bodies in adequate amounts. One matter of the greatest importance is that there shall be an ample provision of water to be taken up by the roots, and there are other essentials†, such as proper aëration of the soil. It is not the purpose of this article to discuss these: it is only expedient to point out that insufficiency in any one of them prevents the proper use by the plant of all the others. Their useful provision depends, in turn, on such factors as climate, exposure and depth of soil, and drainage. The chief

* The *Journal of the Board of Agriculture*, September 1912, p. 479.

† *Agricultural News*, Vol. IX, p. 257.

limitation to soil analysis is that these factors, obviously, cannot be determined in the laboratory. Even when they are known to the analyst and he is able to correlate them with the results of his investigation of the soil itself, they are quite insufficient to determine the fertility of any given area. They must be supplemented by the local knowledge, experience and judgment of one, such as a planter or investigator, who may be said to be agriculturally familiar with that area.

The difficulty does not end here, for the analyst up to the present is not able to give any complete information as to the availability of the food bodies in the soil: this may contain nitrogen, phosphates and potash in amounts that are far greater than those required by plants, but one or more of these bodies may be unavailable, or locked up as regards immediate needs, to such an extent that the soil is actually less fertile than one containing them in much smaller amounts but presenting them in forms that are easily taken up by plants. This is the reason why a soil showing lack of fertility will often readily respond to small dressings of certain manures. Such a soil is amenable to treatment other than manuring: it requires that the plant food in it shall be made to become available at a greater rate, and good cultivation, draining and liming are partial means to this end.

In this consideration regarding availability of plant food in the soil, it must not be forgotten that methods have been devised with the object of ascertaining roughly the amount of certain soil constituents ready for direct use by the plant: an example is the determination of the proportion of the phosphates soluble in weak citric acid. This is useful for obtaining broad indications of what is wanted in certain directions as regards manuring, as well as for comparing soils of the same kind. The serious limitation of such methods is that they do not include a ready means of finding the availability of the chief forms in which nitrogen—the most important of plant food elements—usually exists in soils.

More directly useful results are afforded by the second kind of analysis of soils, under discussion, which is the physical or mechanical analysis. In most cases this gives a means of estimating approximately such matters as the power of the soil to retain water, the ease with which water drains away from it, and its ability to withstand drought: it may even supply indications as to the best methods of cultivation of the soil. Conditions in the tropics nevertheless render the humus content of the soil of such paramount importance regarding its permeability, water capacity and drainage that this factor has to be considered very seriously when interpretation is being given to the results of physical analysis. If this is remembered, these may be used in a most valuable way by the planter and other agriculturists.

A further complication of the matter is that the results of analyses of the chemical and physical conditions of the soil do not enable much to be inferred concerning its biological condition. These pages have been often employed recently to explain and emphasize the importance of the modern conception of the work of bacteria in the soil. It is here that the physical analysis again shows its usefulness, provided that its results are interpreted in the light of knowledge mainly concerning the water and lime content of the soil, and regarding its aëration. To make the matter plain, it is only necessary to contrast the nitrification and maintained fertility in an open soil, with an efficient water-supply, with the loss of nitrogen and non-productiveness in a waterlogged clay soil.

It can be concluded from these matters that, while their proper employment may be most useful, chemical and physical analyses of the soil—especially the former kind of investigation—are rarely capable by themselves of providing direct conclusions regarding fertility in a particular area. Their main use, in a broad way, is for supplying material in such work as a soil survey, by which the soils of a country may be usefully classified so that general predictions as to the manurial requirements of these may be made. They can never replace the simple field experiment as a means of ascertaining the suitability of a given area of soil for raising any crop that it is intended to cultivate on that area.

The Purification of Camphor.—With reference to the information concerning camphor given on page 302 of the last number but one of the *Agricultural News*, the following note on its purification, by R. D. Anstead, in the *Planters' Chronicle* for August 3, 1912, is of interest.—

'The impure camphor should be mixed with about its own bulk of lime, which acts as a drying agent, or powdered charcoal, and spread out in a thick layer on a copper plate and covered with a glass bell jar supported at a little height above it. Heat should then be gently applied to the plate. The camphor in the mixture will then evaporate, or sublime, leaving the impurities behind and the vapour will condense on the cool sides of the bell-jar in a pure powder-like form known as "flowers". When the process is complete and no more camphor sublimes off, the bell-jar is removed and the pure camphor collected from it.'

THE MANURING OF RUBBER TREES.

The following is an abstract, in the *Bulletin of the Bureau of Agricultural Intelligence and of Plant Diseases*, July 1912, of a paper by E. de Wildeman in *Le Caoutchouc et la Gutta-Percha* for March 15, 1912, p. 6037.—

It has been demonstrated that the use of a certain amount of manure is necessary for the successful growing of rubber trees. Some chemical compounds not only exert a favourable action on the development of the trees, but also on the yield of latex. Thus it appears from various experiments, which however are not completely conclusive, that nitrate of soda increases the flow of latex and the proportion of rubber.

At Hawaii some manihots were manured with nitrate of soda buried to a depth of 4 inches. The experiment was conducted with three lots of manihots. The first was kept as control, the second was manured with ¼-lb. of the salt per tree and the third ½-lb. per tree. The control trees yielded during the experiment 1 to 2 oz. of dry rubber each; those of the second lot 1 to 3 oz.; and those of the third lot 2 to 3 oz. per tree. The effects of the nitrate begin to show after forty-eight hours. [See *Agricultural News*, Vol. X, p. 265.] M. E. Lierke has demonstrated that potash plays a most important part in furthering the development of heveas, but it must also be borne in mind that manures, and especially potash, seem to favour the development of plant parasites also.

Among the rubber growers in the East, lime as a manure raises at present the greatest interest. The value of lime must be considered according to the soil in which the trees are grown. In the Middle East the soil is peaty, clayey or sandy. In peat soils deep drainage is advisable, after which the soil must be allowed to dry and then it is limed in order to neutralize its acidity. Clay soils improve physically after the addition of lime; they are easier to till and do not crack after prolonged drought. In sandy soils lime improves the cohesion. Lime acts also directly as plant food; it prevents the development of the weeds which infest acid soils, and its application may also become necessary after the repeated use of other manures, such as sulphate of ammonia, kainit, and superphosphates which, in the long run, produce a certain amount of acidity in the soil.

Lime further stops the development of fungi which produce root rot, and especially of *Fomes semitostus*, which causes serious injury to heveas.

It is recommended to slake quicklime with water, allowing it to turn to a dry powder, and then to spread it broadcast at the rate of about 5 cwt. per acre, and at least four times as much on peat or clay.

Experiments conducted in tropical regions where the rainfall is abundant show that it is preferable to apply lime and the other manures during the relatively dry season.

In the Malay States the following formula is recommended:—

	Quantity per acre.
Slaked lime	½ to 1 ton
Basic slag	350 lb.
Sulphate of ammonia	150 ,,
Sulphate of potash	100 ,,
or kainit	400 ,,
or chloride of potash	100 ,,

Instead of salts of ammonia, castor oil, linseed, cotton seed, earth nut [ground nut] or Hevea seed cake may be given, and guano may be used instead of basic slag.

Most crops grown between the Hevea trees appear to retard their development and diminish the yield of rubber. Tapioca [cassava], sugar-cane and pine apples exhaust the soil considerably; coffee and cacao are not so harmful, especially if the plants are kept at a sufficient distance.

There is a good deal to be said both in favour of and against the use of artificials or of green manures, and the planter must judge according to his special conditions and decide which type of manuring may be most useful, or whether he may not preserve and improve the fertility of the soil by 'clean weeding', and sterilize its surface by the heat of the sun. This last method naturally requires a great amount of careful labour which cannot always be given.

SOME USES FOR SUGAR.

The *Bulletin Agricole* of Mauritius for April 1912 gives a summary in an interesting manner of the many ways that sugar is used in addition to its consumption as food and flavouring, the information being based on an article by M. A. Vivien, a well known French chemical engineer. On the larger scale it is employed in tanning, particularly in connexion with the use of chromic acid for preparing skins, for dyeing, the silver-plating of glass, textile manufactures, and is even mixed with mortar and cement. Other large consumptions of sugar are concerned with the making of explosives, blacking, transparent soap, clear coco-nut oil, white linens, and the regulation of the rate of emission of acetylene gas. In America it is mixed with coke, in the manufacture of briquettes and similar materials. By burning it in a closed vessel, a form of carbon is obtained which is useful for making electric arc 'carbons'. Sugar also enters into the composition of many copying inks and gums. Lastly, one of its chief means of consumption is in medicines.

It is claimed that sugar heated on a metal plate yields 6 per cent. of formaldehyde, and this appears to justify the old method of disinfecting a room by burning sugar.

The power of sugar as a preserving agent is well known, and greater use of this may be made, particularly for keeping fresh meat and fish; a patent has actually been granted in which a solution of sugar containing formalin or creolin is employed for preserving eggs. In another way, cut flowers may be made to keep fresh for a longer time by placing their stalks in water containing 5 to 20 per cent. of sugar: for roses the strength is 7 to 10 per cent.; for chrysanthemums it is 15 to 17 per cent. There are flowers, however, such as lilies, pelargoniums and sweet peas, which fade more quickly in water containing sugar.

The antiseptic properties of sugar are employed in wood preservation by such means as the Powell wood process (see *Agricultural News*, Vol. IX, p. 201), and it enters into many preparations intended for preventing the ravages of fungi. Boilers and other steam-producing apparatus are kept from 'scaling' by the use of preparations containing sugar. Various useful organic acids are made with the aid of that substance, and in the course of the preparation of some of them gases possessing a high calorific value (heating power) are produced; it is also employed in preparing such acids by fermentation: among them are butyric acid, yielding butyric ether which has the smell of pine-apples and is used largely in the perfumery trade and in making syrups.

The matter in this account serves as a reminder of a similar article describing many uses for cotton, devised in recent years, contained in the last volume of the *Agricultural News*, p. 246.

FRUITS AND FRUIT TREES.

SILK COTTON, OR KAPOK.

Much information concerning silk cotton, or Kapok as it is usually known in commerce—chiefly the product of the tree *Eriodendron anfractuosum*—has been given in the *Agricultural News*, and reference to the principal articles dealing with the product may be found on page 117 of this volume. It is intended now to supplement this information by details taken from various sources which will be mentioned.

The chief producer of kapok is Java, where the trees are grown systematically for their produce. A table showing the exports of the fibre from that country, given in the *Philippine Agricultural Review* for August 1912, indicates that these rose from 1,500 tons in 1890 to 3,500 tons in 1900; five years later the shipments were 6,300 tons, and in 1910 they amounted to 7,930 tons. The total export of kapok from the Dutch East Indies in 1910 was 8,625 tons. No such systematic cultivation of the plant exists in the Philippines, where there is only a comparatively small production—in 1905, 4 tons, in 1910, 30 tons, and in 1911 98 tons.

Observations made by the Philippine Bureau of Agriculture have caused it to be estimated conservatively that the annual yield of silk cotton trees under seven years old is $3\frac{1}{3}$ to $5\frac{1}{2}$ lb. of fibre, older trees give $7\frac{3}{4}$ lb. or more. Trees of the former age are considered to be giving a fair production when they yield three to five hundred fruits in a year; those that are older may give as many as 1,000 fruits, but this is exceptional. There is much variation in the size of the fruits, for sometimes it takes only sixty of these to give 1 lb. of clean fibre; in other cases the number may be as high as 120, or even higher. The yield of the fibre is 58 to 65 per cent. of the weight of the seed. These figures refer to investigations in the Philippines.

The value of kapok has risen gradually in recent years. A table given in the article already mentioned shows that this increased from 12-13c. per lb. in 1905 to 20c. per lb. (the approximate maximum value) in the present year, the price being that of Dutch East Indian kapok.

At present, kapok (from Java) enters the United States free of duty.

The Board of Trade Journal for August 8, 1912, reviews a recent report of the German Consul at Amsterdam which shows that 61,449 bales (of 40 kilos. or 88 lb.) of cleaned kapok and 2,335 bales of uncleaned kapok were imported into Amsterdam in 1911, and 3,000 bales of cleaned kapok were received at Rotterdam in the same year; the total importation into Holland was 66,784 bales, as compared with 67,175 in 1910 and 67,377 bales in 1909. The prices per lb. for East Indian kapok were as follows: for special cleaned, about 8*d.*; for good cleaned, very little less than this; for cleaned, about 7*d.*; and for uncleaned, about 3*d.*

The Imperial Commissioner of Agriculture has recently received inquiries from London importers of the article, Messrs. Kraft Brothers, 14 Bevis Marks, E.C., regarding the possibility of obtaining kapok in commercial quantities from the West Indies; they state that at present about 6*d.* per lb. is being paid for British East Indian kapok. It has been explained before that the small number of isolated trees that exist, and the absence of systematic cultivation, make unlikely any useful export of kapok from this part of the world.

It is recommended in the *Bulletin of the Imperial Institute*, Vol. IX (1911), p. 121, that silk cotton trees should stand in plantations so that there are about 144 to the acre. If the figures given above for yield in the Philippines are taken, the kapok on 1 acre of yielding trees less than seven years old would, on an average return and at 6*d* per lb., be worth about £16. Its value from trees older than this, taking the minimum yield, would be about £28.

In Java, the tree is not only raised in plantations, but is commonly planted about 12 to 15 feet apart along the roads in coffee and cocoa cultivations, which are usually on a much larger scale than those in the West Indies. Each tree above seven years old yields kapok valued at nearly 4*s.*, in England, taking the minimum figure for the Philippines. The similar value of the fibre from the trees along a mile of road, planted on both sides at the greater distance, works out at £136.

Nothing useful is known as to the cost of the establishment of the trees and of picking and cleaning the fibre, in the West Indies.

In St. Vincent, the silk cotton trees are being actually destroyed, because they harbour an enemy—the cotton stainer (*Dysdercus delauneyi*)—of a fibre that is far more valuable than kapok.

TRADE OF PANAMA, 1911.

An account of the agricultural possibilities of Panama was given in the *Agricultural News* for June 22. The following details of the trade of the Republic during 1911, taken from *Diplomatic and Consular Reports*, No. 4978 Annual Series, issued in August, is of interest in connexion with that article:—

Exports from the Republic of Panama, with the exception of bananas, are insignificant in amount and value. The entire export of bananas comes from the plantations of the United Fruit Company, an American company, at Bocas del Toro, and amounted to 3,643,900 bunches, valued at £184,257 in 1910 and to 4,297,260 bunches, valued at £214,835 in 1911. Other exports are rubber, coco-nuts, ivory nuts, gold and mother-of-pearl. Mahogany, cedar and cocobolo are beginning to be exported.

Attention may be drawn to the increase in the exportation of ivory nuts, locally known as Tagua, which in 1911 was the export of highest value after bananas. These nuts are collected by Indians on the Caribbean coast and are brought by them to Colon, where they are readily bought by merchants for shipment to New York and Hamburg. A new field for ivory nuts is being developed near the headwaters of the Chepo, or Bayana River, whence the nuts are shipped to Panama. These nuts are larger in size than those brought to Colon, but in actual quality they are not equal to the Ecuadorian nuts. They command a high price in New York at present, where there is a demand for the large size buttons which can be made from them. Specimens of the nuts have been forwarded to London firms, but British button makers demand the highest quality, and their prices are as a rule not so good as those offered in New York. There are also cacao and ipecacuanha growing wild on the land referred to, but the latter is valuable and easily damaged, and the cultivators have not yet touched it with unskilled workmen.

Coco-nuts come from the San Blas coast and are shipped by a merchant in Colon to the United States in his own ships. The San Blas nuts rank high on the New York market, and have realized $40 per 1,000 nuts. The Smithsonian Institute at Washington has pronounced them superior to any on the European or American markets. Two large plantations have recently been started, one for a grove of 50,000 trees at Nombre de Dios, on the Caribbean coast, and another near the Pacific entrance to the Canal.

Practically all the gold exported comes from the mines of the Darien Company, a French company registered in the United Kingdom, which has been working for years. Nearly all the streams of the country bear evidence of gold, but the difficulties in the way of practical working appear to be insurmountable. Prospectors continue, however, to explore the Darien country and the provinces of Los Santos and Veraguas in the hope of making a rich 'find'. No other minerals are worked.

Mineral rights in the Canal zone are reserved to the United States Government, and it is stated that quicksilver exists. The Canal geologist has examined the so called 'coal deposits' in the Zone, and has reported that it is certain that no coal of any commercial importance will ever be found within the Canal Zone, and that the local lignite shale beds of Culebra Cut, and at other points, have no commercial value whatever, because of their very high percentage of ash and high content of water.

The effect of the completion and opening of the canal on local trade is difficult to predict, but on the whole there appears no reason for expecting any development, unless Colon is made a free port and its merchants are permitted by the United States Government to supply, or compete in supplying, shipping in transit through the Canal. Local merchants fear that when the canal is completed the Government stores which furnish supplies duty free to canal employees, will be continued and will extend their operations to shipping, also that the supply of coal and ship chandlery will be made a Government monopoly.

A NEW GROUND BEAN.

The discovery of a new genus of Leguminosae in Togoland, three years ago, led to the addition of a new generic name, Kerstingiella, to the very large number of names under that order. The plant first described by this name is *Kerstingiella geocarpa* and it is particularly interesting from the fact that its fruits, like those of the common ground or monkey nut (*Arachis hypogaea*) and of the Bambarra ground nut (*Voandzeia subterranea*), ripen underground. The same plant was also reported from Dahomey under the name *Voandzeia Poissoni*. It has since been under cultivation in the Botanic Gardens at Dahlem and Jena.

The plant is cultivated fairly largely in Upper Guinea and exists as a field crop in British Nigeria; the *Kew Bulletin*, 1912, p. 209, which is the source of this information, states: 'The plant is undoubtedly of some economic importance,' and suggests that further information should be obtained.

In Togoland there are three varieties, and the plant goes under the name of Kandela; in Dahomey it is called Doi; varieties also exist in the latter place, and in both cases they are separated by the appearance of the seeds. Analyses of these indicate a high nutritious value; they are said to have a nitrogenous content as large as that in the richest ground nuts, and it is claimed that Europeans find them more palatable, the taste recalling that of the best varieties of beans. The seeds are small, so that the yield is not large; their size is given as 8 to 10 cm. by 6 to 7 mm., but cm. is here surely a misprint for mm., and this means a maximum size of $\frac{2}{5}$-inch by nearly $\frac{3}{4}$-inch. The French explorer Chavalier states that, in Dahomey, the women are not allowed to eat the seeds.

K. geocarpa, like *V. subterranea* at first, is not known, so far, out of cultivation. It is described as a prostrate herb with a main stem 2 inches to something over 3 inches long, which roots from the nodes; the tap root possesses slender branches sometimes bearing nodules. Each leaf consists of three leaflets, and there is much variation in size. The flowers are in pairs, or solitary, borne in the axils of the leaves; while the outer covering of the seed is thin, and its colour white, red or black, or it may be mottled. The article in the *Kew Bulletin* gives a useful table of differences between the plant and *V. subterranea.*

The way in which the pods of *K. geocarpa* are buried in the ground to develop and ripen is almost unique among the Leguminosae. The fully-developed flowers are close to the ground, and after fertilization the very short base of the pistil lengthens and turns toward the ground, and then the corolla and style fall away. This lengthening causes the ovary, while it is still very small, to be pushed out of the calyx, and it is eventually driven into the ground, where it ripens.

The article concludes by giving circumstances of the discovery of the Bambarra ground nut in the wild state.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date September 23, with reference to the sales of West Indian Sea Island cotton :—

West Indian Sea Islands continue neglected and sales are confined to about 30 bales stains from $7\frac{1}{2}d.$ to $9d.$ and a few Barbados at $18d.$

Buyers are still waiting the price at which American Carolinas will open. The first arrivals of the Florida crop are good in quality and the price asked is $13\frac{1}{2}d.$

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending September 21, is as follows:—

The receipts to date of new crop cotton are only 6 bales which have not been sampled, consequently there are no offerings as yet for sale. The stock consists of old crop cotton, which is nominally held at previous prices.

We omit quotations, as they would be entirely nominal.

Cotton-growing in Egypt.—The Commercial Intelligence Branch of the Board of Trade has received a copy of a Report on Cotton-growing in Egypt, by Mr. Arno Schmidt, Secretary of the International Cotton Federation, which has just been issued. The report contains information as to the history of cotton-growing in Egypt, together with suggestions for the improvement of the industry, and remarks as to its future prospects.

At the conclusion of his report, Mr. Schmidt summarizes the prospects as follows:—

'The outlook for the future is decidedly hopeful. . . . There are schemes under consideration for extending the area of agricultural land. Lord Kitchener mentioned to me that by a scheme which would be begun in January he hoped to be able to get, in years to come, 1,000,000 feddans (feddan = 1·038 acres) under cultivation, half or a third of which would produce cotton. Other land reclamation schemes are spoken of, and consequently we may expect that every year in the near future will see an increased area under cotton. The active Department of Agriculture will no doubt deal energetically with seed distribution, pests, and errors of cultivation, and although the Afifi cotton has degenerated there are signs of another new and improved quality, 'Assili', taking its place.' (*The Board of Trade Journal*, March 21, 1912.)

THE QUALITY OF UGANDA COTTON.

The following is appended to a report by the Imperial Institute on samples of Uganda cotton which is reproduced in a Supplement to the Uganda *Official Gazette* for June 30, 1912:—

'The reports of the Director of the Imperial Institute reproduced above bring out clearly the following points

'1. That irregularity in strength and length are still outstanding features of Uganda staple which require attention on the part of the Agricultural Department.

'2. That Uganda cotton is tending rather to improve than to deteriorate in length of staple, for whereas both these samples are stated to possess staple mostly from 1·0-1·3 inches in length, two samples submitted by the British Cotton Growing Association in July 1910 (*vide Gazette* of December 15, 1910) were reported on as having staple mostly from 1·0-1·2 inches, and 0·9-1·2 inches in length respectively.

'Ginners would do well to note the remarks about seed-husks and seed being found in the lint, and to endeavour as far as possible to prevent these impurities from finding their way through the gins

'The two main causes of stained cotton in Uganda undoubtedly are:—

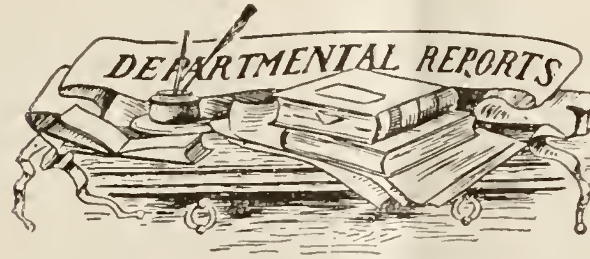
(a) The attacks of cotton stainers which suck the juices from immature bolls thus checking their growth and arresting the ripening process. In this condition the bolls remain upon the plants and become stained and rotted by the weather.

(b) Exposure to heavy storms in the picking season.

'These causes can both be greatly controlled by the establishment of one regular season for sowing cotton, and a definite date for uprooting the plants.

'Further, the proportion of stained cotton exported will tend to diminish annually as the crop gradually establishes itself in those districts best adapted by nature for its growth.'

The Cotton Industry of Carriacou.—Twenty-two thousand, seven hundred and ninety-four pounds of cleaned lint, representing 76 bales, were turned out from the factory during the year. Receipts for cotton ginned amounted to £36 4*s.* 4*d.* and working expenses (including repairs) to £24 1*s.* 2*d.*, thus disclosing a profit of £12 3*s.* 2*d.* for the year under review. There are at present seven steam ginneries, capable of turning out 60 bales of cotton per day, now at work in the island. (From the Report of the Commissioner, Carriacou District, for 1911; in the Grenada *Government Gazette* for May 1, 1912.)



JAMAICA: ANNUAL REPORT OF THE DIRECTOR OF AGRICULTURE AND ISLAND CHEMIST, 1911-12.

This report is issued as a Supplement to the *Jamaica Gazette* of August 29, 1912. It commences by reference to the severe drought that was experienced in Jamaica during part of the period under review. The general observations are then concerned, among other matters, with the state of the gardens at Hope and Castleton, where by adding to the plant collection and improving the conditions of the buildings and similar matters these places are being made more attractive and interesting. Additional land has been taken in on the leased property belonging to the Department, and a matter of some small interest is that *Cassia siamea* is being used in this and other places to form a live fence. Strenuous efforts have been made toward the acclimatization of imported dairy stock from England, Canada and the United States; much difficulty has been experienced, chiefly because the imported cattle do not appear to acquire any appreciable immunity from Texas fever even after they recover from a severe attack of the disease; better results are being obtained with young stock, the progeny of the imported cattle, and much assistance is derived from the use of trypan blue as a remedy against the fever. Confidence is expressed that this work will be successful eventually. A short review is given concerning the recent outbreak of the Panama disease of bananas; it has been shown to be actually the Surinam form of the disease. This is not the only enemy of banana cultivation that is being observed, as five distinct diseases of the plant have been found in Jamaica since January 1911, four of which are of such a dangerous type that they have been scheduled for compulsory treatment under the Diseases of Plants Law. The seriousness of these diseases and the fact that the existing variety of banana is better than any other kind for growing in Jamaica lead to the conclusion: 'The preservation of this variety is therefore of supreme commercial importance to the island.'

Interesting details are given in the report of the Superintendent of Public Gardens which deals with the Hope Gardens and Experiment Station, the Castleton Gardens—Kingston, the King Street Gardens, the Hill Gardens—Cinchona, the Bath Garden and Nursery, and the Herbarium. This section concludes with the Report of the Superintendent, King's House Gardens.

The sugar exported from the island during last year was 20,000 tons, which is the greatest amount since the year 1902-3—a period of high average production; of the quantity 80 per cent. went to Canada. Several estates have co-operated to enable a well-equipped central factory to be established at Rose Hall, but the poor season has made the results only moderate so far. There are signs that Jamaica rum is recovering from the depression of two years ago, partly because the planters have by means of a maximum production of sugar reduced their output of rum. Among seedling canes, B.208 is stated to continue to do well in many districts and its area of cultivation is being rapidly extended. D.625 has also confirmed the promise that it gave on its first trials in Westmoreland on strong soils. Among the locally produced seedlings, J.71 and J.72 appear to be useful, and it is intended to try them more largely. Reference is made for further details to Bulletin No. 5 of the Department of Agriculture. In a report of the Superintendent of field experiments, favourable mention is made of B.208, B.147 and D.625, and it is stated that the Jamaica seedlings promise so far to do all that is expected of them.

In spite of the drought, the increased price of coffee has made this product worth nearly twice as much (over £150,000) as it was six years ago—an encouraging feature in what is mostly a useful peasant industry. The case with cacao is at present far otherwise, chiefly because of bad cultivation and neglect; though confidence is expressed that there will be a large improvement in the future.

In 1911, the export of bananas reached its highest value, having become worth nearly 1½ million sterling, and it is considered that it will soon reach a value of at least 2 million pounds a year. Emphasis is again laid on the necessity for a strict watch in connexion with banana diseases in Jamaica. The security of the valuable coco-nut industry has been increased by the passing of the new Plant Diseases Law, which makes compulsory the treatment of coco-nut trees affected with bud rot, and in several districts both planters and peasant cultivators have adopted energetically measures of eradication. It is estimated that over 20 million nuts were exported during 1911, at good prices. The export value of citrus fruits continued to show a fall, and there does not appear at present to be any prospect of the revival of the industry. The growing of mangoes extends, and there has been a good demand for grafted plants of the Bombay mango. Cassava dried by a United States patent process is being tried. Trials are also being made of the chief varieties of the castor oil plant, in consequence of the recently enhanced price of the oil. Exhibits of Jamaica rubber were sent to the last International Rubber Exhibition in London, and although the specimens were mostly resinous in quality and roughly prepared, the recorded tapping results of the Castilloa trees compared quite favourably with those from this species in other countries. Efforts have been made to increase the interest in Castilloa and a representative collection of all the chief species and varieties of this tree has been planted at Castleton, for eventual trial of their rubber yielding capacity.

The section dealing with agricultural education includes the report of the Senior Travelling Instructor, the report of the Travelling Agricultural Instructor, the report of the Head Master at the Hope Farm school and the report of the Veterinarian. These contain details of interest pertaining to the subjects with which they deal. The report on the Hope Stock Farm is mainly statistical and serves as a useful record.

The report on the Government Laboratory shows that the number of official samples examined and analysed during the time under review was more than double of that in any of the previous years. Among the work done for the Department of Agriculture there figures the bacterial examination of water-supplies; the results of the tests are shown to have been generally favourable. In the work connected with veterinary pathology interesting experience is described with Texas fever, which has received a large amount of attention on account of its importance in the island. Regarding fermentation work, the distribution of pure yeast cultivations and the maintenance of a supply to prevent delay in cases of urgency have been continued. This part of the report concludes with details regarding the staff, publications and revenue of the Jamaica 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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NOTES AND COMMENTS.

Contents of Present Issue.

The leading article in this issue deals with the practical value of soil analysis, and is written with the object of pointing out where this is valuable and the limitations that the results possess in application.

An article on page 323 gives an idea of the very many uses possessed by sugar, in addition to its consumption for food and flavouring.

Information concerning silk cotton, or kapok as it is generally known in commerce, has been given several times in the recent volumes of the *Agricultural News*. The additional details on page 324 have been provided in order to afford an answer to enquiries concerning its production in the West Indies. Particulars as to yield and price are also given.

On page 325 there appears an article having for its subject a new ground bean that has been discovered in recent years in West Africa.

The Annual report for 1911-12 of the Director of Agriculture and Island Chemist, Jamaica, is reviewed on page 327.

The Insect Notes in this issue reproduce matter concerning plant protection in the United States.

Pages 333 and 334 present the Fungus Notes, which give information regarding three well-known fruit diseases and their control.

A Way of Using Calcium Cyanamide.

An abstract of a paper in the *Experiment Station Record* for May 1912, p. 622, describes an investigation regarding the suggestion that has been made to use calcium cyanamide or nitrolim with nitrate of lime in order to overcome its injurious effect on some young plants.

Pot experiments with oats were made, in which the manures were applied separately and in mixtures of 1 and 2 parts of calcium cyanamide to 1 of nitrate of lime, applied as a top dressing or thoroughly mixed with the soil before sowing. In every case the soil was manured with a mixture supplying the necessary amounts of constituents other than nitrogen compounds.

When the materials were mixed with the soil before the seed was sown, the effect of nitrate of lime was found to be greater than that of sodium nitrate. Good results were also obtained with calcium cyanamide, the yield of grain being slightly greater than that with sodium nitrate; there did not appear to be any injurious effect from its use. The best results were obtained from mixtures of the two manures, the most useful proportion being apparently 2 parts of calcium cyanamide to 1 part of nitrate of lime.

The application of the two manures as a top dressing appreciably increased their effect: calcium cyanamide employed in this way, however, proved injurious, and in some cases the plants were killed.

Manganese in Hawaiian Soils.

A consideration of the presence and effect of manganese in the soils of Oahu is given in Bulletin No. 26 of the Hawaii Agricultural Experiment Station, and a summary is presented here of the conclusions that have been reached with reference to the matter.

The soils bearing the manganese occur in local areas as surface accumulations in the alluvial superstratum, and never in the sedimentary strata below; this indicates that the collection of the manganese salts has been brought about through solution and leaching, the manganese compounds being subsequently oxidized and deposited.

The manganese is derived from the basaltic lavas of the islands, in the course of whose normal weathering they became soluble. This fact, together with the occurrence of the manganese-bearing soil in the lower altitudes, shows that water has been the active agent in its transfer and ultimate deposition. Indications also exist that submergence was taking place during the time that the alluvial soil was being deposited.

Further, it is probable that manganese exists in the water in the soil in greater quantities than any other element. The manganiferous soils are superior to red soils, as regards physical properties, so that they afford a freer circulation of air.

The presence of manganese in the soil does not appear to influence nitrification and the formation of ammonium salts. The former certainly takes place more readily in the manganese soil, but this is probably because the circulation of air is better in this kind of soil.

The Jamaica Farm School.

A review appears, on another page, of the Report of the Director of Agriculture and Island Chemist, Jamaica, 1911-12. In this, want of space prevented detailed attention from being given to the subjects of the report, among these being the Farm School at Hope, and it is thought well to make larger mention here of this institution.

With reference to the prospects of continued success of this school, it is of interest that the report states that accomodation, consisting of a new dormitory and class-room, was provided during the year for twelve additional students, and that improvements and additions to the former buildings were also made. The additional room for classes made it possible to divide these in a better way, for study. Additional stables and two stave silos were also erected during the year. The statement is made: 'The development of the stock farm has given the students unique opportunities of obtaining experience in the handling and management of various classes of live stock.'

Another interesting matter in the same connexion is that over forty applications were received for twelve vacancies for students at the farm, in January. These were filled from among the applicants, who showed on the whole a considerably higher educational standard than that possessed by applicants when the school was started. The full number of students—thirty-six—is in residence.

The Head Master, in reporting on the conduct and progress of the students states: 'The conduct of the students has continued to be satisfactory and I am able to report considerable progress on the part of some, both in the acquiring of knowledge and manual skill and in the development of a keener sense of responsibility and reliability than was at first evident.'

Growing Crops With Nitrogen fixing Plants.

The *Agricultural News*, Vol. X, p. 59, contained an article dealing with the results of growing crops together with leguminous plants, with special reference to increased growth and the enhanced content of nitrogen in the plants that are not leguminous.

An abstract in the *Experiment Station Record* for May 1912, p. 617, gives attention to the results of somewhat similar work in which peas and barley and oats and vetch were grown separately and together, as indicated, in pots, and these plants and corn and horse beans were raised in the field with and without manures.

It was found that the dry matter of the mixed crops was higher in amount than that of the separate crops, but smaller in comparison with the weight of seed used. The employment of manure affected the quantity of dry matter produced less in the case of mixtures than where crops were grown separately. In the mixtures, again, leguminous plants were poorer, while cereals were richer, in nitrogen, than in the case of the separate crops—a fact that is attributed to the diminished growth of the cereals and not to the presence of the leguminous plants; while the lower nitrogen content of the latter is considered to be due to their smaller growth.

The nitrogen content of the leguminous crops showed an increase only when their growth was poor and there was a sufficient amount of nitrates in the soil. The employment of manures affected the nitrogen content of the cereals to a greater degree than that of the leguminous plants.

Lastly, the amount of nitrogen produced per unit area was greater in the mixed crop than the sum of the quantities of nitrogen produced by the separate crops, but it was influenced to a greater degree by manures when the plants were grown separately than when they were mixed.

The Cause of the Jamaica Earthquake, 1907.

An account of this earthquake was given in the *Geographical Journal* for March 1908, by Dr. Vaughan Cornish, F.R.G.S., F.G.S., and extracts from this appeared in the *Agricultural News*, Vol. VII, pp. 123, 139 and 175. The issue of the first-mentioned journal for September 1912 now contains a further article on the catastrophe, by the same writer.

The evidence of the earthquake itself, and that of the after-shocks, has led Dr. Cornish to conclude that the tremors originated in two regions, 'one near the shore south-of-east from Kingston, and the other, less precisely located, in the mountainous region within the triangle formed by the points Newcastle, Buff Bay and Glengoffe.'

The first inclination was to attribute the earthquake to subterranean agencies, but a subsequent visit to the island in 1910 has caused the conclusion to be reached that it was caused by the redistribution of surface material through the transport of such matter, from the area of their head-waters in the Eastern part of the island, by the rivers Hope, Buff Bay, Wag Water and Yallahs. Dr. Cornish states. 'My theory of the cause of the earthquake is that it was due to a disturbance of pre-existing equilibrium by this modern redistribution of load, that the southern tremors came from subsidence with fracture at sea near the mouth of Hope River, and that the northern tremors were produced by elevation with fracture near the Gaps.'

The matters adduced in the article lead to the comforting statement that it is reasonable to think that the earthquake was brought about by a familiar, everyday agency, which may be seen at work, operating at a slow and fairly regular rate, and not by any gigantic and deep-seated cause, unlimited in its powers to destroy and likely to act at any moment. There is the additional satisfaction that the necessarily slow reproduction of the agency means that a long period must elapse before a similar catastrophe can take place.

INSECT NOTES.

PLANT PROTECTION IN THE UNITED STATES.

The information given below is copied from Circular No 37, from the Office of the Secretary of the United States Department of Agriculture and is presented herewith as likely to be of interest to readers of the *Agricultural News*. The circular includes an introduction and the development of points under four headings: the introduction and the first of these parts are given herewith. The West Indian Colonies are equipped with legislative enactments by means of which it is sought to prevent the introduction of pests and diseases along with imported plants. The instances quoted as illustrations of the conditions calling for legislation can hardly fail to impress the mind of the reader with the importance of these imported pests and the necessity for preventing the introduction of additional forms with similar capacity for harm.

INTRODUCTION. The effort to secure national legislation to keep out new and dangerous insect pests or plant diseases which may be brought in with imported nursery stock has been actively favoured by the Department of Agriculture, just as the department in the past has promoted and secured legislation enabling it to exclude from this country diseased animals or to quarantine and stamp out animal diseases whenever such have appeared. In the case of domestic animals, the exercise of these powers has brought enormous benefit and has worked entirely satisfactorily to the live stock industry. It is reasonable to believe that like benefits to fruit and forest interests, including the nursery business, will undoubtedly come from similar legislation to exclude insect pests and plant diseases.

The mere statement is sufficient to show the need, but a strong concerted effort is being made to array the nursery trade of this country against such legislation and put this important industry in the very unfair altitude of opposing reasonable legislation, which is quite as much for its own protection as it is for the protection of fruit and forest interests. In view of the evident misunderstanding which is being broadly circulated in relation to the intent of the proposed act and of its probable manner of enforcement, and the groundless fear that the Secretary of Agriculture or his experts would take an unreasonable attitude toward the nurserymen, it seems desirable to make a fair statement (1) of the conditions calling for such legislation, (2) the history of the efforts to secure it, (3) an explanation of the scope and working of the Bill now before Congress, and (4) the relation of the Secretary of Agriculture and his assistants to the enforcements of such a measure.

CONDITIONS CALLING FOR LEGISLATION. Practically all of the European powers have very stringent plant inspection laws, and, in the case of the United States, absolutely prohibit the entry of nursery stock. Apples and other American fruits are admitted only when the most rigid examination shows freedom from insect infestation. Canada and other important British possessions have similar protective legislation.

The United States is the only great power without protection from the importation of insect infested or diseased plants, and thus becomes a sort of dumping ground for European refuse nursery and ornamental stock. This does not often apply to the importations of the larger and reputable importing firms, but does apply to the poorly packed miscellaneous ornamental and other stock imported by department stores of large cities or that sent to this country to be sold under the hammer by auctioneers for whatever price may be obtained.

The immediate danger which led to the recent effort to secure legislation was the discovery in 1909 of the abundant importation and wide distribution into the United States of nursery stock infested with brown-tail moth nests and occasional egg masses of the gipsy moth. During the years 1909 and 1910 such infested stock was carried into twenty-two States, covering the country from the Atlantic seaboard to the Rocky Mountains. During the first of these years no less than 7,000 winter nests of the brown-tail moth, containing approximately 3,000,000 larvae, were found in shipments into New York State alone—seed material enough to infest the whole United States within a few years. During the second of these years, 617 of these nests were found on nursery stock shipped into the State of Ohio, and a much larger number, appromimately the same as the year previous, were again sent into New York. Smaller numbers of these nests, proportioned to the amount of nursery stock received, were sent into other States east of the Rocky Mountains during both of these years. Fewer brown-tail moth nests were received during the season just ended (1910-11) owing to the agitation in this country and more strict supervision by foreign Governments. These winter nests are, however, still coming in, and the danger is now perhaps even greater, for the reason that as infestation becomes more infrequent a laxity of examination is likely to result.

So far as possible, this stock, as voluntarily reported by customs officers and railroads, has been examined and the brown-tail nests removed or destroyed by state authorities, or, where these were not available, by agents of the Bureau of Entomology of the United States Department of Agriculture. Undoubtedly many shipments have not been reported or examined, and it is quite probable that local infestation has already started at different interior points. The history of both the gipsy and brown-tail moths in New England shows that these insects may be present for several years without being noticed, slowly gain headway, and then suddenly develop their full power of destructiveness.

It is scarcely necessary to comment on the danger to this country from the careless introduction and wide distribution of these two orchard and forest pests. In a limited district in New England more than a million dollars a year has been spent for a long period in a mere effort to control these two insects, and the General Government is now appropriating $300,000 annually to endeavour to clear them from the border of main highways and thus check their spread. These expenditures do not take into account the actual damage done, but they do serve as a measure of the danger to the whole country from the recent distribution of these two insects on imported nursery stock.

As further illustrations of the constant risk from lack of legislation may be mentioned too very recently introduced insects which will undoubtedly prove very expensive pests in future years. The European alfalfa leaf weevil, on the authority of the entomologist of the Utah Experiment Station, Mr. Titus, was probably brought into Utah on packing of nursery stock or other merchandise from Europe. This leaf weevil has already destroyed much of the value of the important alfalfa crop of Utah, and is spreading into adjacent states. The other illustration is the oriental cotton scale (*Pulvinaria psidii*), probably the worst scale pest of citrus and other sub-tropical plants in Southern Asia. This scale insect has recently been introduced into Florida on imported stock and is already well established there.

New plant diseases, againt the entrance of which there is at present no bar, may even more seriously jeopardise the farm, orchard, and forest products of this country. Imported potatoes from Newfoundland are now bringing in the potato wart disease, which, wherever it has been introduced in Europe, and also in Newfoundland, puts a stop to potato culture. The importation of white pine seedlings is now bringing in the European white pine rust, which, if established and disseminated, will destroy much of the value of our white pine forests. Absolute quarantine against these two plant diseases is the only means of keeping them out. The chestnut disease, now practically shown to have been introduced on trees imported from Japan. illustrates what may quickly happen from such unchecked introductions

More than half of the important insect enemies and plant diseases now established in this country have been brought in on imported nursery stock, and new insect enemies and new diseases are being thus introduced every year. Twenty different insect pests, new to this country, some of them very formidable in the Old World, have been intercepted in the inspections of the imported material by this department this year, and this does not include the introduction of brown-tail moth nests and other European pests with imported seedling stock.

A properly enforced quarantine and inspection law in the past would have excluded many, if not most, of the foreign insect enemies and plant diseases which are now levying an enormous annual tax amounting to several hundred million dollars on the products of the farms and orchards of this country.

In spite of the many pests which have already gained foothold and the control of which will be a permanent annual charge on production, there remain many other insect pests and plant diseases with equal capacity for harm which, fortunately, have not yet come to us, and it is to protect from these new dangers that legislation is now sought, not with the intention of prohibiting the trade in imported stock, but to throw such safeguards around it as will most protect both the importers and the subsequent purchasers of such stock.

The insect pests and plant diseases that have come in are probably here for all time, but certainly no reasonable objection can be made to the effort to safeguard the future. The conscientious importer will be benefited, and the home producers, the dealers, and all the great fruit and forest interests will be protected by suitable inspection and quarantine legislation.

A NEW COVER CROP.

The following is taken from the first number of the *Agricultural Bulletin of the Federated Malay States*, which is a new publication issued by the Department of Agriculture of the Federated Malay States and the Planters' Association of Malaya. The plant referred to is closely related to the plant called the yam bean (*Dolichos Lablab*) in the West Indies:—

During the past eighteen months seeds of some thirty varieties of plants have been procured from India, Philippine Islands, Barbados, Antigua, etc., for the purpose of attempting to secure a cover crop for this country which would fulfil the necessary requirements. After a long series of experiments I have come to the conclusion that one of the cover crops that may possibly meet with success is Horse Gram [*Dolichos biflorus*].

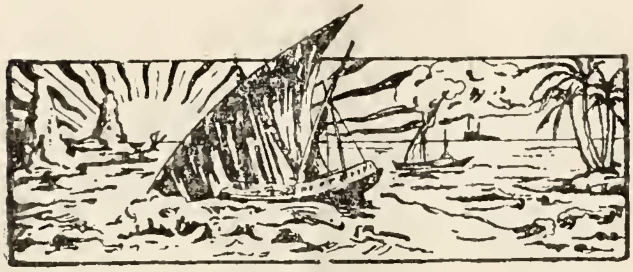
Dolichos belongs to the family of the Leguminosae and is either sub-erect or twining in habit. It is largely cultivated in South India and is wild in the Himalayas. It is stated that on the plains of India this pulse is grown either as a green manure or as a cattle food and fodder, and that few Indian crops are perhaps more valuable in this respect than the horse gram, especially when grown as a green manure. Its great value in this respect lies in its power, in common with other leguminous plants, of fixing atmospheric nitrogen in the soil through the agency of bacteria contained in the root nodules and by so doing it increases the fertility of the soil and indirectly the growth of the rubber growing amongst it. Being a close-growing, dense shading plant it keeps the surface soil damp and prevents it from being baked by the heat of the sun.

Although not deemed a superior pulse it is largely used by the poorer classes owing to its being perhaps the cheapest of pulses. The husk is regarded as a valuable cattle food. The split peas may be reduced to a meal or may be boiled or fried and eaten with rice or other articles of food. There is a fairly extensive trade done locally with the seed.

CULTIVATION. The ease with which it may be cultivated recommends it most highly. The plant may be made to grow at any season of the year as it requires but one shower of rain to start its growth, but even if this be not obtained the seed will remain alive for months in the soil and germinate after the first rain.

The land should be chungkolled, or when possible ploughed, the weeds collected and burned, and the seed sown broadcast at the rate of 12 to 15 lb. per acre. It is advisable to cover the seed and this may be done by breaking up the surface lumps of earth or chungkolling the land to the depth of one or two inches. No after-cultivation is necessary until the crop is mature, which is in about five months' time. The seed is then collected, and if a second crop is required, the land chungkolled and the seed resown. It is advisable to plant the second crop as soon as the first has died down in order that the weeds may not have an opportunity of getting the upper hand. Horse gram grows on the poorest land but it is best suited to a mixed soil.

VALUE AS A COVER CROP. Two plots, similarly weedy, and containing lalang, were selected for this experiment. these areas were chungkolled and in one of them seed of horse gram sown. Two crops were obtained in one year which necessitated weeding the land twice. Comparing this with the control plot which had to be cleaned every month it will be seen that there is a great saving of labour, and that from an economic point of view it is most satisfactory. As to its primary value, namely the checking of lalang growth, I would not go so far as to say that it eradicates weeds, but it had certainly the advantage over the control in that the plot containing it was freer from lalang at the end of the year's experiment It has an advantage over most other crops in dying down naturally and therefore has not to be eradicated by chungkolling, previous to tapping, as Java Crotalaria, *Tephrosia purpurea*, etc , have to be. In view of its power of checking the vigorous growth of lalang, its beneficial chemical, mechanical and bacteriological effect on the soil and the saving of the labour bill, I would recommend that this cover crop be given a trial, where a cover crop is required.



GLEANINGS.

Regarding cotton cultivation in Turkey, H.M Vice-Consul at Adana reports that the Government has granted a concession over 111,150 acres to a French syndicate, in the Cicilian Plain, and it is probable that a large planting of Egyptian and American varieties will take place.

A Proclamation contained in the St. Vincent *Government Gazette* for August 22, 1912, announces that the Government has made into a forest reserve all such Crown Lands in the Colony as are situated higher than 1,000 feet above sea-level (except those already disposed of in some other way).

The Department of Land Records and Agriculture, Assam, reports that the estimated area under cotton in Assam, this year, is 34,900 acres against 36,300 acres last year, the decrease being due to unfavourable weather at the beginning of the sowing time. The present prospects of the crop are fair.

Statistics issued by the Mauritius Chamber of Agriculture indicate that, according to the factory figures, the total production of the island for the sugar crop of last season (1911-12) was 169,551 metric tons (1 metric ton = 2,205 lb.), as against 222,837 in the previous season. The extraction was somewhat lower than that of the year before, being 10·62 in place of 10·65 per cent.

The St. Vincent Arrowroot (New Market Fund) Ordinance 1910, which was to be in force up to December 1 of the present year, has been renewed for a further period of two years from that date, and power is reserved to extend further the Ordinance at the end of this time if it is deemed advisable. The new Ordinance is No. 9 of 1912, and was published in the *Government Gazette* on August 22.

The British Vice-Consul at San Luis Potosi (Mexico) reports that the Forseck fibre-shredding machine, put on the market in 1911, produces 875 lb. of cleaned fibre in ten hours, and he expects that large quantities of ixtle or lechuguilla and maguey fibre will be available for export during this year. It is stated that the machine can be used also for the extraction of other Mexican fibres, such as henequen (sisal) and zapupe. (From *Diplomatic and Consular Reports*, No. 4976 Annual Series; August 1912.)

A table in Vol. XLVI, Part IV, of the Agricultural Statistics, issued recently by the Board of Agriculture and Fisheries for 1911, shows that the quantities of sugar imported into the United Kingdom, per head of the population, has been since 1890, in five year periods, as follows: 1891 82 lb., 1896 86 lb., 1901 94 lb., 1906 86 lb, and 1911 94 lb. In no year were the proportions exceeded, of 1901 and 1911.

A report by the British Acting-Consul at Para shows that the total quantity of rubber exported from Para, Manaos, Iquitos and Itacoatiara, by way of Para, during the six months ended June 1912 was 22,410 tons; for the similar period of 1911 the amount was 17,731 tons. The total exports from these sources in the crop year 1911-12 reached 40,074 tons, and in the same period in 1910-11 32,930 tons.

The *St. Lucia Gazette* for August 31, 1912, contains the draft of an Ordinance to amend the Minor Products Protection Ordinance, 1899. It may be cited as the Minor Products Protection Ordinance, 1899, Amendment Ordinance, 1912, and it enacts that the following subsection shall be added to section three of the older Ordinance: '(2) In sections eight, fifty-one and fifty-two, of this Ordinance "minor products" includes limes and coco nuts.'

The announcement is made in the Trinidad *Royal Gazette* for August 22, 1912, that the Department of Agriculture in that island proposes to establish at River estate a supply of sugar-canes for planting purposes. It is expected that canes will be ready for sale from about August 1913. Orders for canes are requested and 'plants' will be sold at a maximum price of $2·40 per 1,000, exclusive of packing and freight, and at cost price if the cost is less than $2·40.

It is shown in the *Board of Trade Journal* for August 8, 1912, that the total value of the sea-borne exports (excluding specie) from the Gold Coast during 1911 was £3,471,309, as compared with £2,613,919 in 1910. The values of the exports of the principal articles in 1911 and 1910, respectively, were: cacao, £1,613,468 and £866,571; gold and gold dust, £1,057,692 and £280,060; rubber, £219,447 and £358,876; palm kernels, £175,891 and £185,058; native timber, £138,821 and £148,122; palm oil £128,916 and £161,388; kola nuts, £93,099 and £77,716.

In consequence of allegations of cruelty in plucking ostrich feathers, the Government of the Union of South Africa has issued a statement by Dr. J. E. Duerden, M.Sc, F.R C.S., Professor of Zoology at Rhodes University College, Grahamstown, to the effect that no such cruelty exists. The first plumes (spadonas) of the bird are clipped after all the living matter has been withdrawn into the quill, which is still growing, so that the operation amounts to no more than cutting human hair or nails, or shearing a sheep. Later, the living matter leaves the quills, which are then drawn, so as to obtain a succeeding regular crop of plumes—an operation which in any case would have to be effected clumsily by the bird, and does not cause it to show the slightest sign of irritation. These facts are true for all subsequent crops of feathers.

STUDENTS' CORNER.

OCTOBER.

Second Period.

Seasonal Notes.

In continuation of the notes on agricultural economics which appeared in the last issue but one of the *Agricultural News*, the student's attention is now directed to matters connected with agricultural co-operation.

Interdependence, not independence, is the basis of co-operation. In the present connexion the subject naturally divides itself into the following main lines: (1) co-operative credit, (2) co-operative production, (3) co-operative manufacture, (4) co-operative buying, (5) co-operative marketing. Before proceeding to the study of West Indian practices and business concerns bearing upon the above lines of co-operation, the student may make use of the following for information on agricultural co-operation in general: *Agricultural News*, Vols. IV, p. 383; IX, p. 49.

Proceeding now to considerations of co-operative credit, the student is advised to read the following articles dealing mainly with the subject of agricultural banks: Pamphlet Series No. 35; *West Indian Bulletin*, Vols. VI, p. 129; VII, p. 317. VIII, pp. 16, 250 and 334: *Agricultural News*, Vols. IV, pp. 49, 73 and 186; VI, p. 249; VIII, pp. 89 and 104, X, p. 9, XI, p. 171.

Co-operative methods among planters do not obtain to any great extent in West Indian agricultural production, except in the case of cotton-growing. Give examples of the employment of such methods. It should be borne in mind that the co-operative efforts of the local departments of agriculture and local agricultural societies greatly benefit agricultural production. Joint ownership for the purchase of pedigree stock or expensive implements, or even co operation in matters of labour when practicable, will often prove profitable to those concerned. The following references should be consulted in connexion with co-operative production: *West Indian Bulletin*, Vols. VII, p. 311; and IX, p. 243. The preparation for market, and the selling of agricultural produce, lend themselves to co-operative methods more readily than does pure production. The activities of the British Cotton Growing Association, the establishment of central cotton ginneries, and as regards sugar, the establishment of central factories, are examples of the benefit to be derived from co-operative manufacture and selling. In connexion with central factories, the student is advised to read the following on the subject: *West Indian Bulletin*, Vols. I, pp. 52, 64, 195 and 200; IX, p. 56; X, pp. 107 and 305; *Agricultural News*, Vol. VII, p. 193.

Co-operative buying has already been referred to in connexion with joint ownership, but the student should note that this method can be applied in the purchasing of seeds, manures and food stuffs: also in the matter of obtaining the services of scientific experts, and in other ways.

Closely connected with co-operative credit and co-operative methods in general are the various Small Holdings and Land Settlement Schemes, and the student will derive considerable benefit by studying these questions. As regards small holdings the following references are given: *Agricultural News*, Vol. IX, p. 89 and *West Indian Bulletin*, Vol. VIII, p. 267. Information on the subject of Land Settlement Schemes will be found in the following literature: *Agricultural News*, Vols. V, pp. 15 and 410; VIII, p. 247; X, pp. 217, 329, 27 and 305; *West Indian Bulletin*, Vol. XI, p. 194; as well as in the various Annual Reports on the Botanic Stations in the islands where such schemes exist.

Three of the following questions have been set to enable the student to test his knowledge of the economic subjects referred to in the last issue of the *Agricultural News*. The next issue will contain questions on agricultural co-operation.

Questions for Candidates.

Preliminary Questions.

(1) Why are plants cross-fertilized?
(2) Give methods for the control of insects.
(3) What are fungi, and how are they spread?

Intermediate Questions.

(1) How would you cross-fertilize maize on a large scale?

(2) Supply examples of fungi seriously attacking more than one plant.

(3) Give your views as to the practical value of the following methods for improving labour conditions: (a) the provision of bonuses; (b) the letting out of land as estate small holdings; (c) wages on a sliding scale; (d) technical instruction.

Final Questions.

(1) State broadly the directions in which the plants raised from crossing two different varieties may show differences from the parents.

(2) The total cost of team labour is made up of the following items: (a) feed and bedding, (b) shoeing, (c) care including veterinary attendance, (d) interest, (e) depreciation, (f) stable rental. Give an approximate idea of the charges per month that you would make under these headings for half a dozen mules, or horses.

(3) State in a general manner the different classes of individuals through whose hands either (a) cotton or (b) the lime fruit passes during the course of its transport from the field to the comsumer, and say which of these has the greatest effect in determining the final cost.

Sunn Hemp.—The Commissioner of Agriculture has received, through the courtesy of the Superintendent of the Royal Botanic Garden, Sibpur, Calcutta, seeds of sunn hemp (*Crotalaria juncea*), for distribution among some of the botanic stations in the West Indies. This plant is a native of India, where it is grown chiefly for its fibre which is used mainly for making a coarse canvas employed mainly for sacking. There is a general and firmly rooted opinion in that country that the plant improves the soil in which it grows, and this is undoubtedly true because of its possession, in common with other leguminous plants, of root nodules containing the bacteria which attach nitrogen from the air. This circumstance makes it useful for employment as a green dressing.

The Indian agriculturist sows sunn hemp by itself, most generally at the commencement of the rains, and cuts it at the end of September or the beginning of October. The plant needs a light soil, which is not rich necessarily, and is not considered to require high cultivation. When it is grown for fibre, the seeds are sown (broadcast) at the rate of 12 to 80 ℔. to the acre, the actual amounts varying greatly in different parts of India.

FUNGUS NOTES.

THREE FRUIT DISEASES AND THEIR CONTROL.

MANGO AND AVOCADO PEAR. At the Agricultural Conference held in Trinidad in January last Mr. J. B. Rorer presented a paper entitled Some Fruit Diseases, which was subsequently published in the *West Indian Bulletin*, Vol. XII, p. 464. In this paper, among other matters, he dealt with anthracnose or black spot disease of mangoes and avocado pears, and stated that in each case the damage could be controlled by spraying with Bordeaux mixture. The disease of the mango is due to a small fungus, *Gloeosporium mangiferae*, while that of the avocado is probably caused by an allied species. Reference to the presence of the mango anthracnose in St. Vincent was made in the *Agricultural News*, Vol. X, p. 190, while the same malady is probably to be found in all the smaller islands; it has been observed very markedly in Dominica, especially on the better, grafted varieties. An anthracnose of the avocado pear is described by Stevens and Hall in Diseases of Economic Plants, p. 184, and is attributed by them to *Colletotrichum gloeosporioides*, a fungus better known as causing wither-tip of citrus trees. These authors do not state definitely in what locality this disease occurs, and it may not be quite identical with the Trinidad form, but the causative fungi are at any rate closely related.

In the case of the mango the fungus not only attacks the fruit and leaves but also the flowers and flower stalks. The spots on the fruit are at first about the size of a pin's head and are often arranged in parallel streaks along the fruit, the streaks representing the course of drops of rain water laden with spores that have fallen from the leaves on to the surface of the fruits and then run off leaving many spores behind to germinate and cause infection. Mr. Rorer showed some excellent photographs illustrating this. The spots rapidly increase in size and run into one another, until finally the whole surface may become discoloured and the rot is found to extend in to the seed. In the case of the avocado pear, the leaves and fruit alone appear to be affected. This disease, though disfiguring, is not very serious when the fruit attacked is used for local consumption, but at once becomes of primary importance when it is packed and shipped for export to temperate countries, as it will develop so strongly while the fruit is in transit as to cause the loss of a large part of the shipment.

Anthracnose of both host plants can be controlled by careful spraying. In the case of the mango the first spraying must be carried out as the flowers open, in order to protect them as well as the flower stalks. Successive applications must be made until the fruit is well set and then they must be repeated when the fruits are half to three-quarters grown, according to the weather conditions. In the case of the avocado, the time of spraying follows closely that of the mango, but the applications need not begin so early.

To test the possibility of shipping mangoes from Trinidad and the effect of spraying, a box of sprayed and unsprayed fruit was sent to Mr. A. W. Hill, the Assistant Director of Kew, and according to the minutes of the meeting of the Board of Agriculture, Trinidad, held on August 16, the following remarks were contained in the reply, and showed that sprayed mango fruits can be successfully shipped to England in quantity.

'There were ninety-five mangoes in the cases:—

Gordons	10
Divine	15
Julie (unsprayed)	22
Julie (sprayed)	29
,, ,, (less ripe)	19

'A few fruits were slightly bruised or squashed owing to pressure from the overlying fruit but none were rotten and every fruit was edible.

'At the date of writing there are still nearly two dozen fruits not quite ripe.

'We were very much struck with the fine appearance of the sprayed fruits and they have not ripened so quickly since their arrival as the unsprayed Julies.

'The fruits which were found to be ripe or somewhat squashed on arrival were as follows:—

Gordon	1 ripe
Divine	5 ripe, 1 rather squashed
Julie sprayed	5 rather squashed
,, ,, (less ripe)	1 ripe
,, unsprayed	1 ripe 3 rather squashed

'Of the more or less squashed fruits four were rather split but all could be eaten.

'The fruits have been appreciated by over forty people.

'The Gordons did not meet with general favour as they have more of the turpentine flavour.'

BREAD FRUIT. In the *Journal of the Board of Agriculture*, of British Guiana, Vol. VI, p. 14, Mr. F. A. Stockdale describes a disease of bread fruit that was found to be fairly common in Georgetown and on the farms of the East Coast of Demerara.

'The disease commences as small brownish spots generally approximately circular in shape which are to be observed on the surfaces of the bread fruits. On examining this closely, it can be noticed that the centre is generally darker than the edges of these discoloured areas, and it is probable that these darker sunken areas mark where infection took place. These discoloured areas become sunken and gradually assume a darker brown hue. They usually measure about 1½ to 2 inches in diameter but cases have been observed where they measure up to four inches in diameter. If one of them is cut through it will be seen that the internal tissues are also discoloured and present a brownish hue, and they eventually become "water-soaked" and slimy.

'The disease may affect the breadfruit at any stage of its growth, when the "fruits" are young or when they are practically ripe. Where only a single spot becomes affected the "fruit" may ripen and a portion of it can be used, but when the fruits are affected at several points they usually fall before they are ripe, and rot. If the diseased areas are examined closely when they are dark-brown in appearance small pin points of a pinkish grey colour will be seen. These on examination under a lens can be observed to be the spores of a fungus and infection experiments conducted in the laboratory have shown that these spores are produced by the fungus that is responsible for the disease. Injections that have been made in healthy "fruits" have shown that infection takes place during forty-eight hours, and that within four days the diseased sunken areas had a diameter of 1½ inches with an internal depth of slightly over 2 inches. These injections were made under aseptic conditions by means of shallow cuts through the epidermis. How infection takes place in nature has yet to be ascertained.'

The actual identity of the fungus causing the disease has yet to be worked out, but a species of Gloeosporium is suspected, and with it are associated Fusarium spores whose relation to the disease is undetermined.

The disease does considerable damage in the district in which it occurs, but it has been proved by experiments conducted at the Botanic Gardens in Georgetown that it can be successfully controlled by collecting and burying with lime all diseased fruits lying under the trees, and by spraying the fruits of infected trees with a 4 per cent. solution of copper sulphate or with Bordeaux mixture. The first application of the fungicide should be made when the fruits are very young.

It is interesting to note that all three of the diseases dealt with in this article are probably due to species of the genus Gloeosporium. Members of this genus and of its near relative Colletotrichum are extremely common in the tropics and cause damage to a number of fruits of various kinds; examples are cotton boll anthracnose, ripe rot of bananas and plantains, and cacao anthracnose, to mention only very few. Often they are confined to the fruit and leaves, or more generally all the soft green parts including the tips of young twigs. Often too, the spots resulting from an individual infection are limited in extent, especially on leaves, while on fruits they may not spread or cover any considerable area until the fruit commences to ripen. Practically all cases of this kind of fruit rot can be dealt with by spraying the leaves and young fruits, or in some cases the flowers before the fruits set, and by collecting and burying with lime all diseased and rotting fruit on the ground.

THE DURATION OF SOIL FERTILITY.

The following extract is taken from an account of a discourse entitled Recent Advances in Agricultural Science—the Fertility of the Soil, delivered at the Royal Institution on Friday, May 24, by A. D. Hall. The account appeared in *Nature* for August 22, 1912.

The question of the duration of the fertility of the land under continual cropping has excited much attention of late, chiefly because the United States has begun to take alarm about the reduced production of some of its most fertile lands, as, for instance, the old prairie lands of the middle West—a reduced production which, amongst other causes, has helped to set in motion a stream of migrants from the United States to the newer lands of the Canadian North-West. In the development of agriculture three distinct stages may be observed. In the first place, we may have a process of pure exploitation of the initial resources of the soil, when the farmer is to all intents and purposes mining in its fertility. This is the process which, in the main, has been going on in America, and, indeed, in all the newer countries which have been opened up to agriculture during the last two centuries. Not all virgin soils are rich, and the system of cropping alternately with wheat or maize which prevails over so much of North America has reduced great areas of the land in the eastern States to such a poverty-stricken condition that it has been allowed to go derelict. In the great plains, however, where the first settler found 4 or 5 feet of black soil, containing nearly $\frac{1}{2}$ per cent. of nitrogen, the land has kept up its productivity almost unimpaired for nearly a century. If we suppose the black soil only extended to a depth of 3 feet, and contained $\frac{3}{10}$ per cent. of nitrogen, both limited estimates, there would still be 30,000 ℔. of nitrogen per acre—that is to say, nitrogen enough for 500 crops larger than the American farmer has been accustomed to win from that land—and yet in less than a century such soils are beginning to show signs of exhaustion. The farming of the kind just described is destructive; but in the older lands of the west of Europe, which have been under cultivation for something like a century, a conservative system has been devised which is capable of keeping up the productive power of the soil, though not, perhaps, to a very high pitch. Perhaps the best example of this may be seen in the Norfolk four-course rotation prior to the introduction of artificial fertilizers. In this system a turnip crop, which was either consumed on the ground or converted into manure, and so returned to the soil, was followed by barley in which clover was sown, and the clover, which also got back to the soil, was followed by wheat. The farming covenants prevented the sale of anything more than barley and wheat grain, and the meat that was produced by the consumption of the turnips and hay. Thus but a small proportion of the nitrogen taken out of the soil by the crop left the farm; the rest was returned and used over again, although considerable losses of gaseous nitrogen occurred during the making of the dung. Both losses, however, were more than replaced by the nitrogen which the clover crop gathered from the atmosphere during its growth. At any rate, we find that under such a conservative system of farming the productivity of the land remained pretty constant at about a level of 20 bushels to the acre from the time of Queen Elizabeth down to the beginning of the nineteenth century. This conservative farming about 1840 began to give place to the third stage in the development—intensive farming, rendered possible by the discovery of artificial fertilizers and the cheap freights which brought foreign fertility in the shape of cheap feeding stuffs to the soil of this country. By these means the average production of the land of the British Isles has been raised from the twenty-bushel level to something over 30 bushels, and the most intensive farmers reach an average level at least 25 per cent. higher. In their case the soil has become practically a manufacturing medium transforming the nitrogen and other fertilizing materials added to it into crops, giving nothing to those crops from its original stock, and indeed up to a certain point gaining rather than losing fertility with each year's cultivation.

Dominica and the Canadian National Exhibition.—The Secretary of the Dominica Permanent Exhibition Committee reports on the exhibit of limes sent from Dominica to this exhibition as follows (Dominica *Official Gazette*, September 6, 1912):—

'I beg to report the despatch of twenty-seven barrels of limes to the Canadian National Exhibition to be held in Toronto at the end of this month, and of one box containing Roseau plumes to assist in decorating the West Indian section.

'A large number of leaflets of the "Lancet's" article on Dominica limes were also forwarded for distribution to visitors at the Exhibition.

'The exhibit of limes was contributed by the following gentlemen to whom the thanks of the committee are due: Dr. Nicholls, C.M.G.; J. F. Johnson, Esq.; A. D. Riviere, Esq.; F. A. Gordon, Esq.; F. Potter, Esq., A. R. C. Lockhart, Esq.; J. T. Greg, Esq.; A. Emanuel, Esq.; S. Didier, Esq., and the Dominica Fruit Growers' Association.

'Owing to the action of the above it has been possible to send on a good exhibit of Dominica limes, which, it is hoped will prove of considerable assistance in advertising the fruit in Canada.

'The Superintendent of the Quebec Steamship Company kindly allowed the exhibit to be conveyed to New York on board the S.S. "Guiana" free of charge.'

MARKET REPORTS.

London.—The West India Committee Circular September 24, 1912; Messrs. E. A. De Pass & Co., September 13, 1912.

Arrowroot—$3\frac{7}{8}$*d.* to 5*d.*
Balata—Sheet, 3/6 ; block, 2/5 per ℔.
Beeswax—No quotations.
Cacao—Trinidad, 71/- to 85/- per cwt. ; Grenada, 57/- to 65/-; Jamaica, 55/- to 63/-.
Coffee—Jamaica, 70/- to 73/- per cwt.
Copra—West Indian, £27 per ton.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, $7\frac{1}{2}$*d.* to 18*d.*
Fruit—No quotations.
Fustic—No quotations.
Ginger—49/- to 65/- per cwt.
Isinglass—No quotations.
Honey—No quotations.
Lime Juice—Raw, 1/6; concentrated, £18 12*s.* 6*d.* to £18 17*s.* 6*d.*; otto of limes (hand pressed), 7/6.
Logwood—No quotations.
Mace—2/1 to 2/6.
Nutmegs—7*d.* to 10*d.*
Pimento—Common, $2\frac{9}{16}$*d.*; fair, $2\frac{5}{8}$*d.*; good, $2\frac{11}{16}$*d.*; per ℔.
Rubber—Para, fine hard, 4/8; fine soft, 4/$6\frac{3}{4}$; Castilloa, 4/2 per ℔.
Rum—Jamaica, 2/1 to 6/-.
Sugar—Crystals, 15/9 to 18/6; Muscovado, 11/6 to 14/6; Syrup, 11/6 to 13/-; Molasses, no quotations.

New York.—Messrs. Gillespie Bros. & Co., September 20, 1912.

Cacao—Caracas, $14\frac{1}{2}$c. to $15\frac{1}{2}$c.; Grenada, $14\frac{1}{4}$c. to $14\frac{1}{2}$c. Trinidad, 14c. to 15c. per ℔.; Jamaica, $11\frac{1}{2}$c. to $12\frac{1}{2}$c.
Coco-nuts—Jamaica, select, \$33·00 to \$35·00; culls, \$18·00 to \$19·00; Trinidad, select, \$35·00 to \$36·00; culls, \$18·00 to \$19·00 per M.
Coffee—Jamaica, $15\frac{1}{2}$c. to 17c. per ℔.
Ginger—$8\frac{3}{4}$c. to $12\frac{1}{4}$c. per ℔.
Goat Skins—Jamaica, 50c.; Antigua and Barbados, 46c. to 48c.; St. Thomas and St. Kitts, 43c. to 45c. per ℔.
Grape-Fruit—Jamaica, \$3·00 to \$5·00.
Limes—\$8·00.
Mace—54c. to 56c. per ℔.
Nutmegs—110's, $14\frac{3}{8}$c.
Oranges—Jamaica, \$2·00 to \$2·50 per box.
Pimento—$2\frac{5}{8}$*d.* per ℔.
Sugar—Centrifugals, 96°, 4·36c. per ℔.; Muscovados, 89°, 3·86c.; Molasses, 89°, 3·61c. per ℔., all duty paid.

Trinidad,—Messrs. Gordon, Grant & Co., September 30, 1912.

Cacao—Venezuelan, \$15·75 per fanega; Trinidad, \$14·75 to \$15·50.
Coco-nut Oil—\$1·01 per Imperial gallon.
Coffee—Venezuelan, 18c. per ℔.
Copra—\$4·50 per 100 ℔.
Dhal—\$5·00 to \$5·50.
Onions—\$1·75 to \$3·00 per 100 ℔.
Peas, Split—\$6·15 per bag.
Potatoes—English, \$1·25 to \$1·50 per 100 ℔.
Rice—Yellow, \$5·00; White, \$6·25 to \$6·35 per bag.
Sugar—American crushed, no quotations.

Barbados,—Messrs. James A. Lynch & Co., Ltd., October 5, 1912; Messrs. T. S. Garraway & Co., October 5, 1912.

Arrowroot—\$7·00 to \$7·50 per 100 ℔.
Cacao—\$13·00 to \$14·00 per 100 ℔.
Coco-nuts—\$20·00.
Hay—\$1·60 to \$1·80 per 100 ℔.
Manures—Nitrate of soda, \$65·00; Cacao manure, \$45·00 to \$48·00; Sulphate of ammonia, \$80·00 to \$85·00 per ton.
Molasses—No quotations.
Onions—\$2·50 to \$3·75 per 100 ℔.
Peas, Split—\$6·40 to \$6·50 per bag of 210 ℔.; Canada, \$3·00 to \$4·90 per bag of 120 ℔.
Potatoes—Nova Scotia, \$2·20 to \$3·00 per 160 ℔.
Rice—Ballam, \$5·20 per 190 ℔.; Patna, no quotations; Rangoon, no quotations.
Sugar—American granulated, \$5·00 per 100 ℔.

British Guiana.—Messrs. Wieting & Richter, September 28, 1912; Messrs. Sandbach, Parker & Co., September 27, 1912.

Articles.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent		
Balata—Venezuela block	No quotation	Prohibited
Demerara sheet	76c. to 77c. per ℔.	
Cacao—Native	17c. per ℔.	15c. to 17c. ℔.
Cassava—	80c. to \$1·20	No quotation
Cassava Starch—	\$7·50 to \$8·00	No quotation
Coco-nuts—	\$16 to \$20 per M.	\$10 to \$16 per M., peeled and selected
Coffee—Creole	20c. per ℔.	18c. per ℔.
Jamaica and Rio	20c. per ℔.	20c. per ℔.
Liberian	17c. per ℔.	15c. per ℔.
Dhal—	\$5·00 per bag of 168 ℔.	\$5·50
Green Dhal	\$5·25	
Eddoes—	60c. to 80c.	
Molasses—Yellow	None	
Onions—Teneriffe		
Madeira	$4\frac{3}{4}$c. to 5c. per ℔.	5c.
Peas—Split	\$6·25 to \$7·00 per bag (210 ℔.)	\$7·25 per bag (210 ℔.)
Marseilles		No quotation
Plantains—	16c. to 48c.	
Potatoes—Nova Scotia		
Lisbon	\$2·00 to \$2·25	No quotation
Potatoes-Sweet, B'bados	\$3·00 per bag	
Rice—Ballam	No quotation	
Creole	\$6·00	\$6·00
Tannias—	\$2·16	
Yams—White		
Buck		
Sugar—Dark crystals	\$3·30 to \$3·40	\$3·50
Yellow	\$4·00 to \$4·25	\$4·25
White		
Molasses	\$2·80	
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	No quotation.

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CONTENTS.

Problems of Economic Importance Regarding Plant Diseases.

IN his presidential address* to the British Mycological Society delivered in 1911, Professor Salmon states and illustrates, among others, four practical problems connected with certain aspects of the life-histories of economic fungi.

* *Transactions of the British Mycological Society*, 1911.

Although these problems were all considered and illustrated with reference to economic mycology in England, yet in themselves they are equally important in connexion with plant pathology in the tropics. Stated shortly they are as follows:—

'What is the economic importance of that specialization of parasitism now proved to exist in many fungi?

'What degree of importance, from the economic point of view, is to be attributed to the *saprophytic* stage in the life-history of any fungus causing a plant disease?

'What are the conditions under which some saprophytic species of fungi become parasites?

'What are the conditions under which a parasitic fungus attacks a new host species?'

Some few words of explanation are necessary to elucidate the subject involved in the first problem. It has been shown by inoculations, notably among members of the rust family (Uredineae) and of the family of powdery mildews (Erysiphaceae), that of a fungus species occurring on a large number of host species one form on a host species *a* cannot attack a host species *b*, and vice versa. Thus although the two forms of fungus cannot be distinguished from one another by their morphological characters, that is by those characters that together may be said to make up their general appearance, yet biologically they are different in that their powers of parasitism are very strictly limited. The economic aspect of this is that if the host species *a* and *b* are growing together and only the biological form of fungus parasitic on *a* is present, then the species *b* will appear immune. But if the fungus strain parasitic on *b* is also present or is introduced, *b* also will be attacked or its immunity will appear to break down. There is, moreover, another means whereby *b* might become attacked from *a*. It has been found in some cases that the fungus parasitic on *a* can attack a third species *x* and that when it has grown on *x* for one or more generations, spores from *x* can infect *b*. Thus *x* serves as a bridging species to carry the fungus from *a* to *b*, and the introduction of *x* into a cultivation where *a* is attacked and *b* is immune would naturally result in the breaking down of *b*'s immunity. Finally, it has also been shown that the immunity of the species *b* to the fungus strain on *a* may be partly broken down, if the parts of *b* liable to attack are damaged by adverse conditions, wounds, or the depredations of insects.

Very little, if anything, is known of the existence of biological species in the tropics; yet the matter is clearly worthy of attention, particularly in relation to the production or introduction of immune varieties of host plants and in considering legislation restricting the introduction of plants from one country into another. These applications are so evident that they do not call for further elaboration here. In conclusion it may be added that the related genera Colletotrichum and Gloeosporium, to mention only two, might well repay investigation from this point of view.

The next point raised by Professor Salmon is that of the degree of importance, from the economic point of view, of the saprophytic stage of a fungus causing a plant disease. It has been found that the mycelium producing conidial fructifications of a fungus may live as a parasite, while that producing the ascigerous fruit lives as a saprophyte on dead and often fallen portions of the same plant. In countries with a very marked change of climate in summer and winter this power may be of considerable economic value, since the saprophytic stage may serve to carry the fungus through the winter and give rise to new outbreaks of disease in the succeeding spring. In mild winters the parasitic stage may persist, but under extreme conditions the saprophytic form may alone be able to survive. An investigation of this problem is of more importance in temperate countries than in the more uniform climatic conditions of the tropics, yet even there it should hardly be entirely neglected. It is possible, for example, that definite knowledge of the part played in spreading infection by the ascospores of *Rosellinia bunodes*, the black root disease fungus, would be of value. The perithecia in this instance always develop on a saprophytic mycelium, some time after the tree is dead. Their growth is slow and the spores have a thick outer coat—all facts which point to this stage as intended to carry the fungus through unfavourable conditions. It would appear, however, that most fungi perpetuate themselves in the tropics largely by means of conidia, since the ascigerous stage is often either entirely absent or only rarely formed.

The question of the conditions under which some saprophytic species of fungi become parasites is one of very great importance in the tropics, and one on which some information, of a rather preliminary nature, has been obtained. Quite a large number of the more serious diseases of crops are caused by fungi that are far more usually saprophytic than parasitic in habit. As an example may be taken the ubiquitous *Thyridaria tarda* found as a saprophyte on an immense number of different plants, and as a wound parasite on cacao, Hevea and tea, among other hosts. Its parasitism is largely dependent on conditions unfavourable to the growth of the host, as well as on other factors. Again, the root disease of Para rubber in the East is due to a fungus (*Fomes semitostus*) usually saprophytic on forest stumps. Its parasitism depends on the presence of large quantities of decaying wood which afford it food for vigorous vegetative development before it begins its attack, and on the presence of an ample supply of moisture. The same is probably true to some extent of *Rosellinia bunodes* referred to above. The solution of the problem in connexion with many species of the family of bracket fungi (Polyporaceae), to which *Fomes semitostus* belongs, is a matter of some importance in the tropics, as many of them appear to act occasionally as wound parasites or as root parasites on trees planted in newly cleared forest land. Similar investigations would be valuable in the case of many of the toadstools (Agaricaceae) and of the genera Colletotrichum and Gloeosporium, of which many forms are found on ripe or fallen fruits.

Of the last of Professor Salmon's questions, namely what are the conditions under which a parasitic fungus attacks a new host species, nothing appears to be known in the tropics, since the records as a rule do not go back far enough to show that when a parasitic fungus is found on an apparently new host plant, it has never actually occurred on that host before in the same locality, or in some other. This again is a problem worthy of attention.

Other problems of some economic importance also occur in connexion with the life-histories of fungi, besides those mentioned by Professor Salmon. One is to what extent a strain of a parasitic fungus may lose its virulence when growing for some time on the same host plant in a limited area, exhibiting fairly uniform conditions of climate. Another is: to what extent do strains showing very marked differences in virulence occur in one species of parasitic fungus. While yet another is: to what extent do certain species of partly parasitic fungi, such as *Thyridaria tarda*, found throughout the tropics on several host plants and originally probably pure saprophytes, exhibit before our eyes a process of developing parasitism, becoming at the same time specialized to the host plant predominating in any given locality. So many partly parasitic fungi are of universal distribution in the tropics, and are capable of attacking several host plants, that it seems very possible that some of them may actually afford instances of the progress and specialization of parasitism.

The investigation of problems of the nature of those just considered belongs in a sense to the realm of pure research, and requires more time than is usually available to the plant pathologist engaged in pioneer or routine work. In fact such investigation bears much the same relation to routine plant pathology that medical research does to the work of a general practitioner. The future may prove that the parallel can be carried farther; and that the solution of these problems is as important to the economic welfare of an agricultural community as the results of medical research are to its bodily health.

PELLAGRA.

Information concerning this disease, which is common in parts of the West Indies, is contained in an abstract of a paper, given in the *Bulletin of Agricultural Information and of Plant Diseases*, August 1912, p. 1701:—

The investigation of pellagra moves now essentially on bacteriological lines. It differs from the preceding diseases, [beri-beri, polyneuritis, epidemic dropsy and scurvy] in in that it cannot be produced experimentally in animals. Pellagra, which was known in Italy in the eighteenth century, now occurs in Italy, Roumania, Austria, Spain, Portugal, Egypt, Algeria, United States, Mexico and Central America; it is strictly limited to districts where maize is used as the staple diet. The disease, which breaks out mostly in spring and autumn, shows nervous and psychic symptoms and leads often to general cachexia, diarrhoea, and suicide. A very characteristic symptom is an erythema of the skin, which is caused by the sun and is localized in uncovered parts of the body.

In addition to such views as those expressed by Hodson, that pellagra is not a definite disease, there exist five distinct theories—namely, the intoxication, auto-intoxication, infection, photodynamic and deficiency theories.

According to the first, held by the Italian authors (Ceni, Otto, Lombroso, Gosio, Gavina, Bertarelli, Antonini, Camuzzi), the disease is caused by toxic substances produced in maize by the action of micro-organisms, especially fungi (Aspergillus, Penicillium, etc.). The ferments capable of producing the toxic substances remain active even after cooking.

According to the auto-intoxication theory (v. Neusser, De Giaxa) pellagra is due to toxic products formed in the intestine under the influence of certain bacteria, especially of *B. coli.*

As regards the infection theory, an enormous amount of different organisms have been credited with the power of causing pellagra: a particular strain of *Penicillium glaucum*, *Aspergillus fluorescens* and *A. fumigatus*; *Streptobacillus pellagrae*, a protozoon transmitted by a biting fly of the genus Simulium.

But post-mortem bacteriological investigations (Raubitscheck) revealed nothing in favour of the infection theory of the etiology of pellagra and the sero-diagnostic examination of the blood did not show the presence of antibodies against maize proteins or germs contained in maize.

According to Raubitscheck's theory, spoiled maize produces a toxic substance, which is able to sensitize the skin for sun rays.

The deficiency theory is the one brought forward by the writer [C. Funk]. He draws attention to the fact that the diet in pellagra districts is very one-sided and consists chiefly of starch, which is known to produce beri-beri. Maize prevents beri-beri and scurvy, as do beans, vegetables, milk and potatoes; these appear, though in very small quantities, in the diet described by Lombroso and Camuri. Thus Dr Funk concludes that pellagra is due, probably to the deficiency of a vitamine* different from those of beri-beri and scurvy.

Food has, till now, been valued only by its content in proteins, fats and carbohydrates, and calories value; but the nutritive value of the proteins depends on their amino-acid content. An animal fed on proteins which differ in the quantity of amino-acids from the proteins of its own body is forced to use much more proteins and is unable to use these amino-acids, which are in larger proportion in the food than in its own body. In future, the amino-acid vitamine content will have to be considered.

It is to deficiency in vitamine that the fact must be attributed, that proteins which contain sufficient amino-acids to maintain adult animals in nitrogenous equilibrium, prevent normal growth in young animals. A deficiency in vitamines produces also a predisposition to many other diseases, among which rickets may be mentioned.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture left Barbados by the S.S. 'Guiana' on October 20, for an official visit to Antigua. Dr. Watts is expected to return to Barbados in about three weeks' time.

Mr. H. A. Ballou, M.Sc., Entomologist to the Department, left Barbados for St. Vincent by the S.S. 'Oruro' on October 17, in order to make investigations regarding insect pests in the island.

* Vitamines are substances (organic bases) present in small quantities in foods, which are able to prevent or cure such diseases as beri-beri and scurvy. Their insuffiency in the diet appears to cause the exhibition of those diseases.—Ed., *A.N.*

FRUITS AND FRUIT TREES.

THE LEMON INDUSTRY OF ITALY.

The lemon tree grows in Italy, from Lombardy and Venetia as far south as Calabria and Sicily, but it is chiefly in the latter parts, as well as in the peninsula of Sorrento, that the lemon industry is developed, for it is here that the climatic conditions are most favourable to citrus plants. More particularly yet, Sicily is the great centre for the growing of the fruit: out of a little more than 8 million lemon trees planted in the whole of Italy there are about 7 million in Sicily, representing a number of trees of the kind fifteen times greater than that existing in California.

This information is supplied by the *Journal d'Agriculture Tropicale* for August 1912, which goes on to say that a report summarized in the *Journal de la Chambre de Commerce Française de Milan* states that a lemon tree in Sicily, properly cared for, will give 800 to 1,200 fruits a year, and sometimes as many as 2,000. It is therefore not surprising that the crop of lemons in Sicily and Calabria had risen in 1907 to the figure of 6,900,000,000 lemons, equivalent to 20,000,000 boxes of 300 to 360 fruits; that is to say it would take up 64,000 fruit cars such as are used in California, each of which has a capacity of 312 boxes.

In Sicily, the lemon orchards stretch from the coast to the fertile valleys of the interior and are found on the sides of the hills up to an altitude not exceeding about 1,450 feet. In this island and in the province of Reggio Calabria, the trees are planted in squares at distances of 12 to 18 feet; they are not given protection of any kind, because of the mildness of the climate, and under the conditions well developed trees are the general rule.

At Sorrento, on the contrary, on the coast of Amalfi in the district situated further north, where the culture is undertaken, the trees are generally planted at smaller distances and are protected from frost.

In the province of Palermo the chief shipments are during March to June; in the provinces of Messina and Catania from November to February; and in the peninsula of Sorrento from June to September. There is also a summer harvest of lemons of a kind called Verdelli. The ripening of these fruits in summer is caused by suspending irrigation in June and July, then stimulating the trees by means of a rapidly acting manure, and resuming irrigation in abundance from the time that flowering commences.

The quality of the lemons varies perceptibly according to the soil and the time of the crop. The best fruits in every respect, and those which keep longest, come from the strong soils of the hill gardens. Those raised on light soil ripen earlier, but do not generally possess as good an appearance as the others and are of medium quality. Choice lemons are usually packed for export in boxes containing 300 to 360 fruits.

The Italian lemon is remarkable for its resistance to disease, the richness in essential oil, for the strength of its juice and for its citric acid content. These matters explain the important demand that exists in the United States for Italian lemons, in spite of the very active competition of fruits from California and the advantages which protection gives to the products of the United States, over those which are imported.

In Italy, the lemons that are not suited for exportation are employed for making the essential oil; this is prepared chiefly in the districts near Etna, Messina, Palermo, Syracuse, and Barcelona. The time of year for this work lasts generally from December to the end of March. The methods employed vary to a certain extent with the district. Near Etna, Messina and Syracuse the fruit is cut for the purpose into two halves, the pulp is removed with a spatula, then the empty skins are wetted with water for four or five hours before the essential oil is expressed. According to the size, the state of ripeness and the shape of the fruit, 1 lb. of oil may be obtained from 1,600 to 2,200 half skins; the green fruits give a little more of the oil than the ripe. A good worker obtains 3½ to just over 5 pints of oil a day. At Palermo the fruit is cut longitudinally into three parts; in this method the separation of the rind and the pulp is less perfect than in the preceding, but the oil filters better and is more limpid.

Information concerning the lemon industry of Sicily and the manufacture in that island of citrate of lime and of the essential oil has appeared in the *Agricultural News*, Vol. VI, p. 83, and Vol. VIII, pp. 180 and 324.

Particulars regarding the citrus industry of Sicily in 1910-11 have been extracted from the report for the year ended November 30, 1911, of the Royal Commissioner administrating the Camera Agrumaria (see *Agricultural News*, Vols. VIII, p. 377 and IX, p. 233), and appear in *The Board of Trade Journal* for August 29, 1912. These show that the estimated production of lime and lemon juice in Sicily, in 1911, was 4,800 metric tons, as compared with 6,300 tons in 1910 and 7,500 tons in 1909; in making this estimate 162 litres of concentrated lemon juice are calculated as equivalent to 100 kilos. of citrate: there is a relatively small production of lime juice, as compared with citrate of lime, in Sicily. It is also stated that the position of the Camera Agrumaria has improved during the year, and the following interesting information is given: 'It is calculated that the world's production of citrate of lime and concentrated juice amount to an average of about 7,200 metric tons per annum, of which about five-sixths are produced in Sicily. The remaining 1,000 tons are produced in the British Antilles (principally in the islands of Dominica and Montserrat), in Mexico, and in Central and South America.'

TULIP WOODS AND TULIP TREES.

An article in the *Kew Bulletin*, No. 5, 1912, p. 241, gives a useful account of eleven plants that are either called tulip trees or yield woods called tulip woods. It draws attention to the confusion that exists generally through the use of one common name for several kinds of trees, and states that this confusion is increased in the case under discussion because some of the plants called tulip trees do not give wood designated as tulip wood. The term tulip wood seems to be associated with at least seven different kinds of trees. Among the plants described, there are three that are of interest in the West Indies or British Guiana, and the following information concerning them is for the greater part abstracted from the article mentioned.

DICYPELLIUM CARYOPHYLLATUM, OR LICARIA GUIANENSIS. It seems that this plant is plentiful in the Guianas and in Brazil, 'where it attains a height of 50 or 60 feet, with a trunk 3 feet or more in diameter with reddish, corrugated bark and strong, close-grained wood.' Like some other members of the Lauraceae it possesses wood, leaves and bark which are fragrant, hence its name 'bois de rose', and probably 'Cayenne sassafras'. Its bark is called 'clove bark' and 'Brazilian clove bark', because of its scent and taste: distillation with water gives an essential oil called 'clove bark oil', bearing a strong resemblance in all its properties to clove oil and used in perfumery.

The name tulip wood is given to this wood in England. It seems, from *Diplomatic and Consular Reports*, No. 4818 Annual Series, that the timber and oil are quickly becoming important articles of commerce, and development of its exploitation is expected in the forests of Brazil. The export has increased steadily since 1902; in 1910 it was 1,262 tons, and it all went to Grasse (Alpes Maritimes), France. The essential oil is also shipped to France.

THESPESIA POPULNEA. This is known in some parts of the West Indies as 'seaside mahoe'; in India it seems to be commonly called 'tulip tree'. The flowers are yellow and purple, and very much like those of cotton, to whose family, the Malvaceae, it belongs. 'The wood is fairly strong and heavy, fine-grained with light-coloured soft sapwood and hard, red heartwood. It is used for gun-stocks, wheel-spokes, boat-timber, carts, and furniture. The bark yields a good fibre, and the capsules a yellow dye like gamboge. Both bark and wood contain tannin.'

In the West Indies, this plant is usually seen growing near lagoons and swamps. The fibre in the bark is used by fishermen.

HIBISCUS ELATUS. It is stated that the two common names of this plant are 'blue mahoe' and 'tulip tree'. In Stone's Timbers of Commerce, the wood is described as possessing a faint, aromatic or peppery scent, causing sneezing when it is worked. It finds uses in making gun-stocks, carriage poles, ships' knees and fishing rods, and is like European ash but is said to be more durable and longer in the fibre.

PRODUCTION IN THE UNITED STATES 1911.

CROP PRODUCTION. Most of the crops of 1911, as far as their production is ascertained, compare unfavourably with the average production of the preceding five years. Cotton is the most conspicuous exception. If the commercial expectations of the size of this crop are realized, it will be one-quarter larger than the five-year average, and also the largest cotton crop ever grown.

The sugar-beet crop is much above the average production of the previous five years, and is the largest ever grown, while rice and buckwheat are considerably above.

All other crops are below the five-year average in production, hay being the most prominent one in percentage of deficiency.

VALUE OF WEALTH PRODUCED. For the first time in many years the total value of farm products has declined from that of the preceding year. The estimate for 1911 is based on the census items and \$8,417,000,000, or \$277,000,000 under the total for 1910. The loss is chargeable to the general classes of animal products and animals sold and slaughtered. Dairy cows are the only farm animals for which increase of price is indicated. Eggs, wool, butter, and poultry have likewise suffered in farm price during the year. In consequence of the decline of prices of farm animals and their products, the group is estimated as having produced a value of \$2,913,000,000 in 1911, or \$321,000,000 below the amount for 1910.

On the other hand, the crops are worth more than those of 1910, the estimate of farm value being \$5,504,000,000—a gain of \$44,000,000 over 1910. Farm prices of all crops are higher than for 1910, except for cotton, cotton seed and flax seed, and this general fact, notwithstanding the other general fact that production was low, makes about ten crops of 1911 the most valuable ones of the same kinds that the farms of this country have ever produced.

If the census value of farm products for 1899 is represented by 100, the relative standing of subsequent years can be readily perceived if they also are represented by index numbers. After 1899 the total value of farm products increased yearly about five to seven in the index number for six years, ending with 1905. For 1906 the increase was ten, for 1907 it was fifteen, for 1909 it was sixteen, for 1910 the increase was less than two, and for this year there is a loss of six in the index number. At the end of six years after 1899, or the year 1905, the index number had risen from 100 to 133; in five years more it mounted to 183; and the highest point reached 184·3 for 1910. The number for 1911 is 178·4. The progression was broken by this year, so that two other years, 1909 and 1910, exceed 1911 in the value of the wealth produced on farms.

Little is known of the total agricultural wealth production of foreign countries, but the little that is known affords interesting comparisons. A rough but official estimate of the value of the wealth produced by agriculture in Italy in 1910, a year of large production, is \$1,351,000,000. Official returns of the production in Japan, averaged for the three years 1905-7, give an annual value of a little more than \$613,000,000. The official yearbook of the Commonwealth of Australia reports for 1908 a value of \$484,000,000. According to the Canadian census of 1901 the value of the farm products of the foregoing year was \$363,000,000; the census of 1911 has not yet published the corresponding figures for 1910, but the annual official report of agriculture indicates a present production valued at about \$900,000,000. (From the *Yearbook* of the United States Department of Agriculture, 1911.)

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date October 7, with reference to the sales of West Indian Sea Island cotton:—

West Indian Sea Islands have been neglected since our last report, the only business being about 25 bags of St. Kitts at 17*d.*

Buyers are waiting the opening prices of the New Crop Carolina Sea Island. Meanwhile, Old Crop Carolina lots are offering at as low as 16*d.*, without finding buyers. The best Floridas are offering at 13½*d.*, but spinners prefer Sakellarides Egyptian at 11½*d* to 12*d.* per lb.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending October 5, is as follows:—

There has continued some demand for the Planters' crop lots left in stock from last year, which has resulted in the sale so far of 65 bales of Uneeda at 38c. for export. Also there has been put on shipboard, but not yet cleared, 100 bales medium Fine Islands which have been held in warehouse by an exporter for nearly two years. In our next circular we will be able to give the destination of both of the above lots.

The receipts of the new crop to date amount to only 99 bales, which the factors have decided to postpone sampling and offering for sale until next week. The impression is that they would be willing to open the market on a basis of, viz:—

Extra Fine	30c.	= 17*d.*	c.i.f., & 5 per cent.
Fully Fine	28c.	= 16*d.*	,, ,, ,, ,,

COTTON-GROWING IN ARGENTINA.

The information below is part of a report by H.M. Consul at Buenos Aires, reproduced in *The Board of Trade Journal* of September 5:—

Cotton-growing in Argentina cannot be said to have emerged from its initial stage of development, but indications are not lacking of a possible flourishing and profitable industry in the future. Unfortunately Argentina does not possess the population needed for the development of her latent resources and is dependent upon immigration. The lack of labour is undoubtedly the most serious obstacle to the expansion of cotton-growing in the Republic. The only available local labour is supplied by a few native Indians and peasants from Paraguay and the Province of Corrientes. Apart from this difficulty cotton would seem to offer extensive possibilities, the vast districts of the Argentine lying to the north of the 32nd degree of south latitude being admirably adapted to its growth. The climate is particularly favourable to the cotton plant, the absence of rain at the critical ripening period conducing to the production of fibre of almost unrivalled quality. The greatest advantage of all is beyond doubt the total absence in Argentina of the much dreaded boll weevil, to the ravages of which is attributed the loss of a large part of the cotton yield of 1911 in the Mississippi valley alone. While this scourge is spreading throughout the entire cotton belt of the United States, causing millions of dollars of damage, the only parasite in Argentina detrimental to the cotton plant is a cotton worm that is easily exterminated by the use of Paris green.

The area under cultivation in the United States amounts to 30 000,000 acres and the same extent of territory is available for cotton-growing in Argentina. A Spanish syndicate in Barcelona has sent a commission of experts to Argentina to study the industry more particularly from a labour standpoint, a fact that tends to show how seriously the problem is being grappled with, particularly when taken in conjunction with the large Spanish immigration into that country, amounting to 102,277 in 1911.

The future success of the industry would of course lie in cultivation for export, and the aim of the Barcelona syndicate would be to draw supplies of raw cotton from Argentina instead of the United States. At present cotton is being grown on a scale that falls a long way short of even satisfying the modest demands of the home market.

Out of about 6,200 acres at present under cultivation some 4,700 acres fall to the share of the Chaco territory. An expert comparison of the rich alluvial soil of this territory with that of the Mississippi valley leaves no room for doubting its productiveness. The principal centres of the cotton-growing industry are in the colonies of Resistencia, Benitez Margarita, Belen, Popular, Pastoril, Zapallar and General Vedia. A government experimental station has also been started in the Chaco territory to supply seed which will be distributed, on application, by the Ministry of Agriculture; the industry is at present exempt from taxation.

The Government have started agricultural colonies in the Chaco territory. These colonies may be occupied by settlers, who have a right to apply for a grant of land on payment of 2½ dollars per hectare (about 1*s.* 9*d.* per acre). This concession is offered to settlers who comply with the law. Applications should be made to the Land Office, Calle Tucuman 950, Buenos Aires, but the only way to secure the land appears to be by first settling thereon and then making application for a provisional lease. This lease is only granted provided the land is entirely free from any previous lien thereon.

The Government have also allotted a large track of land some 2,500,000 acres in extent, to be divided up into lots of 5,000 acres and sold by auction in Buenos Aires to the highest bidder. The price of the land is payable in half-yearly instalments according to the decree at present in force.

This region will be traversed by a railway under construction from Barranqueras in the Chaco territory to Metan in Salta. As soon as the railhead reaches the 127th mile connexion will be made with a branch line of the National Central Railway, thus establishing communication between the Northern provinces and the deep waterway of the Parana river, which will have a stimulating effect upon the industries of the district to be opened up.

The date of the sale by auction of the lands above referred to will be fixed as soon as the surveys of the new railway are complete, and will be announced at least three months before the sale takes place. The surveys will probably occupy a period of from three to six months.

THE BRITISH COTTON GROWING ASSOCIATION.

The following account of a meeting of this Association has just been received.

The one hundred and fourth Meeting of the Council of the British Cotton Growing Association was held at the Offices of the Association, 15 Cross Street, Manchester, on the 1st instant.

The President, the Right Hon. The Earl of Derby, G.C.V.O., occupied the Chair.

SOUDAN. A discussion took place as to the best method of pushing on the development of cotton-growing in this country and as to organizing a deputation to His Majesty's Government. The question was postponed pending further information on the subject.

WEST AFRICA. The purchases of cotton in Lagos to the end of September amount to 8,853 bales, as compared with 5,274 bales for the same period of last year and 5,469 bales for 1910. The purchases in Northern Nigeria to the end of September are 2,301 bales as compared with about 500 bales for the whole of the previous season. There is every reason to believe that the quantity of cotton produced in West Africa this season will create a record.

NYASALAND. It was mentioned that the Shire River has been very low for some time and that it may be December next before any quantity of cotton can be shipped home from Port Herald. At the end of July the Association had over 400 bales lying at Port Herald, and this quantity has since been greatly increased, thus necessitating the locking up of several thousand pounds capital for many months owing to the inadequate transport facilities. In this connexion it was hoped that arrangements would soon be completed for the extension of the railway from Port Herald to the Zambesi.

UGANDA. It was mentioned that a Conference had been held at the Colonial Office at which Mr. J. Arthur Hutton, the Chairman of the Council of the Association, was present to discuss the question of the expenditure of a portion of the Government loan of £500,000 towards the improvement of roads, etc., in the cotton-growing districts of Uganda. Mr. Hutton stated that he considered the lines on which it is proposed to work were sound, and that the proposed roads would be most useful in opening up new cotton lands.

Satisfaction was expressed at the progress which was being made in the different colonies on the eastern side of Africa and it was pointed out that during September the Association had sold about 3,000 bales of cotton from these districts.

A financial statement with which the account concludes shows that on October 3 the balance to be raised, to complete the authorized capital of the Association, namely £500,000, was £23,039. On September 5 it was £23,127.

AGRICULTURE IN THE GOLD COAST NORTHERN TERRITORIES.

The Protectorate is purely agricultural, and owing to the cost of transport bulky produce cannot be profitably exported: the people in consequence have no inducement to till more land than is sufficient to produce such foodstuffs as are necessary for their personal consumption However, they are quick enough to recognize the advantage of trade as is shown by the fact that around places like Tamale, Salaga, Tamale Port, Zouaragu, and other important trading centres, where food can be sold for money, the natives have made great progress in extending the area of land under cultivation, and in various other ways have shown that the previous indifference was only due to lack of demand for their farm produce.

Increased interest has been taken by the chiefs and people in the work of the agricultural station at Tamale. Various experiments have been made at this station during the year in the rotation of crops, and in the comparison of different varieties of cotton, rice, fibres, etc. Foodstuffs such as cassava, sweet potatoes, ginger and peppers have been introduced, and are gradually being distributed to the native farmers. Bullocks have been successfully trained to draw carts and to plough.

A large number of ornamental trees and shrubs have been planted in the cantonments at Tamale, and they appear to be thriving very well.

To encourage cotton-growing, small cotton farms have been made in eighteen villages, and in addition a considerable amount of cotton seed has been distributed.

The British Cotton Growing Association during the year completed a number of permanent buildings at Tamale, containing gins and a press, which are quite adequate to deal with all cotton likely to be purchased locally. A ginnery and a press-house, containing a hydraulic press, have also been erected at Tamale Port, on the Volta River, to further compress bales for transport.

The price paid by the Association for native and American cotton has been increased respectively by $\frac{1}{4}d.$ and $\frac{1}{8}d.$ per lb., and it is hoped that this enhanced price may be an inducement to the natives to grow more cotton in 1912 The amount of cotton brought for sale during the past season has been very disappointing, but a considerable increase is expected next season.

The harvest throughout the Protectorate has been reported abundant; in consequence an ample supply of maize, guinea corn, millet, yams, beans and rice was to be had in the markets.

In order to improve the local breed of cattle an experiment similar to that of 1909, of importing specially selected bulls from the United Kingdom, has been tried during the year, unfortunately with a like result, as the bulls died on their journey from Coomassie. It is now proposed to start, under the superintendence of the Curator of the Agricultural Station, a herd of specially selected native cattle for experimental purposes. (From *Colonial Reports Annual*, No 722; August 1912.)

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

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NOTES AND COMMENTS.

Contents of Present Issue.

In this number the leading article treats of Problems of Economic Importance Regarding Plant Diseases, giving special attention to interesting suggestions that have been made recently in connexion with the subject.

In view of the existence of the disease in the West Indies, particularly in certain islands, the article on pellagra, on page 339, is of some interest.

On page 340, an account is given of the lemon industry of Italy, and this includes statistics concerning lemon and lemon products in Sicily, where the industries are carried on to their greatest extent.

An article on page 341 gives information that has been brought forward recently concerning plants either giving what is called tulip wood, or being themselves named tulip trees, in the West Indies.

The Insect Notes appear on page 346. They contain articles on a coco-nut pest in the Philippines, on the corn ear worm and on a sugar-cane pest that has appeared in St. Croix. The second of these articles is illustrated.

Useful information regarding some well-known edible beans appears on page 347.

The Fungus Notes of this issue, on page 350, present information concerning a disease described as a knot of citrus trees. This disease is not well known in the West Indies, except in Jamaica.

The Cotton Crop of Egypt for 1911-12.

Diplomatic and Consular Reports, No. 4938. Annual Series, states that this was estimated at 7,250 000 cantars (317,187 tons). The quality of the lint is rather poor and below the average, chiefly because of large damage by the cotton worm in the summer, a general deterioration of the seed used for sowing, and, in Lower Egypt, to cool weather during summer.

The large crop in the United States has caused prices to be a good deal lower than in 1910-11, so that although the Egyptian cotton crop is estimated at only 250,000 cantars (10,937 tons) less than the record crop of 1910-11, it represents an estimated net value of only £E 29,000,000 as compared with £E 36,000,000 of the previous season. Another result of low prices is that dealers in cotton nearly throughout the world have replenished their stocks.

Plant Food in Sandstones.

An account of work contained in the *Bulletin of the Bureau of Agricultural Intelligence and of Plant Diseases* for June 1912, draws attention to the fact that while unweathered rocks are as a rule not adapted for supporting plant life, fragments of sandstones that have been formed by the natural 'cementing' together of pieces of the rock are so adapted because the cementing material was originally a product of disintegration and contains comparatively soluble plant food.

It appears that chalky sandstones with less cementing matter were found to be more useful than those in which the proportion of siliceous material was greater, at any rate in the case of oats; with peas the opposite results were obtained.

The conclusions finally reached, as stated in the account, are '(1) the value of the product resulting from the weathering of rocks as nutritive medium for plant growth is confirmed: (2) among rocks, sandstones, as being directly utilizable form an exception.'

Importation of Coco-nuts into Grenada.

A Gazette of September 2,1912, states that, under the authority of section 12 of the Plant Protection Ordinance of Grenada, the following regulations have been made by the Governor in Council: '(1) All coco-nuts in husk or growing plants of coco-nuts imported into the Colony shall on arrival be forthwith delivered to the Superintendent of Agriculture for treatment with efficient fungicides. (2) All such nuts and plants shall be planted in nurseries apart from growing coco-nuts in such places as may be approved by the Superintendent of Agriculture. (3) All such nurseries shall be visited from time to time by the Superintendent of Agriculture or any person deputed by him for the purpose, and any resulting plants which are suspected of disease may, at the discretion of the Superintendent of Agriculture, be destroyed.'

As these regulations have been made, a Proclamation was issued on August 31, 1912, declaring that a preventive Proclamation dated November 30, 1910, shall cease to be in force, so far as it relates to coco-nut plants or parts of them, or coco-nuts in husk or any earth or soil, or any package, article, covering or thing packed or in any way associated with coco-nut plants or portions of plants, or coco-nuts.

A New Method for Investigating the Needs of Plants.

The *Annales de l'Institut Pasteur* for October 1911 contains a paper in which it is suggested that scientific progress in agriculture is receiving interference, not so much on the account of the want of ideas but because of the lack of experimental methods suitable for their verification. Great stress is laid on the suggested necessity of cultivating the higher plants in nutritive solutions free from bacteria, when it is desired to gain further information concerning their physiological functions.

It is recognized that past methods of experimentation have been most valuable, but it is submitted that they require amplification in the direction indicated. The mode of procedure brought forward is to develop the plants at first in a complete nutritive solution, and then with these plants, after their roots have been well washed, to conduct investigations in incomplete nutrient solutions free from bacteria. The author calls this method the method of interrupted nutrition: he has employed it already in studying the formation of citric acid in fungi. It has also been applied to a certain extent to the study of the growth of maize.

It will be recognized that the idea is not new. The method is rendered extremely difficult because means have not been devised so far for growing plants easily in nutrient solutions that will remain free from bacteria.

Candelilla Wax.

Articles and notes on candelilla wax have appeared already in the *Agricultural News*, Vols. IX, pp. 104 and 124; X, pp. 203 and 409; and XI, pp. 72 and 199.

Diplomatic and Consular Reports, No. 4943 Annual Series, July 1912, shows that in the year 1911 there were several companies in Mexico which were exploiting candelilla. One of these has a plant with a capacity of 25 tons of the wax per month, and it is intended to erect a second plant having a similar output; the product of this company, which finds a ready market in the United Kingdom, the United States of America and Germany, possesses a melting point varying from 67° to 76° C.

The plants producing the wax only grow in the most arid regions: in well-watered districts they contain little or no wax. With the best plants the quantity extracted averages about 2 per cent. It is expected that some by-products will be obtained, among them tannin.

As has been stated in the *Agricultural News*, candelilla wax is used at present in the manufacture of such articles as shoe polishes, floor waxes, varnishes, carbon papers, phonograph records and for electrical insulation. It sells for 11*d*. to 1*s*. per lb. delivered in Europe.

The record has already been made that plants of candelilla are growing in the Botanic Stations in Montserrat, Antigua and St. Kitts, from planting material obtained by the Imperial Commissioner of Agriculture.

The Nitrogen, Phosphorus and Sulphur Content of Plants at Different Times.

The *Bulletin of the Bureau of Agricultural Intelligence and of Plant Diseases*, for August 1912, gives an abstract of a paper appearing in the *Comptes Rendus de L'Académie des Sciences*, Paris, 1912, p. 1627, dealing with this subject. It points out, first, that Isidore Pierre had discovered that the weight of the dry matter and of ash in wheat diminishes from the time of flowering until the grains are mature, and that Joulie had found the same to be true for all cereals. The fact that the losses vary with different plants and the circumstance that they are very irregular have caused the author of the paper to make further investigations regarding the matter, using barley as the plant cultivated.

It seems from the results that the dry matter in the plant increases regularly up to the time of complete maturity; after this a lessening takes place. The phosphoric acid content also increases regularly up to maturity but does not take part in the diminution afterward. The facts are the same for sulphur, except for a slight lessening in the content after ripeness.

It is claimed that this demonstrates that both phosphorus and sulphur exist in the plant in a state insoluble in water and not diffusible, such as lecithin, nuclein and albuminoids, and that the phosphorus is also probably in an insoluble state in a mineral form such as the phosphates of lime and magnesia. This would serve as an explanation of the fact that the phosphorus does not diminish even after the plant has attained maturity.

There is an increase in the nitrogen content up to the period of maturity, and after this it suffers considerable loss, which may be as much as 16·4 per cent.

The acid elements considered here have their maximum percentage in the plant at the time of complete maturity. The author does not think that this is the case with the alkaline elements, and he proposes to demonstrate the truth of his opinion later.

INSECT NOTES.

A SUGAR-CANE PEST IN ST. CROIX.

Dr. Longfield Smith. Ph D., Director of Agriculture, St. Croix, Danish West Indies, in correspondence with the Imperial Commissioner of Agriculture, has given a brief account of an insect which occurs in that island as a pest of sugar-cane.

The insect is a large, brown beetle the name of which Dr. Smith gives as *Strategus titanus*; it belongs to the same family as the common hardback (*Ligyrus tumulosus*) The larva of *Strategus titanus* is in shape and general appearance similar to the typical larvae of insects in this group, but it is much larger than the common hardback larva, attaining a length of over 2 inches, while it is about ½-inch in thickness.

The insects of this group, Dynastides, are more often scavengers, feeding on decaying organic matter, than actual pests feeding on the living tissues of plants of economic importance. When however, they do occur as pests the injury to plants is usually the result of the feeding of the grubs on the fine roots after the manner of the related insects of the Melolonthid group, of which the brown hardback (*Phytalus smithi*) and the May beetles (*Lachnosterna patens* in St. Vincent and *L. patruelis* in St. Kitts) are examples. In the case of the sugar-cane beetle (*Ligyrus rugiceps*) of the United States, however, the injury is reported to be due to the adults tunnelling into the base of the stem The injury to canes in St. Croix by *Strategus titanus* is different from both these. The habits of this insect are stated by Dr. Smith to be as follows: 'It occurs very abundantly, much to our disadvantage. It [the larva] eats the roots of canes, sweet potatoes and other plants, and burrows into the bases of the cane shoots, eating its way upward, and turning the cane into a hollow tube. The insect is saprophytic as well as parasitic. I have found it living in decaying megass heaps. At present (September 18) the grubs do not seem to be so abundant as they were, probably because many have turned to beetles, which are now busy laying eggs.'

There would seem to be no doubt that *Strategus titanus* is capable of becoming a very serious pest, and it is obvious that every effort should be made to prevent the introduction of this insect into any colony where it does not at present exist.

A Coco-nut Pest in the Philippines.—In the *Philippine Agricultural Journal* for March last an article appeared which gave an account of a new coco-nut pest in those islands.

This insect has been described as *Aleyrodicus destructor*, Quaintance. It is one of the white flies, closely related to the white fly (*A. cocois*) of coco-nuts and other palms in the West Indies, and although it differs from the latter somewhat in the appearance of the adults and of the masses of wax filaments among which, on the surface of the leaf, the eggs, larvae and adults are to be found, the nature of the injury inflicted on the tree is the same in the case of both species. It is probable therefore that the newly discovered white fly may become as serious a pest in the coco-nut growing districts of the East as its relative has been in the American tropics.

THE CORN EAR WORM.

The corn ear worm appears to be causing a very considerable amount of damage in the Southern States, and it would seem from a report of the Entomologist of the Trinidad Board of Agriculture, in July last, that this insect was also unusually abundant in Trinidad.

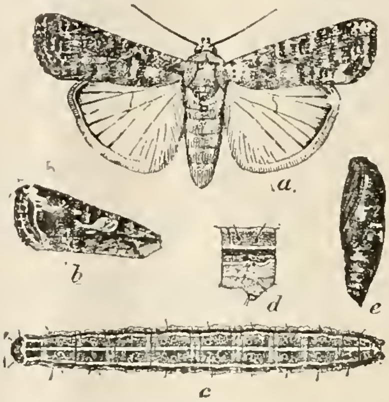

Fig. 13. The Corn Ear Worm.

a, moth, plain gray form; *b*, forewing of more ornamental form; *c*, larva extended; *d*, abdominal segment of larva, lateral view; *e*, pupa, lateral view; *d*, twice natural size; others enlarged one-fourth.

(From U S. Dept. Agric.)

Dr. W. E. Hinds, in a letter to the Entomologist on the Staff of the Imperial Department of Agriculture, states that the boll worm (*Heliothis obsoleta*) is usually the more common worm attacking corn in Alabama, but that this year (1912) the corn ear worm (*Laphygma frugiperda*) is the more abundant, and that it does not seem possible to maintain an efficient control over this insect, when it occurs in such enormous numbers in fields of Indian corn, even by the use of such insecticides as arsenate of lead and Paris green. In fact Dr. Hinds states that some of the farmers assert that this insect is not killed by these poisons, even when it eats them. In Trinidad, however, good results in its control on Indian corn are reported to have been obtained by the use of arsenate of lead.

It is of interest to note that the corn ear worm is usually much the more abundant of these two insects, in the West Indies. Both species attack corn generally, and cotton but rarely. In the attacks on cotton, also, the corn ear worm appears to occur more frequently than the boll worm in the West Indies, and this also is in contrast to the conditions in the Southern States where the boll worm is in most seasons a serious pest on cotton, and the corn ear worm is very seldom recorded as a pest of this crop.

A note in *Der Tropenpflanzer* for August shows that the production of camphor and camphor oil (to the nearest 1,000 lb.) in Formosa during 1911 was 5,200,000 and 7,467,000 lb.; in 1910 it was 7,067,000 and 7,733,000 lb., and in 1909, 4,667,000 and 5,067,000 lb. Similarly the output of these products in Japan, in the same order, was for 1911, 1910 and 1909, 1,467,000 and 2,400,000 lb., 1,333,000 and 2,133,000 lb., and 1,067,000 and 1,467,000 lb.

SOME WELL-KNOWN EDIBLE BEANS.

About the middle of last year, the Imperial Institute received from Hong Kong samples, for examination, of seeds of various kinds, and there were included among them some edible beans that are well known in the West Indies. An account of the examination was given in the *Bulletin of the Imperial Institute* for July 1912, p. 235, and this is used in presenting the following facts.

DOLICHOS LABLAB. This is known in the West Indies as the bonavist or yam bean (another plant called yam bean is *Pachyrhizus tuberosus*). In the instance under report, the beans are imported into Hong Kong from Chekiang; those in the sample measured 1½ by 1 by 1 cm., and possessed a hard, woody, pale, straw-coloured seed coat, while the inside of the beans was hard, of a similar colour, and had a compact waxy appearance.

The following table is reproduced from the article; it compares the beans with Lablab beans from India:—

	Beans from Hong Kong. Per cent.	Indian Lablab beans. Per cent.
Moisture	12·63	12·1 to 14·6
Crude proteins	19·51	17·1 to 22·4
True proteins	18·46	——
Other nitrogenous substances	1·05	——
Fat	1·24	1·4 to 2·3
Starch, etc.	57·56	54·2 ,, 57·4
Fibre	5·89	5·0 ,, 6·5
Ash	3·07	3·4 ,, 3·6
Nutrient ratio*	1:3·10	1:2·5 ,, 1:3·7
Food units†	109·5	105·9 ,, 113·7

Reports on the beans by two firms of merchants in London were not good. It was stated by one firm that their appearance was unfavourable and that the results of the analysis do not indicate that they possessed any special quality for feeding purposes; in order to be sold in London, they would have to be offered at a price much below that of Rangoon beans—£6 to £7 c.i.f. in March 1912.

VIGNA CATJANG. This is the plant usually called cowpea. The seeds in the sample were said to be imported into Hong Kong from Quinhon, Annam; they measured about 1 by ½ by ½ cm. and had a thin, cream-coloured, tightly-adhering seed coat, while internally they possessed the same colour and were hard. In the following table, the composition of the seeds is compared with the same bean from India:—

	Beans from Hong Kong. Per cent.	Indian Catjang beans. Per cent.
Moisture	11·65	12·7
Crude proteins	22·05	23·1
True proteins	20·38	——
Other nitrogenous substances	1·67	——
Fat	1·23	1·1
Starch, etc.	57·99	55·3
Fibre	3·83	4·2
Ash	3·25	3·6
Nutrient ratio*	1:2·75	1:2·5
Food units†	116·2	115·8

Merchants who examined the sample stated that there is a small sale for the beans in the United Kingdom at £8 per ton (October 1911).

PHASEOLUS MUNGO. The common name for this plant in the West Indies is woolly pyrol. Three samples are described—the first and third from Newchwang and the second from the West River, Kwantung Province. The first beans were about 1 cm. long and slightly less in width and thickness, and the second the same in length and about ⅓-inch in width and thickness; while the third were smaller, being about ½-cm. in diameter and nearly round; the colour of the first two kinds was kidney-red to brownish purple and light reddish brown to purplish brown, while internally they were all hard, whitish and wax-like. The value, c.i.f. United Kingdom ports (October 1911), was given as £6 12*s.* 6*d.* per ton for the first two samples, and £6 15*s.* for the third.

A table is reproduced here, which compares the beans from Kwantung (the second sample) with Indian 'mung' beans:—

	Beans from Hong Kong. Per cent.	Indian 'mung' beans. Per cent.
Moisture	11·88	10·1 to 11·4
Crude proteins	19·98	22·2 ,, 23·8
True proteins	18·04	——
Other nitrogenous substances	1·94	——
Fat	0·75	2·0 ,, 2·7
Starch, etc.	58·96	54·1 ,, 55·8
Fibre	4·76	4·2 ,, 5·8
Ash	3·67	3·8 ,, 4·4
Nutrient ratio*	1:3·03	1:2·5 ,, 1:2·7
Food units†	110·8	116·3 ,, 119·3

The article from which this information is abstracted concludes as follows:—

'In the cases of all the prices quoted in the preceding paragraphs the merchants pointed out that the current prices for beans in the United Kingdom were exceptionally high, and that the various samples would probably fetch less in an average year.

'Samples of all these beans have been placed on exhibition in the Hong Kong Court in the Public Exhibition Galleries of the Imperial Institute.'

Rainfall in St. Kitts and Nevis.—A communication from Mr. F. R. Shepherd, Agricultural Superintendent, St. Kitts, dated October 8, 1912, describes the improved conditions regarding rainfall that have taken place recently in St. Kitts and Nevis. On the 6th and 7th of the month, good rains fell in both islands. In the Basseterre district of St. Kitts, the fall was about 5 inches; and in the southern district, from 6 to 7 inches. At Cane Garden estate in Nevis 3·25 inches was received, and in the lowland district to the south the precipitation was 2·69 inches. Some damage was done to roads, in St. Kitts, but none to crops; on the other hand, the benefit brought to the cane crop is incalculable. Mr. Shepherd states that the cotton crop in Nevis should now be almost assured, as the prospects were fair, even before the rain.

*The ratio between the percentage of crude proteins and the sum of the percentages of starch and fat, the latter being converted first into its starch equivalent by multiplying by 2·3.

† The total obtained by adding the percentage of starch to 2·5 times the sum of the percentage of fat and crude proteins.

GLEANINGS.

The plant distribution from the Dominica Botanic Station during September reached 4,057. There were included in it: limes 3,300, cacao 569, budded citrus 97, Para rubber 60, nutmegs 12, grafted mangoes 4, and miscellaneous plants 15.

Returns issued by the Ceylon Government show that the exports of rubber in June 1912 amounted to 681,259 lb., as compared with 449,904 lb. in June 1911. The shipments of rubber in the year ended June 1912 were 10,094,018 lb.; in the previous similar period they were 5,428,080 lb.

In September, the plants distributed from the Antigua Botanic Station included: limes 1,800, Eucalyptus 531, coconuts 458, mahogany 129, ornamental plants 302, and miscellaneous economic plants 47. There were also sent out 42,000 sweet potato cuttings, 197½ lb. of onion seed and 20 lb. of cotton seed.

The *Cuba Review* for September 1912 gives a table which shows that the chief exports of fruit and fruit products from Porto Rico to the United States during 1912 were valued as follows: grape fruit $524,976, oranges $584,368, pine-apples $683,801, lemons $3,131, limes $960, canned pine-apples $258,671. Shipments of honey to the value of $42,251 were also sent.

In common with other parts of the West Indies, Dominica experienced very dry conditions during last month, when the rainfall at the Botanic Station was 3·32 inches whereas the average rainfall for September, during a period of eighteen years, is 9·26 inches. The precipitation during the first nine months of this year has been 38·63 inches; in the similar period of last year it was 76·12 inches.

It is reported by H.M.Vice-Consul at Adana, Turkey-in-Asia, that the estimate for the cotton crop of the present season is about 100,000 bales, as compared with 80,000 bales last year. It is expected that about 4,000 or 5,000 bales of the output will be American cotton. Reference is made to a company that has recently loss money in an attempt to introduce American cotton into the district, and efforts are being made to improve the native cotton by seed selection. The climate is unsuitable for Egyptian cotton, while the fact militating against American cotton is the want of labour. A report concerning cotton-growing in Adana, having a very different tenour from this, was noticed in the last issue of the *Agricultural News*.

The International Horse Agency and Exchange, Ltd, announces, from 46 A Pall Mall, S. W., the sales to take place at Newmarket early in December, and its willingness to act for purchasers, at the ring side, take delivery and see the stock safely shipped; an expert is retained in the interests of customers. The Agency will also supply information, including books relating to thoroughbred stock, to those who may enquire for it.

According to *Colonial Reports*, Annual, No. 726, the imports and exports of the Turks and Caicos Islands during 1911 were valued at £24,722 and £23,703, as against £27,916 and £24,461 in 1910, respectively. The salt exports rose from £14,889 to £19,503, and those of sponges from £1,316 to £1,530; while those of sisal, chiefly because of the retention of stock in consequence of the low prices in the United States, fell from £7,351 to £1,225.

The exports of sugar industry products from British Guiana during 1912 were as follows: sugar 22,337 tons, rum 1,275,992 gallons, molasses 906 casks, cattle food 2,417 tons. The corresponding quantities for the previous year were 30,368 tons, 671,468 gallons, 437 casks and 2,461 tons. Among other exports during 1912 there were rice 2,068 tons, lumber 99,550 feet, timber 142,359 cubic feet, firewood, wallaba, etc., 5,290 tons and balata 317 cwt.

A note in the *Agricultural News* for September 28, 1912, stated that a collection of plants had been obtained recently by the Commissioner of Agriculture, from Kew, for the Grenada Botanic Station, and a short account was given of the nature of the collection. It is of interest that a similar collection has been obtained for the Antigua Botanic Station, where the plants will be propagated, as the time comes which permits of this, for distribution to other stations especially in the Leeward Islands.

It is shown in *Diplomatic and Consular Reports*, No. 4940 Annual Series that the production of raw sugar in Hawaii in the fiscal year 1911 was 441,344 tons value £7,419,360; this was 97 per cent. of the total output, as very little sugar is refined locally. Although it has not been long started, the pine-apple industry ranks after the sugar industry. During 1910 some 610,000 cases were exported, and for the following year it was estimated that the number had increased to 800,000 cases. It is supposed that over 6,000 acres are devoted to pine-apple cultivation in Hawaii, and that capital amounting to £200,000 is invested in the industry.

In *La Información Agrícola*, Madrid, for June 1912, an account is given of a private institution that has been founded at Valencia for the encouragement of silk production in the province. The chief matters with which this is to be concerned are the free distribution of mulberry trees, improvement in silkworm-rearing, cultivation of the mulberry in the best way, the preference of planting of mulberry hedges and espaliers, the foundation of a silk cultivation station, and the establishment of travelling lectureships on silk production. At present a pavilion has been opened at Valencia, and the public is admitted free to this and demonstrations in the raising of silkworms are given.

STUDENTS' CORNER.

NOVEMBER.

First Period.

Seasonal Notes.

The economic functions of agricultural departments and experiment stations have already been referred to in these notes in connexion with co-operation, land settlement schemes and other matters; but for a full appreciation of the various lines of activity the student should read the following: *Agricultural News*, Vol. IX, pp. 129, 141 and 145; the Annual Reports of the Departments of Agriculture in the different islands, and the *West Indian Bulletin*, Vol. XI. There exists perhaps no more important function than that of advising the Government on questions of agricultural legislation and the influence of agricultural societies is important in this respect. Agricultural legislation includes the law of the landlord and tenant and transfer of real estate, the taxation of land and agricultural produce (including by-products, for example rum), the taxation of imports in its bearing upon agricultural progress, and the laws relating to the control of plant and animal diseases. Legislation in relation to agriculture is to a great extent of a local nature and information on many of the points referred to can best be obtained from local sources, but the following references dealing with legislation for the control of plant diseases should be consulted: *West Indian Bulletin*, Vols. I, p. 309; II, p. 344; III, p. 140; X, p. 197 and *Agricultural News*, Vol. X, pp. 12 and 252.

The student's attention is now directed to the subject of land-surveying and mensuration in relation to the valuation and improvement of estates. Field-surveying and levelling find their application in the determination of the areas of fields, forest and waste land, and in drainage, irrigation and road-making operations.

A knowledge of practical surveying and levelling can be utilized to good purpose in estate management without necessarily employing expensive instruments, and the student is advised to obtain one of the several handbooks dealing with this subject from an agricultural point of view.

The importance of mensuration in estate management hardly needs emphasizing. The student should make himself familiar with methods of calculating the areas of different plane figures and the cubic contents of stacks, manure heaps, stored fertilizers, food stuffs, etc., and the cubic capacity of buildings, carts, etc.

Building construction is also a subject of great economic value in agriculture but here again, as in the case of surveying, text-books must be consulted, though the following references will prove useful and suggestive: *Agricultural News*, Vols. X, pp. 66 and 333; VIII, p. 364 and XI, p 267.

Building construction embraces the structure of roof trusses, wall and fence building, flooring for stables and cattle sheds, indoor and yard drainage, construction of cattle pens and covered yards, systems of ventilation, together with their cost and valuation.

The student will find McConnell's Agricultural Notebook useful in regard to the subjects of surveying and building construction.

Mechanical as well as civil engineering finds its application in estate management, both as regards machinery and implements. The construction of steam and oil engines should be studied mainly with the view of learning how to test their efficiency and cost of running under different conditions, and how to reduce depreciation to a minimum.

As regards implements the student is advised to obtain catalogues from the big makers and study the construction and special advantages of different types. Draft is an engineering problem of the greatest economic importance and should be carefully studied under the following headings: steam versus live stock, the effect of gradient and soil, attachment of animals to implements, strain, heat values of different rations and fuels. The following references are given in connexion with machinery: *West Indian Bulletin*, Vol. X, p. 318; Pamphlet Series, No. 60; *Agricultural News*, Vol. X, pp. 41, 72, 89, 108, 121, 124, 156, 184.

Questions for Candidates.

Preliminary Questions.

(1) What substances are found in the atmosphere, and which of these are of direct use to plants?

(2) How do roots grow in length?

(3) In what ways are flowers pollinated in nature? Illustrate your answer by examples.

Intermediate Questions.

(1) How much cordwood is likely to be required to boil completely one hogshead of concentrated lime juice?

(2) Write an account of the German system of co-operative credit.

(3) Where and how are artificial manures, containing nitrogen from the air, made?

Final Questions.

(1) Discuss the question of the connexion between weather and pollination

(2) Explain clearly the economic benefits derived from central sugar factories, giving figures as far as possible to illustrate your statement.

(3) State what you know concerning land settlement schemes; and if you can, compare those of St. Vincent and Carriacou.

THE WORLD'S PRODUCTION OF SILK IN 1911.

An abstract of a paper in the *Bulletin of the Bureau of Agricultural Intelligence and of Plant Diseases* for July 1912, states that the Syndicate of Lyons Silk Merchants has published general statistics of silk production, and proceeds to give information concerning these. The statistics are provisional as concerns exportations from the Far East.

The first table shows that the production of fresh cocoons and raw silk in Western Europe, in 1910, was respectively 126,570,400 ℔. and 1,034,000 ℔.; that for 1911 was 115,310,800 ℔. and 9,537,000 ℔. In the Near East and Central Asia the output of raw silk was 6,160,000 ℔. in 1910, and 6,193,000 ℔. in 1911; in the Far East, it was 37,389,000 ℔ in 1910 and 36,641,000 ℔. last year.

The world's production of raw silk for the years 1910 and 1911, calculated from the figures given was 53,889,000 ℔. and 52,371,000 ℔.

It is stated in the article that the year 1911 marks an arrest in the progress of the world's supply of silk factories, and this is illustrated by a table indicating that while this supply had increased from 20,913 metric tons in 1906 to 24,510 metric tons in 1909, it has since fallen to 23,805 metric tons in 1911.

FUNGUS NOTES.

A KNOT OF CITRUS TREES.

In Bulletin No. 247 of the Bureau of Plant Industry of the United States Department of Agriculture, entitled A Knot of Citrus Trees Caused by Sphaeropsis Tumefaciens, by Florence Hedges and L. S. Tenny, an account is given of a peculiar knot disease of limes and oranges in Jamaica. The causative organism is described at some length, with its cultural characters, and details of numerous inoculation experiments, almost all successful, are also provided. The same or a very similar disease has also been recorded in Florida but it has never been observed up to the present in any of the smaller West Indian Islands. A few years ago the damage caused by this disease in Jamaica was of some importance on certain estates, but recently by severe pruning, and by burning badly diseased trees, it has been brought under effective control.

SYMPTOMS. The knots may appear on the stem or branches, and vary in size from $\frac{3}{8}$-inch to 2 or 3 inches in diameter. 'Generally they are approximately round, but in the earlier stages before they surround the stem they have a broad, flattened base, and may be somewhat elongated, the longer axis being parallel to that of the infected branch. In some cases, instead of forming a well-defined gall, the disease produces an eruption extending several inches along the limb. This consists of slightly raised and variously fissured portions.

'At first the incipient knot is covered by the bark, but after some months this usually dies and falls away, exposing the enlarged woody tissues. In the early stages of growth the surface of the knot (the bark) is light-coloured and rather smooth. With age the surface becomes darker and more or less fissured, and an old gall divested of its bark is often almost black, rough, knotty, and deeply furrowed. When the growth is rapid, however, the malformation may reach a large size and the bark surface still be intact, smooth, and light in colour.

'The surface of the knot is usually quite different in texture from that of the healthy stem; the firm greenish bark is replaced by a softer, more or less crumbling surface, cutting easily with a knife. The interior of the knot, however, is very hard and compact, being composed of firm woody tissues. The outer layer of the knot (modified bark) is about the thickness of ordinary bark, i.e., the knot grows chiefly by additions to the woody, not to the cortical tissues. The colour of the interior of the knot may be similar to that of healthy wood, or it may be more or less streaked with black. The knots are attached by a broad base and cannot be broken off. As they grow they extend laterally and may ultimately girdle the branch.

'The first indication of infection is a slight swelling of the branch. As this increases in size the bark, which at this stage covers the young knot, becomes lighter in colour and is noticeably cracked and has a cork like appearance. Growth under greenhouse conditions in Washington is slow, several to many months being necessary for the production of knots 1 to 3 inches in diameter. When many knots appear upon a branch the single ones may be smaller. In the artificial infections in the Department greenhouses it has taken from five months to two years for the knots to girdle the branch and to become 1 to 2 inches in diameter, but our temperatures were considerably lower and the moisture less than in Jamaica. By the time the stem is girdled all that part of the branch above the knot is usually dead or dying. When a tree contains numerous infections, therefore, a large portion of it dies.'

These knots often give rise to a large number of branches, from two to forty or more, and thus form typical witches' brooms. The branches may attain a height of several feet with few if any branchlets, and often themselves bear knots. They are of short duration and die after some months. Gumming also occurs from the knots, and gum pockets are of frequent occurrence in the infected wood.

Since, when a knot encircles a branch, the upper portion of the branch dies, a badly infected tree may have so much dead wood as to be commercially useless. Moreover, the causative fungus can spread in the stems and give rise to secondary knots, which, on neglected trees, arise in large numbers on the branches and main stem and may extend to the ground, so that the tree ultimately dies.

The disease attacks trees of all ages and appears on old as well as young wood; its occurrence is independent of weather conditions, but it was noted in Jamaica to be more prevalent on the so-called 'red dirt', which is rich in iron. In that island affected trees are usually killed in about eighteen months; cutting back the affected tree did not appear to be always successful, as the young shoots springing from below developed knots.

THE CAUSATIVE FUNGUS. The disease is due to a fungus named by the investigators who isolated it *Sphaeropsis tumefaciens*. It possesses a mycelium that is white at first, but becomes brown when older by the colouration of the cell-walls of the hyphae. Many of its cultural characters are similar to those of *Thyridaria tarda* and of *Diplodia natalensis*, but it is a species quite distinct from these, as is shown by the shape and colour of its pycnidiospores. The mycelium occurs in the bark and wood of the knots, and in the bark, wood and pith of the stem. In rapidly growing galls the mycelium is not very plentiful and is often colourless, while in those developing more slowly it may occur in quantity sufficient to cause a blackening of the tissues. Three distinct strains were isolated by Miss Hedges and Tenny, two sterile on culture media, one from limes, and one from oranges, and a vigorously fruiting strain from oranges. The fructifications are of two kinds, pycnidia and so-called spermagonia. These are also formed very freely in some cases on knots on inoculated or diseased plants. The pycnidia on the host are produced beneath the epidermis, but eventually burst through it. They are small, round, black and usually crowded together. They contain colourless or yellow spores oblong or ovoid, usually unicellular, sometimes 1-, 2- or even 4-septate, especially in cultures. The spermagonia are sometimes the actual pycnidia, sometimes are formed separately and occur after the pycnidia; they produce small unicellular colourless spore-like bodies, which, however, have not been observed to germinate.

INOCULATION EXPERIMENTS. Almost all the inoculations were made by inserting spores or mycelium of the fungus, or both, into cuts in the stems of the host plants, so that the majority were wound infections. An attempt to infect an old healed wounded surface, without further damaging it, failed. The summary of the results of the inoculations as given in the Bulletin under consideration is as follows:—

'Successful inoculations have been made on lime, pomelo, lemon, tangerine, and *Citrus trifoliata*. Only one trial (five inoculations) was made on oranges, the trees not being available. As knots occur on oranges in the field and as infection took place in the limes inoculated the same day with the same culture, the failure of the experiment was probably due to the fact that the trees were not in good condition or were not of a susceptible variety.'

It was found that non-fruiting strains of the fungus lost their virulence when cultivated for a long time on artificial media It was also observed that woody parts of the host are apparently as susceptible to disease as are the young, rapidly growing ones.

'The fungus can live for some years in the host. It has been isolated from secondary knots four years and eight months after the tree was inoculated, and one year after it had been cut down and brought into the laboratory.'

REMEDIAL MEASURES. 'Affected limbs should be removed, care being taken to cut them off well below the lowest knot. Badly diseased trees should be rooted out and burned, that they may not prove a source of infection to sound trees through the dissemination of the fungus spores. Great care should be taken to select only sound trees for grafting purposes.'

WEST INDIAN PRODUCTS.

DRUGS AND SPICES ON THE LONDON MARKET

Mr. J. R. Jackson, A.L.S., has forwarded the following report on the London drug and spice market, for the month of October 1912:—

The opinion expressed in our report for August, that brighter conditions in the drug and spice markets, might be expected on the termination of the summer holidays has not been altogether realized. The month of September indeed, opened with a small and inactive amount of business, which however, generally improved as the month advanced. Many important chemicals and a few drugs showed a decided advance in prices, but of these few were of vegetable origin, and fewer still of West Indian produce. Thus glycerine continues to advance while quinine has declined. The following are the details affecting West Indian products.

GINGER.

At the first spice auction on the 4th of the month the offerings amounted to 545 packages. Of 498 packages of Cochin, only a few were sold, 40*s*. per cwt. being paid for cut tips. Washed rough was bought in at 40*s*. to 43*s*., and small cut Calicut at 65*s*., medium at 80*s*. and bold at 85*s*.

On the 11th of the month Jamaica was represented by 47 bags of good small ordinary, all of which were bought in at 54*s*., 181 bags of Cochin were also offered without reserve, and sold at 28*s*. for washed rough, chiefly small and wormy, 25*s*. to 25*s*. 6*d*. being paid for small and wormy. On the 18th the offerings consisted of only 50 bags of Cochin, brown rough fetching 44*s*. other descriptions being bought in. On the 25th the offerings consisted of 196 bags of washed rough, wormy Cochin, which were bought in at 30*s*. per cwt. Forty-three cases of Calicut were sold without reserve, bold cut fetching 78*s*. per cwt. and small cut 55*s*. per cwt.

NUTMEGS AND MACE.

At auction on the 4th, 60 packages of West Indian were disposed of at the following rates: 65's 7½*d*, 94's to 101's 7*d*., 113's to 120's 7*d*. to 7½*d*. and 140's 6¾*d*. A week later 44 packages of West Indian were brought forward and sold 95's at 8*d*., 102's to 107's 7½*d*. to 8*d*., 112's to 118's 7½*d*. to 8*d*. and 122's to 126's 7½*d*. On the 18th, 113 packages of West Indian were offered and mostly sold 71's fetching 7½*d*, 86's to 96's 7½*d*. to 8*d*., 103's to 118's 7½*d*. to 8*d*. and 141's 7½*d*. Seventy-five packages of Eastern were also disposed of at the following rates: 117's 8½*d*. and 127's 7½*d*. On the 25th 747 packages of West Indian were offered and all sold at rates varying slightly from the above. There has been a steady demand for mace during the month. On the 18th, 33 packages of West Indian and 17 of Eastern were offered the former realized 2*s*. 3*d*. to 2*s*. 5*d*. for good, and 2*s*. to 2*s*. 2*d*. for broken. On the 25th the offerings were 257 packages of West Indian all of which were sold at 2*s*. to 2*s*. 7*d*. for sound and 1*s*. 9d. to 2*s*. for broken.

SARSAPARILLA.

At the first drug auction on the 5th sarsaparilla was in good supply, the offerings amounting to 25 bales of grey Jamaica, 35 of native Jamaica, 4 of Lima Jamaica, 10 of Honduras, and 10 Mexican. Of the first, 3 bales only were sold; of the second 18; of the third all 4 bales; of the fourth none, and of the fifth none. The bulk of the grey Jamaica was held firmly, at 2*s*. 3*d*. per ℔., offers of 2*s*. 2*d*. being refused. Two of the three bales which found buyers were of an ordinary character, and fetched 2*s*. 1*d*. per ℔. and the remaining one—sea damaged—1*s*. 10*d*. Of the 18 bales of native Jamaica which also found buyers 1*s*. 2d. was paid for good red, 10*d*. for dullish red, and 8*d*. to 8½*d*. for inferior yellow and grey mixed. For the 4 bales of Lima Jamaica, fair fetched 1*s*. 10*d*. to 2*s*. and sea damaged 1*s*. 6*d*. per ℔. The whole of the Mexican was held at 7½*d*. A fortnight later, namely on the 19th the offerings of sarsaparilla were only 10 bales of grey Jamaica. and 17 of native Jamaica. The first were disposed of at 2*d*. per ℔. cheaper than previous rates, namely 2*s*. for fair, and 1*s*. 11*d*. for ordinary, partly rough. Of the native Jamaica 11 bales only were sold, fair red fetching 1*s*. to 1*s*. 1*d*., ordinary 9*d*. to 10*d*. and dull red and yellow 8½*d*.

OIL OF LIME, CASSIA FISTULA, KOLA AND TAMARINDS.

At the beginning of the month there was a demand for genuine hand pressed West Indian oil of lime, and towards the end of the month one case of Dominican oil of the above character was brought forward and limited at 7*s* 6*d*. per ℔. On the 5th one bag only of Dominica cassia fistula was offered and sold at 25*s*. per cwt. for good fresh pods. At auction on the 18th kola was represented by 40 bags, 20 of which were sold at 4*d*. per ℔.: for Ceylon halves and quarters, partly of dark colour, one bag of good St. Lucia fetched 5½*d*. per ℔. At the end of the month kola was reported to be scarce, but that an arrival was shortly expected from the West Indies. Of tamarinds, 25 packages of West Indian were brought forward on the 19th, 22 of which sold at 14*s*. per cwt. for juicy Barbados and 11*s*. per cwt. for St. Thomas, in bond.

MARKET REPORTS.

London.—The West India Committee Circular, October 8, 1912.

Arrowroot—$3\frac{7}{8}d.$ to $4\frac{3}{8}d.$
Balata—Sheet, 3/6 ; block, $2/3\frac{1}{2}$ per lb.
Beeswax—No quotations.
Cacao—Trinidad, 72/- to 82/- per cwt. ; Grenada, 57/- to 65/-; 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, 17*d.*
Fruit—No quotations.
Fustic—No quotations.
Ginger—Quiet.
Isinglass—No quotations.
Honey—No quotations.
Lime Juice—Raw, 10*d.* to 1/3; concentrated, £18 15*s.* to £19; otto of limes (hand pressed), 7/6.
Logwood—No quotations.
Mace—2/- to 2/6.
Nutmegs—8*d.* to 10*d.*
Pimento—Common, $2\frac{9}{16}d.$; fair, $2\frac{5}{8}d.$; good, $2\frac{11}{16}d.$; per lb.
Rubber—Para, fine hard, 4/7; fine soft, 4/5; Castilloa, 4/ per lb.
Rum—Jamaica, 2/1 to 6/-.
Sugar—Crystals, 15/9 to 18/6; Muscovado, 11/6 to 14/6; Syrup, 10/6 to 13/3; Molasses, no quotations.

New York.—Messrs. Gillespie Bros. & Co., October 4, 1912.

Cacao—Caracas, 15c. to $15\frac{1}{2}$c.; Grenada, $14\frac{1}{4}$c. to $14\frac{3}{4}$c. Trinidad, $14\frac{3}{4}$c. to $15\frac{1}{4}$c. per lb.; Jamaica, $11\frac{1}{2}$c. to $12\frac{1}{2}$c.
Coco-nuts—Jamaica, select, \$37·00 to \$38·00; culls, \$18·00 to \$19·00; Trinidad, select, \$37·00 to \$38·00; culls, \$22 per M.
Coffee—Jamaica, 15c. to 17c. per lb.
Ginger—$8\frac{3}{4}$c. to $12\frac{1}{4}$c. per lb.
Goat Skins—Jamaica, 50c.; Antigua and Barbados, 46c. to 48c.; St. Thomas and St. Kitts, 43c. to 45c. per lb.
Grape-Fruit—Jamaica, \$4·50 to \$5·00.
Limes—\$5·50 to \$6·00.
Mace—52c. to 56c. per lb.
Nutmegs—110's, $14\frac{3}{4}$c.
Oranges—Jamaica, \$2·30 to \$2·50 per box.
Pimento—$4\frac{1}{4}$c. per lb.
Sugar—Centrifugals, 96°, 4·17c. per lb.; Muscovados, 89°, 3·67c.; Molasses, 89°, 3·42c. per lb., all duty paid

Trinidad.—Messrs. Gordon, Grant & Co., October 14, 1912.

Cacao—Venezuelan, \$15·50 to \$16·00 per fanega; Trinidad, \$14·75 to \$15·50.
Coco-nut Oil—\$1·01 per Imperial gallon.
Coffee—Venezuelan, 17c. per lb.
Copra—\$4·60 per 100 lb.
Dhal—\$4·50 to \$4·75.
Onions—\$1·75 to \$3·00 per 100 lb.
Peas, Split—\$5·75 to \$6·00 per bag.
Potatoes—English, \$1·25 to \$1·75 per 100 lb.
Rice—Yellow, \$4·80 to \$5·00; White, \$6·25 to \$6·35 per bag.
Sugar—American crushed, no quotations.

Barbados.—Messrs. James A. Lynch & Co., Ltd., October 19, 1912; Messrs. T. S. Garraway & Co., October 21, 1912.

Arrowroot—\$7·50 per 100 lb.
Cacao—\$13·50 to \$14·00 per 100 lb.
Coco-nuts—\$20·00.
Hay—\$1·60 to \$1·80 per 100 lb.
Manures—Nitrate of soda, \$65·00; Cacao manure, \$45·00 to \$48·00; Sulphate of ammonia, \$80·00 to \$85·00 per ton.
Molasses—No quotations.
Onions—\$2·20 to \$4·00 per 100 lb.
Peas, Split—\$6·50 per bag of 210 lb.; Canada \$3·00 to \$4·90 per bag of 120 lb.
Potatoes—Nova Scotia, \$2·40 to \$3·25 per 160 lb.
Rice—Ballam, \$5·15 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
Sugar—American granulated, \$5·00 per 100 lb.

British Guiana.—Messrs. Wieting & Richter, October 12, 1912; Messrs. Sandbach, Parker & Co., September 27, 1912.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	—	—
Balata—Venezuela block	No quotation	Prohibited
Demerara sheet	76c. to 77c. per lb.	—
Cacao—Native	17c. per lb.	15c. to 17c. lb.
Cassava—	\$1·00.	No quotation
Cassava Starch—	\$7·50 to \$8·00	No quotation
Coco-nuts—	\$16 to \$20 per M.	\$10 to \$16 per M., peeled and selected
Coffee—Creole	20c. per lb.	18c. per lb.
Jamaica and Rio	20c. per lb.	20c. per lb.
Liberian	17c. per lb.	15c. per lb.
Dhal—	\$4·50 to \$4·60 per bag of 168 lb.	\$5·50
Green Dhal	\$5·25	—
Eddoes—	60c. to 80c.	—
Molasses—Yellow	None	—
Onions—Teneriffe	—	—
Madeira	$4\frac{3}{4}$c. to 5c. per lb.	5c.
Peas—Split	\$6·25 to \$7·00 per bag (210 lb.)	\$7·25 per bag (210 lb.)
Marseilles	—	No quotation
Plantains—	16c. to 48c.	—
Potatoes—Nova Scotia	—	—
Lisbon	\$2·00 to \$2·25	No quotation
Potatoes-Sweet, B'bados	\$2·64 per bag	—
Rice—Ballam	No quotation	—
Creole	\$6·00	\$6·00
Tannias—	\$1·68	—
Yams—White	\$2·64	—
Buck	\$2·40	—
Sugar—Dark crystals	\$3·30 to \$3·35	\$3·50
Yellow	\$4·00 to \$4·10	\$4·25
White	—	—
Molasses	\$2·80	—
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	No quotation.

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CONTENTS.

The Influence of Molasses on Soil Fertility.

THE question of the possible influence on its fertility, of molasses applied to the soil, has excited some interest in the West Indies since 1908, when a report of work in relation to the subject was received by the Commissioner of Agriculture from Mauritius. This, as well as subsequent information, has been published* and the possible practical value of the problem has caused experiments in using molasses on sugar-cane lands to be made by the Department of Agriculture in Antigua. The investigation has also been taken up by the Hawaiian Sugar Planters' Association. Before reviewing the latest results of the work, it will be well to summarize briefly what has appeared concerning the subject in the past.

* *Agricultural News*, Vols. VII, p. 227; IX, p. 339; and X, p. 179.

The first work described from Mauritius was carried out at the suggestion of Mr. W. P. Ebbels. It appeared to show that Azotobacter, or allied organisms, are present in the soils of the island and that there is a connexion between their presence and an increased nitrification that was found to take place when soils containing them are treated with sugar. Later observations in the field indicated that an increase of as much as five tons of cane per acre had been obtained in the case of third ratoons, the molasses being exhausted molasses, and having been applied before the cane was planted; it is claimed that this is sufficient to show that the effects of the molasses had not ceased during the three previous crops. Similar results were obtained by M. P. Boname, Director of the Station Agronomique, Mauritius, who states* that the increases obtained by the use of molasses are larger than those which could be produced by the employment, in mineral salts, of amounts of nitrogen and potash equal to those added in the molasses; further, the influence of the molasses continues to exhibit itself for some time, after the first crop, though it is shown better with plant canes than with ratoons.

The Report on the manurial experiments with sugar-cane in the Leeward Islands for 1909-10 draws attention to work relating to the matter, conducted in

* Station Agronomique, Mauritius; Rapport Annuel pour 1908, p. 22.

Hawaii with definite solutions or with small quantities of soil kept under constant conditions of temperature and moisture. The conclusions reached were not to be accepted as final, owing to the fact that the work was carried out under circumstances so far removed from those in the field; they have been expressed as follows:* 'Molasses applied at intervals to growing canes which have received artificial manure is likely to do harm, either by destroying nitrates that have been already applied or by preventing nitrates from being formed from other compounds containing nitrogen, in the manure. Further, it is considered that the application of molasses to fallow land, or to land in which sugar-cane is to be planted after several weeks have elapsed, may have a beneficial effect in stimulating the action of the nitrogen-fixing organisms and thus adding to the store of nitrogen for the crop that will be growing after such a time has elapsed as will have allowed this stimulus to have had its proper effect.'

An account† has appeared recently of further investigations in Hawaii on the influence of molasses on nitrification in cane soils. These were made in a manner more nearly imitating field conditions than the former, being conducted with soil in galvanized iron cylinders, two feet high and eight inches in diameter, painted inside with asphalt paint, the bottom of each being perforated: the soil was placed on three inches of sand, supported by a piece of coarse sacking. The general conclusion from these experiments with soil in small containers substantiates the results of the former work, just expressed; and it is stated that the harmful effects of molasses on artificially manured lands is due entirely to the organic constituents of the molasses, while dressings of calcium carbonate do not correct such adverse action.

Investigation of the subject was commenced by the Agricultural Department in Antigua in the season 1908-9, and the results obtained are recorded in the annual reports on the sugar-cane experiments in the Leeward Islands. In the first season, gains in tonnage of sugar-cane were apparent, from the use of exhausted molasses; these were repeated in the second season, but were not as definite as in the first. Indications were obtained of a residual action of the molasses. Small increases followed the application of molasses in the third season, but it was not considered that these would be renumerative unless the value of exhausted molasses was very low; this opinion is of particular interest in view of the statement by Professor J. B. Harrison, at the last Agricultural Conference, to the effect that it had been shown in British Guiana that the application of molasses to soils, for sugar-cane growing, is certainly not a commercial success.* In the last report, dealing with experimentation with sugar-cane in the Leeward Islands in 1911-12, which is in the press, Mr. H. A. Tempany states that appreciable increases of yield were obtained in an experiment confined to an application in one season only, but that no reliable inferences are to be drawn from the trial; while the results bear out his opinion, already expressed, that the use of exhausted molasses as manure is unremunerative unless its monetary value is very low. The experiments seem to show, in a broader way, that some residual action of the molasses exists, but the effects are small and appear to be irregular.

There is no doubt that further investigation of the matter is required, and this is being made. Confusion of the issues must be avoided. Does the sugar in molasses increase the activity of Azotobacter? Are preliminary applications of molasses useful? Is there any residual effect? Is it advisable to apply molasses with other manures? If so, how? And: Can the use of exhausted molasses for sugar-cane growing be regarded as remunerative?

* *Agricultural News*, Vol. X, p. 179.

† Bulletin No. 39, Hawaiian Sugar Planters' Association.

* *West Indian Bulletin*, Vol. XII, p. 162.

The Preparation of Bitter Oranges in Valencia.—The oranges canned in Valencia for use in the manufacture of marmalade are exclusively the bitter oranges grown in that district, supplemented occasionally by supplies of the same variety brought from Seville. The operation of canning is as follows, each of the steps being performed by a different set of workers. The oranges are immersed in hot water for a few moments and cleaned with a stiff brush; they are cut in half perpendicularly to their axes; the interior is scooped out of the skins with a chisel shaped wooden implement some 8 or 10 inches long by 1 inch wide. The seeds are then picked from the pulp by hand, and the latter is put in cauldrons where it is boiled by itself for half an hour. It is then passed through a macerating machine, when it is ready to be mixed with the shredded peel and canned. The skins, after the pulp has been removed from them are placed in a machine which cuts them into long, thin shreds. These shreds are boiled by themselves for forty-five minutes, when they are ready to be mixed with the pulp and canned. The pulp and shredded peel are canned together in their original proportions—that is to say, the skin of one orange is considered in Valencia the proper amount to balance the pulp of one orange in the finished product, though British preserving houses frequently add extra pulp, which they obtain chiefly from manufacturers of essential oils and flavouring extracts, who use only peel for those purposes. The cans are sealed and then boiled for ten minutes, when the process is complete. (The *Journal of the Royal Society of Arts*, September 13, 1912.)

THE FUEL VALUE OF MEGASS.

The following information regarding the fuel value of megass is taken from Bulletin No. 40 of the Agricultural and Chemical Series of the Experiment Station, Hawaiian Sugar Planters' Association, issued recently under the title Heat of Combustion of Bagasse from Hawaiian Cane:—

In the investigation of fuels for practical purposes there is not much advantage in the direct comparison of thermal values. The amount of heat that can be obtained from a fuel is not dependent solely on its thermal value, though it is necessary to know this in order to determine its value as a fuel. The fuel value may be considered the *net* thermal value, or the available heat per unit weight. The amount of heat available depends on the thermal value, the moisture content, and the total heat removed by all the products resulting from the combustion in the furnace.

The effect of the moisture in the megass on its fuel value is, in the first place, to reduce the amount of combustible matter per unit weight. In a pound of megass containing 50 per cent. moisture, there is only half a pound of fuel, so that instead of there being 8,100 B.T.U.* per pound there are only 4,050 B.T.U. to start with. According to the mill reports the moisture in megass in Hawaii averages about 45 per cent † and there would therefore, be 4,455 B.T.U. per pound of green megass. For other percentages of moisture the heat set free would be as follows:—

Per cent. moisture.	Heat contained per lb. of megass, B.T.U.
42	4,698
43	4,617
44	4,536
45	4,455
46	4,374
47	4,293
48	4,212
49	4,131
50	4,050
51	3,969

The moisture in the megass reduces the amount of available heat in another manner also—it carries away whatever heat is used in bringing it to the stack temperature. According to Thurston this is usually 600°F. or over, but the average in a number of sugar factories in Cuba, investigated by Kerr, was only 434°F., and he believes that for the highest efficiency it should not be over 500°F. Taking 500°F. as an average for the temperature in the stack, and 85°F.‡ as the temperature of the water in the megass, the loss of heat from this source for each pound of average megass would be as follows: $0.45 \times (212 - 85) = 57$ B.T.U. to raise the water to the boiling point; $0.45 \times 966 = 435$ B.T.U to convert it into steam, 966 being the latent heat of vaporization of water; and $0.45 \times (500 - 212) \times 0.48 = 62$ B.T.U. to raise the temperature of the steam to 500 F., 0·48 being the specific heat of steam. A total of $57 + 435 + 62 = 554$ B.T.U. to be subtracted from the 4,455 B.T.U., in a pound of green megass.

There is a further loss also in the heat carried away by the products of combustion, and excess of air. From the elementary analysis given previously we may assume a pound of green megass to contain $0.55 \times 0.48 = 0.264$ pounds of carbon and $0.55 \times 0.057 = 0.0314$ pounds of hydrogen, which on combustion would give $0.264 \times 3.67 = 0.969$ pounds of carbon dioxide and $0.0314 \times 9 = 0.282$ pounds of water vapour, and would require $0.262 \times 11.59 = 3.06$ pounds of air. Taking the excess air as 100 per cent. we would then have in addition to the carbon dioxide and water given above, 3·06 pounds of air and $3.06 \times 0.77 = 2.35$ pounds of nitrogen leaving the furnace for every pound of megass burned. The air would contain also, on an average, one and a half per cent., or $6.12 \times 0.015 = 0.092$ pounds of water vapour. From the following specific heats we can calculate the total heat carried away by these products of combustion:—

Carbon dioxide	0·2163
Nitrogen	0·2438
Air, dry	0·2375
Water vapour	0·48

Assuming the temperature of the air entering the furnace to be the same as that of the megass,¶ we would have.—

Loss from combined water	$0.282 \times \frac{554}{0.45} = 347$	B.T.U.
Loss „ water vapour	$0.092 \times 0.48 \times (500 - 85) = 18$	B.T.U.
Loss „ carbon dioxide	$0.969 \times 0.2163 \times (500 - 85) = 87$	B.T.U.
Loss „ nitrogen	$2.35 \times 0.2438 \times (500 - 85) = 238$	B.T.U.
Loss „ excess air	$3.06 \times 0.2375 \times (500 - 85) = 302$	B.T.U.
Total loss from products of combustion	992	B.T.U.

The combined loss of heat from the products of combustion and the moisture in the megass would then be $554 + 992 = 1{,}546$ B.T.U., leaving available for generating steam in a pound of the megass which we have taken as typical, $4{,}455 - 1{,}546 = 2{,}909$ B.T.U. For megass containing different amounts of moisture the available heat, by the same method of calculation, would be as follows:—

Per cent. moisture.	Fuel value per lb. of megass, B.T.U.
42	3,129
43	3,057
44	2,982
45	2,909
46	2,835
47	2,762
48	2,687
49	2,614
50	2,540
51	2,468

On the basis of these values not only different megasses may be compared with one another, but megass with other fuels through corresponding values for the latter.

The amount of heat which these fuel values represent is not actually obtained for the production of steam, because there are other losses, such as radiation, but these are functions of the furnace rather than the fuel. There is a slight loss through the heat carried away by the ashes, which directly affects the fuel value, but it is so small as to be practically negligible.

* In accordance with the usual custom the British Thermal Unit and Fahrenheit scale of temperature will be used in discussing fuel value.

† The moisture in the megass as it enters the furnace is probably somewhat less than this owing to evaporation after it leaves the mills.

‡ There is probably a variation of as much as 15°F. in this temperature in different factories, depending on whether hot or cold water is used for maceration, the distance the megass is carried to the furnace, and the temperature of the air surrounding it.

¶ It is probably somewhat less, as most of the air comes directly from the outside through the grates.

FRUITS AND FRUIT TREES.

THE PRODUCTION AND CONSUMPTION OF VANILLA IN DIFFERENT COUNTRIES.

PRODUCTION OF VANILLA. Information regarding the production of vanilla has been given in the *Agricultural News*, Vols. IX, pp. 53, 295, 319; and XI, p. 261; other references to the subject have also been made. In continuation, the following statistics have been taken from an article in *L'Agriculture Pratique des Pays Chauds* for April 1912.

From the figures given it is calculated that the exports of vanilla from the French colonies during 1910 were as follows:—

1910.	Pounds.
Tahiti	564,782
Réunion	142,868
Madagascar	94,169
Mayotte and dependencies	106,095
Guadeloupe	19,996
Martinique	2,554
The Gaboon	693

It should be added that figures are available which show that the exports from Guadeloupe in 1911 were 39,178 ℔.; and from the Gaboon, 1,111 ℔. The latest figure given for French Guiana is that of 18 ℔. for 1909. As is pointed out in the article, the matter should be completed by the inclusion of New Caledonia which produces annually a fair amount of the spice, of which statistics hardly make mention.

The exports for 1910 from places other than the French colonies were:—

1910.	Pounds.
Seychelles	51,377
Mauritius	1,874
Ceylon	660

The production of Mexico is given as an amount corresponding to 333,043 ℔. for 1909-10. The latest figure given for Java is that of 1909—7,700 ℔. It may be mentioned that the exports from Ceylon in 1909 were comparatively high, being 3,562 ℔.

The world's production is placed at an equivalent of 1,320,000 ℔., of which about 880,000 ℔. is stated to be grown in the French colonies.

CONSUMPTION OF VANILLA. Before the figures are given, it is pointed out that the consumption year by year in the different countries is much more regular than is shown by the statistics. In order to give exactly the quantities of vanilla consumed annually at the different centres, it would be necessary (and this is not possible) to know the amount of the local stocks at the end of the year. The following figures are equivalent to those given for the different countries, for 1909:—

1909.	Pounds.
Germany	234,080
France	125,239
Austria-Hungary	62,040
Italy	24,823
Belgium	23,166
Sweden	2,158
Norway	1,984
United States	1,118,106

Statistics do not give information as to the consumption of vanilla in the United Kingdom; it is considered to be about 100,000 ℔. yearly. Further, the estimate is made that the amount of vanilla consumed by Russia is 33,000 to 44,000 ℔. The value of the vanilla used in Holland in 1909 corresponds to about 12,000 ℔. The best sources of information permit it to be stated that the Swiss consumption of vanilla is about 13,000 ℔. In 1910, France exported 5,588 ℔. of vanilla to Denmark, and this figure represents approximately the consumption by that country.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture is expected to return to Barbados from Antigua on November 9, or on November 14, 1912.

Mr. H. A. Ballou, M.Sc., Entomologist to the Imperial Department of Agriculture, returned to the Head Office from St. Vincent, by the S.S. 'Ocamo', on November 2.

THE BUDDING OF THE AVOCADO.

The illustration on this page has been made from two negatives sent by Mr. J. Jones, Curator of the Botanic Station, Dominica. It shows the successful budding of a Mexican variety of the avocado pear (*Persea gratissima*) on a common avocado stock.

On the left-hand side of the illustration is seen a flourishing branch grown from the inserted bud; above the latter is the upper part of the main stem of the stock, which has been bent over so as partly to break it and divert plant food to the bud. The right hand section of the picture shows the plant after the upper part of the stock has been cut off just above the position of the bud.

In forwarding the negatives, Mr. Jones draws attention to the circumstance that there is no reason why varieties of the avocado should not be selected and budded in the West Indies, just as this is done with oranges and grape fruits.

Mr. Jones, in a later letter (September 23) to the Commissioner of Agriculture, states: 'The early attempts to bud avocados in Dominica were made on stocks growing in bamboo pots. These efforts failed owing to the difficulty of keeping stocks, within the limited area of bamboo joints, in a healthy and growing condition. It was then decided to transplant seedling avocados raised for stocks from the seed to the nursery beds (after the manner employed in citrus budding). The stocks were placed out in two rows in a bed 4 feet wide, the distance between the plants in the rows being 18 inches. Planted under such conditions the stocks grow vigorously and are soon ready for budding, which latter can be done when the stems have attained the thickness of a lead pencil. It is essential that the stocks should be in a healthy growing condition, at which time the bark separates readily from the wood.

'The budwood used in the Dominica experiments was taken from the comparatively young branch (green wood) of a vigorous seedling of a Mexican variety. A good percentage of the buds grew. There is a tendency in avocado stocks to callus so quickly at the point of insertion that the buds are sometimes covered before growth has started.

'The method employed was shield budding with an inverted T, the procedure being the same as that commonly followed in budding citrus, a method now well understood in the West Indian Islands.

'It is not yet known how budded plants will stand lifting and transplanting, but it is thought that, after the wood is ripened, and the leaves are removed, the plants may be lifted, packed, transported and replanted in the field with no more loss than in the case of citrus plants.'

It may be useful to mention that other information concerning the propagation of the avocado pear, and regarding its growing and marketing, may be found in the *Agricultural News*, Vols. IX, pp. 116, 213; and X, pp. 180, 356.

FIG. 14. STAGES IN THE BUDDING OF THE AVOCADO PEAR (DOMINICA).

Cotton-Growing in Madagascar.—According to the *Bulletin de l'Office du Gouvernement Générale de l'Algérie* of September 1, various attempts have been made to grow cotton in Madagascar in the provinces of Morondava, Analalava and Tulear, especially at Nanera and Andranolava. The seeds used are supplied by the Colonial Cotton Association, but the results have not been very satisfactory, owing in part to the prevalence of very dry weather from May to July, which is unfavourable to the opening of buds. Moreover, the plants are attacked by red and green bugs and by caterpillars, which penetrate the pods before they have time to ripen. Experiments are at present being conducted by the Cotton Association at various points along the west coast, by several planters in the south-west, by the Compagnie du Lac Alaotra in the district of Ambatondrazaka and also by the Administrative Authorities at Marovoay station. It is estimated that about 1,400 hectares are under cotton cultivation. (*The Board of Trade Journal*, September 12, 1912.)

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date October 21, with reference to the sales of West Indian Sea Island cotton :—

Sea Island cotton has continued neglected since our last report and sales are confined to 15 bales of St. Vincent at $21\frac{1}{2}d.$ and a few bales from other islands from $17\frac{1}{2}d.$ to $18d.$

American Sea Island cotton is still pressed for sale and superior crop lots of last season are being sold at $15\frac{1}{2}d.$ to $16\frac{1}{2}d.$, with difficulty; meanwhile, the new crop has not arrived. Spinners are quite indifferent and there is no doubt that the cheapness of Sakellarides Egyptian is inducing them to go on to lower counts of yarn in preference to spinning the finer numbers, for which there is a limited demand, the lace trade being so depressed.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending October 12, is as follows:—

The receipts this week of 225 bales were composed of 105 bales Planters' crops carried over on plantations from last year and previously advised sold, and 120 bales of new crop cotton. The 105 bales have not been cleared and therefore we cannot yet give their destination.

The sales consisted of a Planter's crop, Hams 31 bales at 30c., brought over from last year.

The receipts of the new crop have only been partially sampled and Factors are postponing offering their cotton until they have some accumulation of stock. They intimate, however, that they would be willing to open the market at:—

Extra Fine	30c.	=	17*d.*	c.i.f., & 5 per cent.
Fully Fine	28c.	=	16*d.*	,, ,, ,, ,,

BRANCHING OF EGYPTIAN COTTON PLANTS.

The following conclusions are reached after an investigation of the manner of branching of Egyptian cotton, described in Bulletin No. 249 of the Bureau of Plant Industry, United States Department of Agriculture. Reference to the original publication is made, for a description of the diagrams that are mentioned:—

The Egyptian cotton plant bears two kinds of branches, long vegetative branches on the lower part of the stem, which bear no flower buds directly, and above these, to the top of the plant, shorter fruiting branches which bear flower buds.

The differences between vegetative branches and fruiting branches are very sharp: (1) vegetative branches usually approximate the length of the main stem, while fruiting branches are about one-third as long; (2) vegetative branches bear no flower buds except as they produce secondary fruiting branches. Fruiting branches bear a flower bud at each node opposite the leaf; (3) the vegetative branches, like the axis, bear fruiting branches and may bear vegetative branches. The fruiting branches rarely bear fruiting branches or vegetative branches.

Vegetative branches may be either axillary or extra-axillary. Normal fruiting branches are always extra-axillary Single bolls or short fruiting branches are sometimes developed from buds in the axillary position, at nodes bearing fruiting branches. Such branches may be regarded as secondary fruiting branches borne by the axillary vegetative branch, which is itself suppressed.

From six to eight large vegetative branches are usually produced from the first ten nodes of the axis. At the next two or three nodes the buds frequently remain dormant or are abortive, and above these a fruiting branch is produced at each node.

Under conditions of great luxuriance extra-axillary limbs occur at some of the lower nodes which would bear fruiting branches if the development of limbs was restricted.

The length and number of vegetative branches largely determine whether the plants are bushy and spreading or upright.

The control of the production of vegetative branches that is of the stature of the plant, is necessary because of the desirability of small plants in cultivation and harvesting.

Egyptian cotton when planted late apparently develops more numerous vegetative branches than when planted early. Early planting is therefore advisable as a means of restricting the development of vegetative branches.

Abortion of early fruiting branches on both axis and large limbs is common in a greater or less degree to all stocks grown from imported seed. Even the Arizona acclimatized plants frequently abort their lowest fruiting branches.

Some of the selected acclimatized types of Egyptian cotton originated in the United States bear fruiting branches at lower nodes on the stem than the stocks of imported Egyptian cotton. Selection for low fruiting gives promise of being a practical means of increasing earliness and yield.

Of the six Egyptian varieties grown in Arizona in 1909 from imported seed, Nubari most nearly resembled the acclimatized stocks in putting out fruiting branches at comparatively low nodes of the stem.

A method of recording branching habits of cotton by means of diagrams has been devised. The diagrams show the location of branches, the development of fruiting branches, and the stature of plants. Such diagrams promise to be of value as records in the cultural and breeding study of cotton.

Preliminary experiments in topping young plants have resulted in stimulating the growth of buds in the axils of cotyledons. Branches just below the point where the plant is topped make an excessive vegetative growth and tend to assume an upright position in place of the severed axis. The topping of nearly mature plants to hasten the ripening of fruit has not yet been adequately tested.

Egyptian cotton plants grown on soil containing considerable alkali restrict the development of limbs and reject their early fruiting branches.

Differences in the branching habits of the different Egyptian varieties grown from imported seed are not sharply defined because of the diversity within each variety and hence cannot at present be used to distinguish one variety from another.

COTTON SEED MEAL AS FOOD FOR STOCK.

Two articles on this subject have appeared recently in the *Agricultural News*, in the issues for August 31 and September 14. In continuation of the matter, the following are the conclusions reached in a recent bulletin of the Arkansas Agricultural Experiment Station (No. 108), which describes work having for its chief object the testing of methods designed for the purpose of removing the poisonous properties possessed by the meal when it is fed to pigs and young cattle:—

It was found, in one trial, that 'fermentation' or decomposition of cotton seed meal for forty-eight hours at a temperature of 20° to 28° C. did not lessen its toxic action when fed to pigs.

Cotton seed meal, from which 2 per cent more of fat had been removed by extraction with gasoline, showed no diminution of toxicity.

In two trials it was found that cold aqueous extraction removed from cotton seed meal no substance which could be shown to be toxic for pigs.

The extract similarly obtained by dilute hydrochloric acid proved non-toxic in one trial. In a second test a temporary sickness occurred in one animal, the identity of which with cotton-seed poisoning was not established.

The fluid strained from cotton seed meal, after prolonged steaming, caused death with symptoms and post-mortem changes of cotton seed poisoning in one case. This fluid, however, was not a clear solution of matters extracted from the meal, but contained much material in suspension. The meal itself after such cooking and separation of the fluid also proved toxic.

In young cattle (fattening steers) symptoms of poisoning appeared after a consumption of cotton seed meal (along with hulls) equal to from 75 to 108 per cent. of the body weight. The anatomical lesion of cotton-seed poisoning of cattle is an interstitial keratitis [inflammation of the cornea or front covering of the eye] which may end in complete blindness.

In hogs there is a degeneration of the muscular tissue of the heart and of the parenchyma of the liver and kidneys, with extreme passive congestion of all the viscera, and fluid effusion into the serous cavities, especially the pleura. Hogs which have recovered and regained their thrift did not show, after slaughter, any microscopic changes in these organs.

It may be noted, finally, that the ill effects resulting from the feeding of cotton seed may be due to a prolonged absorption of poisonous products generated in the digestive tract by decomposition or putrefactive changes peculiar to this feed. The problem, however, has not yet been approached from this point of view.

COTTON EXPERIMENTS IN THE UNITED STATES, 1911.

There has been issued recently (July 17) Circular No. 96 of the Bureau of Plant Industry of the United States Department of Agriculture, dealing with the results of cotton experimentation by that department during 1911. The statement of the results is to be considered as supplementary to that contained in the Annual Report of the Chief of the Bureau mentioned. It will be useful to quote here the conclusions that are reached in the circular:—

Improved varieties of American Upland cotton bred by the Department of Agriculture and sent out through the Congressional Seed Distribution are being utilized for the improvement of the cotton industry.

New types of Upland cotton, introduced from weevil-infested regions of Mexico and Central America, have been acclimatized in the United States and have given excellent results in Texas and other South-western States.

One of the new varieties from Mexico, called Durango, is the most promising Upland long-staple cotton for irrigated districts. Long-staple cotton is likely to become one of the most important crops in the irrigated regions of Texas and other South-western States.

Cotton-growing communities have much to gain by co-operative organization for the production and marketing of a single superior variety of cotton.

An improved method of distributing select varieties has been devised to avoid waste and encourage the production of superior fibre on a community basis.

The necessity of continued selection to preserve superior varieties has been demonstrated and improved methods of selection have been devised. The value of distinctive characters that enable the plants to be recognized in the field is being taken into account in the breeding of varieties

Cultural methods are suggested for avoiding malformations of young seedlings, which often delay the development of the plants and reduce the yield.

Several methods of utilizing superior first-generation hybrids between Egyptian and Upland varieties of cotton are being tested, including the propagation of such hybrids from cuttings.

Experiments have shown the possibility of controlling the development of vegetative branches by thinning the plants gradually and restricting the supply of water in the early stages of growth.

The Egyptian type of cotton proves to be less susceptible to the shedding of the buds and young bolls than the Upland cotton, which is an additional element of security for the crop.

Differences in habits of growth and methods of picking render the Egyptian cotton superior to the Upland type as a family crop.

The successful production of Egyptian cotton in Arizona and Southern California does not justify expectations of similar results in Texas, where the conditions are essentially different. The Durango variety is preferable for irrigated districts in Texas.

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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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial of this issue brings forward various conclusions that have been reached regarding The Influence of Molasses on Soil Fertility. It summarizes the results of recent investigations, as well as information that has been given already concerning the subject in this journal and in other places.

An article on page 355 deals with detailed work regarding the fuel value of megass that has been carried out recently in Hawaii.

An interesting illustrated article having for its subject the budding of the avocado pear is to be found on page 357.

Information concerning the buchu of South Africa, sent by Mr. J. R. Jackson, A.L.S., and in addition abstracted from a recent number of the *Kew Bulletin*, is given on page 362.

A summary of the results of the continuation of work having for its subject the influence of radioactive substances on plants appears on page 363.

The Fungus Notes of this issue are on pages 366 and 367. They deal with a disease of sugar-cane called Iliau, which up to the present appears to be confined to Hawaii. A summary of a bulletin giving an account of recent work with the disease is supplied, and note is made of the remedial measures that have been suggested.

Page 367 contains an account of various matters in connexion with the representation of the West Indies at the recent Canadian National Exhibtion held at Toronto.

Trade of Venezuela, 1911-12.

Statistics originating from H.M. Legation at Caracas show that the imports and exports of merchandise to and from Venezuela for the financial year ending June 30, 1912 were worth £224,434 and £328,368, respectively; in 1910-11 they were £200,447 and £242,300.

The coffee crop of Venezuela for 1911-12 was above the average. In spite of the drought it is probable that the crop to be shipped in 1912-13 will be only about 20 per cent. less than that exported in 1911-12. Last year's crop of cacao was very small because of drought, and prospects are poor for this year. The drought has also caused the balata and rubber exports for this year to be small, but conditions have improved lately in the Orinoco region.

Vanilla in the Seychelles, 1911.

During the year mentioned almost the smallest crop of vanilla on record was obtained; it was 11,008 kilos. (24,218 lb.) worth Rs. 223,200 (£14,880). It is explained in *Colonial Exports—Annual,* No. 271, that the cause of the small yield was not disease of the plants but unseasonable rainfall at the flowering season. The last good crop was in 1907, and was valued at a million rupees.

The crop of 1912 is expected to be as low as that of the previous year. If nothing unfavourable occurs at the present time, the year 1913 should see a large crop.

Prices have been high for several years, and it is stated that there is no longer much dread that vanillin will replace the natural product in popular favour.

Vanilla is sold chiefly in London and Paris, in about equal proportions.

The Cutting of Sisal.

Opinions vary greatly regarding the best way to cut leaves of Agave for the production of sisal hemp The subject receives attention in the *Journal d' Agriculture Tropicale* for May 1912, which quotes an article in the *Bulletin Economique de l' Indo-Chine* as saying that to cut too plentifully, leaving a straight stump in the place of the crown of twenty-two leaves which should nourish the plant, constitutes one of the most clumsy methods, besides giving leaves of irregular maturity and therefore fibre that sells at an inferior price. It is pointed out that this view receives confirmation in a letter sent to the Agricultural Department of New South Wales by the Director of the Fibre Department of the International Harvester Company of America. So far, the procedure in Australia, for this recently introduced cultivation, has been that of Java. In Yucatan, it is admitted that a leaf ought to be allowed to become almost horizontal before it is cut; in any case it ought not to be removed before its angle has become at least 22°.

Cotton-buying in Grenada.

The assent of the Acting Governor of the Windward Islands has just been given to an Ordinance to amend the Cocoa, Nutmegs and Cotton Ordinance, Grenada; it is No. 13 of 1912, dated September 16, 1912.

By this Ordinance, notwithstanding anything in the Principal Ordinance, it shall be lawful for any person to sell, offer for sale or deliver to a licensed dealer, and for any licensed dealer to purchase or take delivery of, cotton at any ginnery, the expression Ginnery meaning a building where cotton is ginned, whether it is Government or private property.

Provision is made for the keeping of books giving particulars of transactions in cotton, at ginneries, the inspection of such books and the production of the books for inspection.

According to the Ordinance also, notwithstanding anything in the Principal Ordinance, it shall be lawful to issue half-yearly licenses for the purchase of cotton only, the licenses to expire at the end of the half year and at the end of the year, the price for each being £1. A form is prescribed for such licenses.

The Ordinance may be cited as the Cocoa, Nutmegs and Cotton Ordinance, 1912, and is to be construed as one with the Principal Ordinance. It may be cited with this as the Cocoa, Nutmegs and Cotton Ordinances, 1911 and 1912.

Growing Vanilla under Mango Trees.

The *Queensland Agricultural Journal* for September 1912 makes the suggestion that vanilla vines may be cultivated on the trunk and over the lower branches of mango trees. The practical nature of the suggestion is illustrated by reference to a case in which vanilla is raised under some nine large mango trees, planted about 30 feet apart and occupying about $\frac{1}{10}$-acre, the number of vines being about forty. In this case the vanilla is growing on rows of posts and rails between the trees, as well as on the trees themselves.

In such a cultivation, protection from stock must of course be provided. There must not be too much shade, so that this must be lightened in the case of older trees by cutting away some of the middle branches in the centre of the tree, from the inside. It is claimed that this does not necessarily make the tree unsightly. Generally speaking, the proportion of the tree opened up in this way is about one-quarter of the diameter.

Four vines may be planted at the base of large trees; two or three are sufficient in ordinary cases. Where horizontal branches are available the vines should be trained along them, and later merely draped over them; in their absence rails may be laid from fork to fork or supported on posts. The rails need not be more than about 4 inches, and should not be less than 2 inches, in diameter.

The opinion is expressed in the article that no weeding, no pruning and no watering are ordinarily necessary, 'the work of culture consisting of watching the vines to prevent their growing out of reach, pollinating the flowers in season, and harvesting and curing (drying) the beans as they ripen.'

It should be stated that the article is not intended to suggest that mango trees are the best for growing vanilla, nor is it implied that other trees are not suitable for the purpose.

The Direct Assimilation of Nitrogen by Green Plants.

The *Journal of the Chemical Society* for October 1911 contained an abstract of a paper describing the continuation of work by Messrs. H. B. Hutchinson and N. H. J. Miller, having for its object the investigation of the direct assimilation of inorganic and organic forms of nitrogen by other plants.

In the work, the plants are grown in water cultures, under sterilized conditions which exclude nitrification, while the nitrogen is supplied in many various forms.

The greatest assimilation was shown for urea, and several less well-known organic nitrogen compounds were also readily assimilated. Doubtful results were obtained with some of the other compounds; others still were not absorbed at all, while one of them proved to be actually poisonous.

The matter of chief interest is that soluble humus was readily assimilated and produced considerable growth. Peptone was also taken up, but the increase in dry weight of the plants was a good deal less than that with humus.

The Japan 'Culture' Pearl Industry.

Part of the report by H.M. Commercial Attaché at Yokohama shows that there is a considerable export from Japan to Europe and America of what are called Japanese 'culture' pearls. These have the same appearance and nature as the natural oyster pearl, but are obtained by a special process. In the first stage, the oysters are carefully watched and tended until they are three years old, when they are taken out of the sea and opened, and a foreign substance introduced. They are then replaced in the sea and allowed to remain for about four years; after this time the finished pearl is taken from the shell.

Apart from its origin, the chief difference between the culture pearl and the natural pearl is that it has to be cut from the shell, instead of being found free in the oyster. The consequence is that one part of the culture pearl is inferior in appearance, and this causes the value to be much lower than that of the natural product.

This information appeared in the *Board of Trade Journal* for September 26, 1912, where it is stated that some further particulars regarding the industry may be seen by British firms at the Commercial Intelligence Branch of the Board of Trade, 73 Basinghall Street, London, E.C.

THE BUCHU OF SOUTH AFRICA.

Mr. J. R. Jackson, A.L.S., has sent the following note on the Buchu of South Africa.

'So long ago as 1821 the leaves of one or more species of Barosma were introduced from South Africa to the notice of the medical profession in London, under the name of Buchu, or Buku, which is the native name of the plants themselves. For a long time before their introduction to England they were used by the native population for various diseases, and ever since their adoption in European practice—principally as a tonic and diuretic remedy—they have been more or less in demand. The plants producing them are shrubs, natives of the Cape of Good Hope, and have been referred to three species of Barosma, namely, *B. betulina*, *B. crenulata* and *B. serratifolia*, belonging to the natural order Rutaceae. They are classified in the London market by the shape of the leaves such as 'round', 'longs', 'ovals', 'long ovals', etc., and their value depends partly on their colour. They have a strong smell somewhat suggestive of mint, and it is said that in Thunberg's time the natives used them, dried and powdered, and mixed with grease, to anoint their bodies, which gave them such a rank disagreeable odour that Thunberg could not bear the smell of the men who drove the waggon.

'For some time past there has been an increasing demand for Buchu leaves in the London Market, and the limited supply that often occurs, automatically results in increased prices, especially in the best qualities; but prices all round have almost doubled within the last few months Thus at the drug auctions at Mincing Lane at the end of August and the beginning of September the market was very firm, nothing being obtainable on the former date under 6*s* 6*d*. per lb., and a few bales of good green round leaf were held at 7*s*., while on September 5, 2 bales of good green round leaves free of stalk were bought in at 7*s*. Fair green somewhat stalky were held at 6*s*. 3*d*., and very stalky yellow green at 4*s*. 3*d*. It was stated at the time of this auction that 29 bales had arrived from the Cape, 15 of which were destined for New York and the remaining 14 for London.

'It is worthy of note that while the exports from South Africa for the six months ending 30th of June last, amounted to 172,510 lb. of the value of £29,344; the quantities and value for the corresponding period in the previous year were 146,803 lb. valued at £21,578. On the other hand, the exports and values for the month of June only, show that in 1911 they amounted to 31,871 lb. of the value of £5,388, while in June last the quantity was 8,497 lb. and the value £2,121.

'With a plant, the uses of which have been of such long standing, and are apparently increasing, so that there is every promise of a continued increase in the demand at good prices, it would seem that an extension of its cultivation might be taken in hand in such British possessions as approach in climate and other conditions suited to its culture.'

It may be added to Mr. Jackson's observations that the *Kew Bulletin*, 1912, No. 7, issued recently, in describing a buchu (*Barosma Peglerae*), mentions that other names loosely applied to the plants by the natives of Cape Colony are Bukku and Bucco, and that the stuff called Buchu Vinegar or Buchu Brandy is made by infusing the leaves in vinegar, brandy or 'dop'. This is employed for sundry complaints, though as one authority remarks: 'in these cases its chief value perhaps is the excuse and cover it affords for the occasional dose of alcohol.' In any case the leaves are held in high esteem for sprains, contusions, etc., and it has not been denied that they are of importance in alleviating rheumatic troubles.

The *Kew Bulletin* goes on to point out that the trade names of 'longs', 'ovals' and 'short-broad', 'obovate' or 'rounds' apply respectively to leaves of *B. serratifolia*, *B. crenulata* and *B. betulina*; though in recent years the last have been preferred, and constitute now the Folia Buchu or Folia Bucco of the British Pharmacopoeia. It also draws attention to the fact that an article preliminary to further investigation appeared in the *Agricultural Journal of the Cape of Good Hope*, 1910, p. 252, and states that more information is to be given in a future issue of the *Agricultural Journal of the Union of South Africa*. The article concludes with the description of *B. Peglerae*, stating that its leaves may possibly prove to be of pharmaceutical importance.

PRIZE-HOLDINGS COMPETITION, CARRIACOU, 1912.

The Superintendent of Agriculture, Grenada, Mr. G. G. Auchinleck, B. Sc., has forwarded a copy of a report by Mr. W. Malins-Smith and himself on the Prize-holdings Scheme in the island of Carriacou for the year 1912:—

We hereby submit our report on the Prize-holdings Scheme in the island of Carriacou for the year 1912.

There were thirty-one entries of which five had done so little work and the appearance was so poor that no marks were given to them.

We cannot say that we found any holding in excellent condition; and on the whole, the appearance of the holdings was backward and poor. At the same time there were evidences of some attempt at improvement. This however was considerably handicapped by the severe drought experienced this year.

Among the next striking features observed on the holdings we may mention a contrivance for collecting rain-water from the stem of a tree by Alfred Akie of Belair, by nailing a bit of tin partly around the stem, so as to catch the water trickling down and spout it into a tub Alexander of Beausejour has a large plot of selected cotton which gave a yield last year of 33⅓ per cent. of lint to seed-cotton.

Rebecca Philip of Beausejour was able to show a splendid field of bananas and cacao. Stephen Mark of Tophill is growing a large variety of fruit trees and bringing them on very satisfactorily in a rather exposed situation.

There were only four of the competitors who made any attempt at the conservation of manures.

The competitors do not yet seem to have got a real grip of the idea of the Prize-holdings Scheme. We would recommend that visits of the Agricultural Instructor be increased next year.

The crops generally throughout the island are very late and poor this year. The corn crop is particularly poor. This is due no doubt to the prolonged and severe dry season which ended in June.

A list at the end of the report shows that the following were successful: S. Mark and S. Augustine, Tophill, awarded first and second prizes of £2 10*s*.; Rebecca Philip, and G. M. Joseph, Beausejour, awarded third and fourth prizes of £1 10*s*.; J. Cummins, Prospect Hall, and P. Augustine, Harvey Vale, awarded fifth and sixth prizes of £1.

THE INFLUENCE OF RADIOACTIVE SUBSTANCES ON PLANTS.

Work directed toward finding if radioactive substances possess any influence as regards plant growth is being carried out under the direction of the Professor of Botany and Plant Physiology of Melbourne University. At the commencement the investigations were carried out in plots; they received attention on page 183 of the last volume of the *Agricultural News*.

A second account in the *Journal of the Department of Agriculture*, Victoria, for July 1912, states that the experiments have been extended to field trials. In comparing the results with those obtained in the laboratory, it must be remembered that these were obtained by the use of quantities of the radioactive substance impossible to employ on the same scale in the field. Further caution is given that it may not follow that a substance which accelerates germination may be of any further advantage to the plant, and that it is possible that the addition of a radioactive mineral to the soil may affect injuriously the development of useful soil bacteria.

Trials in culture fluids showed that bacteria are able to develop even when large quantities of radioactive mineral are present; but that there is a retarding action, increasing with the length of exposure. It was proved that this influence was actually due to the rays from the mineral, and not to any poisonous substance dissolved from it. There were indications that organisms of the *Bacillus subtilis* type may be more resistant to the rays of a radioactive mineral than are other bacteria.

It appears that, in the presence of bacteria, carbon dioxide and water, the rays from a sufficient quantity of radio-active mineral can cause the formation of small amounts of formaldehyde. This substance was not present because of the action of light, for the cultures were in darkness during the whole of the time. It may possibly be that the retarding action was caused by the formaldehyde, but the amount of this does not seem sufficient to account for the whole of the action.

In the field, trials were devised to see if this retarding action is shown when the mineral is employed in the quantities customary when mineral manures are being given. It seems that such dressings do not produce any distinct action; while enormously heavy dressings actually do reduce the number of soil organisms. Another result obtained was that, in quantities capable of practical application, the radioactive mineral does not affect appreciably the early stages of germination in wheat.

The final conclusion reached is: 'There is nothing, therefore, in these results to show that radioactive mineral is of the least benefit to wheat when applied in the same manner as manure, and the hopes that had been raised by the stimulating action of large quantities upon the early stages of germination, that this substance might be of use in the field, have failed to be established by experiment as regards wheat, at least. Whether results of value may be obtained with other plants is, of course, another question, but the radioactive mineral does not appear to have any direct value for the growth of wheat.'

CACAO CONSUMPTION AND PRODUCTION, 1911.

The *Gordian* has issued recently its final estimate of the production (exports) and consumption of cacao for 1911. This, expressed in long tons and with the figures for 1909 and 1910 for comparison, is as follows:—

THE WORLD'S CACAO CROP.

Countries.	1909. Tons.	1910. Tons.	1911. Tons.
Gold Coast	20,213	22,751	39,726
Ecuador	31,071	35,738	38,883
San Thomé	29,788	36,092	34,453
Brazil	33,290	28,702	34,447
Trinidad	23,025	25,821	20,888
San Domingo	14,586	16,363	19,518
Venezuela	16,585	16,981	17,109
Grenada	5,356	5,755	5,855
Lagos	2,240	2,931	4,401
German Colonies	3,763	4,009	4,335
Ceylon	3,514	4,005	3,016
Fernando Po	2,683	2,312	2,953
Jamaica	3,166	1,716	2,740
Dutch East Indies	2,430	2,539	2,421
Surinam	1,867	2,011	1,570
Hayti	2,089	1,822	1,462
French Colonies	1,351	1,550	1,343
Cuba	1,910	1,390	1,232
St. Lucia	546	731	925
Congo State	757	888	670
Dominica	970	565	568
Colombia	719	292	394
Costa Rica	231	181	338
Other countries	984	984	1,476
Total	203,134	216,129	240,722

THE WORLD'S RAW CACAO CONSUMPTION.

Countries.	1909. Tons.	1910. Tons.	1911. Tons.
United States	52,545	49,529	58,044
Germany	40,089	43,254	50,060
France	22,891	24,676	26,913
United Kingdom	23,885	23,706	24,999
Netherlands	19,084	18,887	23,169
Switzerland	6,580	8,947	9,698
Spain	5,887	5,431	6,279
Austria-Hungary	4,179	4,885	5,821
Belgium	4,932	4,717	5,410
Russia	2,886	3,644	3,986
Italy	1,591	1,857	2,159
Canada	1,156	1,500	2,095
Denmark	1,491	1,576	1,678
Sweden	1,118	1,217	1,524
Australia and New Zealand	692	1,119	1,281
Norway	722	838	1,003
Portugal	209	167	196
Finland	85	104	111
Other countries	1,772	1,969	1,969
Total	191,794	198,023	226,395

GLEANINGS.

The *Jamaica Gazette* for September 5, 1912, notifies for general information that a Bill passed by the Legislature of Jamaica, namely Law 6 of 1912, entitled A Law for the Encouragement of Agricultural Loan Societies, has become law.

It is stated in the *Official Messenger*, St. Petersburg, for September 17, 1912, that the Russian Department of Agriculture has decided to form next year several new experiment stations, to encourage cotton-growing, in Russian Turkestan and the Trans-Caucasus.

Official returns dated September 3, 1912, show that the Japanese rice crop for the present season is estimated at 55,293,945 koku, or 274,257,967 bushels. This is 7 per cent. greater than the crop of last year, and 12·6 per cent. over the average for the past seven years.

The Superintendent of Agriculture, Grenada, states that the next meeting of the Grenada Agricultural and Commercial Society will be held on November 15 at the Botanic Gardens. A guide leaflet will be issued by the Agricultural Department to members for the purpose of showing the chief points of interest in the Gardens.

An Ordinance, No. 9 of 1912, St. Lucia, dated October 12, has been enacted for the purpose of amending the Minor Products Protection Ordinance, 1899. It adds a sub-section to section three of the latter Ordinance, to the effect that, in sections eight, fifty-one and fifty-two of this Ordinance, 'minor products' includes limes and coco-nuts. It may be cited as the Minor Products Protection Ordinance, 1899, Amendment Ordinance, 1912.

The *Bulletin of Agricultural Statistics*, of the International Institute of Agriculture, Rome, for September 1912, states that the condition of the Egyptian cotton crop was excellent, and that the worm had entirely disappeared. The state of the United States cotton crop on August 28 is described as 74·8 per cent. of normal as compared with 73·2 at the same date last year, and with 73·6 per cent.—the average condition on August 25 for the last ten years.

According to *Colonial Reports*—Annual, No. 718, the crop of ground nuts of Gambia in 1911 was the third largest recorded, and as prices were exceptionally high, the value of the crop was easily in excess of that of any previous year. The amount exported was 47,931 tons value £437,472, compared with 58,456 tons valued at £387,943 in 1910. Except for the 'picked nuts', which go to England, most of the product is shipped to France to be crushed in the oil mills.

The report of the Sudan Central Economic Board for last July gives detailed attention to the occurrence in the Sudan of the plant (*Calotropis procera*) yielding Ushar fibre. A sample of the fibre was valued at the Imperial Institute in May 1912 at £24 per ton, with Mexican sisal hemp at the same price. This plant is related to the Madar or Mudar fibre plant of India (*C. gigantea*). *C. procera* has been naturalized in the West Indies, where it is sometimes called French cotton, and the hairs from the seeds are used in decorating fans.

The following appears in a report on a recent examination of candidates for pupil teacherships and of pupil teachers, Grenada, printed in the *Government Gazette* for October 15, 1912: Agriculture: 'This is all theory, and is well done. The answers to the papers on Blackie (1st and 2nd year) disclosed accurate and familiar knowledge of the year's work. The 3rd year standard was higher, and furnished less scope for memory work. Questions on the handling of this or of that product as permanent crops, at any stage, met with poor response.'

Comparison of figures given in *Diplomatic and Consular Reports*, Annual Series, Nos. 4953 and 5969 shows that the exports of cotton from Galveston during 1911 amounted to 3,022,131 bales, while the receipts at Savannah, for the twelve months ending August 31, 1911 were 87,583 bales. The value of the cotton shipped from Galveston was £37,758,219, and was less than that in 1908, namely £35,752,535, although in that year the shipments reached a record amount, being 3,289,354 bales. The total crop of United States Sea Island cotton for the period September 1910 to August 1911 was, as indicated, 87,583 bales, compared with 96,656 bales for the previous season and 101,420 bales for the similar period in 1909.

At a meeting of the Board of Management, Jamaica Agricultural Society, on August 15, 1912, the following resolution (copied from the Journal of that Society) was passed unanimously: 'That in the interests of the fruit growers of the island, this Board hereby asks the Government, in the negotiations for a weekly subsidized service of steamers between Jamaica and the Dominion of Canada, to give special consideration to the claims of those growers, or associations of growers of fruit in this island, who desire to make direct shipments of fruit to the markets of the Dominion, and to include in the term of contract between the two countries provision whereby the growers should always have the preference of the space on the subsidized steamers.'

In *Colonial Reports*—Annual, No. 725, it is shown that the total value of all sea-borne exports from the Gold Coast during 1911 was £3,792,454, against £2,697,706 in 1910, the increase being chiefly due to larger shipments of cacao, gold and specie. The exports of the principal articles during 1911 were as follows: cacao 88,987,324 ℔. value £1,613,468, gold and gold dust 280,060 oz. value £1,057,692, specie value £321,145, rubber 2,668,667 ℔. value £219,447, palm kernels 13,254 tons value £175,891, native timber 13,973,396 cubic feet value £138,821, and palm oil 1,610,209 gallons value £128,916. Increases over the values of the previous year took place in cacao, gold and specie (as has been indicated); in all the other cases mentioned, the exports decreased.

STUDENTS' CORNER.

AGRICULTURAL EXAMINATIONS.

The Preliminary Examination of this year, in connexion with the Courses of Reading of the Imperial Department of Agriculture, was held on Monday, October 28. Three hours were allowed for the written paper, which consisted of thirteen questions, of which not more than nine were to be attempted, and among these either question 11 or 12 had to be included. Simple diagrams were required, for illustrating the answers, and for these additional credit was to be given. The questions set were as follows:—

(1) What gas do green plants give off in quantity, in sunlight? How would you show, by a simple experiment, that they give off this gas?

(2) Give the chief reasons why plants require a supply of water, and state how the water is taken into them.

(3) Describe with sketches, any observations that you have made on germinating seeds.

(4) State the chief reasons for cultivating and tilling the soil, and write a description, with diagrams, of any kind of plough that you have examined.

(5) What is the effect in a soil of a large proportion of (a) clay, (b) sand? How may heavy soils be made lighter?

(6) Give a full account of the way in which any plant that you choose may be budded.

(7) Describe the chief parts of an ordinary leaf, mentioning their uses.

(8) Explain five of the following terms, giving examples where this can be done: (a) abomasum, (b) xylem, (c) radicle, (d) atmospheric pressure, (e) evaporation, (f) stamen, (g) artificial manure, (h) proteid, (k) astragalus, (l) ruminant.

(9) Give a list of the ways in which the amount of nitrogen in the soil is increased, in nature.

(10) Make sketches and describe what is seen when a thin section of a young root is observed under a microscope.

(11) Describe the structure and action of the heart of a mammal, and state the uses of the blood in such an animal.

(12) What organs of a mammal are concerned in digestion? Give a general account of this process.

(13) Write a description of the parts of some common flower, and say how fruits are formed.

Sugar in Argentina.—Argentina has a comparatively temperate climate, but the northern part of it reaches up within the limits of the southern tropic and quite a large cultivation of sugar-cane has been developed. The sugar crop for the current year is estimated at 180,000 long tons and this grown on about 180,000 acres of land producing sugar-cane. The chief seat of sugar production is the Province of Tucuman, where 156,250 acres are reported as being in cane culture. The other provinces of Jujuy, Santa Fe and Misiones are estimated altogether at 23,750 acres in cane cultivation.

In the neighbouring republic of Paraguay there is a sugar factory known as La Azucarera of Terbicuary. This is said to be one of the finest sections of Paraguay, the lands being located on that vast area known as the Chaco, or lowlands. This factory is equipped with modern machinery and has tramway connexion with adjacent cane fields along the river. The factory is located about 100 miles from the federal capital and is one of the most thriving and prosperous regions of Paraguay. (The *Louisiana Planter*, August 24, 1912.)

THE LIME JUICE INDUSTRY OF THE VIRGIN ISLANDS.

The following is taken from a report by the Agricultural Instructor on the lime juice industry of the Virgin Islands, during 1911-12. As with cotton in this Presidency, lime juice is shipped and sold by the Agricultural Department, and this is done on behalf of those who sell the fruit at the Experiment Station, where the juice is extracted and concentrated:—

I have the honour to forward a report on the working of the Lime Purchase Industry for the crop season 1911-12.

Messrs. Gillespie have advised me of the payment by them of the sum of £112 4*s.* 3*d.* the proceeds of the sale of the two last consignments of lime juice; this completes the transaction for the last crop year.

During the period under review, 1,580 gallons of raw and 404 gallons of concentrated juice were shipped to London, the net amount realized from its sale being £150 3*s.* 3*d.* This compares with £140 14*s.* 10*d.*, similar receipts for the year 1910-11.

It is much to be regretted that the climatic conditions last season were so unfavourable; but for this circumstance the export of juice would have been considerably more. There is undoubtedly an awakening of interest in the industry and I think we shall see more rapid advance during the next few years, provided of course that climatic conditions are more suitable.

INCREASED SUGAR PRODUCTION IN THE PHILIPPINES.

An article giving information on this appeared in the *Louisiana Planter* for October 5, 1912, and is reproduced below. It may be mentioned that an account of the sugar industry of Negros, under the old conditions, appeared in the *West Indian Bulletin*, Vol. XI, p. 207.

The increase of Philippine sugar exports from 110,604 tons in 1909 to 183,077 during the fiscal year ending June 30 last, is given additional interest by the reason of the fact that for the first time even a small part of the crop was the output of a modern mill. In the past all sugar produced in the islands being the output of old-style mills has been handicapped in the markets, usually grading 88° or lower and bringing approximately 1c. per lb. less than centrifugal sugars testing 96°.

There was in operation near La Carlota, Occidental Negros, during a portion of the last grinding season, a small mill with a capacity of 150 tons of cane per day. Its product met a strong demand, bringing 4¼c. per lb. at wholesale in Iloilo. Another mill of this type installed near Muntinlupa, Rizal Province, met with similar success. A number of similar mills are now being constructed at other points.

The first large mill in the Philippines has recently been completed on the San José estate in the southern part of the island of Mindoro, but until the next grinding season commences it will only be used for reboiling some of the lower grade article and making marketable sugar from it. On this estate some 800 acres are already in cane and there are about 200 to 500 labourers at work preparing land and planting cane. At the date of the last report, contracts were being let for a similar mill on the San Carlos estate on the north-east coast of the island of Negros.

FUNGUS NOTES.

ILIAU—A CANE DISEASE OF HAWAII.

An interesting account of an endemic cane disease known for some time in Hawaii is published in Bulletin No. 11, Pathological and Physiological Series of the Experiment Station of the Hawaiian Sugar Planters' Association, by H. L. Lyon. The disease appears to be limited to the island mentioned, but some account of it may be of interest in case it should appear locally at any time. It was first described by Cobb in Bulletin 5 of the series already referred to; but he failed to recognize its true cause or to appreciate its economic importance, and Lyon's account is the first to deal with it fully.

Symptoms. The disease is essentially one affecting the leaf sheaths, and the major portion of the damage caused by it is inflicted on the young shoots just emerging from the ground. The name Iliau means 'tight skin', and describes the most conspicuous symptom of the disease which is the cementing of the leaf sheaths into a tight, firm jacket about the stem. This encloses the growing tip so effectively that its elongation is prevented and it is eventually strangled. The leaf sheaths killed by the fungus causing the disease are always pinkish brown in colour, while the infected rind of such canes as have produced any stem is bluish grey. These colours are very constant and afford a means of diagnosing the disease.

Since the young shoots are the parts principally affected, the greatest damage is naturally caused in fields of young cane; while it has been observed that plant canes are always attacked more severely than are ratoons. The development of the fungus is favoured by cool, damp weather which checks the growth of the cane, and the amount of harm done varies according to the incidence and continuation of such weather. If it begins when the shoots are young and endures for some time, the fungus, which is always present in cane fields in Hawaii, obtains a good hold and may destroy nearly all the shoots in a stool. Moreover, it is also natural that the disease should be more severe on fields at a high elevation or with a northerly aspect than on those lying low and facing south. Shoots weakened by any other cause than those already mentioned are also more liable to the disease than are healthy shoots. Usually under normal conditions in Hawaii a certain number of shoots grow away from the fungus and only the later secondary shoots are killed. Their death, when they are only about 10 inches long, does not give a field any very diseased appearance, especially as the main shoots are healthy, and the presence of the disease may be hardly manifest except inasmuch as it causes a poor initial stand of cane. At the same time the damage inflicted is considerable. Only when the primary shoots are killed out by the disease does it become conspicuous, and only then is it usually noted on the plantations.

The fungus generally commences its attack on the leaf sheaths of young shoots at a point below the surface of the soil. It then progresses upwards and inwards from leaf sheath to leaf sheath, and finally into the stem. The fungus thus penetrates the compact roll of young leaf sheaths surrounding the growing point and cements them together in a firm jacket; consequently the growing point is killed, often long before the mycelium of the fungus has reached it. Frequently, the stems of young shoots severely attacked are found, when the shoots are split open, to be variously twisted and doubled in their attempts to elongate. Sometimes the bending of the stem splits the leaf sheaths longitudinally and a loop of stem is forced through. The fungus can penetrate the stem, which it enters usually by way of the leaf bases, but it can attack directly where the tissues are soft. Hardening of the stem tissues checks the progress of the mycelium.

Often if a young infected shoot elongates rapidly before the fungus has had time to cement the leaf sheaths into an entirely closed jacket, very little harm is done to it, beyond the destruction of a few basal leaf sheaths and perhaps the scarring of one or two of the bottom internodes. Very rarely, badly attacked shoots recover and make good growth above the point of infestation, but such are liable to break at the base owing to the damage caused to the lower joints, one or two of which are always shrivelled and blackened.

The disease is due to a fungus present almost universally in the soils of the Hawaiian fields and the extent of the damage due to it depends as already stated largely on conditions that tend to check the growth of the cane. Thus the harm inflicted varies in a manner very similar to that caused by the root disease due to *Marasmius sacchari* in these islands, and the lines of treatment of the two are also similar, as will appear below. Part of the damage actually caused by iliau in preventing the formation of a good stand by the destruction of secondary shoots was formerly attributed to the Ithyphallus said to cause root disease in Hawaii (see *Agricultural News*, Vols. VIII, p. 315; IX, 159).

The causative fungus. In one stage, this is an undescribed species of Melanconium very similar in certain of its gross characters to *Melanconium sacchari*, but differing materially in the size and shape of its spores and in other characters. Moreover its complete or ascus-bearing fructifications have been found on the outermost leaf sheaths of dead or very badly diseased canes. These belong to the genus Gnomonia, and as the species is undescribed it has been called *Gnomonia iliau*.

The fungus produces a white cottony mycelium, which under suitable conditions of cultivation gives rise to cups in which are formed spherical black masses of Melanconium spores. These spores are dark-coloured under the microscope and are filled with dense granules; usually, they are one-celled but occasionally they may be divided into two by a cross wall. In nature they are formed between the leaf sheaths of the cane or on the stem itself, where it is enveloped by leaf sheaths, but not on the outside of the sheaths. They are thus rarely disseminated by wind, but are more usually liberated and dispersed by water, since when the compact mass of leaves is wetted, the individual sheaths fall apart and the spores are set free. This usually occurs in the field when the diseased or dead stems are lying on or in the soil. Another fact which suggests that the spores are usually water-borne is that they will not germinate readily in water. The Melanconium spores and the mycelium on the leaf sheaths are, therefore, probably the means by which infection usually occurs, since it commences below the surface of the soil. The spores of the Gnomonia stage, however, being produced on the outside of the sheaths, are probably wind-borne, and serve to extend the area of the disease.

Remedial measures. The most perfect means of control would be to obtain an entirely resistant variety of cane; such is, however, not yet known. The standard Hawaiian canes appear to be all equally susceptible, but the Demerara seedlings grown there have proved partly resistant.

The only measures at present known for controlling iliau are preventive. Since the Melanconium spores and the mycelium are rapidly killed by sunlight, good preparatory cultivation, resulting in a frequent stirring of the soil and the exposure of much of the spores and mycelium, is beneficial in checking the disease; while it also encourages the growth of the cane and enables it to outgrow the fungus. Early planting is another useful measure, as it enables the cane to make a vigorous growth before the cold, damp weather sets in, and thus to form shoots too tall to be badly damaged by the fungus when it begins to develop. It is also stated that the recovery of the cane after an epidemic will be assisted by the removal and burning of dead and dying shoots, through affording the new and healthy shoots more light and air. Finally the soil should be well worked over after the removal of the crop, to ensure the destruction of the large number of Melanconium spores formed on those parts of the cane stools below the surface of the soil.

THE WEST INDIES AND THE CANADIAN NATIONAL EXHIBITION, 1912.

A letter received from Messrs. Pickford and Black states that the West Indian exhibit at the recent Canadian National Exhibition held at Toronto occupied a floor space of 3,200 square feet and attracted a very great amount of attention. Most of this space—nearly three quarters of it—was occupied by exhibits from Jamaica, so that the area used for the Windward and Leeward Islands was small in comparison. A united exhibit from the West Indies was not shown, on account of the circumstance that the material sent from Dominica and Montserrat was not placed in the space mentioned above, but in the Horticultural Building. The larger exhibit from the West Indies was visited by His Royal Highness The Duke of Connaught, who expressed himself as astonished at the variety of what was to be seen.

It is stated by Messrs. Pickford and Black that a permanent space of 5,000 feet has been allotted for exhibits from the West Indies. This is situated in the new Government Building, which is the first building inside the main entrance of the exhibition grounds. The possession of this, by continued and efficient representation at the exhibition, is a matter of importance for the West Indies. It may be said in passing that Messrs. Pickford and Black speak highly of the material sent on this occasion from Jamaica.

Mr. Lewis W. Clemens, President of the Canadian Travel Club, writes to emphasize the importance of continuous and united representation of the West Indies at the Exhibition, and in so doing gives evidence of appreciation on many sides, of the last West Indian exhibits.

The Toronto *Globe* refers to the exhibits from the West Indies in the north wing of the Government Building, under the charge of Mr. C. S. Pickford, of Halifax, and Mr. E. J. Wortley of Jamaica, as a unique display. The efforts of Jamaica to attract tourists from Canada, and of the St. Vincent Arrowroot Growers' and Exporters' Association to increase the interest in their product, in that country, seem to have drawn some of the greatest attention. The useful and attractive nature of the Jamaica exhibits is also attested in an article in the Toronto *Daily Star*. Similar appreciation is expressed in the Toronto *Mail and Empire*.

Suggestions useful in the West Indies for further work in connexion with such exhibitions are given in the *Canada West India Magazine* for September 1912. They amount to the following: (1) continuous representation of the different parts of the West Indies and of British Guiana, year by year; (2) the employment of the most modern methods of display; and (3) the use of enlarged photographs, such enlargements being easily obtainable in Canada, if not in the West Indies. Another article in that periodical describes the display of the exhibits from Dominica and Montserrat, which was in the charge of the Canadian West Indian League; and this appears to have been particularly effective. A feature worthy of imitation in connexion with this was the sending of invitations to visit the booth, to leading merchants and prominent private citizens.

COTTON AND TOBACCO IN NYASALAND.

In spite of the exceedingly unfavourable climatic conditions of the year for cotton, the value of produce exported shows an increase of 2·35 per cent. on last year's figures; this increase (which bears no comparison with the largely increased area under cultivation) was due to the comparative success of tobacco, which thanks to the unusually cold and wet weather prevailing from April to August, could be planted up much later than usual and gave large crops, though the quality suffered.

Four thousand five hundred and seven acres were planted with tobacco, as compared with 3,274 acres in 1910-11. Two million one hundred and forty-six thousand six hundred and fifteen pounds of cured tobacco were exported, an increase of 441,978 lb. over the preceding year's figures; the increase in the local value of the total crop was £11,062 18*s.* 3*d.*

Off 23,332 acres under cultivation on Europeans' estates, cotton to a value of £44,098 11*s.* 6*d.* only was produced as against £58,687 5*s.* 10*d.* off 12,752 acres in the preceding year. Considering the adverse conditions indicated by these figures it is extremely satisfactory to note an increase of 408 bales in the native cotton crop.

The export of native-grown cotton has increased from 196 bales containing 400 lb. lint each in 1908-9 to 1,454 such bales in 1911-12.

The prospects for the 1912 harvest are good for cotton and poor for tobacco, and it is unfortunate that the past year's experience has led to a decrease of the acreage under the former crop and a corresponding increase under the latter. The two crops are admirably calculated to balance each other, the one being as much benefited by an excessive rain as the other is injured by it, while a normal year should produce good crops from both. Tobacco needs less labour than cotton and is of the two perhaps the crop less liable to complete failure, and it is possible that it will ultimately take first place as the European's standard crop in this country. Among natives, on the other hand, the cotton industry is every year obtaining a firmer hold and nothing but a very heavy fall in the price of cotton is now likely seriously to check it. The product is suited as few others could be to the native's present stage of development, and though he has yet much to learn as to its cultivation and grading, he can produce an excellent quality of cotton in quantities which pay him well. The system of cotton markets now being instituted by the Government in the principal native cotton districts will promote competition and secure for the native the best prices for his produce; it is hoped that the more marked correspondence of price to quality which is bound to follow competitive buying in open markets will teach the native to pay more attention to grading his cotton—work which at present has to be done at the ginneries at greater expense, and, probably, less thoroughly than the native producer himself could do it. (From *Colonial Reports*—Annual, No. 732; October 1912.)

MARKET REPORTS.

London.—The West India Committee Circular, October 22, 1912.

Arrowroot—$3\frac{3}{4}$*d.* to $4\frac{3}{4}$*d.*
Balata—Sheet, 3/3; block, 2/2 per lb.
Beeswax—No quotations.
Cacao—Trinidad, 72/- to 82/- per cwt.; Grenada, 57/- to 65/-; Jamaica, no quotations.
Coffee—Jamaica, No quotations.
Copra—West Indian, £27 10*s.* per ton.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 17*d.* to 18*d.*
Fruit—No quotations.
Fustic—No quotations.
Ginger—Quiet.
Isinglass—No quotations.
Honey—No quotations.
Lime Juice—Raw, 9*d.* to 1/; concentrated, £18 15*s.* to £19; otto of limes (hand-pressed), 7/6 to 7/9.
Logwood—No quotations.
Mace—2/- to 2/6.
Nutmegs—8*d.* to 10*d.*
Pimento—No quotations.
Rubber—Para, fine hard, 4/7; fine soft, 4/3; Castilloa, 4/ per lb.
Rum—Jamaica, 2/1 to 6/-.
Sugar—Crystals, 15/9 to 20/6; Muscovado, no quotations; Syrup, 11/6 to 12/3; Molasses, no quotations.

New York.—Messrs. Gillespie Bros. & Co., October 18, 1912.

Cacao—Caracas, $15\frac{1}{4}$c. to $15\frac{1}{2}$c.; Grenada, $14\frac{1}{4}$c. to $14\frac{3}{4}$c. Trinidad, 15c. to $15\frac{1}{4}$c. per lb.; Jamaica, $11\frac{1}{2}$c. to $12\frac{1}{2}$c.
Coco-nuts—Jamaica, select, \$38·00 to \$39·00; culls, \$22·00 to \$23·00; Trinidad, select, \$38·00 to \$39·00; culls, \$22 to \$23 per M.
Coffee—Jamaica, $15\frac{3}{8}$c. to $17\frac{1}{4}$c. per lb.
Ginger—$8\frac{3}{4}$c. to $12\frac{1}{4}$c. per lb.
Goat Skins—Jamaica, 50c.; Antigua and Barbados, 46c. to 48c.; St. Thomas and St. Kitts, 43c. to 45c. per lb.
Grape Fruit—Jamaica, no quotations.
Limes—\$4·50 to \$5·00.
Mace—50c. to 57c. per lb.
Nutmegs—110's, $15\frac{3}{4}$c.
Oranges—Jamaica, no quotations.
Pimento—$4\frac{1}{4}$c. per lb.
Sugar—Centrifugals, 96°, 4·11c. per lb.; Muscovados, 89°, 3·61c.; Molasses, 89°, 3·36c. per lb., all duty paid

Trinidad,—Messrs. Gordon, Grant & Co., October 28, 1912.

Cacao—Venezuelan, \$15·50 per fanega; Trinidad, \$14·75 to \$15·50.
Coco-nut Oil—99c. per Imperial gallon.
Coffee—Venezuelan, 16c. to $16\frac{1}{2}$c. per lb.
Copra—\$4·65 per 100 lb.
Dhal—\$4·50.
Onions—\$1·75 to \$3·00 per 100 lb.
Peas, Split—\$5·50 per bag.
Potatoes—English, \$1·75 to \$2·00 per 100 lb.
Rice—Yellow, \$4·80; White, \$6·25 to \$6·35 per bag.
Sugar—American crushed, no quotations.

Barbados,—Messrs. James A. Lynch & Co., Ltd., November 2, 1912; Messrs. T. S. Garraway & Co., November 4, 1912.

Arrowroot—\$7·50 to \$8·75 per 100 lb.
Cacao—\$13·00 to \$14·00 per 100 lb.
Coco-nuts—\$20·00.
Hay—\$1·60 to \$1·80 per 100 lb.
Manures—Nitrate of soda, \$65·00; Cacao manure, \$45·00 to \$48·00; Sulphate of ammonia, \$80·00 to \$85·00 per ton.
Molasses—No quotations.
Onions—\$2·20 to \$4·00 per 100 lb.
Peas, Split—\$6·50 per bag of 210 lb.; Canada, \$3·00 to \$4·90 per bag of 120 lb.
Potatoes—Nova Scotia, \$3·50 to \$3·75 per 160 lb.
Rice—Ballam, \$5·20 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
Sugar—American granulated, \$5·00 per 100 lb.

British Guiana.—Messrs. Wieting & Richter, October 26, 1912; Messrs. Sandbach, Parker & Co., October 25, 1912.

Articles.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	—	—
Balata—Venezuela block	No quotation	Prohibited
Demerara sheet	70c. per lb.	—
Cacao—Native	17c. per lb.	18c. per lb.
Cassava—	\$1·00.	No quotation
Cassava Starch—	\$7·50 to \$8·00	No quotation
Coco-nuts—	\$16 to \$20 per M.	\$10 to \$16 per M., peeled and selected
Coffee—Creole	20c. per lb.	20c. per lb.
Jamaica and Rio	20c. per lb.	$20\frac{1}{2}$c. per lb.
Liberian	17c. per lb.	15c. per lb.
Dhal—	\$4·50 to \$4·60 per bag of 168 lb.	\$4·80
Green Dhal	\$5·25	—
Eddoes—	60c. to 80c.	—
Molasses—Yellow	None	—
Onions—Teneriffe	—	—
Madeira	5c. per lb.	5c.
Peas—Split	\$6·25 to \$7·00 per bag (210 lb.)	\$7·50 per bag (210 lb.)
Marseilles	—	No quotation
Plantains—	16c. to 48c.	—
Potatoes—Nova Scotia	—	—
Lisbon	\$2·00 to \$2·25	No quotation
Potatoes—Sweet, B'bados	\$2·64 per bag	—
Rice—Ballam	No quotation	—
Creole	\$5·00 to \$5·25	\$5·00 to \$5·25
Tannias—	\$1·68	—
Yams—White	\$2·64	—
Buck	\$2·40	—
Sugar—Dark crystals	\$3·15 to \$3·20	\$3·20
Yellow	\$4·00	\$4·00 to \$4·25
White	—	—
Molasses	\$2·80	—
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	No quotation.

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Seedling Canes and Manurial Experiments at Barbados,
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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,
in 1902-3, No. 30 price 4*d*.; in 1903-4, No. 36, price 4*d*.;
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AGRICULTURAL NEWS

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CONTENTS.

Some Conditions Influencing Soil Nitrification.

FULL RECOGNITION is now given by the agriculturist to the importance of the causes that operate in the transformation of the nitrogen compounds in the soil into forms that can be taken up directly by green plants. These causes are concerned intimately with bacterial life: the work is divided between different kinds of these organisms, and each kind takes its definite part in the process: the putrefactive bacteria bring about the formation of compounds of ammonia from the more complex nitrogenous substances in the soil, and the subsequent successive changes into nitrites and nitrates complete the process that is usually termed nitrification. It is evident that one of the cares of the agriculturist is to determine the conditions required for the most efficient action of this important process, and much work in this direction has been done in recent years. It is the present intention to summarize the results of investigations* of the matter that have been carried out in some detail in Australia

The experiments were designed to gain further information regarding two matters: the influence of moisture on nitrification in soils, and the influence of chalk (calcium carbonate) and other substances in the same way. For the former, two sets of experiments were devised. In one, the different proportions of water in the soil were ten to seventy per cent., advancing by tens, of its total water-holding capacity; in the other, they were ten, twenty, thirty, fifty, seventy and ninety per cent. of the same quantity Where the former proportions were used, the soil, having been treated with a standard solution of ammonium sulphate and aërated regularly, was found to show a rate of nitrification that did not vary to any great extent where the percentages of water were between forty and seventy; while at ten per cent. there was practically no nitrification, and at twenty per cent. it had been greatly reduced. A sandy soil was used in this case, and in the second set of experiments to determine the influence of moisture, the work was conducted with a clay soil as well. Here, the former results with the sandy soil were confirmed, and the additional conclusion was reached that when

* The *Journal of the Department of Agriculture of Victoria*, Vol. X, 1912, pp. 275 and 393

the percentage of water is as much as ninety, there is little nitrification, probably because of the large occupation of the air spaces of the soil by water. The greater ability of the clay soil to hold water caused this to show a smaller range of good nitrification in relation to the percentages of water present: at the same time the process took place more actively in the clay than in the sandy soil.

In the investigation concerning the effect of chalk and other substances on nitrification, the experiments were conducted with a sandy soil deficient in lime, in the same way as those in the trials with varying amounts of water. It was found that chalk, of all the substances tried, was favourable to the process to the greatest extent, and that it exerted its helpful action soonest. Burnt lime practically caused nitrification to cease; its harmful effect was greatest where most of it was used. The process was hastened to a much smaller extent by gypsum. Magnesium carbonate was similar in its effects to chalk: while superphosphate of lime and iron (ferric) chloride were favourable, though the action of the iron salt was slow. Starch and sugar caused denitrification at first, and nitrification was recommenced soonest where sugar was present: the action of the sugar is parallel with that of molasses in soils manured with sodium nitrate. Common salt and citric acid proved to be quite inimical to nitrification.

The investigation is of practical value in that it shows or confirms that: excessive drying or wetting of soils retards nitrification; the surface cultivation of fallow land may be all the more valuable in that the water which it helps to conserve is caused to be present in amounts favouring nitrification: a growing crop may reduce the amount of nitrates for the next crop in two ways: by the simple removal of nitrates in the produce, and by drying the land to such an extent that subsequent nitrification is greatly retarded: and that, where it can be done, a single flooding of fallow land, when the rainfall is low, may increase usefully the fertility of the soil.

There are other practical conclusions also to be reached, in relation to the treatment or state of the soil. Calcium carbonate is useful and prompt in its action, as a soil dressing to promote nitrification: while burnt lime may be employed for the same purpose but with caution—not near the time of sowing or during the growing of the crop, and in smaller quantities than chalk. Magnesium carbonate, gypsum and superphosphate of lime are favourable to nitrification; and the same is true of red and brown soils, on account of the iron that they contain. Salt is among the substances that delay nitrification. Lastly, the process is influenced very unfavourably in sour soils, and the application of undried green dressings, or of fresh stable manure to wet soils may be expected to reduce for a time the amount of nitrates present.

SUGAR INDUSTRY.

DISTANCE OF CANE-PLANTING.

The following is taken from the Second Annual Report of the Porto Rico Experiment Station, 1911-12:—

All the plantings were made in furrows, the width between rows varying as well as the distance between the seed in the row. The object of the planting was to determine the proper distance between rows, between seed in the row, and to determine the value of group planting, as against continuous planting. Each plot is approximately $\frac{1}{4}$-acre.

It is seen from the above table [not reproduced] that the cane in the close planting contained less sugar than that from wide planting and that the cane was less mature, nevertheless there is a very great difference in final results in favour of the close planting. In fact there is but one case in which there was no increase in yield from close planting, and this in a total of seventeen experiments. The soil where the 4-foot rows are planted was apparently in better physical condition than that where the 6-foot rows were planted, and this may account for a part of the difference in yield; nevertheless after taking this into account there is a marked difference in favour of close planting.

A great many observations have been made, not only at this Station, but also in plantations where experiments were made in distance planting, of the apparent rate of growth of cane, and almost without exception cane planted close grows faster and develops faster than where planted wide apart. At three months from planting there is generally a difference of 1 or 2 feet in the height of the cane, and the close planting seems greener and more thrifty. This is contrary to the usual opinion among Porto Ricans. They are inclined to the opinion that where cane is planted very wide the individual stalks will develop faster and stronger than the thickly planted cane, and owing to the fact that the individual canes have more room for root and leaf development. The true explanation of the observed fact seems to be that where there is a heavy stand of young cane it forms a protection against the wind, against the cold, and against the trying effects of the sun. An added advantage is that the cane soon covers and shades the ground, preventing the evaporation of moisture, and the development of weeds and grasses. Cultivation, therefore, becomes much less expensive.

These results and observations are quite in accord with those of other cane-growing countries. In Hawaii rows are usually placed 5 feet apart and the cane planted continuous in the furrow.

In Louisiana Dr. W. C. Stubbs made experiments similar to those enumerated above and gives his conclusions in Bulletin No. 14, Second Series. He says (p. 365): 'The above shows conclusively that there is nothing gained on the tonnage or sugar content by very wide rows and suggests the propriety of narrowing them to a distance that will permit of the best cultivation. It may be added that the narrow rows, by the increased amount of foliage, were, we believe, better protected from cold. They were necessarily cultivated very little.'

These experiments were repeated for several years and finally in 1894 Dr. Stubbs says: 'So strong have been the teachings of these experiments, that the station has begun the practice of narrowing all the rows of cane, and is giving the minimum width which will permit of easy culture with two-horse cultivators and ploughs. This width has been found to be about 5 feet.'

Boname says that the width between rows in Guadeloupe varies from 4½ to 5 feet (see *Revista Industrial y Agricola de Tucuman*, July 1911, p. 73).

At the Porto Rico Experiment Station of the United States Government, at Mayaguez, Dr. May reports in Bulletin No. 9 the results of experiments in distance planting.

The conclusion arrived at from the experiments was: 'that in every instance the narrow planting gave the largest yield not only for the plant cane, but for the ratoons.'

In Cuba it is well known that cane is planted at much greater distance than in Porto Rico, and some years ago wide planting was advocated and adopted by many. In 1904 the Cuban Station began some experiments to determine this question. The experiments were made on poor land and the results in favour of close planting were undoubtedly more pronounced than would have been the case had the soil been rich. The results are summed up in the *Segundo Informe* in 1909 as follows: 'The experiments heretofore described have proved that in the soils of this Station wide distance planting is not remunerative. In fact from personal observations of the writer he is persuaded that in general cane is planted too wide in Cuba. In the case of virgin or very rich soils where cane will ratoon many years it is possible that there would be little difference in the final results whether one planted close or wide, since in a few years the cane would fill up the spaces between the rows, but in those fields where the cane is planted every few years the distance between rows should be short in order to obtain a large number of canes the first year. The reason why a field of wide planting does not yield so large a crop the first year as one of close planting, is that the former does not yield a sufficient number of canes the first year. This is apart from the fact that both cultivation and conservation of moisture demand close planting in poor soils.'

SUGAR IN FORMOSA, 1911.

The following information regarding sugar (which is the chief product of the island) in Formosa is taken from *Diplomatic and Consular Reports*, No. 4996 Annual Series, issued in September last:—

The quantity of sugar manufactured in the season 1911, that is, from November 1910 to October 1911, was close on 269,048 tons, or considerably in excess of the estimated production of 244,048 tons to 255,952 tons. The weights of the various kinds were as follows: centrifugal, 192,501 tons; brown, 76,273 tons; black, 214 tons.

While centrifugal sugar was well up to the estimate of 184,524 to 196,429 tons, the production of brown greatly exceeded the estimate of only 59,524 tons; of the total production of centrifugal, 98,153 tons were used for refining in Japan, leaving a balance of 94,347 tons for local consumption and export.

The total quantity exported during the year 1911 (January to December) to Japan and abroad was 242,800 tons, an increase of over 50,000 tons on the export of 1910.

The present estimate of the Sugar Bureau for 1912 of the Formosan Government is: centrifugal, 150,300 tons; brown 24,950 tons.

This estimate may be taken as representing fairly correctly the actual output, as the crushing must now have been completed.

About 8,929 tons of browns will remain in France for direct consumption.

Some 15,800 tons have been exported, including shipments to Vancouver, Liverpool, Calcutta and Bombay.

At the close of the year 1911 there were seventeen companies owning thirty-two modern style mills with a total crushing capacity of 24,450 tons of cane per day. Of these mills, eleven with a total crushing power of 7,200 tons commenced working in the 1912 season. The total paid-up capital of these companies was £4,083,000 with power to increase it to £8,575,000.

WEST INDIAN SUGAR-CANES IN QUEENSLAND.

Near the commencement of the Annual Report of the Bureau of Sugar Experiment Stations, Queensland, 1911, work is described in a first ratoon experiment with six Queensland canes, Mauritius Malagache and B.147; it is stated in this that B.147 gave the best results in the series: it proved to be a promising variety, and remained healthy.

Tables follow, giving analyses of the juice and of the canes at different periods of their growth; in the final examination, after the canes had been growing twelve months B.147 gave: sucrose in juice 20·01, glucose in juice 0·41, purity 93·5. The best crop results were shown by this cane which gave 46·2 tons of canes per acre, for the crop of 1911. In the crops 1910-11 this cane was only inferior, among those tried, to Mauritius Malagache, giving in the plant crop 51·0 tons of cane per acre, and in the first ratoon crop 46·2 tons, making a total of 97·2 tons per acre for the two crops. The similar figures for the Mauritius Malagache were 69·2, 42·0 and 111·2.

A succeeding portion of the report deals with experiments with miscellaneous canes, stating that B.208 had been reintroduced for trial. A plot of D.1135 was planted as a control, and the treatment of this will be brought into line with that of the other canes. A preliminary analysis of the miscellaneous canes, conducted in August 1911, showed that B.208 occupied the first position, after seventeen months' growth, with the following: sucrose in juice 20·53, glucose in juice 0·31, and purity 97·2.

In a list of canes introduced at the Mackay Sugar Experiment Station since its inception, T.60 is mentioned as having been retained for experiment, while T.83, T.202 and T.205 have been discarded . Further, B.208 was discarded, but has been reintroduced from Herbert River and is again under examination, as has been indicated. When a cane is discarded it means that it has been ploughed out because of disease, or because of its worthlessness under the conditions as a cane or sugar producer.

Finally, a table giving a list of canes at present under examination includes B.147, B.208 and D.1135—matters that may have been concluded from what has been said above.

FRUITS AND FRUIT TREES.

LIME CULTIVATION IN MARTINIQUE.

Page 196 of the last volume of the *Agricultural News* contained information regarding lime cultivation in Martinique, and an opportunity to add to this has arisen through the publication, in answer to an enquiry: of a letter from the President of the Chamber of Commerce of that island, in *L'Expansion Coloniale* for October 1912.

The letter states that the cultivation of the lime in Martinique is little developed, so far, although numerous plants exist in the Colony. It may be asserted that there is no small holding in the country districts that does not possess one or more plants near the house, and the total crop from these might be reckoned at over 3,000,000 lb., having a value of a figure approaching £25,000. Actually, some of these fruits are used for household consumption, and the rest have been lost so far.

The Chamber of Commerce has paid attention to the possibility of recovering part of the wasted fruit, but success in this direction is not expected. The idea has been useful, however, in that the owner of a recently planted lime cultivation proposes to buy fruit from this source until his own trees are in bearing. This planter intends to manufacture citrate of lime.

It is thought that this good beginning will certainly draw attention in Martinique to the profits that may be made out of the lime, and there exists the probability that the example will be followed and that small citrate factories will be established in different parts of the island.

As is indicated above, however, the actual value of the production is small, but it is hoped that the situation will change. It was pointed out in the article mentioned, in the *Agricultural News*, that trials of lime cultivation have been made during the past two or three years, and the latter states that in this time several proprietors have commenced lime-growing on areas estimated at about 250 acres.

The letter concludes by prophesying an extension of the cultivation in Martinique, in one case under the auspices of a French company, provided that the present prices for lime products are maintained: and points out that areas of land exist in the island that are specially suitable for the growing of limes.

SOME INTERESTING PLANTS IN DOMINICA.

The following notes on three interesting plants growing in the Dominica Botanic gardens have been sent by Mr. J. Jones, the Curator:—

RAPHIA VINIFERA. In September 1893, the Dominica Botanic Gardens received from the Director, Royal Gardens, Kew, 200 seeds of *Raphia vinifera*, the Wine Palm of Lagos. A considerable number of plants was raised and distributed, and an avenue was formed in the Botanic Gardens of plants of this species. During the course of years these have developed into medium-sized palms, having leaves of from 6 to 8 feet or more in length with spiny leaflets. The largest specimens have recently fruited. Their large spadices with imbricated shining fruits have attracted a good deal of attention.

Raphia vinifera, also known as the Bamboo Palm, is very common on the low-lying lands of Lagos. The stem, leaves and fruit are used for many purposes by the natives of that region, and it is also the source of African bass fibre.

COLVILLEA RACEMOSA. This plant, which is an interesting ornamental tree of Madagascar, is now in flower in the Dominica Botanic Gardens for the first time. It belongs to the Natural Order Leguminosae and its genus is nearly related to the genus Caesalpinia. The *Treasury of Botany* records: '*C. racemosa* is a beautiful tree which attains a height of 40 or 50 feet and is furnished with elegant fern-like leaves. The beautiful scarlet flowers are in dense racemes which arise from the axils of the upper leaves, and are either simple or branched, and about a foot and a half in length. The pod is straight, about 6 inches long, containing a number of seeds. The genus bears the name of Sir Charles Colville, once Governor of the Mauritius.'

MELOCANNA BAMBUSOIDES The Superintendent of the Royal Botanic Gardens, Calcutta, recently presented to the Dominica Botanic Gardens five seeds of *Melocanna bambusoides*, of which two germinated and are growing well.

In the *Dictionary of the Economic Products of India* this species is described as: 'a tall bamboo with stem from 50 to 70 feet long and from 12 to 13 inches in girth. It is the common gregarious bamboo of the Chittagong hills. The fruit is large, pear-shaped, 3 to 5 inches long and edible.'

It is further stated that the wood is of good quality, durable and largely used for house-building, mat-making, etc.

It would be interesting to learn if this is the first introduction of the species into the West Indies, or whether it is already established in the older Botanic Gardens existing in Trinidad, Jamaica and British Guiana.

OIL AND OIL SEED TRADE OF MARSEILLES, 1911.

The Consul-General in his report on the Trade of the Consular District of Marseilles, states that during the year 1911 Marseilles maintained its position as a great producing centre of seed oils.

OILS AND OIL SEEDS. The total imports of oil seeds during 1911 amounted to 643,634 tons, as against 665,680 tons in 1910, 596,156 tons in 1909 and 465,849 tons in 1908, and were composed as follows:—

	Tons.
Ground nuts:—	
Shelled	200,000
Unshelled	140,000
Copra	173,000
Sesame	80,000

Except for a diminution of 10,000 tons in sesame, these amounts are much the same as in 1910.

Conditions were on the whole favourable to the oil-seed crushing industry. Sesame and ground nut oils and oil cake sold well during the year, while there was an increased demand for concrete (copra and coco-nut butter) oils owing to the continued high price of lard.

Another large copra crushing concern is setting up a plant for the refining of coco-nut oil, which will bring the number of important manufacturers up to four, besides other smaller concerns. This product seems to find more and more favour with the French public, and the exports from Marseilles to the United Kingdom and the North of Europe, as well as to Egypt and the Levant, are very considerable—275,000 tons. The quantity of oil produced seems to have sufficed for local consumption, for imports of cotton-seed oil fell off still further and were comparatively insignificant, amounting only to 4,750 tons of American and 1,330 tons of British oil, all for edible purposes. A noticeable feature of the Marseilles oil trade is the increase in the use of refined low-grade ground nut oil, formerly used only for soap-making without any refining.

These oils undergo two processes after the crushing of the seed. The low grade of oil extracted from decorticated ground nuts is first of all neutralized, i.e., the free fatty acids are eliminated and then the neutralized oil is deodorised and a quite palatable oil obtained. The residue of fatty acids from the neutralizing process is used for soap-making. Probably some 30,000 tons of soap-making ground nut oil was diverted from the soap kettles and neutralized during 1911.

Cotton seed oil seems no longer to play a part in the Marseilles market. The increase in the duty, dating back to the beginning of 1910, together with the ever increasing world's consumption of cotton seed oil and the enormous quantities of other oil seeds available for producing similar oils, would seem to have almost entirely eliminated cotton oil from the Marseilles market. The protective duty on the oil has, it is true, encouraged French crushers to develop more fully the crushing of cotton seed, but owing to the greater facilities found in the North of Europe for the disposal of the cake which forms a large percentage of the products obtained (85 per cent. cake and 15 per cent. oil), it is the northern crushers who have profited most by the new conditions; very little cotton seed oil is being crushed in Marseilles.

The northern crushers at times are able to sell small quantities of their oil in Marseilles and in the South of France. The quality is fairly good.

The prospects for 1912 are less favourable. From China it has been difficult to procure supplies of sesame and ground nuts, as owing to the disturbed conditions prevailing, shippers have exercised great caution in their dealings with native firms. In India, especially in the Bombay Province, the harvests have been poor. For these reasons the price of oil seeds has risen so high that little profit can be made out of them.

This shortage has stimulated the demand for unshelled ground nuts, and in view of this it is fortunate that there is promise of an excellent crop from the Madras Province, where the area under cultivation has been largely increased in recent years. It is estimated that probably about 175,000 tons of decorticated ground nuts will be received here during the year

From West Africa the reports are so far satisfactory, and the yield of crops and the exports will probably be about the same as last year. Unfortunately, speculations early in the year (1912) caused a sharp rise in price, which may hamper the oil industry to a certain extent.

OIL CAKE. The production of oil cake was about the same as in 1910 (312,000 tons as against 317,000 tons).

The following table shows the amounts of the different kinds of oil cake, together with their prices:—

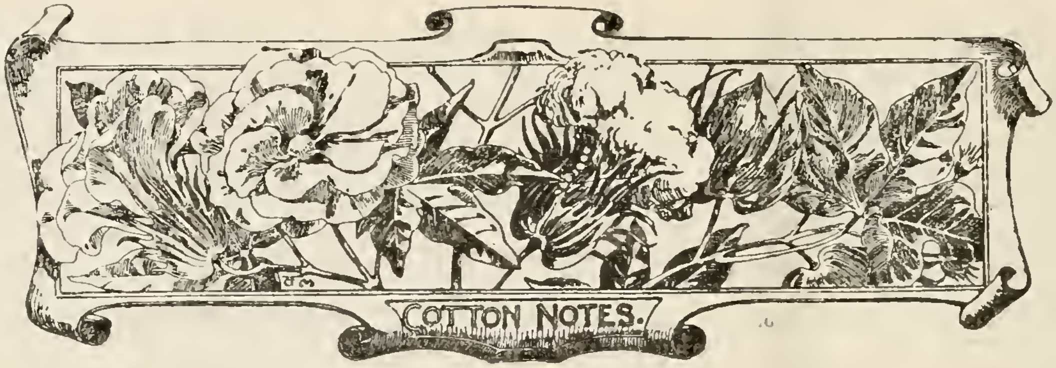
	Quantity, tons.	Prices per cwt. s. d.		per cwt. s. d.
White Levant sesame	5,000	5 8	to	7 6
Indian sesame	45,000	4 3		5 8
Shelled ground nuts	120,000	4 11		7 8
Unshelled ground nuts	56,000	5 8		7 10
Linseed	6,000	7 10		8 0
Egyptian cotton seed	8,000	5 4		6 1
Castor oil	9,800	1 7		4 1
Copra	64,000	4 3		7 1
Palm oil	1,200	5 0		5 8

IMPORTS OF OIL SEEDS

For the First Five Months of 1912.

Articles.	From India, tons.	From China, tons.	From West Africa, tons.	Total (from all parts), tons.
Ground nuts:—				
Shelled	171,274	8,912	893	181,079
Unshelled	6,128	190	76,508	86,086
Sesame	12,423	160	1,534	14,259
Linseed	5,630	—	—	7,210
Colza	1,205	—	—	1,205
Castor oil seeds	8,061	—	—	8,770
Copra, mowra, etc.	—	—	—	71,694
Total	—	—	—	379,303

During the same period the total amount of oils of all kinds exported from Marseilles amounted to a little over 34,000 tons. (From the *Monthly Magazine*, Incorporated Chamber of Commerce of Liverpool, October 1912.)



WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date November 4, with reference to the sales of West Indian Sea Island cotton :—

Since our last report about 200 bales of West Indian Sea Island cotton have been sold, chiefly composed of the lower qualities 12*d.* to 14*d.*, but also including a few extra fine lots at 18*d.* to 20*d.* The medium qualities are neglected.

We are hoping for an improved demand in lace yarns, and if this occurs we hope that Sea Island cotton will be more readily absorbed that has been the case during the past twelve months.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending November 2, is as follows:—

The market opened quiet with moderate demand, resulting in sales of 40 bales of the odd bags, from Fine to Extra Fine, on a basis of our quotations and the crop lot 15 bales Special at 30c. The buying of the odd bags was on account of the northern mills, and the crop lot was for export. After the close of this report there developed a good demand for nearly all the offerings of odd bags off in preparation, resulting in the following sales, viz :—

50	bales	Extra Fine	off in preparation,	at	26c.
275	,,	Fully Fine	,, ,, ,,	,,	24c.
150	,,	Fine	,, ,, ,,	,,	22c.

This buying is presumed to be principally on speculation account, the firmness of the Savannah market with limited offerings and the advance paid in that market, it is thought influenced the party to make the above purchase.

We quote, viz.:—

Extra Fine	29c.	=	$16\frac{1}{4}d.$	c.i.f., & 5 per cent.
Fully Fine	$27\frac{1}{2}$c.	=	$15\frac{1}{2}d.$	,, ,, ,, ,,
Fine	26c.	=	$14\frac{3}{4}d.$	,, ,, ,, ,,

At a special meeting of the Executive Committee of the British Cotton Growing Association, held on October 28 after a visit of inspection to the Manchester Docks, the new General Manager of the Uganda Government Railway, whom the Committee had been asked to meet, referred to the very great increase of traffic that is taking place on that railway (largely because of cotton cultivation), and to the necessity for the provision for further expansion.

THE MECHANICAL HARVESTING OF COTTON.

It has been considered in the past, in connexion with the mechanical harvesting of different plant products, that where the whole of the crop cannot be cut in the same way, as in the case of sugar-cane, or where only certain parts of the plant are removed, as for cotton, any machine designed for the purpose cannot be entirely automatic, but must be under control of a human brain which directs and modifies its operations when necessary. Agreement with this opinion has been expressed from time to time in the *Journal d'Agriculture Tropicale*, but a later article in the issue of that journal for March 1912 indicates that it seems that this opinion will no longer be able to be held in its entirety, mainly owing to the success of a machine for the purely mechanical harvesting of cotton, that is known under the name of the Campbell machine.

Although this and similar machines cannot be used for harvesting Sea Island cotton, even probably from those varieties in which the lint protrudes from the boll to a greater extent than is usual, it will be well to give attention to some of the facts that are brought forward concerning the Campbell machine, in the article just mentioned.

As in the Lowry machine which was described in the *Journal d'Agriculture Tropicale* in 1906 (No. 60, p. 163), in the Campbell apparatus preference is given to collecting claws, over the pneumatic aspirators of some other machines; but while the former machine was semi-automatic, the collecting arms being directed by human agency, the Campbell apparatus carries the claws on vertical drums which surround the part from which the crop is to be momentarily collected and travel lightly through the plants. The general appearance of the machine is simple: it is a structure supported on four wheels, and having a petrol engine of 30 h.p. above it, which drives at the same time the hind wheels and the collecting agencies. Between the front and hind wheels, on each side of the apparatus, there are the two vertical drums bearing the claws or collecting teeth. Behind, there are endless chains, which carry the fibre collected from the ripe bolls to bags suspended at the back of the machine. The driver, sitting at the front of the machine, and above it, steers it by means of a wheel, and has at command at the same time all the agencies for regulating the motor and the drums; in this way labour is reduced to a minimum.

The wheels travel between the furrows, and the two lateral parts of the machine form a kind of bridge which encloses one row of plants; the drums attack these on the outside, rolling each plant between them—if such a term may be employed for an operation which is conducted with great delicateness and without subjecting the plants to any more than a grazing action that cannot do them any harm.

It has been said that the drums carry a series of claws or teeth, which are the true collecting agencies. These teeth are, more exactly speaking, mounted on vertical cylinders themselves fixed to the drums, and this is the matter that gives its distinctiveness to this ingenious machine. The drums move at the same speed as the machine, but in the reverse direction; that is to say, that their surface near the plants moves from before to behind; consequently in regard to the plane of travel of the whole apparatus, it may be considered that one point on this surface is at rest, while the curvature of the surface of the cylinder causes it to describe the horizontal movement in a plane perpendicular to the plane of movement of the machine It follows from this that each of the vertical cylinders fixed on the drum, and on which are placed the claws, can only force these claws into the plant which is opposite to it; the claws themselves, in the reversed motion, drag with them the fibre drawn from the boll. The dragging force and the form of the claws are calculated and designed in such a way that the seed-cotton can only be drawn from the ripe bolls; all half-opened bolls and those not yet ripe allow the claws to pass on empty, without letting any bit of fibre yield to a drawing force which is too feeble to overcome its adhesion to the boll.

In the same way the very slow movement of the picking agencies does not permit them to free themselves from the fibres which they have removed from the plant. This removal is effected by another means, consisting of the endless chains already mentioned; these are vertical at first, and then incline towards tubes which carry the fibre to the bags hanging behind. On each cylinder there are fixed 816 claws, which in action are insinuated gently into the plant, and are mounted in such a way that no capsule can pass between the cylinders without coming within the play of the claws.

Practical trials have been made of the apparatus in Texas under very varying conditions. It travels at a walking pace, which allows it to cover 4½ to 6 acres per day, collecting 95 per cent. of the ripe cotton: that is to say 550 to 880 lb. of fibre per hour, depending upon the thickness of the crop and the maturity of the plant, against 180 to 220 lb. per day, reckoned for hand picking. The cost of working is about 24*s*. per day. The value of the machine is increased by the fact that the collecting mechanism may be easily dismounted, and it may then be used in various ways as a tractor.

Trials have been made in order to ascertain if mechanically collected cotton is in any way inferior to that picked by hand, when it comes to be worked up commercially. They have all shown that the advantage is with the machine-gathered cotton, and microscopical examination of the lint has demonstrated that the Campbell machines does not leave any signs of crushing or of breaking of the fibres.

It should be stated in conclusion that any machines of the kind possess the disadvantage arising from the fact that in a cotton field the spaces between the rows are largely occupied by horizontal branches; so that it may be considered impossible for machines of the kind to move between the plant without damaging a large number of them, for the simple reason that each is an apparatus mounted on wheels.

Information received from the Agricultural Superintendent, St. Vincent, shows that during last season 506,932 lb. of seed cotton was purchased at the Government Central Cotton Ginnery from small growers, the amount being made up of Sea Island 353,485 lb. and Marie Galante 153,447 lb.

CHICLE GUM.

Reference was made at the recent Agricultural Conference to chicle gum, which is used to a large extent in the United States for making the material known as chewing gum. This is extracted from the stem of the sapodilla tree (*Achras Sapota*), or from trees closely related to this plant; the gum is chiefly obtained from Central America and Mexico According to an article in the *Bulletin Agricole* of Mauritius for June 1912, the stems are bled during the rainy season, the incision being made in the form of a V around the tree; where the two oblique lines join, a vessel is placed to receive the gum. At first the resin is white in colour, but contact with the air causes it rapidly to become yellow and solidify. It is said that trees bled periodically, with care and moderation, are capable of giving a yield for twenty-five years.

The article proceeds to show that in 1909 the importations of chicle into the United States had become 5,450,139 lb., value £412,596.

In making chewing gum, the product is scented with mint, vanilla and orange. Digestive bodies such as pepsin are also added.

Up to the present the only trees that have been exploited are wild, but it is proposed to establish them in regular cultivation. The wood of the tree is reported to be useful in cabinet-making.

A Little-known District in Antigua.—Mr. H. A. Tempany, B.Sc., Superintendent of Agriculture for the Leeward Islands, has sent an account of a visit paid by him recently to a district in Antigua lying between Old Road and Falmouth, the visit having been made as part of a general inspection of lands that may possibly be useful for coco-nut growing. As the district is little known, however, the account possesses features that are of special interest and may merit short attention here.

The land behind the opening called Rendezvous Bay presents a very shallow soil that offers no inducement to cultivators, except where there are valleys containing an area of soil apparently suited to coco-nut cultivation; this area is occupied by Deep Bay estate at the eastern end of Falmouth Harbour and by Nock estate further along the coast. Between Tucks estate and Old Road, there is probably a larger area of fertile soil, in scattered places, but the difficulties of communication and transport are such as to make exploitation unlikely. The adjoining estate, Rendezvous Bay or Doigs, offers better opportunities, and Mr. Tempany thinks that there may be as much as about 450 acres suitable for coco-nut, lime and cotton cultivation. An important matter is that an abundant supply of good underground water exists in this area, near the surface. Access to the district is difficult, however. Dealing finally with it Mr. Tempany states: 'On the whole there is no place in Antigua in my estimation which offers better prospects for successful cultivation of coco-nuts; from the situation it seems that the rainfall is almost certainly good and probably averages close on 60 inches per annum.'

A description follows of Ding a Ding Nook estate and the district near, which is on the way from Rendezvous estate to Falmouth. This area is rugged and unpromising, but its afforestation would probably make it the source of a constant supply of water.

The general conclusion is that, although the area visited is for the greater part rugged and uninviting, parts of it are worth development for coco-nuts, limes and cotton, the chief difficulty being that of communication.

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

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NOTES AND COMMENTS.

Contents of Present Issue.

In this number the editorial is concerned with Some Conditions Influencing Soil Nitrification. It deals with recent investigations that have been carried out regarding nitrification in soils, and points out the practical application of the results.

A short article on page 371 gives an account of the behaviour of certain sugar-cane seedlings, from the West Indies and British Guiana, in Queensland.

A brief description of some interesting plants in Dominica is presented on page 372. These are growing in the Botanic Gardens in that island.

The present interest in vegetable oils and the sources of their production has led to the inclusion of an article treating of the oil and oil seed trade of Marseilles, on page 373.

The Insect Notes of this issue contain two articles dealing with methods for protecting coco-nut palms from beetles, and with the curious phenomenon that is shown by what are known as jumping beans.

Some matters in connexion with the recent international rubber exhibition are brought forward in an article on page 379, and certain suggestions for the conduct of future exhibitions are made.

The Fungus Notes appear on page 382. They deal with recently published matter having relation to sugar-cane diseases in Porto Rico.

Crude Carbolic Acid for Mosquito Larvae.

It appears from a paper in the *Annals of Tropical Medicine and Parasitology* for October 18, 1912, that experiments have been conducted recently in British Guiana, by the Government Bacteriologist and the Assistant Government Bacteriologist, in which trial was made of the use of crude carbolic acid against mosquito larvae.

This substance has been investigated in the special connexion because conditions are such in British Guiana that when ordinary oil is poured on the ponds and small temporary areas of water it is generally blown to one side by the strong wind, and evaporated before it has a chance of killing the larvae in the water.

In the case of large amounts of water such as drainage trenches, small fish may be used in the same way as 'millions' for controlling the mosquito pest. Such fish are however useless in the small depressions in land holding temporary water, and it is in these cases that crude carbolic acid has been found to be most cheap and efficient for the purpose.

In an actual instance, its use was completely successful during the camping out of the Local Forces its employment being combined with the stocking of the larger quantities of water with fish. The carbolic acid, in most of the small pits, killed the larvae in about one hour; but a much longer time—frequently as much as twenty-four hours—was required to destroy the pupae.

The authors are inclined to believe that crude carbolic acid applied to temporary small collections of water does not evaporate to any large extent, but remains to impregnate the ground after the water has dried up; and that further there is sufficient of the carbolic acid left even now to render the water subsequently deposited fatal to larvae.

Laboratory experiments showed that a dilution of 1 in 20,000 kills all larvae within two hours, but that a much longer time is required for the death of pupae. For use in practice, one teaspoonful to every 2 cubic feet of water, or 1 oz. to 16 cubic feet is recommended; 'this gives a dilution of about 1 in 16,000, and allows a fair margin of safety to cover errors in calculation.'

Experience shows that the crude carbolic acid, containing all its impurities, is much more efficient than the purified product. It is thought that this is because its sticky nature makes it adhere more strongly to the larvae and pupae, and also in some cases it may act by blocking up the syphon tubes through which the insect breathes.

The possible effect upon animals drinking the treated water is important. In the first place such water is not attractive to animals because of its tarry smell and blackish colour. In the second the dilution suggested is such that an animal would have to drink a very large quantity of the water before it could ingest a sufficient amount of the carbolic acid to cause poisoning.

A disadvantage of the substance is that it is not suitable for spraying over large areas such as ground containing a number of small holes, caused it may be by footprints, unless the mixture with water is constantly stirred, under supervision. In this case it has been found better to employ preparations that mix more freely with water, even though the expense is greater; among these preparations are Cyllin, Chloro-Naphtholeum, and Sanitas-Okol.

Silkworm Rearing in Yucatan.

In the *Nachrichten für Handel* (Berlin) for September 27, 1912, the statement is made, on the authority of the German Consul at Mexico City, that members of the Yucatan Chamber of Agriculture have been recently making experiments in rearing silkworms, and that the results of the work have been very favourable.

The eggs were imported from Europe, and they produced vigorous caterpillars; it was proved possible to obtain four broods of the insect in a year.

The trials have been made so far on a limited scale, but it has been decided to conduct more extensive planting of the mulberry tree, particularly as this plant grows well under the conditions.

It will be remembered that the mulberry tree has been shown to flourish in the West Indies, and that seeds of the plant have been distributed by the Commissioner of Agriculture in various islands, where seedlings are now being raised. (See *Agricultural News*, Vol. XI, p. 239.)

The Feeding Value of Sawdust.

In an abstract of a recent paper giving an account of investigations of this matter, contained in the *Journal of the Board of Agriculture* for October 1912, it is stated that reference is made in the original article to feeding trials with stock, carried out by German experimenters in 1890, and since, with sawdust, both crude and prepared in various ways: the results of these trials showed that sawdust in any of the forms possesses a very low feeding value. Attention is also drawn to the fact that more recent experiments with molasses mixed with sawdust showed not only that the sawdust remained completely undigested, but that its inclusion decreased the digestibility of the ration as a whole.

The experiments described in the paper were carried out with crude sawdust and with sawdust treated with sulphuric acid under pressure. Past experience with the crude substance was repeated: none was digested, and its use caused the other foods in the ration to be less digestible. The prepared sawdust added to the digestibility in one way by converting some of the crude fibre in the food into easily soluble and assimilable carbohydrates (chiefly dextrose); the prepared sawdust itself, however, not only remained undigested, as far as its protein and unchanged fibre were concerned, but decreased the digestibility of such of these substances as were present in the other foods of the ration. No better success was obtained by mixing the prepared sawdust with molasses.

'It is concluded that sawdust, either treated or untreated, is not at all a suitable substance with which to mix molasses.'

Ostrich Meat as Human Food.

Attention is drawn in the *Journal d'Agriculture Tropicale* for September 30, 1912, to the fact that ostrich farmers in South Africa are occupied with the question of utilizing as food ostriches which are useless for the production of feathers, as such birds naturally constitute a loss; and a suggestion is much wanted as to ways in which they may be profitably exploited.

It is said that dried ostrich meat has the appearance of the flesh of the chamois and that it may become as strongly esteemed as this. The suggestion is made that experiments might be made under French auspices in Madagascar; but the question is naively asked as to the way in which the bird should be served. In the same manner, it is stated that the use of the ostrich in this way is not a matter of impossibility, since some time ago the camel as an article of food had a certain amount of vogue in Paris.

Some of the Work of the Egyptian Department of Agriculture.

A short note on the activities of the newly created Department of Agriculture in Egypt is given in *Diplomatic and Consular Reports*, No. 4938 Annual Series. Among the matters mentioned are improved methods of cultivation, particularly for cotton, and in the same connexion, the selection, control and distribution of seed and the prevention of damage by insect pests. Consideration is also being given to the requirements of cotton consumers.

Regarding this crop again, the Department is giving special attention to small holders, which constitute by far the largest proportion of the landed proprietors in Egypt. This is a matter of particular importance as it has been proved that it is through these small holders that the deterioration in the quality of Egyptian cotton has been increasing year by year.

Among new crops or varieties of crops that are being tried for the purpose of finding their usefulness in Egypt, there are included new kinds of sugar-cane, the soy bean and several other crops. For the purpose of dealing with scale insects on orange and other fruit trees, the cyanide tent process has been introduced.

The poultry industry of Egypt has been much neglected, so that the appointment has been made of an experienced Director to organize an experimental poultry-breeding station.

A matter of some particular interest for the West Indies is that various insect and fungus enemies of the cotton worm are being introduced into Egypt, and legislation has been framed for the purpose of protecting the existing enemies of the cotton worm and of other pests.

Attention is called by the Director General of the Department of Agriculture to the demand for a cheap and effective steam plough for use on the larger estates, and for inexpensive soil levellers needed chiefly in Upper Egypt.

The Agricultural Department is publishing Agricultural Circulars and Agricultural Notes and an Agricultural Journal of Egypt.

INSECT NOTES.

PROTECTION OF COCO-NUT PALMS FROM BEETLES.

In view of the interest being shown in the development of coco-nut planting in all parts of the tropics, the following law, which appeared in the *Tropical Agriculturist* for July 1912, is reproduced for the information of the readers of the *Agricultural News*. At the present time insect pests of the coco-nut palm in the West Indies are not of such a serious nature as to render necessary any legislation looking to the destruction of insect-infested trees in coco-nut groves: but it may be convenient to know what steps have been found advisable to take in other places. The information below refers to the Philippines:—

Act No. 286 of the Legislative Council of Moro Province, passed April 29th, 1912, is printed herewith and, though a drastic measure, provides the only apparent remedy for the beetle scourge which has already created great havoc in the coco-nut groves of this Province. This Act as proposed was given publicity several weeks ago, and discussion of the measure was invited. As every tree infected by beetles is doomed to death and is also a nucleus of infection for all surrounding trees, the sooner radical measures are adopted for the destruction of infected trees and the discontinuance of breeding places, the better for the welfare of the entire coco nut industry.

We anticipate that there will be much dissatisfaction with the enforcement of this law by those who already have infected trees; but as the safety of remaining, sound trees, as well as future plantings, depends upon prompt and radical measures, it is to be hoped that there may be co-operation of all coco-nut owners in saving this most important industry.

Section 1. It shall be the duty of the owner or person in charge of any coco-nut tree which is dead or attacked by the *Rhynchophorus ferrugineus*, commonly known as the red beetle, to immediately uproot such tree and either to burn the same or to bury it in the ground at a depth not less than one metre or completely submerge it in water so that said tree may not serve as a breeding place for beetles and that the beetle and eggs and larvae thereof which may be contained in the said tree shall be totally destroyed.

Section 2. Any owner or person in charge of coco-nut trees who shall neglect or refuse to perform the duty imposed upon him by the next preceding section shall be liable to a fine not exceeding fifty pesos [about £5] for every tree in respect to which such neglect or refusal occurs.

Section 3. It shall be unlawful for any person to keep or permit to remain on premises owned or occupied by him dead coco-nut trees or stumps, coco-nut timber or rubbish heaps, vegetable refuse, or other matter likely to harbour or become breeding places for the *Oryctes rhinoceros*, commonly known as the black beetle, or the *Rhynchophorus ferrugineus*, commonly known as the red beetle, and any such person who shall neglect or refuse to remove or destroy the same when requested so to do in writing by any officer of the district or municipality wherein said premises are located, or by any owner or occupant of land planted with coco-nut trees and situated within one mile of the premises on which such dead coco-nut trees or stumps, coco-nut timber or rubbish heaps, vegetable refuse, or other matter are kept, shall be liable to a fine not exceeding two hundred pesos [about £20].

Section 4. Upon the conviction of any person under sections two or three hereof the governor of the district wherein such premises are located shall cause such dead coco-nut trees or stumps, coco-nut timber, or rubbish heaps, vegetable refuse, or other such matter to be removed or destroyed, and the costs necessary therefor shall be a lien upon the property and collectable as are other taxes upon real property.

Section 5. All provincial, district or municipal officers shall have access at all reasonable times into and upon any land whereon any coco-nut tree is growing for the purpose of inspecting such tree and also into and upon any land or premises where there is reason to suppose that there are kept any such things as in article three hereof are referred to.

JUMPING BEANS.

Mr. R. J. Pocock, writing in *The Field* for September 21, last, gives in the notes from the Zoological Society, a brief account of the curious jumping beans from Mexico, which is reproduced below.

In the West Indies, jumping seeds are produced by small weevils which inhabit the flower buds of the Roble tree (*Platymiscium platystachyum*). An account of these was given in the *Agricultural News*, Vol. VII, p. 282.

Most readers of *The Field* are probably familiar with the so-called 'jumping beans', which are brought over from Mexico by the bushel and sold as curiosities even in small suburban London shops. Strictly speaking, the seed in question is not a bean at all, but belongs to the genus Croton, one of the Euphorbiaceae. It is also tolerably well known that the jumping and rolling of the bean are caused by the contortions of a maggot or grub inside it, and that the application of warmth, such as that which comes from the human hand, is sufficient to set the beans a-going. The purpose of the movement is not quite clear but Sir Ray Lankester has suggested to me that if the seed falls in an exposed and sunny place the warmth may stimulate the grub to activity, which will only cease when it reaches cool shade, the use of the instinct being, presumably, to save the grub from desiccation.

The grub is really the caterpillar of a moth (*Carpocapsa saltitans*), one of the tortrices, and about the size of an ordinary clothes moth. The eggs are laid on the pods of the plant when they are green and soft, so that the newly hatched larva can burrow its way into the interior. There it stays feeding on the contents until it reaches full size and is ready to pupate. Before entering upon this period of quiescence, however, it takes steps to ensure the escape of the moth, which with its weak jaws would be unable to bite through the hardened shell of its prison. At one end of the capsule, therefore, the grub eats away the wall from the inside, but ceases operations just before reaching the surface. The result is a circular hole closed and concealed from without by a thin and easily ruptured membrane.

This done, the grub wraps itself in a case of silk, which is everywhere complete except up against the future exit above described. To the area round this the silk is attached, but the membrane itself is not overspun with the material. The grub then settles down cosily in its case, with its head pointing towards the door, and turns into a chrysalis. In due course the moth emerges, and all it has to do to escape from its cell is to break down the frail membrane which lies between it and liberty.

THE INTERNATIONAL RUBBER EXHIBITION, 1912.

The following is taken from a leading article in the *India Rubber World* for November 1, 1912:—

Trade expositions may properly be divided into three kinds—those that are distinctly technical in their character, that are intended only for people directly interested in that particular trade, and without any purpose of attracting outside attention; second, those that are planned expressly to attract the general public, and which carefully avoid everything of a too technical character; and third, those that seek to combine these two functions, having enough of a technical character to appeal to all those associated with the particular trade, and enough of general interest to attract the public at large. The Rubber Exposition just held belonged to this third class, but undoubtedly it was much stronger on its technical side than it was in its general appeal to the public at large. Viewed as a rubber show intended for rubber men, it left little to be desired. The exhibits of crude rubber, reclaimed rubber, compounding ingredients and manufacturing machinery were full and varied, and covered the ground with satisfactory completeness. But in the department of manufactured goods the same cannot be said, for while certain manufacturers made admirable exhibits, there were important branches of the rubber-manufacturing industry which were practically unrepresented.

The exhibitors of crude rubber cannot be complimented too highly on the intelligence, enthusiasm and thoroughness with which they did their work. Brazil exhibited with a lavish hand—nor was the Middle East far behind. Both wild rubber from the Amazon and plantation rubber from the Federated Malay States and Ceylon were forwarded to the exhibition in generous quantity and impressive variety. It was altogether the finest collection of crude rubber ever brought together in this country. A certain rubber mill superintendent, after going over these exhibits carefully, remarked: 'I have learned more about crude rubber in the ten days of this show than I had ever learned before in any ten years in the factory.' Of reclaimed rubber and of compounding ingredients there was also a comprehensive exhibit; while the foundry men, with their machinery set up and in motion, contributed a great deal to the importance and value of the enterprise. Undoubtedly, all these groups of exhibitors—crude rubber producers, planters and importers, manufacturers of compounding ingredients and makers of machinery, found their ten days at the Exposition time profitably spent. Many of them indeed expressed great satisfaction over the results of their participation.

But among the manufacturers of finished rubber goods who attended the show and who undoubtedly derived great benefit from what they observed, there must have been a number who regretted that they had not seized upon this opportunity to exploit their products in a large way. Some of them when approached before the exhibition took the stand that they could see no particular benefit for them in showing their goods to other rubber men—which undoubtedly was true. But in a city like New York, with its five million permanent population and with its half million floating population—more or less—it would have been possible at a show of this character, covering so large a floor space, to have secured an extremely large attendance of people outside of the rubber trade—consumers of rubber goods; and to this class the rubber manufacturer might have appealed, with no little profit to himself. And that undoubtedly is the chief lesson learned from the first rubber show, the result of which will be shown at the second American Rubber Exposition, whenever that may be held. There is a great deal connected with many lines of rubber manufacture that could be made extremely interesting to the general public. There are many articles made almost exclusively by hand, which had they been manufactured at this show would have proved great centres of attraction. Some of the footwear manufacturers have gone to considerable expense in sending demonstrators around the country—and even abroad—to explain and to illustrate, by the actual operation, the making of rubber footwear. It is thought worth while to give the demonstration even before small groups of people. At an exposition in such a place as New York it would be possible to have thousands of spectators during a single day. The public can always be relied on to attend any sort of exhibition, if it is properly encouraged.

Nor would the attendance of the general public in large numbers interfere with the success of the more technical side of an exhibition, especially in a place like the Grand Central Palace, where (as was the case in the recent show) the technical departments were grouped chiefly on the upper floors, the main floor being reserved for exhibits of a more general character.

One feature of the recent show—which on another occasion would undoubtedly be much enlarged upon, because it was one of the most successful features of the Exposition—consisted of the moving pictures. There were two of these moving picture shows, one on the main floor under the auspices of the Brazilian exhibit, the other on the second floor under the auspices of the Federated Malay States. Both attracted a great deal of attention, and to many of the visitors proved the most interesting part of the exhibition. The plantation pictures were particularly to be commended, as they set forth in such orderly fashion the whole process of rubber culture in the East, showing the clearing of the forests, the preparing of the ground for the seed, the planting of the seed, the destruction of weeds and insects, the tapping of the trees, the gathering of the latex, its coagulation, the preparation of the rubber for the market and its final shipment to the rubber centres of Europe. This feature could be—and probably would be at another exhibition—made much more prominent, and with most gratifying results.

The management of the recent Exposition is certainly to be congratulated. It was a most creditable achievement, far beyond the expectations of many American rubber men. But by reason of the lessons taught by this first experience, the next exposition (whenever that may occur) will undoubtedly be more complete, more fully rounded out and symmetrical. It will not only be highly instructive from a technical standpoint to rubber men, but will be equally attractive to the public at large.

Published paper No. 135, of the Wellcome Chemical Research Laboratory, deals with an investigation of the dried leaves of the soursop (*Anona muricata*), obtained from Dominica. An alcoholic extract of the material, distilled with steam, yielded a small amount of an essential oil which possessed a strong, somewhat agreeable odour. The portion of the extract soluble in water contained a large amount of potassium chloride, together with dextrose, tannin, amorphous products, and a small amount of an alkaloidal substance which could not be crystallized. The part of the extract insoluble in water was a dark-green resin, consisting largely of fatty matter. The constitution of this resin is given at the end of the paper.

GLEANINGS.

The plant distribution from the Antigua Botanic Station during October included: limes 19,216, forest trees 577, coco-nuts 493, miscellaneous plants 34, sweet potato cuttings, 38,100, seeds 2 gallons and $8\frac{1}{2}$ lb. and 3 packages.

The *Bulletin of the Pan-American Union* for August 1912 shows that the production of coffee in Guatemala during last year was about 645,000 cwt. At the end of the year there were in the State 2,156 coffee plantations, covering an area of 880,320 acres.

The Uganda *Official Gazette* for September 15, 1912, contains a declaration by the Acting Governor of the Protectorate to the effect that epizootic lymphangitis is a disease, for the purposes of the Cattle Disease Ordinance, Uganda, 1902. An account of this disease was given in the *West Indian Bulletin*, Vol. XII, p. 72.

The values of the chief exports from British Honduras during 1911 were: chicle (see page 375) \$968,392, mahogany \$850,801, coco-nuts \$131,140, bananas \$93,392, cedar \$89,455, logwood \$54,549, plantains \$23,206, tortoiseshell \$19,485, and rubber \$18,047. (From *Colonial Reports—*Annual, No. 733; October 1912.)

Information received from the Director General of the Department of Agriculture, Egypt, shows that the cotton crop of both Upper and Lower Egypt was estimated at the beginning of last month to be above the average for the past ten years. The rice crop of Lower Egypt was below normal and that of Upper Egypt above normal.

Among the plants distributed from the St. Lucia Botanic Station during October, there were chiefly: limes 6,350 and Para rubber 1,380. Smaller numbers of cacao plants, oranges, grafted mangoes and decorative plants and cuttings, as well as others, were also sent out. In the seed distribution there were 98 packets of vegetable seeds and $\frac{1}{2}$-gallon of horse beans.

Regarding the exhibit from Dominica at the Canadian National Exhibition held recently in Toronto, information has been received to the effect that this exhibit has been awarded a gold medal diploma by the exhibition authorities. The plant distribution in this island, by the Agricultural Department during October was: limes 11,825, Congo coffee 1,500, cacao 550, Para rubber 300, grafted cacao 11, budded citrus 40 and miscellaneous 60; the total was 14,286 plants. The rainfall at the Botanic Station during October was 7·26 inches, of which 5·26 inches fell on October 3, 4 and 5. There was no rain after the 14th ultimo.

It is stated in *Diplomatic and Consular Reports*, No. 4932 Annual Series, that the imports of cotton into Japan from Corea for 1911, only amounted to 900 tons worth £32,600, compared with 2,200 tons worth £47,900, in 1910. Notwithstanding the encouragement of cotton-growing in Corea by the Japanese Government, the results have not been very satisfactory.

A heavy fall of rain was experienced in St. Lucia on October 8, when as much as 2·10 inches fell at the Botanic Station, which was flooded, the drains being silted up. The Experiment Station was also flooded and a large number of lime seeds and seedlings intended for next season was washed away and lost subsequently. The rainfall for the month at the Botanic Station was 13·01 inches; at the Experiment Station it was 12·64 inches.

A special meeting of the St. Vincent Agricultural and Commercial Society, at which His Excellency the Acting Governor of the Windward Islands presided, was held on October 30. At this, Mr. H. A. Ballou, M.Sc., Entomologist to the Imperial Department of Agriculture, gave an account of the different pests seen in the island during his recent visit, and made suggestions for dealing with them. The distribution from the Botanic Gardens during the month was mainly concerned with cacao plants and mahogany seedlings.

A note appears in the *Tropical Agriculturist* for September 1912 on the lac tree (*Schleichera trijuga*), the source being the *Indian Trade Journal.* It is from the seeds of this tree that Macassar oil is obtained, and they have been collected from Orissa under the name of Paka seeds. The composition of the seed is 40 per cent. of shells and 60 per cent. of oil, the percentage of oil being equivalent to about 36 per cent. of the nuts. The tree occurs in the dry, deciduous forests over the greater part of India, Burma and Ceylon.

In the *Board of Trade Journal* for October 10, 1912, publicity is given to a decree regulating the collection and sale of rubber in French West Africa. The decree is designed to protect the rubber industry of that country by prohibiting the manufacture, sale of, and traffic in, coagulated rubber otherwise than in sheets or in cakes having a maximum thickness of 1 cm. The tapping of rubber trees is also prohibited during not more than three months of each year; the period of this prohibition is to be decided separately by the Governor of each Colony.

Reference is made in the *Agricultural News*, Vol. XI, p. 44, to schemes that have been put forward for the general improvement of the harbour of St. Thomas, Danish West Indies. According to the *Standard* (London) for October 9, 1912, the Danish Syndicate that had obtained a concession from the Government for the work has returned the concession because of the failure to raise the necessary capital to carry out the extensive plans. It appears that only about one-quarter of the money has been forthcoming, and that the syndicate will, with the sanction of the Government, merely carry out that part of the scheme dealing with the deepening of the harbour.

STUDENTS' CORNER.

AGRICULTURAL EXAMINATIONS.

The Preliminary Examination in connexion with the Courses of Reading in Practical Agriculture, 1912, of the Imperial Department of Agriculture, was held on October 28. Four candidates presented themselves for examination—two in Grenada and two in Antigua—and all were successful, the individual results being as follows:—

Centre.	Name.	Result.
Grenada	Bertrand, L. J.	2nd class.
	Phillip, H. H. A.	2nd ,,
Antigua	Gallwey, A.	2nd ,,
	Peters, A. E.	3rd ,,

The questions set in the examination were reproduced in the last number of the *Agricultural News*, p. 365. It will be well to review here the answers given to those chosen by candidates.

The first question was generally attempted by candidates, and in only one case was a fairly good description given of the experiment required; in most instances the method suggested for collecting the oxygen involved its mixture with a large amount of air, so that the detection of its addition would have been impossible by the usual simple means; an account of a form of experiment for the purpose may be found on pages 74 and 75 of the last edition of *Nature Teaching*. Fair answers to question 2 were received, but sufficient stress was not laid on the importance of root hairs and the youngest parts of the roots in relation to water absorption. The answers to question 3 that were given all required carefully drawn diagrams, but in only one case were these not totally inadequate and slipshod. It may be said at once, indeed, that nearly all the papers showed weakness in the matter of providing simple illustrations to the answers to questions, notwithstanding the stress that was laid, in the last of the instructions to candidates printed on the examination paper, on the importance of supplying these wherever they may be of use. Some of the best of the answers were received to question 5, though in some cases confusion of ideas led to repetition; the use of sand for lightening clay soil (especially in horticultural and nursery work) should not be forgotten. The replies to question 6 were good as far as they went, except for the feeble drawings; attention was not paid however to the request for a full account of the process of budding, so that the preparation of budding tape (or of grafting wax) was often omitted, and there was hardly any reference to the after-treatment of the budded plant. Fair replies were received to question 7, and it was recognized that this may be answered in a number of ways. The choice exercised in answering question 8 showed that there is weakness among candidates in their knowledge of animal physiology. The answers to question 9 sometimes showed that the words 'in nature' were not considered when it was read A more important matter regarding this question, however, and one that requires most careful attention, is that in all the answers, the nitrifying organisms were cited as agencies for increasing the amount of nitrogen in the soil. They are not, and the nitrifying action including in order putrefactive changes—ammonia formation—nitrite formation—nitrate formation, results in some loss rather than in gain of nitrogen. The nitrogen is made easily available for plants, by the process, but none of the element is added to the soil.

Poor answers to question 11 were received, except in one case. The confusion that exists in the minds of candidates as to the structure and action of the heart of mammals could be greatly reduced by the examination of a sheep's heart—easily obtained—in the light of what they have read or heard about the matter. Question 12 was answered inadequately, and little or no attention was paid to the part that the liver and pancreas take in connexion with the process of digestion. Lastly, among the questions mostly attempted, number 13 should have been given far better answers than were received, and here again the diagrams submitted were generally quite inadequate; while in replying to such a question, it is always best to make the answer relate strictly to one definitely chosen flower.

Reference to the questions not mentioned has been kept to the last, as none of these was attempted by any of the candidates. In the case of number 4, it may be that they have not had many opportunities for the detailed examination of a plough, and the drawing of its various parts; though this is a matter of importance that should not receive further neglect. The same may be said of question 10. Candidates should refer frequently and carefully to the syllabus of subjects for the examination, which, while its intention is not to limit the field of their knowledge, will help them to make that knowledge complete as far as it is required and give them a greater scope when dealing with questions that they may be asked.

The following were the questions set in the paper on General Agricultural Science in the Intermediate Examination, held on November 11 last; not more than eight were to be attempted, and among these, numbers ten and either eleven or twelve had to be included:—

(1) Give an account of some form of tillage with which you are acquainted, and say how tillage benefits the soil.

(2) How is the nitrogen of the air made available to plants (a) naturally, (b) artificially?

(3) Write a description of the way in which a given kind of seed is stored, that has to be used later for planting purposes, and say how you would conduct a germination test of seed.

(4) Describe with careful sketches any stem that you have examined, stating how the different parts are suited specially to do the work that is required of them.

(5) Mention all the uses, with which you are acquainted, of the rotation of crops.

(6) Give a description of the manner in which any artificial manure of which you have knowledge is obtained, and supply instances where you have seen it used.

(7) In what ways are soils formed? How would you show by means of a simple experiment what different classes of substances usually exist in soils?

(8) Show by means of careful description and sketches how any plant that you may choose is grafted and budded.

(9) What are the consequences of the presence of too much water in the soil? For what reason may land be flooded purposely, in agricultural practice?

(10) State what is included among the soft parts of the body of a mammal, and give the uses of all the structures or organs that you mention.

(11) Give a general description of any three orders of insects, and mention two examples in each order that are of agricultural importance.

(12) Supply an account of any fungus causing plant disease that you have had under observation, and suggest measures for its control.

FUNGUS NOTES.

SUGAR-CANE DISEASES IN PORTO RICO.

In the Second Annual Report of the Experiment Station of the Sugar Producers' Association, Porto Rico, some interesting information is given by J. R. Johnston on the more important fungus diseases attacking the sugar-cane, and some of the points made by this writer might apply equally to the same diseases found in the English islands of the Lesser Antilles.

ROOT DISEASE. The most important is the root disease, which appears to be caused by at least two different fungi. The first is *Marasmius sacchari*, which has long been known throughout the whole of the West Indies. The second is an unidentified fungus of which the mycelium is characterized by the presence of stellate crystals, but of which no fruiting bodies have yet been found. Unlike Marasmius this latter fungus does not appear to cement the leaf sheaths together but is found as a white feathery mycelium at the base of the lower leaf sheaths. Investigations with a view to determining if these root fungi of the sugar-cane occur on any other host plants have revealed the fact that the stellate crystal fungus is common on many grasses, more especially on such as form dense growths, as an example of which one kind of guinea grass (*Paspalum hemisphaericum*) is mentioned. It is also stated that a root fungus has been found on corn, and it may be advisable to mention here that such a fungus has also been recorded on corn in Barbados and Antigua, and that its mycelial characters are very similar to those of the Marasmius root disease of the sugar cane. As a result of this Johnston recommends that land known to be infected with sugar cane root diseases should not be allowed to lie fallow with a view to their elimination, but that it should be planted with some leguminous crop or some crop of economic importance, other than corn. Another point mentioned is that ratoons of Otaheite cane were found to be particularly susceptible to root disease.

RIND DISEASE. It is observed in Porto Rico that this disease has close relation to the climatic conditions, and to the presence of the moth borer. This was also found to be the case to some extent in St. Kitts recently; while another factor influencing the virulence of the disease would seem to be the condition of ripeness of the cane, as mature or over-ripe cane would appear to be more susceptible than green cane. Instances are recorded in Porto Rico of severe attacks of this disease on a cane, apparently D. 625, which was mature but comparatively free from the presence of moth borer; also on over-ripe Otaheite cane that was suffering from drought, and in a third instance on nearly matured cane that was badly infested with moth borer. 'The occurrence of this fungus (i.e. rind fungus) at the base of the leaf sheaths has been noted, but its importance there has not been sufficiently emphasized. We have no data as to whether or not the fungus at the base of the leaf sheaths aids in killing the leaves. It probably does, but not to an alarming extent. We have, however, observed, that at least in the case of Otaheite and of D.116, the fungus passes from the leaf sheaths into the stalk, if for any reason the vitality of the stalks is lessened, thus neither moth borer holes nor rotted tops are essential in every case to the infection of the stalk by this fungus.'

Another point of importance that has received attention is the value of treating cuttings with Bordeaux mixture previous to planting. Johnston calls attention to the fact that this treatment will not destroy the mycelia of fungi which have already entered the stems from which the cuttings are made, and that the first step of importance is the selection of cuttings free from disease, that is, showing no discoloration at the cut ends nor the presence of the white mycelium of the root disease on the surface of the rind. With regard to the treatment itself, it was found, as has also been discovered in the West Indies, that its effect is much more valuable during dry weather than it is when the atmospheric conditions are moist enough to ensure a good stand of canes; under such conditions, its principal effect is only to hasten the germination. On plantations where a large number of cuttings fail to germinate owing to attacks of the pine-apple fungus, disinfection is to be recommended, but on estates that are comparatively free from the disease it may not be necessary in a good season.

RED SPOT OF THE LEAF SHEATH. 'In the Annual Report of the Pathologist for last year it was questioned what effect the presence of diseased leaf sheaths on the cuttings might have on the subsequent stand of canes. The particular fungus related to this question is *Cercospora vaginae* causing the red spot of the leaf sheath Experiments were made with Crystalina seed which is characteristically badly affected by this disease. There resulted a difference in the number of shoots arising from the cuttings, a difference, however, clearly not due to the fungus infection. In comparing the shoots arising from the two lots of cuttings, and the subsequent growth of these shoots, absolutely no difference in amount of disease could be detected between the plants from cuttings with diseased sheaths and the plants from cuttings without such sheaths. All the plants had abundance of the fungus and in no case could it be said to be doing any material injury. The difference in number of shoots in these experiments is due partly to the effect the leaf sheaths have on the preservation of the moisture content of the seed and possibly to protection in other ways.'

This red spot fungus is fairly common on several varieties of cane in the English islands, but it has never been believed to occasion any injury of importance.

RED ROT DISEASE OF THE LEAF SHEATH. Observations were also made on a disease of the leaf sheaths occasioned by a fungus having a white superficial mycelium with small, brown, spherical sclerotia. This fungus may occasionally penetrate the leaf sheaths and inflict a certain amount of injury on the surface of the rind. In Porto Rico it was found as a result of observations on a limited number of stools, that no very serious damage was inflicted by the fungus even when it was present in considerable quantity. On the other hand, occasionally instances have been recorded from other countries in which the fungus is believed to have caused severe damage to growing canes, and Johnston states that his 'observations must not be taken as proof that this fungus is not sometimes injurious to canes but merely as an indication that it is not always serious.'

In his concluding remarks this writer states: 'over twenty-five different fungi have been found on different parts of diseased and dead cane and are now being identified. It is believed important to determine not only the fungi found on living, green cane, but also those of badly diseased cane, for many fungi even if not parasitic tend to reduce the sugar content of the cane.' He also records that attention is being given to the question of whether certain of the cane fungi may not live on other host plants, and states that certain small mushrooms found on grass showed a resemblance to those growing at the base of canes, while certain of the leaf fungi of the cane have also been found on grass. It is interesting here to note that a species of Colletotrichum, *C. lineola*, almost indistinguishable from *C. falcatum*, has been recorded by Butler in India on the Guinea corn (*Andropogon Sorghum*, var. *vulgaris*), and by Edgerton in Louisiana on broom corn (*A. Sorghum*, var. *textilis*), and

Johnson grass (*Sorghum halepense*): while a very similar species has recently been seen on the leaves of Indian corn in Barbados; and that the red rot fungus itself can attack the leaves of sugar-cane. Edgerton tried inoculation experiments on sugar-cane stems with *C. lineola*, but did not obtain any very conclusive results. (See *Agricultural News*, Vol. XI, p. 78.)

WEST INDIAN PRODUCTS.

DRUGS AND SPICES ON THE LONDON MARKET.

Mr. J. R. Jackson, A.L.S., has forwarded the following report on the London drug and spice market, for the month of October 1912:—

The first week of October in Mincing Lane, opened with an improved business prospect, but later the outbreak of war between the Balkan States and Turkey, produced a depressing effect, especially with regard to products derived from those countries, such as opium and otto of rose. Towards the end of the month the markets became less active, buyers in general purchasing only for their immediate requirements. Amongst many products commanding advanced prices may be mentioned Eucalyptus and clove oils, the latter of which is scarce, causing a consequent advance in the price of vanillin, which is now chiefly made from clove oil.

In the matter of West Indian products generally, there has been but little change since our last report, as the following details will show.

GINGER.

At auction on the 9th, 440 packages of Cochin and Calicut were offered and 28 sold without reserve, 80*s.* 6*d.* to 81*s.* 6*d.* being paid for bold A. cut, and 54*s.* 6*d.* for C. cut, 45*s.* was the price at which fine bold round Calicut rough, was held, and 40*s.* for washed rough Cochin. A week later 215 bags of small shrivelled brown rough Calicut, were sold without reserve at 26*s.* per cwt. Washed rough slightly wormy being bought in at 37*s.* On the 23rd as many as 1,400 packages of Cochin and Calicut were offered and all bought in at the following prices 85*s.* for A. cut, 80*s.* for B. cut, small and medium 75*s.*, C. cut 60*s.*, washed rough Calicut 40*s.* and fine brown 45*s.* At this sale there were also some 60 bags of limed Japan brought forward, but all was bought in at 28*s.* per cwt. At the last auction on the 30th 40 bags of Cochin were offered without reserve and sold at 26*s.* per cwt. for washed rough wormy.

NUTMEGS, MACE AND ARROWROOT.

At the first spice auction on the 2nd of the month 65 packages of West Indian nutmegs were brought forward and sold at the following rates: 75's 8½*d.*, 92's to 102's 7½*d.* to 8*d.*, 117's to 127's 8*d.* and 147's 7½*d.* The following rates prevailed for West Indian on the 9th: 69's to 70's 8*d.* to 8½*d.*, 100's to 148's 7½*d.* to 8½*d.* Sixty-eight packages of limed Java were also disposed of at this auction. On the 16th 55 packages of West Indian were sold, 76's to 77's fetching 7*d.* to 8*d.*, 92's to 102's 7½*d.* to 8*d*, 124's to 128's 8*d.* A week later there was a steady demand both for West Indian and Eastern, 88 packages of the former, and 68 packages of the latter being disposed of, the rates for the former being as follows: 62's to 90's 7*d* to 8*d*, 95's to 105's 7½*d.* to 8*d.*, 110's to 120's 7*d.* to 7½d. and 135's to 146's 7*d.* to 7½d. For the Eastern 8*d.* to 8½d. was paid for 60's to 70's and 6½d. to 7*d.* for 95's to 105's. At the last auction on the 30th, 306 packages of West Indian were brought forward and disposed of at rather easier rates. Of mace 16 packages of West Indian were disposed of at the first auction on the 2nd of the month at 2*s.* 1*d.* to 2*s.* 2*d.* per lb. for sound, and 1*s.* 9*d.* to 1*s.* 10*d.* for broken. A week later good fine pale thin, West Indian fetched from 2*s.* 3*d.* to 2*s.* 4*d*, and broken 2*s.* to 2*s.* 1*d.*, while good red Java realized 2*s.* 5*d*, and broken 2*s.* 2*d.* per lb. For the rest of the month these prices remained fairly steady, West Indian being in good demand, 67 packages being disposed of at auction on the 30th. Of arrowroot 23 barrels of St. Vincent were brought forward on the 16th, part of which sold at 4¾*d.* per lb. and again on the 30th, 25 barrels of St. Vincent were offered and partly sold at from 2*d.* to 4*d.* per lb.

SARSAPARILLA.

There has been a steady demand for this article throughout the month, and good prices have been realized. At the first drug auction on the 3rd. of the month 21 bales of grey Jamaica were brought forward, and all were sold for part coarse to fair fibrous, at 1*s.* 11*d.* to 2*s.* per lb., 2 bales of fair Lima-Jamaica were offered, and both sold at 1*s.* 10*d.* per lb.; of 27 bales of native Jamaica offered, 15 found buyers, fair to good red fetching 1*s.* to 1*s.* 1*d.*, ordinary to dull reddish 10*d.* to 11*d.*, while ordinary grey and pale red mixed, realized 10½*d.* and dingy red 8*d.* per lb. A fortnight later, namely on the 17th, the offerings consisted of only 9 bales of grey Jamaica, and 5 of Mexican. The whole of the former which consisted of ordinary dark to fair, was disposed of at from 1*s.* 10*d.* to 2*s.* per lb. None of the Mexican found a buyer. At the last auction on the 31st, the offerings were as follows, grey Jamaica 6 bales, native Jamaica 22, Lima-Jamaica 10 Honduras, 4 Two bales only, of the grey Jamaica were sold, fetching 2*s.* per lb. the other four being held at 2*s.* 1*d.* per lb. Only 3 bales of the native Jamaica sold, 2 at 10½*d.* to 11*d.* for fair red, and 1 at 1*s.* per lb. The whole 10 bales of the Lima-Jamaica were disposed of at from 1*s.* 8*d.* to 1*s.* 9*d.* for fair, part roughish. The Honduras failed to find a buyer.

KOLA, LIME OIL, LIME JUICE, CASSIA FISTULA AND TAMARINDS.

Kola has been in greater demand during the month. At the first auction 16 bags of good bright dried Jamaica whole and halves, together with some halves from St. Lucia, were all disposed of at from 5½*d.* to 5¾*d.* per lb. At auction on the 9th, 8 packages of West Indian were brought forward and sold, fair fetching 5½*d.* and dull 5*d.* per lb. It was stated at this sale that 6½*d.* was asked for good sound halves. A week later the large consignment of 76 packages were offered, 64 of which were disposed of, 22 bags of West Indian fetched from 4½*d.* to 5*d.* per lb. for good small dried, 3½*d.* per lb. for 14 bags of dark and mouldy, and 4¼d. to 4½*d.* for fair halves, slightly dark. One batch of 12 bags of fair halves were held at 6½*d.* At the last spice auction on the 30th, 22 bags of West Indian sold at from 3¼*d.* to 4¾*d.* per lb. and at the drug auction on the following day, one bag of small to medium dull, St. Lucia, realized 3*d.* per lb.; white 5¼*d.* per lb. was the price asked for 2 bags of bright Dominican.

At the first auction in the month 4 cases of hand pressed lime oil from Dominica were disposed of at 7*s.* 6*d.* to 7*s.* 7*d.* and for another 4 cases of distilled oil 1*s.* 3*d.* was asked Of lime it is reported that plentiful supplies are forthcoming, and 1*s.* to 1*s.* 6*d.* per gallon, according to quality is the nominal current price. Cassia Fistula is very scarce, 30*s.* per cwt. being the price quoted for fair plump West Indian pods. At the last spice auction on the 30th, 34 barrels of ordinary dry stony West Indian tamarinds were brought forward and sold at 11*s.* 6*d.* per cwt. in bond.

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR, November 5, 1912: Messrs. E. A. de PASS & Co., October 11, 1912.

ARROWROOT—3¾*d.* to 5*d.*
BALATA—Sheet, 3/4 ; block, 2/2 per lb.
BEESWAX—£7 5*s.* to £7 17*s.* 6*d.*
CACAO—Trinidad, 72/- to 80/- per cwt. ; Grenada, 58/- to 66/-; Jamaica, 55*s.* to 64*s.*
COFFEE—Jamaica, 70*s.* to 81*s.*
COPRA—West Indian, £27 5*s.* per ton.
COTTON—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 12*d.* to 20*d.*
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—49*s.* to 65*s.*
ISINGLASS—No quotations.
HONEY—25*s.* to 31*s.*
LIME JUICE—Raw, 9*d.* to 1/4; concentrated, £18 5*s.* to £18 10*s.*; otto of limes (hand-pressed), 7/6.
LOGWOOD—No quotations.
MACE—2/- to 2/6.
NUTMEGS—7½*d.* to 9½*d.*
PIMENTO—2½*d.* to 2⅝*d.*
RUBBER—Para, fine hard, 4/3; fine soft, 4/0½; Castilloa, 3/8 per lb.
RUM—Jamaica, 2/1 to 6/-.
SUGAR—Crystals, 16/6 to 19/-; Muscovado, 11/6 to 14/6; Syrup, 11/3 to 12/3; Molasses, no quotations.

New York.—Messrs. GILLESPIE BROS. & Co., November 1, 1912.

CACAO—Caracas, 15c. to 15½c.; Grenada, 14½c. to 15c. Trinidad, 15c. to 15¼c. per lb.; Jamaica, 11¼c. to 12¾c.
COCO-NUTS—Jamaica, select, $34·00 to $35·00; culls, $20·00; Trinidad, select, $34·00 to $35·00; culls, $20·00 per M.
COFFEE—Jamaica, 15½c. to 17¼c. per lb.
GINGER—8¾c. to 12¼c. per lb.
GOAT SKINS—Jamaica, 50c.; Antigua and Barbados, 46c. to 48c.; St. Thomas and St. Kitts, 43c. to 45c. per lb.
GRAPE FRUIT—Jamaica, $1·50 to $2·00.
LIMES—$5·00 to $5·50.
MACE—53c. to 56c. per lb.
NUTMEGS—110's, 15¾c.
ORANGES—Jamaica, $1·25 to $1·50.
PIMENTO—4c. per lb.
SUGAR—Centrifugals, 96°, 4·05c. per lb.; Muscovados, 89°, 3·55c.; Molasses, 89°, 3·30c. per lb., all duty paid.

Trinidad.—Messrs. GORDON, GRANT & Co., November 11, 1912.

CACAO—Venezuelan, $15·50 to $16·00 per fanega; Trinidad, $14·75 to $15·50.
COCO-NUT OIL—$1·02c. per Imperial gallon.
COFFEE—Venezuelan, 16½c. to 17c. per lb.
COPRA—$4·70 per 100 lb.
DHAL—$4·20.
ONIONS—$1·50 to $2·50 per 100 lb.
PEAS, SPLIT—$5·50 per bag.
POTATOES—English, $1·75 to $2·10 per 100 lb.
RICE—Yellow, $5·00 ; White, $6·25 to $6·35 per bag.
SUGAR—American crushed, no quotations.

Barbados.—Messrs. JAMES A. LYNCH & Co., Ltd., November 16, 1912; Messrs. T. S. GARRAWAY & Co., November 18, 1912; Messrs. LEACOCK & Co., November 7, 1912.

ARROWROOT—$8·00 to $9·00 per 100 lb.
CACAO—$12·50 to $14·00 per 100 lb.
COCO-NUTS—$20·00.
HAY—$1·60 to $1·80 per 100 lb.
MANURES—Nitrate of soda, $70·00; Cacao manure, $45·00 to $48·00; Sulphate of ammonia, $80·00 to $85·00 per ton.
MOLASSES—No quotations.
ONIONS—$2·20 to $3·75 per 100 lb.
PEAS, SPLIT—$6·00 to 70·00 per bag of 210 lb.; Canada, $3·00 to $4·90 per bag of 120 lb.
POTATOES—Nova Scotia, $3·75 to $4·25 per 160 lb.
RICE—Ballam, $5·15 to $5·60 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
SUGAR—American granulated, $4·90 per 100 lb.

British Guiana.—Messrs. WIETING & RICHTER, November 9, 1912 ; Messrs. SANDBACH, PARKER & Co., October 25, 1912.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	—	—
BALATA—Venezuela block	No quotation	Prohibited
Demerara sheet	70c. per lb.	—
CACAO—Native	19c. to 20c. per lb.	18c. per lb.
CASSAVA—	$1·00.	No quotation
CASSAVA STARCH—	$7·50 to $8·00	No quotation
COCO-NUTS—	$16 to $20 per M.	$10 to $16 per M., peeled and selected
COFFEE—Creole	20c. per lb.	20c. per lb.
Jamaica and Rio	20c. per lb.	20½c. per lb.
Liberian	17c. per lb.	15c. per lb.
DHAL—	$3·50 to $4·00 per bag of 168 lb.	$4·80
Green Dhal	$5·00	—
EDDOES—	60c. to 80c.	—
MOLASSES—Yellow	None	—
ONIONS—Teneriffe	—	—
Madeira	5c. per lb.	5c.
PEAS—Split	$6·25 to $7·00 per bag (210 lb.)	$7·50 per bag (210 lb.)
Marseilles	$4·00 to $4·25.	No quotation
PLANTAINS—	16c. to 48c.	—
POTATOES—Nova Scotia	—	—
Lisbon	$2·00 to $2·25	No quotation
POTATOES-Sweet, B'bados	$2·64 per bag	—
RICE—Ballam	No quotation	—
Creole	$4·50 to $4·60	$5·00 to $5·25
TANNIAS—	$1·68	—
YAMS—White	$2·64	—
Buck	$2·40	—
SUGAR—Dark crystals	$2·25 to $2·70	$3·20
Yellow	$3·50 to $3·80.	$4·00 to $4·25
White	—	—
Molasses	$2·50	—
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	No quotation.

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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 2d.; in 1901, No. 13, price 4d.; in 1902, No. 19, price 4d.; in 1903, No. 26, price 4d.; in 1904, No. 32, price 4d.

Seedling Canes and Manurial Experiments at Barbados, in 1903-5, No. 40, price 6d ; in 1904-6, No 44, price 6d.; in 1905-7, No. 49, price 6d.; in 1906-8, No. 59, price 6d.; in 1907-9, No. 62, price 6d.; No. 66, price 6d.

Seedling and other Canes in the Leeward Islands, in 1900-1, No. 12, price 2d.; in 1901-2, No. 20, price 2d.; in 1902-3, No. 27, price 2d.; in 1903-4, No. 33, price 4d.; in 1904-5, No. 39, price 4d.; in 1905-6, No. 46, price 4d.; in 1906-7, No. 50, price 4d.; in 1907-8, No. 56, price 4d.; in 1908-9, No. 63, price 6d.; in 1909-10, No. 67, price 6d.

Manurial Experiments with Sugar-cane in the Leeward Islands, in 1902-3, No. 30 price 4d.; in 1903-4, No. 36, price 4d.; in 1904-5, No. 42, price 4d.; in 1905-6, No. 47, price 4d.; in 1906-7, No. 51, price 4d.; in 1907-8, No. 57, price 4d.; in 1908-9, No. 64, price 4d.; in 1909-10, No. 68, price 4d.

GENERAL.

(7) and 22 Scale Insects of the Lesser Antilles, Part I. price 4d.; Part II., price 4d.

(5) General Treatment of Insect Pests (Revised), price 4d.

(14) Screw Worm in Cattle at St. Lucia. Price 2d
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CONTENTS.

The Educational Work of Museums.

THE PLANNING OF A MUSEUM should be made to relate as closely as possible to the purposes that it is intended to serve, and in the West Indies, where the chief interests of the different islands are so very well defined, it is a comparatively easy matter to decide the scope of the subjects to be dealt with directly, and to determine the extent to which attention shall be given to interests that belong specially to other parts of the world. There are, at the same time, several general principles to be observed in the collection and arrangement of material for a museum, whose early recognition will lead to an increased efficiency of the work and the saving of trouble and expenditure in later rectifying mistakes.

It is possible in most of the larger countries of the world to provide museums of two kinds: those on a great scale serving alike the interests of the general public and the specialist, and those maintained generally on a smaller scale for the uses of the specialist alone This cannot usually be done in the West Indies, where the only 'museum' of the second kind is likely to be found in the laboratories of the various scientific departments; these are of course accessible to any one who wishes seriously to consult their contents, but are not public in the common sense of the word. It seems that the best museum for the West Indies is the most popular kind, possessing with its popular attributes material that will serve to guide the specialist in his quest for the local aspects of his further researches.

The construction of a building for a museum should be carried out in a way that such additions as may be required can be made without interfering with the consistent nature of the original architectural plan. Even in cases where the lack of funds prevents new building, and necessitates the use of buildings that exist already, this matter must be kept in sight in making a choice. A similar principle is to be observed in setting out the collections: room for expansion must be left, so that the housing of fresh accessions may not necessitate a large moving of material already in place. Additional and unnecessary trouble and expense will thus be avoided, as well as the confusion arising from the bodily removal to new situations of definite sections, that carelessness in this matter would entail.

The purpose of a museum, as regards a large proportion of its visitors, is to suggest new activities of the mind, and to awaken curiosity. This is why it should be housed in a conspicuous building easily accessible to the public, and why its contents should be arranged as attractively as possible. In this way, it will be enabled to serve as a means of increasing interest in local products, and what is ultimately more important, of bringing about a desire for instruction in useful subjects. Attention to these circumstances will also make it more efficient as a direct means for education, and if it is to serve well in this capacity, its equipment must include printed guides to the different sections, together with such pamphlets as can be prepared for the purpose of elaborating the information given on the labels belonging to the exhibits.

A use of the museum that is often forgotten is to provide a place for the safe keeping and exhibition of rare and valuable objects belonging to private individuals. In a museum building that is properly constructed and managed, such articles are in much less danger from fire and theft than when they are kept in dwelling-houses; and are available for the pleasure and instruction of the many, rather than the very few. Caution has to be exercised, however, by those who are responsible for the reception and disposal of such articles, lest space in the museum should come to be taken up largely by things that are merely objects of curiosity.

Correlation of the material in a museum is a most important matter—making at once for the liveliest arousal of interest and the largest educational value. This correlation should always be natural rather than artificial, and objective better than subjective; it may be expressed simply by saying that an article for exhibition and study should be brought into association with other objects of the same nature, as far as possible in surroundings that belong to its normal environment, rather than be used simply to illustrate some 'subject' in an educational curriculum. In many large museums much labour and expenditure are employed toward reproducing naturally the conditions that surround a group of objects, in nature; where such means are not available, much can be done by providing printed descriptions and pictures of the necessary scenes, countries or other details of nature.

The most successful museums are those in which the members of scientific staffs (not necessarily belonging to the museum), or specialists, are available to take an active part in the direction of the work. The arrangement of the exhibits and the preparation of the labels and descriptive matter are among the chief duties of such persons, and their special knowledge and interest are available for making the institution as useful as possible, and for keeping it in a condition of activity. In the West Indies, where the most general concerns are agricultural, much assistance can be, and is, given in museum and exhibition work by those who have charge of the botanic and experiment stations in the different islands. These officers, as well as those more directly employed in educational pursuits, should find their work simplified in places where an efficient museum exists, and the possession of such an institution should make easier the organization of that most useful means of instruction—the school museum.

Models of objects of interest or learning will always find a place in museums, partly because they constitute a way of representing things that it is not easy or possible to acquire, and because they may be made on a scale magnifying the original, and thus form a means of simplifying study. Pictures and maps, and a library of books chosen carefully in relation to local needs and to the contents of the museum, are also necessary. Where funds are available, it is of the greatest use as well to keep a supply of printed reproductions of photographs of the more commonly consulted objects or groups, so that they may be distributed to those needing them, and particularly for employment in schools. A useful extension, again, in this direction, is the provision of lantern slides for the use of lecturers and teachers: in the case of large museums, even moving pictures are available for responsible use where they are required. Matter to be lent for educational purposes should also include cases of specimens prepared in such a way as to make them most useful with the least fear of damage. Lastly, public museums should possess one or more lecture halls that may be available for meetings and demonstrations.

The nature of the material collected for museums necessitates that some of this cannot be exposed without suffering damage, and has to be stored in special ways, out of sight. Articles of this kind should never be refused on that account, but should be kept as carefully as those that are exhibited, so that they may be always available in a fit state for examination and research.

Where it is intended to organize a museum, those who have the work to do should not be discouraged because they have little material to exhibit at first. A beginning may well be made in connexion with an existing organization such as a scientific society or an agricultural society, or the first collections may be housed and exhibited in a public library until the time that a special building becomes necessary. In any case, it must be realized that the work in a museum is never finished. A museum that is regarded as complete has lost its activity and is fast hastening to decay.

SUGAR INDUSTRY.

THE PRODUCTION OF WHITE SUGAR DIRECTLY FROM SUGAR-CANE.

The present efforts among cane and beet growers to produce pure white sugars by one continuous process from the canes or the beets, are attracting much attention throughout the sugar world. The Wiese Process Company for making white granulated sugar has been tested at Wallaceburg, Ontario, Canada, and the results are said to have been very satisfactory. These experiments at Wallaceburg, however, have been chiefly in the way of refining raw cane sugar imported from the West Indies under the privilege given to the sugar factories in Canada to import free of duty, or comparatively free of duty, as much raw cane sugar as they produced of sugar from home-grown beets in their own country. This concession to these beet sugar factories has led to a considerable development of this method of cane sugar refining in these same beet sugar factories.

Pure white beet sugars have been made for years directly from beet juice without the use of bone black. Dr. von Lipmann inaugurated the addition of the sulphuring process to the standard carbonatation process in Germany some twenty years ago and has been successfully making pure white sugars ever since. This same process has been utilized in Canada in its beet sugar factories, and of course, they have been disposed to make efforts to handle cane sugars in the same way, although their process begins with cane sugar, and not with cane juice. Beet sugar is singularly free of glucose, while cane sugar always contains more or less of it and cane juice contains still more.

We shall discuss first the success in refining cane sugars in Canada, and later some of the other features of the business.

The beet sugar factory at Wallaceburg when used as a sugar refinery has a capacity of 200 tons of refined sugar per day of twenty-four hours. There is said to be another factory, located at Marine City, Michigan, of still less capacity and that a third plant is to be erected at Toledo, Ohio. It is said that at Wallaceburg no lime or sulphurous acid gas is used in the final processes with cane sugar, although they are used with beet sugar, but in the final processes more attention is given to filtration and the thorough purification of the cane syrup, including its decolorization, are secured in this way. The results seem to have been satisfactory and the sugars produced at Wallaceburg, as well as at Marine City, Michigan, have been sold in competition with sugar turned out by the Canadian sugar refinery, which has a full bone black filtering equipment. It is stated that the cane sugars brought equal prices with the white beet sugars.

The advantage of this process of sugar-refining in a beet sugar house is that the beet factories already have all the machinery ready to handle raw sugar in this way, excepting the melting pans and a few minor machines, the cost of which would be but a few hundreds of dollars, and with this limited outlay these beet factories can handle raw sugars to their heart's content throughout all the dull season, provided, always, that they can make any money at it.

The beet sugar factories being located back in the interior, it becomes quite a problem as to how they can receive their freights of foreign sugars and distribute their refined product. All these matters, however, are yielding to the good sense of the railroad management and can doubtless be adjusted.

The next most serious problem is the question of the loss in this process of refining. It has always been thought that in refining raw cane sugars the bone black process would give the largest possible yield. In liquoring sugars with a white liquor, or by washing them white in the centrifugals, the losses are ordinarily greater and yet by this Wiese process it was found in certain experiments that from 100lb. of raw sugar nearly 93½lb. of refined sugar were obtained. It was estimated at Wallaceburg that in handling approximately 16 million pounds of Java sugar the manufacturing cost of producing 100 lb. of refined sugars reached 41 2c. The resulting sugar was sold in successful competition with first-class refined sugar and seemed to give satisfaction. All this speaks well for this method of production, but by it cane sugar is still denied the advantage of being made in one continuous process directly from the juice of the sugar-cane. Dr von Lipmann's method in Germany revolutionized the production of pure white sugar there in many of their great sugar factories, although some still adhere to raw sugar production. It has been the dream of thousands of sugar planters everywhere that the day would come when with our improved mechanism, our better methods of decolorizing by the proper use of sulphur or by improved methods of filtration, we should be able to produce pure white sugars without the cost of rehandling or remelting, all of which go to make the expenses of sugar-refining, and all of which can practically be saved in the handling of cane juice in the original sugar factories and turn out there the high grade product at a single process.

This new method, known as the Wiese process, is attracting much attention and may revolutionize the cane sugar industry of the world by carrying the refineries right into, and making them part of, the great sugar factories, where the bulk of the sugars of the world are now produced. (From the *Louisiana Planter*, November 2, 1912.)

The Fibre of Gomphocarpus Semilunatus.—A note based on information regarding this plant in the *Kew Bulletin*, 1906, p. 397, and the *Bulletin of the Imperial Institute*, Vol. III, p. 316, as well as in the *Agricultural Bulletin of the Straits and Federated Malay States*, was given in the *Agricultural News*, Vol. IX, p. 72. It appears, further, from the Annual Report of the Biological Agricultural Institute, Amani, for 1911-12, in *Der Pflanzer* for September 1912, that the work in the laboratory of that institution included experiments in the extraction of the fibre from the stem of the plant by soaking it in water. The investigation showed that, after two or three days' soaking of strips of the inner bark, these rotted, together with the fibres. The preparation of the fibre without soaking in water is very laborious and can only be carried out by natives, who employ it for simply making rope for their own use.

It may be added that *G. semilunatus* is sometimes referred to as *Asclepias semilunata*. The plant is related to the Mudar fibre of India (*Calotropis gigantea*).

FRUITS AND FRUIT TREES.

THE CHERIMOYER.

CLIMATIC REQUIREMENTS. That the cherimoyer is not highly successful in strictly tropical countries is conclusively shown by the fact that even when it has been grown for some time in such regions and is comparatively well known, it is not held in high esteem. It is reported that it succeeds in some parts of Ceylon, and is popular with the natives. Obviously it is not at its best or it would call for a greater degree of enthusiasm. In Jamaica it is only a success in the coolest and driest parts of the island. Writers in other parts of the West Indies, and in Réunion, have remarked that it is not as fine a fruit as some other members of the genus.

But a glance at its popularity in the Mexican highlands, Madeira, the Canary Islands, and Peru shows a contrary state of affairs. It has reached a degree of perfection never attained in tropical lowlands, and is esteemed as one of the finest of all fruits

The great central plateau of Mexico may be taken as an example of climatic conditions best suited to this fruit, since it is there found in perfection, and has been cultivated from the remotest antiquity.

The hardiness of the tree has been so thorougly tested in this state [California] as to leave no room for dispute, and it can be relied upon to succeed in locations suited to citrus fruits, with the same amount of protection. The same provision must be made as with the citrus fruits, however, that some localities will produce finer fruit than others. And it must be recognized and remembered that varieties introduced from other countries will not necessarily be successful here—if from climates widely different from our own—without undergoing a process of acclimatization.

PROPAGATION. Although the majority of cherimoyers in this state are seedlings, the tree can be readily budded. It is only through this or some other asexual means of propagation that desirable forms, originated as chance seedlings, can be perpetuated, and cherimoyer culture on a commercial scale made profitable.

For germinating the seeds an excellent medium is a mixture of two-thirds silver sand and one-third *old* redwood sawdust; lacking this, any light, well-drained soil can be used with good results. The seeds should be covered to a depth of ½-inch, and if conditions are favourable, they will germinate within four or five weeks. The young plants should be potted off when they have attained a height of 3 or 4 inches, using pots of a diameter not less than 2½ inches. The plants are not particular as to soil, it only being necessary that it is light and porous.

Budding is best done in early spring, shortly after the sap has begun to flow. In some seasons this will be as early as the first of March, but more frequently late in March or early in April. The trees should be watched and the work begun as soon as it is found that the bark will slip readily.

The most advantageous method of budding the cherimoyer is that known as shield budding, the operation being practically the same as with the citrus fruits.

The stocks should be free from ⅜- to ½-inch in diameter—seedlings of this size being usually from a year to a year and a half old. Wood from which the leaves have dropped and of about a year's growth is the most desirable for budwood, and Mr. Wester advises cutting the buds not less than 1¼ inches in length. If cut smaller than this, on account of the rapid callousing and thick bark of the Anonas, the buds have difficulty in starting and are choked out. Insert the buds exactly as in budding citrus fruits, and tie with waxed tape. At the end of three or four weeks they should be unwrapped, and if alive, the tree should be lopped back and the bud rewrapped loosely, leaving the 'eye' exposed so that it may start into growth. The buds of the cherimoyer are sunk into the bark tissues, and there is not the danger of their dropping and leaving a 'blind' bud that there is with the avocado.

CULTURE. Experience in California has shown that the cherimoyer thrives under the same treatment as is accorded the citrus fruits. The seedlings grow to much larger size than any of the citrus trees, however, and should be planted at least 25 feet apart. Budded trees will probably require less room, as budding dwarfs the tree to a certain extent.

The tree has proved to be about as hardy as the orange—though this must be largely a matter of variety—and is semi-deciduous in nature, the extent being dependent upon the severity of the climate.

Whether seedling or budded, the tree ordinarily comes into bearing about the fourth year. The fact that large trees are quite frequently unproductive, though blooming profusely, has led to a series of investigations by P. J. Wester of the United States Department of Agriculture, which throw considerable light on the matter, although there is still much to be learned. Mr. Wester found that the flowers of the cherimoyer were unable to fertilize themselves because of the pistils maturing before the stamens, and consequently not receptive to the pollen when it was liberated, thus necessitating the assistance of some outside agency for fertilization. The pollination of the mature pistils with pollen from another flower was attributed to insects. Mr. Wester believed the sterility of the cherimoyer in Florida to be due to a scarcity of flowers and an insufficient number of insects to assist in pollinating them. He further states that: 'the extraordinary productivity of a few individual trees suggests a chance in regard to the pollination of the flowers of these trees, possibly due to synacmy [the coming to maturity of the anthers and stigmas at the same time] and self-pollination.' (From the *Pomona College Journal of Economic Botany*, May 1912.)

CASTILLOA ELASTICA ON THE IVORY COAST.

Here, in the same way as other plants yielding rubber that are being tried, *Castilloa elastica* has been planted in open spaces and seems suited to the conditions. It appears, however, to be unable to bear standing water at the roots, as is shown by the death of trees that have been reached by floods; nevertheless it behaves well under the rainy conditions of Tiassalé, where the trials are being made.

This and the following information is given in *L'Agriculture Pratique des Pays Chauds* for December 1911, which proceeds to remark upon the large growth of one of the trees, in comparison with that of the others in the same set, from which however it is situated at some distance. Although this tree is only three and a half years old, it has commenced to fruit, and it is thought that its better development is due to its superior position. In any case, measurements (which are given) show that on the Lower Ivory Coast, Castilloa makes rapid growth, comparable with that of *Manihot Glaziovii*, and it is considered that facility in producing rubber should go along with this.

Tapping trees two and a half years old by means of horizontal grooves about an inch long, arranged vertically, gave 0·35 oz. of dry rubber from three plants. Another tree of the same age, for which herring-bone tapping to a height of about 4 feet was employed, gave 0·15 oz. of scrap rubber possessing little elasticity; in this case, all the rubber remained in the cuts. These experiments with very young trees are not considered to show that plants of such an age should be tapped, on account of the interference with their growth and the poor quality of the rubber given by them.

In the case of older trees, three and a half to four years old, one plant tapped by means of horizontal grooves arranged vertically gave 0·62 oz. of dry rubber, in scraps, the product being black in colour and very elastic. A second tree of the same age, with herrring-bone tapping to a height of about 4 feet, gave 0·14 oz. of rubber, all of which remained in the incisions: though the product was good, the yield, as is seen, was small. Lastly, a very vigorous tree which had been bled three months before by the careless herring-bone method used by the natives for Funtumia, in the forest, was first tapped in horizontal grooves; but the latex was so much more fluid than that in the other cases that there was a risk of the loss of the rubber. Tapping was therefore carried out by the herring bone method, from a height of about 6 feet, on one half of the trunk. Coagulation took place before the latex could reach the cup placed at the foot of the tree. The product, like that of the first of these older trees, resembled the grade Sernamby; it was black in colour, with an agreeable smell, and very elastic, being a better product than that obtained by collecting the latex and treating it in order to obtain the rubber. It is stated that the rubber does not coagulate immediately in the air, but forms a more or less pasty mass having a white colour turning to yellow. The yield from the tree was 0·44 oz. of dry rubber, and the reason for this low return is seen easily in the way that the plant had been abused three months before.

The article concludes by reviewing shortly the prospects for Castilloa-growing on the Ivory Coast, which appear to be good.

THE CAMPHOR INDUSTRY IN FORMOSA, 1911.

The details below have been taken from the *Board of Trade Journal* for September 12, 1912. An account of the Camphor industry in Formosa in 1910, and an article entitled Useful Information Regarding Camphor, are to be found in this volume of the *Agricultural News*, pp. 9 and 302.

The export of camphor (a Government monopoly) showed a decrease of 872,554lb. in 1911. The quantity shipped was 5,613,718lb.

The estimated output of refined camphor by the Monopoly Bureau's refinery during 1911 was 7,267,000lb.

The number of owners of crude camphor works was fourteen, but the number of works exceeded this. It is stated that no new licenses will be issued during 1912 as the authorities still hold surplus stocks brought over from two years ago. The estimated receipts of crude camphor and camphor oil for the financial year 1911 were 6,264,000lb. and 7,272,000lb. respectively. These quantities were received, though in part after the turn of the year, the late receipts being brought over to the following year.

The estimated demand in Japan for Formosa camphor during 1911 was 3,280,000lb. to be extracted from the oil sent over. The quantity of camphor sent was very small. This demand is expected to increase considerably this year in consequence of the newly established manufacture of celluloid.

The improved refining machinery installed by the Bureau last autumn is said to give satisfactory results, producing camphor to the amount of 48 per cent. of the weight of oil used; this camphor is of superior quality, viz., 93 per cent. pure, containing only 2 per cent. of oil and 5 per cent. of water. The distillation is effected by steam heat, steam being also forced through the oil during distillation.

The Government has since 1906 encouraged the planting of camphor trees by distributing seedlings gratis. Over 3,000,000 plants were distributed in 1911.

As the result of experiments carried on for five years, the Bureau will commence the distillation of camphor from leaves on a practical scale this year. A considerable area has been afforested for this purpose. Leaves will be gathered from the young trees. The best results were obtained from the use of the leaves only, branches not being cut; 1·3 per cent. of camphor was obtained in this manner, together with 0·4 per cent. of oil.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date November 18, with reference to the sales of West Indian Sea Island cotton :—

West Indian Sea Islands have been in moderate request since our last report and sales comprise about 200 bales chiefly Leeward Islands cotton from 12*d.* to 14*d.*, with a few extra fine New Crop lots of Barbados and St. Kitts from 18*d.* to 19*d.* The medium qualities between 15*d.* and 18*d.* are quite neglected, there being very little demand for the yarns for which they are used. Prices remain firm.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending November 16, is as follows:—

There continued a demand for all the offerings of the receipts classing Fine to Extra Fine off in class, at prices ranging from 22c. to 26c., and some small sales were made of Extra Fine at 29c. There was also some inquiry for Fully Fine, which did not result in any sales.

Factors are not very willing sellers at our quotations, as the report of cotton ginned, and the continued small receipts, together with unfavourable reports from the plantations, has resulted in crop estimates being reduced to 8,000 to 10,000 bales.

We quote, viz.:—

Extra Fine	29c.	=	$16\frac{1}{2}$*d.*	c.i.f., & 5 per cent.
Fully Fine	$27\frac{1}{2}$c.	=	$15\frac{1}{2}$*d.*	,, ,, ,, ,,
Fine	26c.	=	$14\frac{3}{4}$*d.*	,, ,, ,, ,,
Extra Fine off in preparation,	26c.	=	$14\frac{3}{4}$*d.*	,, ,, ,, ,,
Fully Fine off in preparation,	24c.	=	$13\frac{3}{4}$*d.*	,, ,, ,, ,,
Fine off in preparation	22c.	=	$12\frac{3}{4}$*d.*	,, ,, ,, ,,

BRITISH COTTON GROWING ASSOCIATION.

The following account of a recent meeting of the Council of this Association has just been received:—

The one hundred and fifth meeting of the Council of the British Cotton Growing Association was held at the offices, 15 Cross Street, Manchester, on Tuesday, November 5, Mr. J. Arthur Hutton occupied the chair.

A letter was read from the President, the Right Hon. The Earl of Derby, G.C.V.O., regretting his inability to attend as he had intended; but his presence was necessary at a meeting in Liverpool in connexion with the threatened carters' strike.

WEST AFRICA. The purchases of cotton in Lagos to the end of October amount to 9,035 bales, as compared with 5,368 bales for the same period of last year, and 5,575 bales for 1910. The purchases in Northern Nigeria to date are 2,326 bales, as compared with about 500 bales for the whole of the previous season. The new crop in Northern Nigeria will begin to come forward towards the end of the present month, and there is every indication that the production will show a considerable increase over that of any previous season, and it is estimated that some 7,000 bales will be produced this year.

NYASALAND. It was reported that the crop in the Port Herald district is now coming in in small quantities, but the cotton is again mixed owing to the fact that the natives have not destroyed the old season's plants which have again cropped; it was felt that the only solution of this difficulty was to have a close season for cotton and ensure that all plants are rooted up every year. It was decided that representations should be made to the Agricultural Department if it is found that the cotton is badly stained when it arrives in this country.

A letter was read from the Director of Agriculture for Nyasaland suggesting that the Association should establish a small ginnery in the Upper Shire District, where during the last season over 80 tons of seed cotton was produced, and the crop now being harvested promises to show a considerable increase, over 100 tons of native-grown cotton having already been purchased. The matter is under consideration, but it was pointed out that it was most expensive to establish these pioneer ginneries, as an expenditure of something like £10,000 to £20,000 per annum would be necessary for some years if present developments were to continue. The question of the continuance of the Government grant, which expires on March 31, next, will very shortly have to be brought forward, and the opinion was expressed that the Association should not be expected to continue this pioneer work unaided.

SUDAN. Reports have been received stating that on the whole the cotton at Zeidab is looking healthy and promising, and at Tayiba the crop looks fairly healthy with the exception of a few patches which have been attacked by the cotton-flea and Asl. The cotton at Tayiba which has been planted on land under cultivation last year looks stronger than that which has been sown on new land.

The account closes with a financial statement showing that on November 7 the balance to be raised, to complete the authorized capital of the Association, namely £500,000, was £22,860. On October 1 it was £23,039.

AGRICULTURE IN FIJI, 1911.

The quantities and values of the chief exports from Fiji in 1911 were as follows: sugar 72,834 tons value £797,274, copra 16,337 tons value £294,245, and bananas 897,345 bunches and 219,551 cases value £151,668.

The general increase both in quantities and values is gratifying, and it is satisfactory to note that the anticipated ill-effects of the 1910 hurricane were not realized; while, however, the output was considerably less, the value of the year's produce was £32,242 greater than that exported during 1910. An extraordinary increase in the quantity of green fruit exported is noticeable, and it is due to the fact that during the year the banana industry was not affected by any serious cyclonic disturbance. During the year green fruit of the total value of £151,668 was exported, of which £33,145 was shipped to the Melbourne market by means of the greater facilities in transport provided during the year. The revenue derived from the imposition of the Banana Subsidy and Inspection Tax, levied under Ordinance XII of 1911, amounted to £1,397 12*s.* 11*d.*, against which the cost of inspection and subsidies on account of the banana trade amounted to £6,133 10*s.* 10*d.*

The total area of land under sugar-cane cultivation on December 31, 1911, was estimated at 43,358 acres, from which were produced 488,534 tons of sugar-cane. The area under coco-nuts, or cultivated by Europeans and exclusive of native plantations, was estimated at 37,562 acres. The estimated cultivated area under bananas and pine-apples on December 31 last was 4,692 and 230 acres respectively. These figures do not include native plantations, as to which details are not available. It is from native plantations that the greater part of the green fruit exported is produced. Fruit so grown is sold under contract to European buyers, who ship the produce to the respective markets. . . . . . . It is hoped that greater facilities for transport and conveyance of fruit to the port of Suva may be provided in the near future, and that the cultivation of fruit will increase considerably. This result will follow if planters are guaranteed that vessels suitably equipped for the carriage of fruit will be provided, and that the service will be continued for a definite period.

The continued increase of exports of minor products indicates that more attention might, with advantage, be given to the cultivation of products other than sugar, fruit, and copra. Some considerable area of land is now being leased to planters for the cultivation of sisal hemp. It is anticipated that the production of this fibre will become an important industry in some districts of the Colony. Land in considerable areas unsuited to the cultivation of either of the staple products is available for settlement, and may be utilized in the cultivation of sisal hemp. The quantity of molasses exported during the year was 9,821 tons, as against 8,900 tons in 1910. The value, however, placed on the quantity exported is shown to be £1,419 less than that for the previous year. (Taken from *Colonial Reports*—Annual, No. 727; September 1912.)

A NEW FODDER PLANT.

An article in the most recently received issue of the *Kew Bulletin*, on page 309, deals with an African grass called elephant grass which was described in the *Rhodesian Agricultural Journal* for June 1910 as Zinyamunga or Napier's fodder grass. The grass has since been identified at Kew as *Pennisetum purpureum*, Schum. It is a species widely distributed in Tropical Africa; but as comparatively little is known about it, the purpose of the article in the Bulletin is to give a grief account of what is ascertainable at present.

The plant is described as a tall perennial grass with a creeping rhizome; the stems (culms) are erect, in tufts containing up to twenty, and are 6 to 10, or occasionally as much as 23 feet high. They are branched, the branches being obliquely erect. The leaves are 1 foot to 2 feet (rarely 3 feet) long and up to 1 inch wide, with a strong midrib which is rounded on the back and provided with a shallow channel above, towards the base. The distribution of *P. purpureum* is between 10° N. Lat. and 20° S. Lat. It is found mainly along watercourses and in low-lying marshy land, but also enters the bush and forest in places where there is sufficient light. The stems grow to the greatest height in rich marsh land; on drier soil, as in the savannas of East Africa, they are hardly more than 6 feet high. The plant appears occasionally on abandoned land that has been cultivated, and has in a few cases been seen in a state of cultivation.

Besides its use as fodder, the grass is employed in Africa for making fences, for the interior walls of native houses, and strips of it are sometimes used for cutting up meat. Like pearl millet, it is said to be an extremely good resister of drought. It may be propagated like sugar-cane, either by division of the rhizomes or from cuttings or slips.

The composition of the fodder is compared with that of sugar-cane fodder in the following analyses:—

	Sugar-cane fodder, per cent.	Elephant grass fodder, per cent.
Water	73·63	61·81
Ether extract	0·22	0·29
Protein (nitrogen × 6·25)	1·27	2·92
Carbohydrates	17·73	17·29
Woody fibre	5·32	14·77
Ash	1·83	2·92

Juice from the stripped stalks was compared with juice from the cane, the extraction being made by the use of an ordinary flatting mill for rolling out metals, and was found to amount to 21·3 per cent. of the weight of the straw compared with 56·6 per cent. in the case of the sugar-cane. The juice of the elephant grass was tasteless and contained little sugar, while that of the sugar-cane gave 6·69 per cent. sucrose and 2·84 per cent. glucose.

It is authoritatively considered that the rotting grass, as well as the ash, is a valuable manure.

The article concludes by stating that the best method of propagating the grass is probably by dividing the plants, or from cuttings, and that as only one seed was found in the material received at Kew, and this was not quite mature, it is possible that the spikelets of the grass, with their involucres, detach themselves very easily.

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. XI. SATURDAY, DECEMBER 7, 1912. No. 277.

NOTES AND COMMENTS.

Contents of Present Issue.

The leading article in this issue presents some matters concerned with The Educational Work of Museums. A fuller treatment of the subject may be found in *Science* for November 15, 1912.

Under the heading Sugar Industry, page 387 contains an article reviewing methods of making white sugar directly from the sugar-cane.

On page 389 an account is given of interesting experiments that have been carried out in the tapping of *Castilloa elastica* on the Ivory Coast.

A description is given on page 391 of a new African fodder plant called elephant grass (*Pennisetum purpureum*), based on information appearing in the recent issue of the *Kew Bulletin.*

The Insect Notes, on page 394, contain the first of two articles dealing with ticks. They also comprise two short notes on a new pest of Ficus and a method of treatment for borers in trees.

An account of an address given by the Imperial Commissioner of Agriculture at a recent meeting of the Antigua Agricultural and Commercial Society is presented on page 395.

The Fungus Notes, which are given on page 398, deal with a recent report by the Assistant Director of Agriculture of Trinidad on coco-nut diseases in Tobago.

Nature Object-Lessons and Agriculture in St. Vincent.

The report on the Examination of Schools, St. Vincent, for 1912, which was gazetted on October 31, states that these subjects continue to be taught in the same way as was followed last year, except that more attention is given in some cases to box experiments.

It is thought that the recent reorganization of the the Agricultural Department may have one result in improving the conditions in connexion with the school gardens. This work has received interference during the year on account of the prolonged drought

The report states that the pupils still exhibit keenness in the object-lessons and theoretical agriculture, but the suggestion is made that the senior pupils at least should provide weekly, brief accounts of the experiments that they have been conducting.

The Dodder in St. Lucia.

A memorandum regarding the dodder or love vine (*Cuscuta* sp.) in St. Lucia has been prepared by the Agricultural Superintendent. This is being published in the *Gazette*, and it is intended that copies shall be supplied to the Parish Priests and to the Inspector of Schools, who are being asked to co-operate in spreading information and making known the expediency of united action against the parasite.

The memorandum of the Agricultural Superintendent commences by describing the plant and its common method of propagation, giving attention to its parasitic habit whereby it obtains all its food from its host.

The chief plants that are being attacked are enumerated, and stress is laid on the importance that every effort should be made by man, woman and child to destroy the vine. The method of destruction is thus detailed:—

'To destroy the vine it is necessary to collect it carefully and completely from the trees and shrubs on which it is found growing and then to burn it. Another way is to bury it in a hole in the ground, taking care to well cover it with plenty of soil. The work must be thoroughly done, and in collecting the material care must be exercised that any pieces that get dropped about are picked up. The infested spots should be visited at regular intervals of about seven days to collect any of the vine that may have begun to grow from pieces that were formerly dropped or overlooked.

'In some cases it may not be possible to properly hand-clean infested trees that have spiny branches; it will then be necessary to cut off the infested parts and burn them with the vine. Persistent and united effort for a few weeks will reduce this dangerous pest considerably, and then it will be an easier matter to keep it under control, especially if everyone becomes acquainted with its appearance, nature, and habits, and is always on the look-out for a chance to destroy it.'

It is pointed out that the vine is flowering at the present time in some localities, so that the necessity is indicated for prompt action before seeds are formed.

Rice in Corea, 1911.

It is hoped that the export tax on rice raised in Corea will be removed soon, as this will improve the conditions of the industry notwithstanding the fact that the rice taken by Japan has to pay an import tax. Attention is drawn in *Diplomatic and Consular Reports*, No. 4899 Annual Series, to the fact that the Japanese intend Corea and Formosa to be the sole producers of rice for use in their country, and better methods of agriculture in Corea should go a long way toward the attainment of this hope. In 1911 the exports of rice from Corea decreased from 108,935 tons worth £640,830 in 1910 to 75,286 tons worth £539,390 in 1911. The improved conditions for the circulation of money, in the peninsula, now enable the Coreans to hold their rice crops for better prices.

An Important Constituent of Rice Husks.

In the *Agricultural News*, Vols. X, p. 345; XI, pp. 55 and 339, attention was given to the possible connexion that exists between a diet consisting mainly of cleaned and polished rice and the prevalence of such diseases as beri-beri. Further information regarding the matter is available in an abstract of a paper describing recent work on the subject, contained in the *Journal of the Chemical Society* for October 1912.

In the investigation, it was shown that as in former cases hens, doves, mice and other animals fed exclusively with shelled rice become ill and finally die, after a great loss of body weight. The effect is caused by the absence of a substance essential to life, which is found in rice husks; it has been called Oryzanin.

The necessity of oryzanin in supporting life is proved further by adding it to artificial diets of fat, proteids, carbohydrates and salts, when the diet, originally inefficient, becomes useful.

The experience with the animals mentioned was confirmed in the case of dogs. Without oryzanin, they waste rapidly, and when given 0·3 gram of that substance daily they quickly recover.

The writers discuss the relationship of the absence of oryzanin to beri-beri. The substance has been found to be fairly widely distributed in various foodstuffs. In obtaining it from rice husks, these are first freed from fat by the use of ether, and the residue is extracted with alcohol.

Rubber of Hevea Confusa from British Guiana.

Under this title, the *Bulletin of the Imperial Institute* for October 1912 gives a note on *Hevea confusa*, which is indigenous to British Guiana, where it is known as Hattie or Sibi.

The plant is a large tree, distinguishable from *H. brasiliensis* by its bark being perfectly smooth except for the presence of scattered minute prickles; the bark of the Para rubber tree shows distinct longitudinal grooves.

Attention is drawn to the fact that the rubber furnished by *H. confusa* is weak and has hitherto been considered of little or no commercial value. A sample received at the Imperial Institute in July 1911 was however, of very satisfactory composition, and rubber of the kind would doubtless be saleable, although the product was deficient in elasticity and tenacity.

It is said that the trees give a small yield in rubber, and that experience in British Guiana, Jamaica and Java has shown that there is no improvement in the returns, under cultivation.

The sample from British Guiana consisted of biscuits of very dark rubber, clean, well prepared, and in good condition. The rubber was soft, however, and tore readily when stretched. An analysis which is given shows that the loss on washing was 1·4 per cent.; the percentages of caoutchouc, resin, protein and ash in the dry washed rubber were 92·3, 1·8, 4·9, and 1·0, respectively. It was valued at about 4*s*. per lb. in London, with fine hard Para at 4*s*. 8*d*.

'This sample of the rubber of *H. confusa* was very satisfactory in composition, the dry material containing 92·3 per cent. of caoutchouc and only 1·8 per cent. of resin; notwithstanding this it was very deficient in elasticity and tenacity.'

It is stated that it is impossible at present to assign a definite reason for the poor physical characters of the rubber.

Paper-making from Bamboos.

It appears from the *Bulletin de la Société Belge d' Etudes Coloniales* for September to October 1912 that the French Colony in Tonkin has just become practically interested in a new industry. A factory for making paper paste from the bamboo has been built, and commenced to work in March of this year. It is sufficiently large at present to produce yearly 6,000 metric tons of paper paste by the soda process. Permission has been obtained for cutting in the bamboo forests for a long period, and the factory is thus assured of a supply of raw material.

Emphasis is laid on the importance of the effort, in the light of the fact that the world's production of paper paste is about 8,000.000 metric tons; 55 per cent. of this amount is furnished by Europe, and the remainder by the United States and Canada. The well-known fact of the greatly increasing demand for paper, as well as the circumstances that a smaller area of forests is year by year available and that the Governments of various countries are taking energetic measures for the conservation of the forests, have had the result of increasing the market price of paper.

The work of investigators has shown that certain bamboos may be used with facility for the purpose: they yield more than 50 per cent. of cellulose, are harvested cheaply and can be cut up easily. It appears also that the paste obtained from such bamboos is of excellent quality and would be superior not only to the paste made from wood but also to that obtained from esparto grass.

As is pointed out in the article, the investigations —provided that future experience does not invalidate their worth—may yield results of the greatest importance.

INSECT NOTES.

TICKS.

PART I.

An important contribution to the knowledge of North American ticks has been issued recently by the United States Department of Agriculture as Bulletin No. 106 of the Bureau of Entomology. The authors are Messrs. Hooker, Bishopp and Wood, and the publication has been prepared under the general direction of Mr. W. D. Hunter. The title 'The Life History and Bionomics of some North American Ticks' indicates the lines on which the investigations have been carried out.

Reference to previous articles by Mr. Hooker and Messrs. Hooker and Bishopp will be found in the *Agricultural News*, Vol. X, p. 314, in the Insect Notes entitled: 'Information Concerning Ticks.'

On account of the importance of ticks generally, and of the limited knowledge regarding the ticks of most of the Leeward and Windward Islands, it is proposed to reprint in the *Agricultural News*, two of the introductory chapters of Bulletin No. 106, for the information of the planters and others in these islands who are, or ought to be, interested in these parasites.

One of these chapters 'The Economic Importance of Ticks' is reproduced herewith; the other 'Collecting, Preserving and Mounting Ticks' will appear in the next number of this journal.

'Ticks are of economic importance (1) as agents in the transmission of infectious diseases, and (2) as external parasites, both of man and the lower animals. At least two distinct diseases of man and eight or more of domestic animals are known to be thus transmitted, at least seventeen species of ticks being involved as carriers. Of these diseases one of man and one of cattle occur, and one of fowls is suspected to occur in the United States, while several others would undoubtedly obtain a foothold were they once introduced.

'It has been estimated by Dr. Mohler (1905) that the cattle tick alone is the source of approximately $40,000,000 annual loss in the United States. Mayor (1906) has estimated the annual loss as nearly $100,000,000.

'These parasites are of considerable importance as external parasites, particularly in the Southern States, owing not only to their irritation and great drain upon stock through removal of blood, but also to their indirect effect as well. In one of Theiler's experiments (1909a) a horse that was infested with *Margaropus decoloratus* died as a result of infestation from acute anaemia due to the withdrawal of blood. Within three days, 14 lb. by weight of ticks which had dropped from this horse were collected, and this amount represented only about one-half of the total number of ticks which engorged upon it. After dropping, their places of attachment furnish points at which the screw-worm fly (*Chrysomyia macellaria*) deposits its eggs, the maggots from which then readily enter the host. In the Southwestern States the appearance of equines is frequently injured by screw-worms, which gain entrance at the points in the ears where ticks had been attached, burrow, and destroy the supporting cartilage, causing the ears to lop over. This condition is commonly known as 'gotched'. Not the least of all is the frequent annoyance which man suffers as the result of the attachment of ticks to his body.

'The ticks which moult upon the host, instead of having to wait long periods to find another, merely continue sucking blood from the same animal. As a result these ticks reproduce very rapidly and frequently become of much greater importance as external parasites than species which drop to moult. This is the case with the cattle tick. Those which drop to moult have overcome this great disadvantage by becoming more resistant to heat and cold and by having gained the power to withstand much longer periods of fasting. Certain members of the subfamily Ixodinae, while not occurring in such great numbers on animals as in the case of species which moult on their hosts—all of which belong to the sub-family Rhipicephalinae—are frequently of considerable importance as pests, owing to the fact that the great length of the hypostome permits deep penetration. As the result of this deep penetration by the Ixodinae, an inflammation is produced which frequently results in suppuration. Often in the attempt to remove ticks belonging to this class from the body of the host the capitulum is separated from the body of the tick and remains embedded in the host.

'The periods in the life-history of ticks of particular importance economically, and which should be determined, are: *longevity*, or the period required for starvation while awaiting a host; *minimum parasitic period*, which is used in connexion with the preoviposition and incubation periods to determine the time that tick free areas may be used after infested cattle are turned in before the areas become infested; *maximum parasitic period*, or the period required for cleaning the host of all ticks (except males) when kept in tick-free inclosures; *preoviposition period and minimum incubation period*, used with the minimum parasitic period to determine the time that tick-free lots may be used before becoming infested; *stage or stages of imbibition of infection* and the *stage or stages in which infection is transmitted*, i e., in the case of species involved in disease transmission.'

A Method of Treatment for Borers in Trees.—The following is translated from a note which appeared in the *Journal d'Agriculture Tropicale* for May last:—

M. Miéville, a planter at Tonkin, has reported that he has successfully employed the following method of using rectified benzine against the coffee tree borer.

For this purpose a syringe with a strong, sharp point is used: the injection is made as high as possible in the tunnel of the borer so that the benzine may flow down and thus come into contact with the insect, which is immediately killed by being touched by the benzine.

A few hours after the injection the odour of the benzine will be found to have entirely disappeared, and there are no oil marks or wounds on the tree.

This method, which has been employed successfully for more than a year by M. Miéville, is said to do away with the necessity for cutting out the attacked parts.

A New Pest of Ficus.—A note in *Der Pflanzer* for May 1912 reports a new pest of *Ficus elastica* from Dar-es-Salam, German East Africa. This was observed on the opening leaf shoots, which were otherwise flourishing. and was boring through the young leaves, which later withered, becoming black at the edges and finally falling. The complete stage of the insect is a handsome, yellow beetle, which was described at Amani as *Sternotomis bohemani.* This is 3 to 4 cm. in length, with clear bluish-green wing cases which are marked with dark-brown, wavy, diagonal lines. The antennae of the insect are 5 to 7 cm. long and curved in a semicircle from behind. The land of the observer was freed from the pest by systematic search for it, followed by its destruction.

ANTIGUA AGRICULTURAL AND COMMERCIAL SOCIETY.

At a general meeting of this society, held on Friday November 1, 1912, an address was given by Dr. Francis Watts, C.M.G., Imperial Commissioner of Agriculture. His Excellency Sir H. Hesketh Bell, K.C.M.G., Governor of the Leeward Islands, presided.

At the commencement of the address Dr. Watts, in referring to the useful work of the society, mentioned the interesting circumstance that it is now twenty-one years since its inauguration.

In a survey of agricultural matters in Antigua, the address first paid attention to sugar, and reference was made to the way in which central factories had proved themseleves useful and necessary in the island. Notwithstanding the unfavourable conditions of a series of dry years, the amount of sugar-cane grown had not decreased to anything like the extent that may have been expected, had there been no chance of dependence on central factories. Though there had been great improvements in the direction of the manufacture of sugar, much more attention was required regarding the improvement of the soil, both by proper tillage and the judicious use of manures, particularly pen manure, a circumstance aiding in the production of the latter being the abundant growth of hay grass (*Andropogon caricosus*) that now forms a feature of the vegetation of Antigua. The matter led, in another way, to the consideration of the drainage of the soil, and Dr. Watts expressed agreement with the suggestion made by Mr. H. A. Tempany, B.Sc., Superintendent of Agriculture for the Leeward Islands, that more attention is now needed in relation to this matter, simply because of the deeper root system of the seedling canes that are now being raised in the place of the Bourbon cane.

Among green dressings, the Barbuda bean (*Phaseolus lunatus*) was recommended as being particularly useful, because the hydrocyanic acid formed in its leaves discourages the attack of insects. Most of the other available green dressings were liable to be destroyed by caterpillars of different kinds, and the matter was made all the more difficult for the agriculturist because Paris green and lime in proportions sufficient to kill the insects was fatal to the plants.

Dr. Watts referred to the untoward past experience of cotton growers in Antigua, mentioning the signs of recovery that are to be seen in consequence of the much less serious incidence of the flower-bud maggot. Assistance in combating this pest was afforded by early planting, whereby the state of the crop would be well advanced before the chief time of its attack—about the middle of December.

The consideration of cotton was succeeded by information regarding coco-nut growing, stress being laid on the great demand for coco-nuts, and the consequent attraction of agriculturists and capitalists toward the crop. After giving a few hints on the planting and cultivation of coco-nuts, the speaker passed on to the subject of forestry—a matter whose importance to the island has been recognized for several years. Although there was great uncertainty as to the power of forests to attract rain, it was realized that their presence caused the water falling as rain on hillsides to be held back for a time instead of being poured immediately off the surface of the land. Mr. Tempany had given this matter specific attention in a memorandum drawn up by him this year, dealing with the afforestation of the catchment area around Wallings Reservoir.

Allusion was then made to tuberculin tests that have been carried out recently in Antigua by Mr. P. T. Saunders, M.R.C.V.S., Veterinary Officer to the Imperial Department of Agriculture. Regret was expressed that planters in Antigua had not shown more interest in the subject. The Department had demonstrated the general presence of tuberculosis among stock in the island, and any further action would have to be taken by owners.

Dr. Watts concluded his address by reference to the question of the water-supply of Antigua, mentioning the recent work by Mr. A. A. Camacho at Ottos, and the somewhat unexpected results that had been obtained. It must be remembered that good supplies of drinking water could always be obtained by sinking wells in the limestone district, and economy would be effected in the use of such water by the increasing employment of the brackish waters for domestic purposes other than drinking.

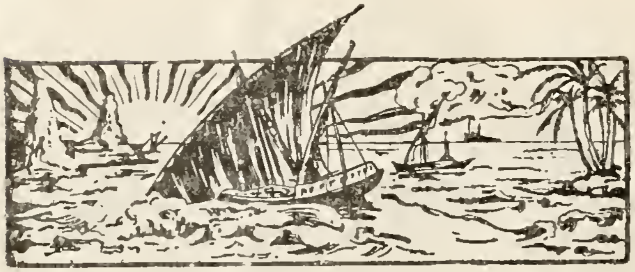
After His Excellency had thanked Dr. Watts on behalf of the members present for his address, the Commissioner of Agriculture made suitable acknowledgement, and a vote of thanks to His Excellency for presiding terminated the proceedings.

The Recent Rainfall in the Virgin Islands.—The following is taken from a recent report by the Agricultural Instructor, Tortola, to His Honour the Commissioner of the Virgin Islands, dealing briefly with the recent useful rainfall received in those islands:—

'The long drought was very effectually broken by the rains of the 7-8th. On the 6th Your Honour and myself left for Virgin Gorda, where it was proposed to hold an agricultural meeting on the 7th at noon. Soon after arrival there a strong south-east wind set in, accompanied by driving rain. We were unable to land on the 7th and eventually left Virgin Gorda at about 1.30 p.m., reaching Road Harbour, after a rough passage, about 3.30 p.m. On reaching home at 4 p.m. I measured what rain had fallen since 9 a.m. and found it amounted to 2·27 inches. During the night very heavy rain fell, and at 6 a.m I measured 7·32 inches (the rain having then ceased) making the total in less than twenty-four hours 9·59 inches. This is by far the heaviest fall in any one period of twenty-four hours since records have been kept here (1899 to date). The previous greatest fall in twenty-four hours was 6·04 inches on July 22-23, 1901.

'Considerable damage was done to the roads by wash. The upper wall of the bridge over the ravine, at the point where the public road crosses it, was washed away and the road cut up a lot. About 100 yards of newly erected fence was washed away, and minor damage done to the station. The water-course, which, fortunately, had recently been cleared out, has been again filled with gravel brought down from the foot of the hills. It is most essential for the preservation of the lower lands of the Station that this water-course be kept clear; much damage has been done in former years by its becoming choked and the water spreading, carrying with it gravel and débris.

'Growth has been very active since the rains, and, though it is too much to hope for normal crops of cotton, limes, sugar-canes, etc., I venture to hope that these crops will be better than was at one time thought possible.'



GLEANINGS.

The Grenada *Government Gazette* of September 16, 1912, publishes an order declaring the love vine (*Cuscuta* sp.) to be a noxious weed under the Noxious Weeds Ordinance, 1912 This is in consequence of a resolution passed by the Legislative Council on August 30, 1912, signifying its consent to such action.

The total export of bananas from Costa Rica during 1911 was 9,309,586, bunches, as against 9,097,285 bunches in the previous year. The total area under bananas at the end of 1911 was about 65,000 acres, and new plantations amounting to about 2,500 acres were made during the year. (From *Diplomatic and Consular Reports*, No. 4919 Annual Series.)

In *Colonial Reports*—Annual, No. 719, it is stated that the area of cacao under cultivation in Ashanti is increasing phenomenally. In order to encourage the natives to bring in better fermented cacao, merchants are beginning to grade their purchases of the article, and it is thought that this practice may produce a decided improvement in the quality of cacao exported from Ashanti.

Much benefit has accrued to the cotton crop in St. Kitts through the rains received in October. The Agricultural Superintendent states that the returns promise to be good and that the quality of the lint seems excellent. During the month mentioned the cotton worm showed much activity, but the use of large quantities of the mixture of Paris green and lime prevented any damage from being done.

An abstract of a paper given in the *Journal of the Chemical Society* for September 1912 deals with work showing that: 'certain bacteria are able to appropriate certain definite constituents of the protein molecule, especially that part which contains a carbohydrate radicle, leaving the remainder but little acted on until the more desirable portion is largely exhausted.' Carbohydrates are therefore enabled to exert a sparing action in regard to the consumption of proteids by bacteria.

According to *Diplomatic and Consular Reports*, No. 4916 Annual Series, the sugar-cane crop of Madeira in 1911 was again greater than that of any preceding year. Sugar was manufactured from 40,000 tons of cane, and 1,200 tons of the product was consumed locally and 2,000 tons exported to Lisbon and Oporto. The total cane crop was estimated at 72,000 tons, of a value of about £240,000. A decreasing amount of the cane is used for making cane brandy.

It is stated by the Agricultural Instructor in Tortola that at the end of October the cotton crop was in a very backward state; while as regards limes, a small crop of fruit was coming in. The growth of sugar-canes had been very good since the receipt of the rains. Meetings for peasants were held during the month at East End and West End, and at the Experiment Station. It was hoped shortly to hold other meetings at Virgin Gorda, Anegada and Jost van Dykes.

It is stated in the Leeward Islands *Gazette* for November 7, 1912, that His Excellency the Governor has been informed by the Secretary of State for the Colony of the approval of Ordinance No. 2 of 1912, Dominica. The purpose of this Ordinance is to amend the Dominica Forests Limited, Acquisition of Land Ordinance, 1910, and to transfer, extend and continue the powers conferred by this Act on the Company called Dominica Forests and Sawmills Limited.

A note in the *Bulletin of the Imperial Institute* for October 1912 states that a patent has been taken out recently for the extraction of candelilla wax: a description of it occurs in the *Journal of the Society of Chemical Industry*, 1912, No. 31, p. 346. In the process, the plant is boiled with gasoline, benzine or naphtha in the presence of fuller's earth, and after clarification the solvent is evaporated. The last reference in the *Agricultural News* to the wax was on page 345 of this volume.

During October, the cotton cultivation in many parts of Nevis suffered somewhat severely from cotton worms, and much of the time of the Agricultural Instructor was taken up in advising energetic measures against the pest. The amount of damage was increased by the fact that many of the holders had not taken measures to ensure the possession of a sufficient amount of Paris green required in the emergency. The rains had caused the crop to make fairly rapid progress, and picking had commenced in some districts.

A Bill has been brought before the United States Legislature which, *inter alia*, imposes an import duty of $\frac{1}{4}$c. per lb. on coco-nut oil, and palm kernel oil, which have hitherto been duty free. This is intended to allow the crushing of copra in the United States, and would probably stop the importation of coco-nut oil, and eventually that of palm oil. The importation of palm oil has grown enormously lately, and no doubt has invited attention. More than half has been sent from this country [England]. The duty is likely to affect Ceylon and other colonies. (The *Colonial Office Journal*, July 1912.)

A résumé of the proceedings at the Eighth International Congress of Applied Chemistry, in *Nature* for October 17, 1912, mentions a paper in which it is stated that the element manganese, present only in minute quantities in plants, is found to occur in laccase, which is an enzyme (first extracted from the lacquer tree) capable of bringing about assimilation of the nitrogen of the air. As small additions of manganese and of some of the other less common elements have been found to increase crop production to a considerable extent, it is likely that there will arise a new class of manures, called catalytic manures, capable of modifying the fertility of the soil in a favourable way without providing directly plant food.

STUDENTS' CORNER.

AGRICULTURAL EXAMINATIONS.

In the last number of the *Agricultural News*, the page corresponding to this contained the questions set in the paper on General Agricultural Science in the Intermediate Examination held on November 11 last. The questions that were asked in the paper on Special Crop Subjects in that stage are now given. Six of the eight questions set in each subject, only, were to be attempted, and where any subject in the syllabus is not mentioned, it means that it was not offered on this occasion by any of the candidates.

SUGAR INDUSTRY.

General.

(1) Give a general account of a method of sugar-cane cultivation with which you have had experience.

(2) What methods for lessening the damage from root disease (*Marasmius* sp.) of sugar cane have been suggested?

(3) State what manures you have seen used for sugar-canes, and why they were employed.

(4) What facts are in favour of the establishment of cane nurseries? How would you proceed to make a nursery of the kind?

(5) Say what you know of any methods that have been suggested for the classification of sugar-canes.

(6) Describe carefully the way in which ratoons are produced from the material left in the ground after crop.

(7) Give a list of insect pests of cane that you have observed, and supply an account of the life-history of any one of them.

(8) What considerations, in your experience, govern the extent to which the sugar-cane should be ratooned?

CACAO.

(1) Give a description of the disease called die-back of cacao, and say what other parts of the plant the fungus causing this disease will attack. Mention any other plants affected by this fungus.

(2) State what manures or other dressings you have seen used for cacao, and describe the way in which they are applied.

(3) Describe the fermentation of cacao.

(4) How have you seen cacao land drained, in your experience? What are contour drains and what are their uses?

(5) Give a list of the activities on a cacao estate, in order, during a complete crop season.

(6) Supply a description of a method of drying cacao.

(7) How is cacao grafted, and why?

(8) Write a short account of three different species or varieties of cacao that you have examined.

LIMES.

(1) Give the life-history of any insect pest of limes that is of importance, suggesting measures for its control.

(2) Write a careful account of the manufacture of any lime product with which you have had experience.

(3) Describe the work that has to be done in a lime nursery.

(4) In what ways is the essential oil obtained from limes? Compare the values of the products yielded by the different methods.

(5) Give details concerning the packing and marketing of *either* (a) lime juice *or* (b) citrate of lime.

(6) Write a description of a method of treating the soil in lime cultivation.

(7) State what you know of any disease of limes with which you have become acquainted practically.

(8) For what is lime juice tested, and how are tests carried out?

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) Describe a method of control of any insect pest of cotton. Give a list of the chief natural enemies of insects attacking cotton.

(3) What manurial treatment of cotton is advised, in the island in which you live?

(4) Mention the chief by-products of cotton-growing and say what uses are made of them.

(5) How should cotton lint be prepared for baling?

(6) What precautions should be taken in storing cotton seed?

(7) Give an account of any fungus or bacterial disease of cotton, stating what measures may be taken against it.

(8) Describe the action of the type of gin used for Sea Island cotton.

COTTON IN CHINA, IN 1911.

The decrease in the total export of raw cotton was chiefly due to the shortage of crops in the districts supplying Shanghai, Ningpo and Hangchow, in all of which the heavy summer rains caused much damage. The difficulty of forwarding money into the interior in the last quarter of the year, and the fall in prices in the United States, where abundant crops were produced, were factors still further operating to reduce the export from Central China, the decrease in shipments from Shanghai alone amounting to 40 per cent. The Hankow crop was a good one, but the revolution broke out before it could be brought to market. In the north of China, on the other hand, the salient feature of the trade of 1911 was the enormous increase in the production of raw cotton, the export from Tientsin being two and a half times greater than in the previous year. In many parts of Chili and Shantung cotton was grown as a substitute for opium, every assistance being given by the Government in experimenting with American seeds, and in other ways. An important reform was accomplished in Shanghai in regard to the long-standing abuse of watering native cotton, the efforts of an anti-adulteration association formed by cotton dealers there resulting in the establishment of a testing-house, by which all cotton intended for export has first to be examined, and is rejected if found to contain more than a certain percentage of moisture. The anarchy prevailing during the last three months of the year, however, checked the bringing in of supplies to the Shanghai market and interfered with the complete success of the new institution At Tientsin a similar association has been formed, and negotiations are proceeding for the establishment of testing-houses at the native customs barriers. Efforts are also being made by the Hankow General Chamber of Commerce to have a similar arrangement adopted at Hankow. (*Diplomatic and Consular Reports*, No. 4979 Annual Series; August 1912.)

FUNGUS NOTES.

COCO-NUT DISEASES IN TOBAGO.

An interesting preliminary Report on Coco-nut cultivation in Tobago, by Mr. W. G. Freeman, Assistant Director of of Agriculture, Trinidad, has recently been published in the minutes of the meeting of the Board of Agriculture, Trinidad, for September 20, 1912. This deals principally with the unhealthy condition of coco-nut palms known as root diseases and calls attention to an important point of some interest that had been overlooked previously, which is that the diseased condition of the roots themselves is confined to the horizontally spreading roots in the top 12 or 15 inches of the soil, and does not extend to the deeper roots. Another point to which attention is called is the existence of a possibly independent disease of which the symptoms are a rotting at the junctions of the leaf stalks with the stem and at the base of the very young fruits. The symptoms described by Mr. Freeman are not confined to Trinidad and Tobago. Diseased trees whose appearance corresponds in every way with the account given by him have recently been examined in St. Vincent and possibly might be found in certain other of the smaller islands. Part of Mr. Freeman's account is as follows:—

'I am not at present in a position to draw any definite conclusions as to the cause of the trouble [i.e. root disease]. It is probable I think, that under varying conditions, various causes result in the symptoms which are characteristic of the disease It can, however, be said that the trouble is not confined to areas of any particular soil. Coco-nut palms are affected on "rotten rock" both on hill sides and on the flat, on sands, coral deposits (coral sand), loams and heavy clays; on virgin forest land, and abandoned cane lands; on places at sea-level and at elevations up to 800 or 900 feet, on places which have been kept clean as well as on neglected areas.

'On most of the areas examined borings were made to a depth of 3 to 4 feet and much useful information obtained regarding the depth and character of the soil and subsoil, and of the level of the water-table. A collection of these soils and subsoils has been made. These will be retained as a reference collection and should be of value to intending planters in the future.

'In certain localities unfavourable conditions of soil and of water-supply are probably connected with the trouble, i.e., they either cause it directly or predispose the plant to attack.

'In other localities no such explanation appears to suit the facts, yet the disease occurs.

'One estate (not in Tobago) offers an excellent instance of the trouble, fortunately slight in amount, occurring under apparently ideal conditions for coco-nuts. The soil is sand to the depth, to which dug down about 4 to 5 feet when water was reached. The area is drained and kept in good cultivation. Trees were dying with all the usual symptoms—premature dropping of leaves, falling of the immature nuts, formation of the red ring in the stem, and reddish brown discoloration and drying up of the upper horizontal layer of roots. Before digging it was thought possible that stagnation of water or other unfavourable soil condition might be a cause of trouble. It was ascertained, however, that the discoloration and decay of roots were confined to those running horizontally in the upper 12 to 15 inches of the soil. Those below, which run vertically down to and below the water-level, were perfectly sound. A similar state of affairs has since been seen elsewhere. If stagnation of water, or lack of aëration of the soil, had been the cause the lower roots would scarcely be healthy when the upper ones were unhealthy.

'Further work is necessary as to the cause of this root trouble, correlated as it is with the red ring in the stem, which red ring gradually progresses apparently from the base of the stem upwards.

'Then quite independent apparently of the root trouble and the red ring of the stem there is the fairly constant and characteristic decay at the base of the leaf where it joins the stem, and at the bases of the very young fruits.

'This trouble has previously been investigated by the Mycologist and others, but further work appears necessary to determine whether its occurrence in trees suffering from "root disease" is merely a coincidence or not.

'It is important to emphasize the fact that on several estates there is but little trouble at all. Others have affected trees over definite, often small areas. In other cases relatively large areas are affected Unfavourable conditions are responsible, directly or indirectly, probably in some cases, but there are others, as already indicated, in which this explanation is not sufficient; at any rate, it is impossible at present to point to any condition and say that it is unfavourable. Investigation in areas apparently well suited to the palm should yield useful results. These I propose to continue. The restriction in some instances of the disease to the portion of the root system in the upper layer of soil of practically similar character throughout appears a point of some importance to which attention has not hitherto been directed.'

In concluding, Mr. Freeman says that this report is only of a preliminary nature and that the work will be continued with a view to ascertaining causes of diseases and to find a practicable and profitable remedy This work should be of great value not only to Trinidad and Tobago but to the West Indian islands in general, and the results obtained will be awaited with interest.

THE PRESERVATION OF WOODEN POLES.

The following are some of the results of various methods of treatment for preserving wooden poles presented in Circular No. 198 of the Forest Service, United States Department of Agriculture. Although the results were not obtained under tropical conditions, they are of interest in the West Indies, where more attention might profitably be given to the subject of timber preservation.

Both the green and seasoned poles butt-treated with coal-tar creasote by the open tank process showed practically no decay at or near the ground line.

The poles brush-treated with two coats of coal-tar creasote, and preservatives sold as Avenarius carbolineum, S.P.F. carbolineum, and wood creasote, showed but little difference in the extent of decay. Their average loss of circumference was 0·02, 0·04, 0·04 and 0·06 inch, and the per cent. affected with decay 14·5, 13·6, 13·4 and 24·0, respectively. The condition of these poles was next best to that of those treated with coal-tar creasote in the open tank.

The poles brush-treated, respectively, with one coat of preservatives sold as S.P.F. carbolineum and Avenarius carbolineum showed a much greater loss of circumference at the ground line than those treated with two coats of these preservatives. The average losses of circumference were 0·10 inch and 0·27 inch, and the per cent. affected with decay 30 and 25, respectively.

The poles brush-treated with two coats of preservative sold as creolin and those similarly treated with one coat of preservative sold as wood creasote showed but slight difference in loss of circumference at the ground line, the average loss being 0·42 and 0·43 inch, and the per cent. affected with decay 69·8 and 95·2, respectively.

The poles brush-treated, respectively, with one coat of preservative sold as creolin and coal-tar, showed a loss of circumference at the ground line of 0·89 and 0·95 inch, and a per cent. affected with decay of 100 and 98, respectively. The loss with these poles was nearly as great as with the untreated.

The untreated poles were practically all more or less affected with decay at the ground line, the average loss of circumference for those seasoned prior to placement being 1·01 inches, and for those placed green 1·16 inches. That two of those seasoned prior to placement showed no decay at or near the ground line is possibly due to the fact that they were both set on a hillside or slope where the drainage was excellent. One of them was set in broken stone or rock.

A second independent set of experiments gave the following additional results:—

The untreated poles set in crushed stone showed less decay at the ground line than similar poles set in sand, the average loss of circumference at that point being 1·77 inches and 2·27 inches, respectively.

The poles with charred butts showed less decay at the ground line than similar uncharred and untreated poles set in either crushed stone or sand, their average loss in circumference at the ground being only 0·71 inch.

RADIUM AND PLANTS.

The influence of radioactive substances on plants has received attention in the *Agricultural News* (Vols. X, p. 183; XI, p. 363). The following note concerning the action of radium itself is taken from the *Gardeners' Chronicle* for November 2, 1912:—

The effects produced by the exposure of seeds and plants to radium emanations have been investigated by Professor Molisch who finds that, generally speaking, they are disastrous. Plants subjected to these emanations are in many cases permanently damaged, the germination of seeds is delayed, and in many cases, for example in various leguminous seed plants, such as *Robinia Pseudacacia*, the leaves are thrown off, even though the experiment be carried out in spring or summer. If extremely small amounts of radium are used, a speeding up instead of a retardation of germination may be obtained, e.g., with stocks, *Cucurbita Pepo* [the pumpkin], and *Helianthus annuus* [the sunflower]. The permanent nature of the injury appears to be due to the action of the emanations on the cells of the growing point, both of shoot and root. A remarkable modification made its appearance as a result of subjecting plants of *Sedum Seiboldii* to this agent. Normally the shoots of this plant bear three leaves in whorls, but those exposed to the emanations for three days developed leaves arranged in opposite pairs. The mode by which radium produces its effects on the cells of plants is unknown, though many of its effects recall those produced by poisons. It is interesting to note that the above-mentioned symptoms are produced by the exposure of plants to ·0000063 milligram of radium.

EXPORTS FROM DOMINICA.

The following particulars of the exports from Dominica during the periods mentioned are given in the *Official Gazette* for November 1, 1912:—

	From Jan. 1 to Sept. 30, 1912.	For same period, 1911.
Bay leaves, cwt.	625	190
Cacao, cwt.	6,901	5,600
Coffee, cwt.	70	53
Citrate of lime, cwt.	2,044	2,502
Essential oils:—		
Lime, écuelled, gals.	587	425
,, distilled, ,,	2,522	2,479
Orange, gals.	40	49
Firewood, cords	1,725	142
Fruit, fresh:—		
Bananas, bunches	3,969	2,770
Coco-nuts	377,836	293,432
Limes, barrels	32,232	32,027
,, boxes	2,864	2,538
Oranges, barrels	686	223
,, boxes	718	247
Fruit juices:—		
Lime, con'cd., gals.	67,745	51,584
,, raw, gals.	385,339	196,901
Hardwood, feet	857,228	30,624
Lime Juice Cordial, gals.	5,160	5,800
Limes, pickled, barrels	474	353

DEPARTMENT NEWS.

Mr. H. A. Ballou, M.Sc., Entomologist on the Staff of the Imperial Department of Agriculture, left Barbados for Antigua by the R.M.S. 'Tagus' on December 2, in order to make investigations regarding insect pests in that island.

Hurricane Insurance for Coco-nut Plantations.—Information has been received from Messrs. Henry Head & Co., Ltd., Insurance Brokers, 27 Cornhill, E.C., who have for the last few years effected insurance on both the trees and crops of coco-nut plantations against the risk of hurricanes, in the West Indies, as to the present terms and rates of premiums. These are as follows:—

Trees: 20*s*. per cent. to pay the excess of 5 per cent. of the value of each plantation, or 15*s*. per cent. to pay the excess of 10 per cent. of the value of each plantation

Crop: 30*s*. per cent. to pay the excess of 10 per cent. of the value of each plantation.

In the cases where the crop is insured, Underwriters require the buildings of the estate to be insured as well, except where they are only of trifling value.

It may be said with reference to coco-nut insurance generally, that it would appear to be easier to estimate the damage due to a strong wind than is the case in many other kinds of cultivation.

MARKET REPORTS.

London.—The West India Committee Circular, November 19, 1912; Messrs. E. A. de Pass & Co., November 8, 1912.

Arrowroot—$3\frac{3}{4}d.$ to $5d.$
Balata—Sheet, 3/4½; block, 2/2½ per lb.
Beeswax—£7 15*s.*
Cacao—Trinidad, 72/- to 80/- per cwt.; Grenada, 59/- to 66/-; Jamaica, 55*s.* to 65*s.*
Coffee—Jamaica, 69*s.* to 88*s.*
Copra—West Indian, £27 10*s.* per ton.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 12*d.* to 19*d.*
Fruit—No quotations.
Fustic—No quotations.
Ginger—49*s.* to 65*s.*
Isinglass—No quotations.
Honey—No quotations.
Lime Juice—Raw, 1/-; concentrated, £18 to £18 10*s.*; otto of limes (hand-pressed), 7/-.
Logwood—No quotations.
Mace—1/11 to 2/6.
Nutmegs—7*d.* to 9*d.*
Pimento—$2\frac{7}{16}d.$ to $2\frac{9}{16}d.$
Rubber—Para, fine hard, 4/5; fine soft, 4/-; Castilloa, 3/8 per lb.
Rum—Jamaica, 2/1 to 6/-.
Sugar—Crystals, 17/ to 19/6; Muscovado, 11/6 to 14/-; Syrup, 13/3 to 14/-; Molasses, no quotations.

New York.—Messrs. Gillespie Bros. & Co., November 15, 1912.

Cacao—Caracas, 15c. to 15½c.; Grenada, 14½c. to 15c. Trinidad, 15c. to 15½c. per lb.; Jamaica, 11½c. to 12c.
Coco-nuts—Jamaica, select, \$34·00 to \$35·00; culls, \$20·00 to \$21·00; Trinidad, select, \$34·00 to \$35·00; culls, \$20·00 to 21·00 per M.
Coffee—Jamaica, 15½c. to 17c. per lb.
Ginger—8¾c. to 12c. per lb.
Goat Skins—Jamaica, 50c.; Antigua and Barbados, 46c. to 48c.; St. Thomas and St. Kitts, 43c. to 45c. per lb.
Grape Fruit—Jamaica, \$1·50 to \$2·00.
Limes—\$5·00 to \$5·50.
Mace—53c. to 58c. per lb.
Nutmegs—110's, 14¾c. to 15c.
Oranges—Jamaica, \$2·25.
Pimento—4c. per lb.
Sugar—Centrifugals, 96°, 4·05c. per lb.; Muscovados, 89°, 3·55c.; Molasses, 89°, 3·30c. per lb., all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., November 25, 1912.

Cacao—Venezuelan, \$15·50 to \$16·00 per fanega; Trinidad, \$15·96 to \$16·68.
Coco-nut Oil—\$1·01c. per Imperial gallon.
Coffee—Venezuelan, 16½c. to 17c. per lb.
Copra—\$4·70 per 100 lb.
Dhal—\$4·00.
Onions—\$1·50 to \$3·00 per 100 lb.
Peas, Split—\$5·75 to \$6·00 per bag.
Potatoes—English, \$1·75 to \$2·10 per 100 lb.
Rice—Yellow, \$5·00; White, \$6·25 per bag.
Sugar—American crushed, no quotations.

Barbados.—Messrs. James A. Lynch & Co., Ltd., November 30, 1912; Messrs. T. S. Garraway & Co., December 2, 1912; Messrs. Leacock & Co., November 22, 1912.

Arrowroot—\$8·00 to \$9·00 per 100 lb.
Cacao—\$12·00 to \$14·00 per 100 lb.
Coco-nuts—\$20·00.
Hay—\$1·60 to \$1·80 per 100 lb.
Manures—Nitrate of soda, \$75·00; Cacao manure, \$45·00 to \$48·00; Sulphate of ammonia, \$80·00 to \$85·00 per ton.
Molasses—No quotations.
Onions—\$2·00 to \$3·75 per 100 lb.
Peas, Split—\$6·25 to \$6·75 per bag of 210 lb.; Canada, \$3·00 to \$4·80 per bag of 120 lb.
Potatoes—Nova Scotia, \$2·70 to \$3·75 per 160 lb.
Rice—Ballam, \$5·10 to \$5·60 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
Sugar—American granulated, \$4·90 per 100 lb.

British Guiana.—Messrs. Wieting & Richter, November 23, 1912.

Articles.	Messrs. Wieting & Richter.
Arrowroot—St. Vincent	——
Balata—Venezuela block	No quotation
Demerara sheet	70c. per lb.
Cacao—Native	18c. per lb.
Cassava—	\$1·00.
Cassava Starch—	\$7·50 to \$8·00
Coco-nuts—	\$16 to \$20 per M.
Coffee—Creole	18c. per lb.
Jamaica and Rio	20c. per lb.
Liberian	17c. per lb.
Dhal—	\$3·50 to \$4·00 per bag of 168 lb.
Green Dhal	\$5·00
Eddoes—	60c. to 80c.
Molasses—Yellow	None
Onions—Teneriffe	——
Madeira	9c. to 10c. per lb.
Peas—Split	\$6·25 to \$7·00 per bag (210 lb.)
Marseilles	\$3·75.
Plantains—	16c. to 48c.
Potatoes—Nova Scotia	——
Lisbon	\$2·00 to \$2·25
Potatoes-Sweet, B'bados	\$2·64 per bag
Rice—Ballam	No quotation
Creole	\$4·50 to \$5·00
Tannias—	\$1·68
Yams—White	\$2·64
Buck	\$2·40
Sugar—Dark crystals	\$2·20 to \$2·40
Yellow	\$3·00 to \$3·25
White	\$4·00
Molasses	\$2·30 to \$2·40
Timber—Greenheart	32c. to 55c. per cub. foot
Wallaba shingles	\$4·00 to \$6·25 per M.
,, Cordwood	\$1·80 to \$2·00 per ton

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CONTENTS

Reading Courses and Examinations in Practical Agriculture.

THE present conclusion of another set of Reading Courses and Examinations in Practical Agriculture conducted by this Department makes a suitable opportunity to provide a general statement of the progress that has been made, and at the same time to draw attention to the scope of the work and to review the principles that are followed in carrying it out. This is done all the more readily because it is realized that the present occasion can be employed usefully to point out and illustrate the practical nature of this work, particularly as regards the method that is followed in conducting the examinations.

The Reading Courses were commenced in the last quarter of 1908. For the guidance of students, a syllabus of subjects for examination was published* and issued subsequently as a leaflet, and part of one of the pages of this journal began to be used as a 'Students' Corner', in order to provide a means of regularly bringing forward subjects for the thought and investigation of students by the aid of short articles and sets of questions. In this feature of the courses, the purpose of the articles was to make suggestions that would lead to careful thought rather than merely to present facts that could be learned by students in other ways: and when the time came for the examinations to be held in the several stages, the questions were graded carefully in order to indicate the scope of those likely to be set in each stage. The syllabus of the examinations has been revised from time to time, as progress was made with the scheme; and the articles in the Students' Corner have been made to refer to the actual conditions in the different islands, with the aid of notes supplied by the agricultural officers in those islands. The student has also been assisted in a most valuable way by these officers, by their personal advice, and in many cases they have organized meetings where students could discuss agricultural matters with them and with one another.

For the intermediate stage of the Reading Courses, the student has to be engaged actually in agricultural work, and to pass a Preliminary Examination, or its equivalent, which will satisfy the Commissioner of Agriculture that he is fitted to enter the Intermediate,

*West Indian Bulletin, Vol. IX, p. 293.

and ultimately the Final, Examination. For both of these, he must continue to be engaged in agricultural work, either on an estate or under an agricultural department, and a nominal period of one year of such work for each of these stages is insisted upon. In the examinations, the thoroughness of this practical work is tested in the case of each candidate by a most efficient method that will be described.

This efficiency has been gained by holding oral, as well as written, examinations in each stage. In the preliminary stage this is conducted by one or more of the agricultural officers in each island. It is, however, in the Intermediate and Final Examinations that the great necessity of the oral part of the tests has been realized, and its efficacy has been shown. This is because it is conducted in these stages by planters who hold an acknowledged position as practical agriculturists in the island where they live, and because no certificate of a pass by a candidate in those stages can be issued until it has received the signatures of the local examiners; at the same time, in order to avoid subsequent misunderstanding, the certificates of candidates who have gained their experience in an agricultural experiment station alone are endorsed with a statement of this fact. As these examiners naturally satisfy themselves as to the usefulness of the practical experience and knowledge of the candidate before they will report his fitness to pass, it follows that his possession of a certificate countersigned by them forms the best possible guarantee that he can be entrusted with the work on an estate, connected with the subjects that he has offered for examination.

The stages of the courses are devised so that a pass gained by a candidate in the Intermediate Examination testifies to his fitness to conduct the work of an overseer on an estate of the kind where he has gained his experience; while the possession of a certificate of the Final Examination entitles him to be regarded as being fitted to undertake the duties of manager on such an estate. The testimony by his oral examiners of his ability, thus possessed by him, is the most important outcome of the scheme; and too much cannot be said of the thorough way that the reports by those examiners have always shown them to have done their work.

It should be evident, from what has been said, that these courses and examinations cannot be regarded as having merely the nature of home reading courses, or similar schemes, which simply enable the candidate to pass an examination on a basis of what is often called 'book learning'. The way in which they are conducted gives them an eminently practical value, both in their oral and written parts: and the recognition of their usefulness, by practical agriculturists who employ men doing the work of the candidates, is their strongest feature.

A matter of indirect interest that has transpired during the examination of the papers is the almost invariable superiority of the style and form of the answers in those islands where secondary agricultural education has been established for some years. These answers generally show that candidates possess a far greater ability to think correctly and marshal their facts in an orderly manner, where the advantages of such education exist, than that shown where they are absent or are of comparatively recent introduction. The import of this circumstance is greater than may be realized at first, for it means that in the more favoured islands, the educational system has become such as to aid in the production of individuals who are the most fitted to assist in leading the thought of the community. It is one of the many examples where the introduction of a system, or the making of a reform, has led to results of wider application than was expected at first—results whose importance is not patent to everyone, because their value cannot be expressed through the medium of figures in statistics.

A short account of the history to the present of the examinations for the reading courses will not be out of place. The first examinations in the three grades were held as follows: preliminary, February 1909; intermediate, November 1909; final, November 1910. The statistical details given after the end of this article show that the numbers of examinations and candidates have been: preliminary, five examinations, with 62 candidates of whom 47 passed; intermediate, four examinations, with 34 candidates of whom 25 passed; final, three examinations, with 12 candidates of whom 8 passed. The reason for the decrease in the number of candidates appears to be chiefly that the examinations have quickly come to be regarded as a serious matter—not to be taken up lightly with the chief aim of getting a certificate of some kind; there is the additional circumstance that no candidates have come forward from Barbados in recent years. With this decrease in numbers there has, however, been an encouraging improvement in the general standard of the papers that are being sent up; and this circumstance, rather than the numbers of candidates entering, makes for the strength and stability of the scheme.

It may be said, in short, that the present state of the Reading Courses and Examinations of this Department is a matter for encouragement: and the active co-operation of the practical agriculturist in the different islands, particularly of those planter examiners who are giving their personal assistance, is one of the best auguries for continued success.

A synopsis of the results of the examinations that have been held is as follows:—

Examination.		No. of candidates.	No. who passed.
Preliminary, Feb.	1909	14	9
,, October	1909	20	15
,, ,,	1910	17	13
,, ,,	1911	7	6
,, ,,	1912	4	4
Totol		62	47
Intermediate, Nov.	1909	12	10
,, ,,	1910	12	8
,, ,,	1911	4	3
,, ,,	1912	6	4
Total		34	25
Final, November	1910	7	5
,, ,,	1911	4	2
,, ,,	1912	1	1
Total		12	8

AN APPARATUS FOR DRYING COTTON.

An account has been received from Mr. W. N. Sands, Agricultural Superintendent, St. Vincent, of a system for drying cotton devised by Mr. C. O. Hazell, K.C., of that island. In forwarding the matter Mr. Sands states that he considers this system the best that has been devised so far for local use.

In the memorandum describing the system, Mr. Sands points out that the heavy rainfall of St. Vincent makes it necessary to equip buildings with special drying arrangements for the purpose of preventing the deterioration of Sea Island seed-cotton. Among the many methods in use, some follow closely the principles of the sliding roof and the sliding tray, of cacao boucans; while others include shallow open trays that can be covered quickly or moved into a building when rain threatens. In all these methods, most of the seed cotton has to be dried in the open air, so that the process is much delayed in wet weather.

The system of Mr. Hazell is referred to as the Car System; it comprises an arrangement of a drying rack on wheels. Its advantages over all other drying arrangements devised so far are that the seed-cotton does not deteriorate by 'heating', and that drying can be carried on both in and out of doors.

The cars are such as can be moved easily. Their length is 13 feet, their width 3 feet 7 inches, and their height 8 feet 4 inches. They hold seven trays each 5 inches deep, running the whole length and width of the car; the bottoms of the trays are made of ¼-inch galvanized wire netting, so that air passes easily through the cotton. As the cars run on rails both inside and outside of the drying house, their attention requires little labour.

When the cars are inside of the house, the cotton is protected from the weather by the device of having the outside end of each leading car covered with galvanized iron sheeting, which exactly fills the exit space in the wall when the car is pushed home.

The account is accompanied by photographs which show plainly that a most efficient means of drying cotton has been devised by Mr. Hazell.

DEPARTMENT NEWS.

Mr. H. A. Ballou, M.Sc, Entomologist on the Staff of the Imperial Department of Agriculture, returned to Barbados, from Antigua, by the S.S. 'Korona', on Friday December 20.

Conditions Suitable for Sisal Hemp Cultivation.—An article in the *Tropical Agriculturist* for September 1912 states that the International Fibre Congress and Exhibition, held at Soerabaya, Java, in 1911, came to the following conclusions regarding the conditions that are best suited for the growing of sisal. The experience is obtained from the cultivation of Agave (chiefly *A. cantala*) in Java, where this is the most important fibre plant. It is quite different from the sisal (henequen) of Mexico, which is *A. sisalana*:—

'The culture of sisal hemp is not remunerative on lands which do not permit cheap transport of the raw material, nor on poor land nor in a cool region where the yield falls below 650 ℔. of fibre per acre. It can be grown with advantage on soil deficient in humus, where cacao and coffee no longer flourish. The soil must be free, and situated not more than 1,200 feet above sea-level. It is most profitable grown as a secondary product, since it can then be left untouched when the market price is low, or during seasons when the production of leaf is small. It cannot be recommended as a catch crop or intercrop. If sisal is the chief product, estates of less than 700 acres are not profitable. For an estate of 900 acres the cost of upkeep and replanting, upkeep of buildings, management, etc., together with 5 per cent. interest on the capital, will be about 54 rupees per acre. The capital required is estimated at 335,000 rupees. The expenses of harvesting, transport, commission, etc., and depreciation are reckoned at about 100 rupees per ton of fibre, while the value per ton of dry fibre, f.o.b. Java, is about 300 rupees. The net profit, with a production of 650℔. per acre is not more than 5 per cent., but with a production of 1,300℔. per acre it increases to 20 per cent.'

The Superintendent of Agriculture, Grenada, has drawn attention to an account of milk made from soy beans, which appeared in the *Times Weekly Edition* dated October 18, 1912. A demonstration of the milk which, it is claimed, contains all the elements of the best cow's milk, and can be used for the same purposes, was given in London before Sir William Crookes and representatives of the Home Office and the Local Government Board. It is stated that the product would yield a profit at the price of *3d.* a quart, and it is proposed to form a company and to erect factories for its manufacture.

FRUITS AND FRUIT TREES.

THE PRODUCTION OF FIGS.

The *Agricultural News* for August 19, 1911, contained an article dealing with the production of Smyrna figs. In connexion with this matter, it has been thought well to draw attention to the following details which should be considered in relation to the account just mentioned. They appear in an article in *Nature* for November 14, 1912, reviewing *Die Feigenbäume Italiens und ihre Beziehungen zu einander* by Dr. Ruggiero Ravasini, which has just appeared.

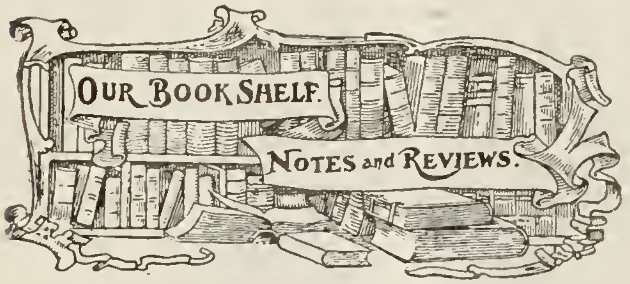
When men began to plant wild fig trees in their gardens, they would, of course, propagate them by cuttings. Now cuttings of the wild fig tree are found to reproduce the characters of the branches from which they were taken. By taking cuttings from branches destined to bear spring inflorescences, trees have been produced in which only the spring inflorescences regularly attain complete maturity; these trees are Caprifigs (goat figs), which are practically male. In the same way, by using as the parent stock branches which bear summer inflorescences, trees have been produced which are entirely female. Of these two the caprifig alone is capable of harbouring the insect guest during its growth period.

Two fig trees, very different in appearance and function, have thus been developed by the action of men out of the single primitive stock; they are often called *varieties*, but Tschirch and Ravasini show that they are really *artificially produced sexual forms* of one and the same natural species, viz., of the wild fig tree. One proof is that seeds of the cultivated fig tree produce either caprifigs or inferior fruiting figs. A further proof is yielded by the fact that the female Blastophaga, when laden with eggs, can only fly a very short distance. Hence we infer that she is adapted to a monoecious fig tree, in which all the forms of inflorescence are to be found on one tree. The cultivated fig tree is practically dioecious, and without artificial pollination ripens no seed. Only one monoecious tree is known, which can be regarded as a possible common ancestor of the two infertile forms, caprifig and fruiting cultivated fig; this common ancestor is the wild fig tree.

Fig cultivators must have become early acquainted with the Blastophaga and the effects of its visits, for the female flowers of the fig remain unfertilized if no Blastophaga enters them, and unfertilized female inflorescences (in unimproved fig trees) fall off prematurely. To prevent such failures, the expedient was successfully tried (ages ago) of fastening to the female trees ripe staminate inflorescences of the wild fig trees. Blastophagas and pollen were thus supplied together, and the female inflorescences duly ripened. In course of time the inflorescences of the wild fig tree were replaced by those of the caprifig, which answer the same purpose, and are easily raised on the spot. Thus arose the practice of 'caprification' which is essential to the production of the best keeping or drying figs.

The dried figs of commerce, which are all seed-bearing, absolutely require fertilization by the Blastophaga, and this is most easily secured by caprification. But if only fresh edible fruits are desired, caprification may be dispensed with. By long-continued selection it has been found possible to create varieties in which the unfertilized figs do not fall off prematurely, but develop into a valuable fruit. The large, non-seeding, sweet and juicy table figs of north and mid Italy require no pollination at all. Ravasini calls this the greatest triumph of fig culture.

The Turkish Silk Industry.—Brusa and Beirut are the chief centres of the silk industry in Turkey, and the gross annual production of fresh cocoons in the Empire may be estimated at 33,000,000 lb., valued at £1,875,000. From 80 to 85 per cent. of this is spun in Turkey, the rest being exported to continental markets. The spun silks are almost entirely exported, as the native looms are limited to a few hand machines. The average annual silk thread exports amount to about 1,100,000 lb. from Syria, and 1,540,000 lb. from Brusa and Adrianople. Turkey's 1911 silk crop was excellent, but prices were low, partly owing to the new fashions requiring less material, and partly on account of Japanese competition. *Bona fide* efforts are still being made to open up direct connexions with the United States for the sale of Turkish raw silk. Merchants engaged in the silk industry in Turkey have had to face several poor seasons in succession, and there is a tendency to abandon silk for tobacco in some places. (*Journal of the Royal Society of Arts*, November 8, 1912.)



THE COTTON PLANT IN EGYPT. By W. Lawrence Balls, M.A. *Macmillan & Co.* 5s. net.

In this book, Mr. Balls has brought together in a condensed form a review of his researches made upon cotton plants in Egypt, and the outcome is striking and valuable, resulting in a book which, while appealing strongly to everyone interested in the problems attendant on cotton-growing, will claim the attention of students of plant physiology and plant-breeding generally. Problems of the broadest interest are dealt with, while the methods of investigation are such as command admiration, and the results constitute valuable additions to knowledge, not only as regards the cotton plant, to which they immediately apply, but also in relation to plant physiology in general.

The book is written in an extremely condensed style, especially in its earlier chapters, and indeed forms an excellent summary of valuable work which serious students will do well to supplement by reference to the author's numerous papers, in which much of the information is given in greater detail. A good bibliography appearing at the end of the work facilitates such reference.

We are told that the investigations began as genetics but necessarily extended into physiology. We are grateful that this happened, for much of the physiological work is of the most fascinating and stimulating nature, so that one asks oneself why similar work should not be carried out on many more of our staple crops, both of the tropics and of temperate regions, feeling sure that results would follow which would ultimately have a bearing on crop production.

It is impossible in the space of a brief review of a book, which is itself an extremely condensed epitome, to give consideration to more than a very limited number of points of interest. The chapter dealing with fertilization, cytology and embryology is a model of close and luminous writing, containing much that is of service to the investigator.

The work on development and environment brings to light a number of most important facts, some of them of an unexpected character; for example 'the sunshine effect', in connexion with which it is established by a fascinating series of observations that direct sunshine completely inhibits growth. The manner is which the fact is established, the careful observations, the ingenious apparatus employed and the careful reasoning will appeal strongly to plant physiologists. In the same way the observations on the growth and functions of the root are full of points of profound importance. The first matter that strikes one is the rapidity of growth of the root of the cotton plant and the enormous volume of soil ultimately occupied by it, whereby under field conditions even under circumstances of wide planting, there is so much root interference that the plants behave as if 'pot-bound'.

The relationship of the root system to the water table is completely worked out; it is shown that a deep water table is essential, and that a rise of the water table to the roots under Egyptian conditions is: 'deadly in July, prejudicial in September and almost harmless in December.' The relationship of this to the changes in the level of the water table induced by irrigation has been worked out by the author and his colleagues so that, as he remarks, 'the preliminary solution of one of the neatest problems ever set to agricultural science has thus been achieved on a crop which is worth 20 to 30 millions of pounds per annum.'

The manner in which the problem relating to the loss of young cotton seedlings was handled constitutes another fine piece of biological work. The loss was attributed by cotton growers to the effect of cold and fog ; it was shown to be due to a specific fungus whose growth and development are absolutely dependent on temperature in such a manner that the injury to the young seedlings ceases when the temperature rises to 37°C. For an account of the interesting observations and reasoning, and the practical suggestions for dealing with the trouble, the reader must refer to the book itself.

The observations on boll-shelling, with the discussions on the mechanism and causes of the shedding, will be read with much interest. It is shown that the principal cause of the trouble in Egypt is root asphyxiation. The observations recorded will doubtless stimulate other workers to a closer study of the causes that may be operative in their own fields of experiments.

The short chapter on the cotton fibre contains valuable additions to knowledge which will find application in the work of other experimenters.

A considerable portion of the book is devoted to the study of questions of heredity; in this connexion a large amount of valuable work has been done, the results of which are briefly recorded. In most instances it is shown that the controlling factors in the cases studied are of a complex character, so that a vast amount of work remains to be done in order to elucidate them. Some instances of fairly simple inheritances are brought to light, but even these are so masked by the effects of environment as to be difficult of perception. The explanation given of the underlying facts relating to the inheritance of seed weight by 'clearing away the lumber brought in by autogenous fluctuation' will appeal to workers in this field.

Difficult and obscure as are the problems of heredity connected with cotton, the author states his conviction that: 'the hybrids studied are subject to Mendel's Law of Segregation often obscurely—on account of defective methods—but none the less certainly,' and: 'that there is no doubt as to the formal inheritance of various characters in cotton crosses, even when such inheritance seems most dependent on simple chance.'

A picture conjured up by the author may fitly come near the end of this notice. 'The outcome of such deductions must be that the colonial agriculturist of the near future will no longer carry a bag of seed, searching for a district in which it will grow to the consumer's liking but will choose his district first and then manufacture a cotton plant to suit it.' But it may be added that he will need the co-operation of such investigators as the author, backed up by adequate means for investigating things which may appear to have little application to the practical problems they may ultimately aid in solving; and that work such as this under review is a powerful appeal for the endowment of research.

In the *Comptes Rendus de l' Académie des Sciences*, 1912, p. 891, an apparatus is described for growing plants with their roots in a sterile medium, while the stem and leaves are free in the air.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date December 2, 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 at firm prices. The sales include old crop from Barbados, St Croix, Jamaica and Tobago at $14\frac{1}{2}d$. to $16d$ and New Crop St. Kitts from $18d$ to $20d$.; also stains at $5\frac{3}{4}d$. to $9\frac{1}{2}d$.

The American Sea Island market remains firm and the quality of the crop is poor.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending November 30, is as follows:—

The market has been firm throughout the week with firm demand at quotations, and after the close of the official report there was an active demand, with sales of about 400 Bales taking the offerings of No. 1 and Extra Fine off Islands at 24c to 26c , and of odd bags of Fully Fine and Extra Fine at $27\frac{1}{2}$c. to 29c. Besides there was some enquiry for the Planters' crops, with sales of C. Royall 15 bales and Palmetto, AHD 25 bales, at 33c. Bids were made on several other lots which Factors refused to accept.

We quote, viz.:—

Extra Fine	29c.	=	$16\frac{1}{2}d$.	c.i.f., & 5 per cent.
Fully Fine	$27\frac{1}{2}$c.	=	$15\frac{1}{2}d$.	,, ,, ,, ,,
Fine	26c.	=	$14\frac{3}{4}d$.	,, ,, ,, ,,
Extra Fine off in preparation,	26c.	=	$14\frac{3}{4}d$.	,, ,, ,, ,,
Fully Fine off in preparation,	24c.	=	$13\frac{3}{4}d$.	,, ,, ,, ,,
Fine off in preparation	22c.	=	$12\frac{3}{4}d$.	,, ,, ,, ,,

THE WEST INDIAN COTTON-GROWING SEASON, 1911-12.

It is proposed to review in this and a following article the conditions that existed in regard to the last cotton-growing season in the West Indies, namely that extending from October 1911 to September 1912, inclusive. The plan followed will be to give an account of the circumstances of the season of growth in each of the islands of the Lesser Antilles where cotton-growing is important, and then to present statistics as to production and prices. The general information is compiled from data supplied by the agricultural officers in the different islands from time to time.

COTTON PRODUCTION, 1911-12.

ST. VINCENT. The selection and disinfection of cotton seed at the Government Central Cotton Ginnery for the new crop commenced in April 1911, and in the next month the preparation of the land had started well; the peasantry bought a large quantity of the selected and disinfected seed, and good germination was obtained where sowing had taken place. From May 1 to the end of June, 7,507 lb. of seed—sufficient to plant 1,500 acres—was sold from the central ginnery, and general satisfaction existed because practically the whole of the Sea Island crop of the past season had been sold at $18d$. per lb. and upwards. The weather in July was fair; though the rainfall and shortage of labour had caused the young cotton to be weedy in some districts. August was a very wet month, and the rain (14·04 inches at the Botanic Station) caused some damage in cotton fields in different parts of the island. The continuation of this weather in the next month—the rainfall at the Botanic Station in September was 21·81 inches—caused more damage and the prevalence of angular spot on both leaves and bolls; small pickings were made of early-planted cotton. In October, the wetness of the season had caused plants of the old crop to become diseased, especially in certain areas, the leaves and bolls being affected; there was also an outbreak of the black scale (*Saissetia nigra*) in the Leeward District. In December of that year, nearly all the estates reported a shortage in the crop; in this month, a few first bales sold at $20d$. per lb. In the end, a low average yield was obtained. Some burning of the old cotton plants was done, and the prevalence of the black scale caused the Agricultural Superintendent to prepare a notice regarding the control of this pest, which was posted by the Government in the different cotton-growing districts.

In another article in this issue of the *Agricultural News*, statistical details are given concerning the last cotton crop in St. Vincent.

MONTSERRAT. Good progress had been made already, in January 1911, in the preparation of new land for cotton-planting; and in February old plants were being destroyed, the work being continued into the next month. The tendency in this island is for the crop to be planted earlier in each year, provided that suitable weather is experienced. Germination tests were conducted with the seed used on estates, and showed that this was good. April saw the experimental planting between sugar-canes of a considerable area of cotton in the Gages and Lees districts; rain was being awaited for the general planting. By the middle of June a regular stand of cotton existed in all parts of the island, and the crop was almost a month ahead of that of last year; an area amounting to 60 acres had been planted with pedigree seeds from the Experiment Station. In general, there was little sign of root disease in seedling cotton, in Montserrat. The want of rain was felt in July, in the northern and windward districts. The leaf-blister mite was observed, but (it is interesting to note) only where there had been carelessness regarding the destruction of old plants—a matter that was also very evident the year before. During the month, severe attacks of cotton stainers were experienced in one or two small areas. Dry weather in August caused premature ripening in the plants that had been put in earliest, and some picking was done; pests were comparatively rare, except that leaf-blister mite was met with in scattered areas, and cotton stainers were perhaps more prevalent than usual. In September, good rains were received throughout the island, and there was a consequent improvement in the outlook for the cotton crop; as has been indicated, picking commenced a month, at least, earlier than in the previous year. Leaf-blister mite was more prevalent than it had been for many years, chiefly in districts where the drought had been most severe; but there was little trouble from cotton worms. The incidence of angular leaf spot was less than in the year before, and the flower-bud maggot had not yet been reported; the attacks of cotton stainers received special report from the Curator of the Botanic Station. Considerable improvement of the plants took place during October; by the end of this month, some of the estates had already reaped half the crop. At this time, the flower-bud maggot was noticed on a limited area at New Windward—the district from which the first report of the pest in Montserrat was received: the attacks of cotton worms were not very severe, but leaf-blister mite was common. It was in the next month that the former pest did considerable damage in part of the island. A peculiar feature of the produce of this crop was the low percentage of lint (on seed cotton) obtained on some of the estates. Cotton-picking was delayed by frequent rains, at the close of December, and this rainfall seems to have had some connexion with a larger proportion of stained cotton that was obtained. Cotton stainers and diseases were prevalent, and in consequence the work in February was concerned chiefly with the destruction of the old plants. At this time, the Curator stated that the reports on cotton sent from Montserrat indicated that the lint was being prepared more carefully for shipment, though there was frequent mention of irregularity of staple. By the end of April, the destruction of the old plants was nearly complete.

ANTIGUA. The preparation of land for sowing was commenced in April (1911), and some few acres were put in during the next month: at the commencement of the season it was expected that there would be an increase in the total area of cotton cultivation. There was dry weather, however, during June, which prevented the further early planting of cotton; and this continued for the next two months, although showers from time to time, in the southern part of the island permitted the sowing of seed to be resumed in August, to some extent. As has been indicated, there were good rains in September, and though the drought had adversely affected the earlier-planted fields, the seed sown in this month showed a good germination. Many of the cultivations required weeding, and there were a few isolated attacks of the cotton worm. By the end of October, the area under cotton in Antigua and Barbuda was 637½ acres, of which 507½ acres were in Antigua. At this time, some severe attacks of the cotton worm were experienced, and there was a slight appearance of red spider and of beetles. The cotton worm continued to require treatment during November, and the flower bud-maggot appeared near the end of the month, though in no serious way: the condition of the cotton crop was, in fact, promising on the whole. These conditions obtained throughout December, except that the attacks of the cotton worm had become very few, and cotton stainers were found especially in fields containing plants with ripening bolls. The general promising state of the crop continued in January, and fair returns from picking were received in February. As in the case of some of the other cotton-growing islands, Antigua was visited at this time by Mr. J. W. McConnel, one of the representatives of the British Cotton Growing Association at the Agricultural Conference held in Trinidad, and it was expected that his visit would do much toward the encouragement and re-establishment of the cotton industry in the island. Up to the end of April, about 12,400 lb. of cotton lint had been shipped from Antigua, and it was all picked by the end of May. There were indications that a large increase in planting would take place in the next season (for the present crop) in the island.

ST. KITTS. The crop season commenced in March (1911) when the preparation of land was begun, and planting took place during this month in small areas in the northern district. In the next month, cotton was planted between young sugar-canes, on two estates as an experiment, and it seemed as if the trial would be successful. Early planted fields at Lodge and Brighton estates gave pickings as early as July; in general, in this month, the cotton was healthy and vigorous, on an area about equal to that of the preceding season. This condition obtained during the next month, although as in several of the other islands, rain was wanted; fair returns continued to be obtained from early-planted cotton, and the receipt of useful rains in October gave hopes of a second picking from this. By the last-named month, harvesting had become general, and there were very promising prospects of a good return; though it was necessary to use large quantities of insecticides to keep the cotton worm in check The trouble with this pest continued during the next month; while picking and ginning were continued actively, with very good returns on some estates and the prospect of an average crop, generally. At the end of December, a considerable amount of the lint had been shipped; leaf-blister mite was prevalent where the cotton was being kept for a second picking. A few cotton stainers were seen in January, on a very small amount of the older cotton. The work of the season ended in March of this year, when all the cotton had been picked and preparations were being made for the new crop.

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

Cotton in Corea.—The cultivation of cotton in Corea appears to be progressing satisfactorily, and there is a great desire on the part of the authorities that this enterprise should be pushed on and developed, as it is of great promise. The area under cultivation at the end of 1911 was estimated at about 125,000 acres. The output for 1911 is estimated at 33,940,000 lb. as against 17,333,000 lb. in 1910, an increase of nearly 100 per. cent. The export for 1911 shows a decrease due to the fact that, as in the case of cereals, the 1911 crop has not yet been shipped.

A company, known as the Kankoku Menkwa Kaisha, has for some years been cultivating cotton in Corea, and an attempt is being made to establish a second company for the same purpose under the title of Chosen Menkwa Kaisha. The promoters of both companies are cotton spinners in Japan. (*Diplomatic and Consular Reports*, No. 4889 Annual Series.)

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: Messrs. Bowen & Sons, Bridgetown, Barbados. *London Agents:* Messrs. Dulau & Co., 37, Soho Square, W. A complete list of Agents will be found on page 3 of the cover.

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Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this issue reviews the circumstances of the Courses of Reading and Examinations in Practical Agriculture, conducted by this Department, giving special attention to the purpose of the scheme and the matters that make it of practical value.

A review of Balls's recent work on the cotton plant in Egypt is given on page 405, under the caption Book Shelf.

The Cotton Notes contain the first of articles giving an account of the production and prices of cotton in the West Indies, for last season. The table of figures of production cannot be given yet, as the returns from the different islands are not complete.

In the Insect Notes, on page 410, are included the second of the two articles promised on ticks, and an account of basic slag as an insecticide.

Page 411 contains a review of the last report by the Director of Agriculture of the Federated Malay States.

The results of the last Intermediate and Final Examinations held in connexion with the Reading Courses of the Department will be found on page 413.

The Fungus Notes, on page 414, present a summary of the information that has been given by the Mycologist during the year, in this volume of the *Agricultural News.*

Agricultural Education and Hygiene in Grenada Schools.

In the Report on the Grenada Primary Schools for the year 1911-12, reference is made to the apathy exhibited by teachers and parents in the matter of agricultural instruction in the primary schools. In spite of the fact that most of the schools are in possession of garden plots, the efforts of the Board of Education have been practically negatived: in one or two instances the teaching of agriculture has been forbidden altogether. It appears that the liberal spirit in which the Board intends the Regulations for the advancement of agricultural teaching to be administered is not properly appreciated: it is distinctly laid down that the employment of plots, boxes, tubs, etc., for purposes of demonstration will receive due consideration in the awarding of monetary grants. Finally it is suggested that the services of an Agricultural Instructor might tend to invest the subject with some of the dignity which at present seems to be the factor most lacking, in the opinion of parents and pupils.

In striking contrast to the apathy so generally displayed in connection with agriculture follows the keeness exhibited in all schools towards the study of hygiene, any drawback to seeming good results being the inability of pupils to express themselves in giving answers, and not inefficency as regards the teaching of the subject.

An Automatic Plough.

The recent invention of a self-contained motor-propelled plough in England receives attention in the *Commercial Motor.* It is stated that the efficiency of the machine has been demonstrated practically. According to the article under review, it seems that a 4 h.p. engine enabled a furrow nearly 6 inches deep to be cut at a speed of over 3 miles per hour in a heavy clay soil. The whole machine weighs 6 cwt. and at the above speed will plough about an acre and a half a day, with a fuel consumption of 3 gallons, costing not more than 3*s.* The cost of horse ploughing in the same district is from 13*s.* to £1 per acre, and taking into consideration the heavy charges for maintenance, interest and depreciation in the case of horse labour, it would certainly appear that such motor-ploughing might be economical.

A locomotive cultivator has also been designed. It is claimed by the inventor that the plough when once started will continue ploughing on its own accord 'with almost human pertinacity' to the end of the furrow: but the cultivator machine, working amongst growing crops, has of course to be steered.

Without doubting the validity of the above information, it must be borne in mind that the matter is still in an experimental stage: and the high degree of novelty attending such an invention as a locomotive plough renders extended and unprejudiced trial necessary before its application can be seriously considered in West Indian Agriculture.

A Possible Source of Rubber.

Attention has been recently directed to a species of Euphorbia (*Euphorbia lorifolia*) which contains an unusually large quantity of easily-obtained latex and occurs in large numbers in Hawaii. So far as is known, this particular species of Euphorbia is found in no other part of the world, being a native of Hawaii. In press Bulletin No. 37 of the Hawaii Agricultural Experiment Station it is stated that the best means of coagulating the latex is with heat or by spraying the latex into alcohol. The former method appears to be the preferable one. The constituents which are likely to be of most commercial value are the resins, the acetone-soluble resin being a product of very fine texture and physical appearance. The caoutchouc-like substance appears to be of an inferior quality in comparison to the better grade: however, it might find use as a low grade product. It is suggested that useful results might accrue from the destructive distillation of the wood of this tree. It is further pointed out that in the event of a commercial working of the latex by means of volatile solvents, the insoluble residue with its 40-50 per cent. protein would have as a means of its disposal a possibility of its sale as a fertilizer on account of its high nitrogen content.

A Silkworm Tree for Rocky Soils.

A very interesting article appears in a recent number of the *Journal d'Agriculture Tropicale*, in which the Tapia tree (*Uapaca clusiaceae*), one of the Euphorbiaceae, is dealt with from the point of view of its value for afforestation purposes and as a host for a silk worm (*Borocera madagascariensis*). The tree is very common on the rocky soils of the western slopes of central Madagascar. In general appearance it is said to resemble certain evergreen oaks, for its leaves are persistent, shiny and leathery. The Tapia tree seldom grows more than 40 feet in height, and its thick bark and general adaptation for dry, or at least for rocky localities, should render this plant extremely suitable for afforesting the hills and mountains of the central plateau of Madagascar, at present covered with scarcely any vegetation except hard, coarse grasses possessing no value as forage.

Added to the cumulative benefits to be derived from the planting of the Tapia, is the important fact that the leaves of this tree constitute the favourite food material of the indigenous silkworm already referred to. It is stated that a large industry exists amongst the natives, who collect annually the cocoons, produced without the application of cultural methods.

It appears that the future prosperity of the industry has of late years been seriously endangered by the removal of an interdict which rightly put restrictions on the making of bush fires. For reasons clearly set forth in the article under review, the burning of the young Tapia wood undoubtedly increases the harvest in the following year or two; but the practice is a short-sighted one, because the trees are prevented from reproducing themselves naturally. Consequently, unless extensive planting is carried out, it is likely that in the near future a profitable industry will have ceased to exist.

The subject as a whole should prove very instructive to those who are interested in such matters, in the West Indies. It is not definitely known whether this particular species of Tapia would thrive in the West Indies, but there certainly exist considerable areas of waste land which might possibly prove suitable for its cultivation. Moreover, the efforts that are now being directed towards the establishment of a silkworm industry in some of the islands should lend a lively interest to the present subject from a purely industrial aspect: though it is not definitely known whether the Madagascar silkworm would flourish under West Indian conditions.

The Assimilation of Nitrates in Plant Cells.

The *Experiment Station Record*, Vol. XXVII, 1912, reviews recent work on this subject by O. Loew. Considering the questions of: (1) what is the first transformation product of the nitrates in the manufacture of protein, and (2) what factors operate in the reduction of such nitrates, the investigator does not agree with the general opinion that hydroxylamine is formed and that light is necessary as a source of energy for the reduction process. The experiments are claimed to show that: (1) contact with platinum sponge is sufficient in the absence of light to reduce magnesium nitrate with glucose in an over-saturated solution of potassium hydrate, or to reduce potassium nitrate in solution with dextrose, a process analogous or similar to one that goes on in the living cell; (2) the absence of light did not prevent, nor did access of light accelerate, the reduction of sodium nitrate in the development of the saprophytic fungus *Penicillium glaucum* in a nutrient medium with glycerine; (3) in various roots kept growing in a cool and totally dark chamber the nitrates were steadily decreased in quantity with a corresponding increase of protein; (4) young etiolated barley plants removed every trace of nitrate from a nutrient solution in the absence of light with increase of protein, while the controls showed strong nitrate reaction. The conclusions based on these results are briefly: (1) that the splitting up of nitric acid with the evolution of nitrogen peroxide under the influence of light has its parallel and equivalent in energy developed by the breaking-down of carbohydrates in the absence of air with the evolution of carbon dioxide (intramolecular respiration); (2) that if hydroxylamine were formed, its toxic influence upon the cells would reveal its presence: (3) that the requisite energy for the more difficult work of reducing sulphates is derived from changes in the living protoplasm initiated to some extent by changes in the composition of the proteins in the living cells.

Finally, it is believed that most roots are obliged to utilize their nitrates in the absence of light, and they are probably not carried to the leaves for reduction before utilization.

INSECT NOTES.

TICKS.

PART II.

As was promised, the subject of ticks is continued from the last number of the *Agricultural News*, by further quotation from the Bulletin mentioned there, namely No. 106 of the Bureau of Entomology of the United States Department of Agriculture.

'Owing to the fact that very few entomologists or zoologists have had experience with the systematic collection of ticks, a few suggestions along this line may prove of value. The writers have found that in many instances zoologists have received and handled specimens of skins and living animals to which ticks were attached and seen but were not preserved. The ease with which this class of parasites may be preserved should encourage zoologists to keep on the lookout for them and to collect all specimens seen.

'Persons who collect specimens of ticks should record the host, point of attachment, date and locality. All parts of the host, including the inside of the ears, should be closely examined. Upon the discovery of a female, and before removing it, the collector should search closely for the male, which may be attached near by. A pair of forceps will be found useful in removing the smaller ticks. Those with short mouth-parts are readily removed without injury, but many, particularly those of the genus Ixodes, are usually so firmly attached that the body of the tick will be separated from the capitulum unless the latter is firmly grasped. Some ixodologists have recommended the application of a penetrating oil and waiting for the tick to loosen its hold, but this will seldom be found necessary.

'In collecting ticks from small animals which have been shot or trapped, a supply of small cotton bags should be at hand into which the host can be placed as soon as shot and the bag firmly tied to prevent the escape of the ticks. If the host animal is too large to be bagged it should be examined at once over some white surface, such as white cotton cloth spread over the ground. The importance of immediate examination is emphasized, as the writers have found that larvae of the rabbit tick, and of other species with short hypostomes, commence to leave the host within a few minutes after the animal is killed. Ticks with long hypostomes, such as Ixodes, are sometimes unable to detach themselves and therefore remain upon the animal. In a number of instances living and dead ticks have been found clinging to the skins of animals which have been nailed on a wall for several days.

'The collection of ticks from herbage, on which they are awaiting a host, may best be done by dragging a white cloth, preferably of wool, over bushes, grass, etc. An ordinary insect beating net may also be employed. Fruitful results have been found to attend the examination of the dens of animals, nests and regular roosting places of birds, and the ground in the vicinity of resting and watering places of mammals. Pill boxes have been found to be satisfactory receptacles for the ticks when collected.

'In preserving we have usually used 80 per cent. alcohol or a mixture consisting of 60 parts alcohol, 1 part formalin, and 39 parts water. Adult specimens, particularly males with bright colour markings, should be mounted on pins as well as preserved in alcohol. For microscopical study specimens should be mounted in Canada balsam on slides. The contents of the body should first be teased out in hot water, through a slit made at the posterior end of the body. Specimens can then be readily cleared by boiling in a 10 per cent. solution of caustic potash, care being taken that the clearing be not carried too far. The method employed by Dr. C. W. Stiles consists in soaking the specimens in from 2 to 5 per cent caustic potash solution for periods varying from twelve to ninety-six hours, after which all the soft body content is removed, and after passing the specimens through water, the alcohols, and xylol or other clearing agents the specimens are mounted in balsam.'

BASIC SLAG AS AN INSECTICIDE.

The following article appeared in the *Journal of the New Zealand Department of Agriculture* for September 16, 1912. The employment of the manure in this way is interesting, particularly in view of the experimental use of nitrolim (calcium cyanamide) in Trinidad against the froghopper; only it must be remembered that the probable manner of action differs in the two cases.

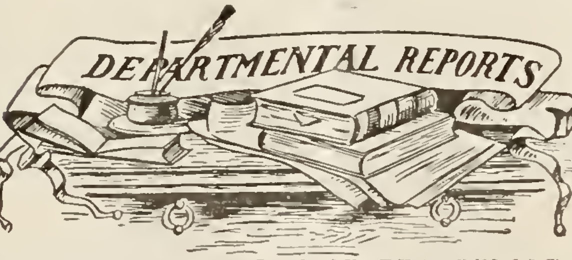
Basic slag, that one-time residual waste of the steel blast furnace—the dross formed in the removal of phosphorus from iron ore—is not only proving a fertilizer of great value in this country, as well as an excellent corrective of acidity in the soil, but it is well known that root crops manured with slag are not affected with certain diseases which are often present when other manures are used.

Now, according to an investigation in France, basic slag is proving of distinct value in the destruction of the plant louse. In Europe this insect has been very destructive, especially to sugar beet. All mixtures or liquors used for spraying plants as a protection against these insects have been applied in vain. The 'false brown rust' or 'curl' of the peach is caused by the plant lice, and it cannot be successfully fought because neither liquors nor powders can be made to reach the little animals. When the beet plant is attacked the leaf curls up and protects the insect against any treatment the farmer may apply.

It has been found that by the application of large quantities of nitrates after rains, the beet is stimulated to push out new leaves, which take the place of those destroyed by the plant lice. But this method has its dangers, since an excess of nitrogen in the soil may be just as harmful to the plants as the action of the insects.

J. P. Wagner, a sugar-beet expert, recently told the National Society of Agriculture of France of a successful attempt to fight these insects by means of basic slag. He spread about 1,400lb. of the basic slag to the acre on fields that were infested with the plant louse. Not only did this treatment prevent the insects from attacking the leaves, but they were driven away from leaves they had already attacked. On another field the slag was applied in larger quantities. Every plant was already attacked by the insects when the dross was applied. Within eight days all the insects had disappeared, and the plants recovered their healthy appearance and colour.

The method by which the basic slag operated in these cases is not known. Wagner thinks that the compound forms a thin layer on the leaf, spreading out over the whole surface, and that it is either distasteful or injurious to the insect. It is well known that many lime compounds are injurious to animals with soft, naked skins, such as snails, caterpillars, naked larvae; but it has not been shown that a similar effect is actually produced in the treatment against plant lice with basic slag.



FEDERATED MALAY STATES: REPORT OF THE DIRECTOR OF AGRICULTURE FOR THE YEAR 1911.

After the commencement of this report it is stated that the headway made with rubber during the year under review has been characterized by steady and quiet development, so that progress of the best kind has been made, from an agricultural aspect. Although the prices for rubber were not very steady, the tendency is thought to be toward a more settled state of the market; in any case, they have been higher than was estimated by the authorities at the commencement of the year. Interesting details are given of the cost of production of rubber in the different States; this was highest in Selangor and lowest in Perak. It is considered that the cost of this production on a good estate should not exceed 1s. 6*d*. per lb. During 1911 the land opened for rubber reached an area of as much as 107,200 acres, which is more than double that in 1910, this being again higher than in any previous year. The amount of rubber produced by the Federated Malay States in 1911 was 21,809,617 lb., as compared with 12,563,220 lb. in 1910. The productive acreage at the end of the year was 105,635, so that the approximate yield per acre of rubber appears to have been 200 lb. The total production of rubber in Malaya in 1911 is given as 11,118 tons.

In a part of the report dealing with more general matters, it is stated that the Department of Agriculture is continuing to experiment with a large variety of cover crops, particularly leguminous plants. The trials should prove ultimately to be of the greatest importance. Advice is given to the effect that more thorough cultivation is required for rubber trees, and that the conditions would be greatly improved by dressings of lime for the soil. More attention is also needed in regard to careful pruning. It is thought that there is a general improvement in the tapping of the trees. Twenty cuts to the inch is stated as a good average, and it is recommended that wounds made in tapping should be treated with coal tar. Much useful information follows regarding certain matters connected with the manufacture of rubber.

The next section deals with insect pests of rubber. These include white ants (*Termes gestroi*), a minute beetle (*Xyleborus parvulus*), borers including another species of Xyleborus and *Platypus* sp., a cricket (*Brachytrypes achatinus*), a beetle closely allied to Xylotrupes, the coco-nut beetle (*Oryctes rhinoceros*) in a very few instances, and *Saissetia nigra* [Lecanium nigrum].

The root diseases of Para rubber are attended to at some length, and a useful summary is given of work carried out mainly by Mr. C. K. Bancroft, then Assistant Mycologist to the Department. The information regarding rubber concludes with a short account of Malayan interests in connexion with the International Rubber Exhibition last held in London.

An estimate is given which places the total area under coco-nuts in the Federated Malay States at about 142,774 acres—an increase of 12,430 acres over that in 1910. A steady increase of this important crop is reported, and the Inspector of Coco-nuts estimates that on an average of forty nuts per tree, there could be produced about 65,500 tons of copra. The exports of this product from the four States during 1911 was about 8,000 tons; in addition a large production was taken up locally by the Federal Oil Mills at Kuala Selangor. As in the case of rubber, advice is given to the effect that much more care is necessary in regard to coco-nut cultivation in the Federated Malay States. The diseases of the latter plant investigated by Mr. Bancroft during the year have included a leaf disease caused by *Pestalozzia palmarum*, a so called bud rot of the coco-nut palm, and a sooty mould (*Meliola palmarum*). The bud rot of this palm that occurs in India has not been recorded in Malaya.

Of the important native crop—rice—there were in the four States more than 100,000 acres during 1911 12, and the yield of padi was 3 313,437 bushels. Of other crops, the area of coffee had doubled by the end of the year, being 11,000 acres. All the sugar-cane raised in the Federated Malay States is grown as a catch crop under rubber; the use of sugar-cane in this way, is, however, being abandoned gradually, and this is indicated by the fact that the total area under sugar in Malaya fell during the year from 9,075 to 6,657 acres.

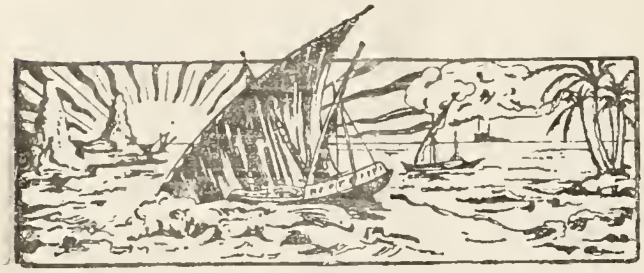
Space does not permit the description of the interesting work that is being carried out in the Experimental Plantations; reference is made to the original for an account of this. In a general way in the Report it is stated that the relations between this Department of Agriculture and planters continue to be excellent; though there is still some need for a more complete recognition of the extent to which the Department is equipped for the assistance of agriculturists. On account of the prosperous and well established state of the Para rubber and coco-nut industries in Malaya, it is not likely that new cultivations will be taken up to any great extent. Possibilities are nevertheless considered to exist regarding Japanese camphor, the West African oil palm (*Elaeis guineensis*), sisal and Manila hemp.

There are appended to the report statistical tables regarding agricultural matters in the Federated Malay States and Malaya which contain much information in a form useful for reference.

The Last Cotton Crop in St. Vincent.—A note based on information received recently from the Agricultural Superintendent concerning the last cotton crop of St. Vincent appeared in the last number but one of the *Agricultural News*. The details show further that bonuses of 50 per cent. and 100 per cent. have been paid by the St. Vincent Government Central Cotton Ginnery to the small growers who sold their seed-cotton to the ginnery last season, on the profit-sharing scheme. The first payments were made at the rate of 6¼c. per lb. for 1st grade Sea Island seed-cotton and 2c. per lb. for 1st grade Marie Galante. With the bonuses now distributed, these payments make the disbursements per pound reach 9⅜c. for good Sea Island seed-cotton and 4c. for Marie Galante. The amount paid on account by the ginnery for cotton was £4,770. This, with £2,760 paid in bonuses, makes the total payments to all small growers £7,530.

As was stated in the issue of the *Agricultural News* mentioned the total purchase of seed-cotton was 506,932 lb., comprising 353,485 lb. of Sea Island and 153,447 lb. of Marie Galante.

It is pointed out by the Agricultural Superintendent that these figures form some indication of the rapid progress that is being made in the cotton-growing industry by the peasantry in St. Vincent. All this does not include the estate work of the ginnery.



GLEANINGS.

Meetings of the Agricultural Societies both of St. Kitts and Nevis were held during last month, at which it was decided to hold agricultural shows in 1913.

During November the weather was unfavourable in most districts of St. Vincent for cotton-picking owing to the heavy rainfall. At the Botanic Station this was 10·91 inches and at the Experiment Station 10·51 inches.

A note in the *Journal d'Agriculture Tropicale* for October 1912, announces a method that has been devised for simplifying the extraction of ramie fibre by acting chemically on the gum in the bark. It also mentions a proposal for making paper paste from the ramie plant.

The Board of Trade Journal for October 31, 1912, contained a note stating that the British Acting Consul-General at Rio de Janeiro reports that the coffee crop in the State of São Paulo, Brazil, has been severely injured by frost after a long drought, and that it is estimated that the coming crop will be much smaller than that of last year.

The distribution from the Antigua Botanic Station during November comprised the following: lime plants 11,797, onion sets 3,500, coco-nut plants 739, Eucalyptus plants 83 and miscellaneous plants 91. There were also sent out 2,000 sweet potato cuttings, and 9 packets and 1 bag of seeds.

The Honorary Secretary of the Barbados Goat Society has forwarded a copy of the prize list of the show of this Society that was to be held on December 18. At this show A first prize of $10 and a Diploma of Merit were offered by the Imperial Commissioner of Agriculture, in the class Milch Goats.

According to the *Lancet*, 1912, No. 19, p. 1291, the amount of ammonia in rain which falls after a period of drought ('rare rain') is much greater than that in ordinary rain. Water which fell in London as rain, after a five weeks' drought, contained 0·525 gr. of ammonia per gallon, which is about seven times more than is found in normal rain, in England.

The use of hydrogen peroxide as a fungicide and stimulant in connexion with germinating seeds receives attention in an abstract of a paper in the *Experiment Station Record* for August 1912. Investigations have shown that dilute solutions of hydrogen peroxide facilitate germination and stimulate the active development of plants, and that at the same time this substance is effective against certain fungi.

The value of the exports from Sierra Leone during 1911 reached £1,300,238. Among these (according to *Colonial Reports*—Annual, No. 724) there were included 42,892 tons of oil palm kernels, and rice to the value of £4,715; the shipments of rice have decreased because of the greater local consumption. The rubber produced in 1911 was the lowest recorded during the past ten years, being only 16 tons value £5,918.

Nature for November 7, 1912, gives attention to the last issue of the yearly memorandum of the chief engineer of the Manchester Steam Users' Association. This shows that, with the present prices of oil, it is not profitable to burn oil rather than coal until the price of the latter has risen to 38*s.* per ton: but that oil can be used profitably in internal combustion engines whenever and wherever the price of coal is higher than 15*s.* per ton.

In the *Journal of the Chemical Society* for September 1912 an abstract of a paper is given showing that by repeated extraction with boiling alcohol (96 per cent.) a glucoside has been isolated from the seeds of Para rubber (*Hevea brasiliensis*) which is found to be identical in every way with the phaseolunatin isolated by Dunstan and Henry from the seeds of the Barbuda or Lima bean (*Phaseolus lunatus*) and from the roots of the bitter cassava.

A report issued by the Commercial Intelligence Department of India shows that the areas and yields of the principal crops of that country during 1911-12 were as follows, the figures being subject to revision: rice 56,443,000 acres and 521,992,000 cwt., wheat 30,386,800 acres and 9,813,500 tons, sugar-cane 2,331,700 acres and 2,390,400 tons, jute 3,106,400 acres and 8,234,700 bales, and cotton 20,333,000 acres and 3,925,000 bales, this quantity of cotton including exports from India and that consumed in the country in and outside mills.

The *Bulletin of the Bureau of Agricultural Intelligence and of Plant Diseases* for October 1912 contains an abstract of a paper which shows that watermelons investigated by the authors contained: juice 43 per cent., rind 47, and pulp 10 per cent. The ash in the juice amounted to about 0·25 per cent., and of this one-eighth was insoluble. Reducing sugars were present to the extent of about 5 per cent. of the juice, and sucrose about 1 per cent. The fermented juice gave 2·5 per cent. of alcohol by weight, which yielded ultimately 1·75 per cent. of pure acetic acid.

Copies of an Order made by the Governor-in-Executive Committee on November 21 last have been received from the Superintendent of Agriculture, Barbados. This prohibits unders Section 45 and 46 of the Trade Act, 1910 (1910 6) the importation into Bardados of sugar-cane and other graminaceous plants, and matters connected with them, from South America, Central America, British Guiana, Trinidad, Tobago, Grenada and St. Croix; and prescribes the conditions under which plants, etc., may be imported from such countries, and repeals the Order made on May 23, 1912. Articles manufactured, or dried articles, from plants in the order Gramineae, such as barley, guinea corn, maize, rice, rye, oats, wheat, and hay, or similar articles may be exempted from the operation of the Order, at the discretion of the Superintendent of Agriculture.

STUDENTS' CORNER.

AGRICULTURAL EXAMINATIONS.

The results of the Intermediate and Final Examinations in connexion with the Courses of Reading in Practical Agriculture, of the Imperial Department of Agriculture, which were held on November 11, 1912 are as follows:—

INTERMEDIATE EXAMINATION.

Centre.	Name.	Result.
Dominica	Auguste, H.	2nd class
Antigua	Athill, S. V.	2nd ,,
	Gomes, C. A.	1st ,,
	Lake, E. H.	2nd ,,

FINAL EXAMINATION.

Montserrat	Howes, S. W.	2nd ,,

In the Intermediate Examination, the candidates in Dominica qualified in Cacao and Limes, as special subjects; in Antigua the candidates qualified in the same way in Sugar Industry—General and in Cotton The candidate in the Final Examination passed in Cotton and Limes as special subjects. It should be stated in connexion with the Intermediate Examination in Dominica that a second candidate obtained a second class, but that as he only took one special subject he must satisfy the examiners in another such subject before he can be granted a certificate. Two candidates had offered themselves in Antigua for the Final Examination, but for various reasons were unable to sit.

The total number of candidates examined in the intermediate stage was six, so that four passed and two failed. There were no candidates examined in the final stage, besides the one who passed.

The questions in the preliminary and intermediate stages, were published in the last three numbers of the *Agricultural News*. Those in the final stage are reproduced below in the same way.

GENERAL SUBJECTS.

(Six questions, only, were to be attempted; and one had to be selected from each of the sections A,B,C,D)

A. Production of Plants.

1. Give an account of any legislation that has been made for the protection of some cultivated plant, under conditions with which you are familiar.

2. State fully the precautions that have been taken against fungus diseases of plants, in the circumstances of your experience.

3. Write a description of any work in which you have taken part, having for its object the improvement of a given plant used as an estate crop.

B. Production of Animals.

1. Supply as much information as you can concerning the use of by products of an estate for feeding stock.

2. With what disease of stock are you best acquainted? Describe its symptoms and a method of treatment for it.

3. What means, as far as you know, are employed for the improvement of stock, in the West Indies? Criticize them.

C. Construction on Estates.

1. State how you have employed the natural resources of an estate in maintaining or constructing buildings upon it.

2. Give a description, accompanied by simple drawings, of any building used directly in production on an estate.

3. Describe any piece of machinery used for agricultural work, giving particulars as to its first cost and cost of maintenance, and the kinds of repairs most usually needed.

D. Economics of Planting.

1. What are chief losses that take place, under estate practice with which you are familiar? How may those losses be prevented or lessened?

2. Give an account of the labour conditions by which you are surrounded, and say how you think they may be improved.

3. Supply details of the expenditure in cultivating and manuring an acre of a crop whose raising you have supervised. (Approximate figures, only, are required.)

SPECIAL SUBJECTS.

(Three questions only were to be answered, chosen from both of the special subjects that the candidate was offering. The time given for the answers is meant to enable candidates to deal with the questions in as detailed a manner as possible.)

Sugar Industry.

General.

1. State how you deal with an area of burnt canes, both as to the canes themselves and the after-cultivation of the land. What comparative losses would you broadly expect through the burning of (a) plants, (b) ratoons?

2. Give particulars, with the cost, of a system of manuring land, for sugar cane, with which you have had experience.

3. In what ways have you dealt with pests and diseases of sugar-cane, in connexion with both prevention and control?

Cotton.

1. Describe the work done on cotton land from the end of crop to the next sowing, and state how much of this is concerned with the control of pests and diseases.

2. Give an account of the expenses of picking and preparing seed-cotton to be sent to the ginnery.

3. Write a description of the appearance shown by plants attacked by any disease of cotton with which you are acquainted, saying how it is controlled and how its manifestations depend upon the state of the weather.

Provision Crops.

1. Discuss the particular and general uses of the cultivation of provision crops in a community.

2. Give a full account of the preparation of the land, manuring and planting in connexion with any provision crop with which you have had experience, supplying details of the cost of the various materials and operations.

3 Describe useful methods of storing provision and grain crops.

As in the Intermediate Examination, some of the subjects of the syllabus were not offered by any of the candidates, so that questions were not set in these.

A review of the questions and of the work done by candidates in the examinations will be given in the next issue of this journal.

FUNGUS NOTES.

SUMMARY OF THE INFORMATION GIVEN DURING THE YEAR.

In this concluding number of the current volume of the *Agricultural News* a summary will be given of the information that has been published during the year on the subject of plant disease, in continuation of the course adopted in Volumes IX and X. As on previous occasions the major portion of the information deals with investigations that have been conducted in other parts of the world, principally in the tropics, or in the larger islands of the West Indies such as Trinidad and Porto Rico. Certain of the articles, however, as for example the following: that dealing with the prevalence of plant diseases in 1910 and 1911, on page 30, that on the general treatment of root diseases of permanent crops, p. 190, as well as others, have been the outcome of observations made either by the agricultural officers in the various islands of the Windward and Leeward Colonies, or by the Mycologist on the Staff of this Department. The information is here classified under various headings in order to facilitate reference.

SUGAR-CANE. There have been three articles dealing with diseases of this host plant in various parts of the world. The first appeared on page 78, and was entitled Red Rot Disease of the Sugar-cane in Louisiana. It contains an account of Edgerton's observations on the symptoms of the disease as found in that State, and of his successful inoculation experiments with *Colletotrichum falcatum*, the causative fungus. The disease appears in its most typical form and causes much damage to the juice of the cane, which it enters principally through moth borer tunnels. In Louisiana the fungus does not appear to spread into the shoots from infected cuttings as it is reported to do in other parts of the world, notably in India. Its presence in the cane stem is often attended by red spots on the leaves believed to be of the same origin. In the course of the inoculation experiments, the seedlings D.74 and D.95 were fonnd to be more immune than the local varieties. Inoculations with two other fungi very similar to that causing red rot gave no very definite results. In the article on page 366 entitled Iliau—A Cane Disease of Hawaii, a summary is given of Lyon's work on a serious disease of cane, confined to Hawaii. This was shown to be due to a fungus previously undescribed and called by him *Gnomonia iliau*. It has a Melanconium stage similar to that of the fungus found so very commonly on dying canes in the West Indies. The disease is mainly confined to the young shoots, which it kills by encasing them in a wrapper of leaf sheaths, closely cemented together by mycelium. The growth of the fungus is much favoured by cool, damp weather, which checks that of the cane; while in its partial parasitism dependent on the reduced vitality of its host, as well as in the fact that it is a soil organism, it resembles *Marasmius sacchari*, one of the local root disease organisms, and the treatment for the two is consequently also similar. Johnston's work on sugar-cane diseases in Porto Rico is summarized on page 482. The most important is root disease which is due to at least two different kinds of fungi, one *Marasmius sacchari* and possibly other species of Marasmius, the other unidentified, but caused by a fungus with a mycelium characterized by the presence of stellate crystals. This latter fungus has been found on other grasses, especially guinea grass. In dealing with rind disease the influence of climatic conditions and of the attacks of moth borer on its virulence are noted, as well as other points of considerable interest. Experiments showed that the red spot of the leaf sheath due to *Cercospora vaginae* did not appear to cause much damage to the cane, and the same was true of the red rot of the leaf sheath due to *Sclerotium* sp., though other observers have recorded it as inflicting serious harm in some cases. It is further noted that the question of other native host plants for the sugar-cane parasites is receiving attention.

COCO-NUT PALM. On pages 94 and 110 is given a summary of Johnston's work on the bud rot of this plant as it occurs in the West Indies. The symptoms, distribution, cause and treatment of the disease, with the means of spread of the infection, are discussedat some length. The causative organism is believed to be a bacterium or strains of bacteria, known as *Bacillus coli* which is found in the human colon. This is an important instance of a plant disease attributed to an organism best known in connexion with animals. The symptoms of the disease are numerous and rather various, and the rate at which it induces death depends very largely, as do the symptoms exhibited, on the original point of infection. The destruction of the diseased trees is believed to be the best remedy. Another form of bud rot disease, due to a fungus *Pythium palmivorum* and described from Mexico by the late Olsen-Seffer is dealt with on page 238. This is the same disease as that found in India by Butler, of which an account was given in the *Agricultural News*, Vol. X, pp. 14 and 30. Finally, part of Freeman's report on Diseases of Coco-nut Palms in Tobago is reproduced on page 398. The diseases dealt with are root disease and one possessing somewhat different symptoms that may be due to other causes. It is stated that the incidence of root disease is independent of soil conditions, while the peculiar fact is noted that only the more superficial roots are diseased in some cases.

CITRUS. In two articles, one entitled Gummosis of Prunus aud Citrus on page 206, and the other Exanthema and Squamosis of Citrus on page 222, the result of Butler's work on these diseases is summarized. It was found that all three are physiological and are not occasioned by any definite organism, but depend on the incidence of a free supply of moisture at a time of active growth The young newly, formed elements of the wood which are still in a more or less embryonic state break down and form gum, which in gummosis swells out the bark tissues and then breaks through them, forming drops which harden on the outside. Certain varieties of Citrus are very resistent to gummosis and may be used as stocks, while applications of salt are suggested as preventive of this disease. The occurrence of an alga, *Cepheleuros* sp., on lime leaves is noted on page 270. On page 350 is a summary of an account of a knot disease of limes found in Jamaica and investigated by Florence Hedges and L. S. Tenney. The disease is characterized by the presence of large galls on the branches and even on the main stem. These when old, girdle the stem and cause the death of the parts above them. The cause is a fungus *Sphaeropsis tumefaciens* of which the mycelial characters are somewhat similar to those of *Thyridaria tarda* and of *Diplodia natalensis*. The disease may be controlled by the destruction of badly damaged trees, and by heavy pruning of those less affected.

PARA RUBBER. A short article dealing with investigations by Bancroft on the cause of spotting of prepared sheets of rubber appears on page 62, while on page 158 attention is drawn to Hevea stumps as possible carriers of disease, especially that due to *Thyridaria tarda*, and Stockdale's advocacy of Government control of their importation into British Guiana is recorded.

FRUIT DISEASES. Under the title The Panama Disease of Bananas, on pages 126 and 142, is summarized the literature dealing with those diseases of bananas and plantains characterized by the progressive destruction of the water-conducting tissue of the roots, bulbs and leaf sheaths. The tentative conclusion is reached that three different diseases of this nature must probably be recognized: the 'Moko' disease of plantains described by Rorer from Trinidad' caused by *Bacillus musae;* the Surinam Panama disease principally confined to the Gros Michel banana, described by Drost and attributed to a fungus *Leptosphaeria musae,* while possibly incompletely described forms of disease in Trinidad and Cuba may be identical with this, as well as a disease with similar symptoms in Bengal: and the true Panama disease of uncertain origin found in Central America. Diseases of avocado pear, mango and bread-fruit, of which the first two are due to species of Gloeosporium, while the third may also be caused by a species of that genus, receive attention on page 334. The first two may be successfully controlled by spraying the young fruits with Bordeaux mixture as shown by Rorer in Trinidad; and Stockdale has found the same treatment effective in the case of the bread-fruit in British Guiana.

ENTOMOGENOUS FUNGI. In a note on page 270 the occurrence of the white-headed fungus of scale insects, *Ophionectria coccicola,* is recorded in St. Lucia on lime scales, and a hint is given as to the best course to follow in making artificial inoculations with it. The presence of *Aschersonia turbinata* on the mango shield scale in the same island is also reported.

MISCELLANEOUS DISEASES. A soft rot of ginger in Bengal, with its cause and remedy, receives attention on page 46. The investigation was conducted by McRae and the disease is attributed to a fungus, *Pythium gracile,* which infects the parts below ground, entering from the soil and eventually transforming the rhizomes into a wet, rotten mass. The well-known mildew of roses is the subject of a short note on page 174, on which a canker of the immortel shade tree found in St. Lucia is also considered; its cause has not yet been definitely ascertained. Some further notes on the distribution and host plants of the black root disease (*Rosellinia* spp.) are given on page 270.

GENERAL ARTICLES. Four articles of a general nature have appeared in this volume. A summary of experiments on the control of leaf rust of ground nuts appears on page 14, and the conclusion is reached that the disease does not inflict sufficient damage in most cases to justify the use of spraying. On page 30 is an article entitled Reports on Fungus Diseases during the years 1910 and 1911. This is a summary of a fuller paper by the Mycologist to this Department read at the Agricultural Conference held this year in Trinidad and published in full in the *West Indian Bulletin,* Vol. XII, p. 425. The third is an article on the General Treatment of Root Diseases of Permanent Crops, which appears on page 190; while the last is entitled Crown Gall of Plants and its Relation to Animal Cancer, and appears on page 318. This last presents a short summary of the work of Erwin Smith and his collaborators on this subject, and of the reasons he gives for considering the plant galls as analogous to human cancers. Since the galls have been shown to be due to the presence in their cells of a bacterium, *Bacillus tumefaciens,* it seems possible from the anology and from the peculiar relation found to exist between the host and the parasite in the plant disease that cancer in animals is due also to a bacterium which has been overlooked

PALMS FOR DECORATIVE PURPOSES.

The information below is taken from an article giving general suggestions regarding plants for tropical landscapes, in the *Philippine Agricultural Review* for September 1912:—

According to their habit and behaviour the palms may be used in a variety of ways for decorative purposes. Because of their slow growth and comparatively small spread of crown which gives but little shade, they are not as frequently planted for street trees as they deserve from a purely ornamental point of view. This is a matter for much regret because no shade tree can approach a well-developed palm of certain species in clean-cut knightly beauty. A tree may be the most majestic or the most graceful, but the palm is, nevertheless, distinctly in a class by itself. 'The princes of the vegetable kingdom', so were the palms termed by the great Linnaeus, and there seems to be no reason for a revision of that expression. And yet Linnaeus received his impressions of the palms from descriptions by others, from herbarium specimens, and from what must have been but poor specimens found in the crudely constructed greenhouses of his day. We can but conjecture his expression if he had seen the palms in their native habitat. One cannot but regret that the great plant lover and botanist never saw the real Tropics—but to return to our subject. If palms are unsuited to line the wider streets and thoroughfares of a city or the country, they should be planted along paths and walks in the park and plazas whenever this can be done so as to conform to the general design.

For avenue purposes only, species having a straight trunk and a fairly well developed crown should be chosen, such as the Canary Island date (*Phoenix canariensis*), the royal palm (*Roystonea regia*), the California fan palm (*Washingtonia robusta*), *Cocos plumosa,* Buri, *Corypha elata,* etc.; the date (*Phoenix dactylifera*) makes a very satisfactory avenue true; though it has a rather 'stiff' and ungraceful appearance; for narrow walks and the 'patio' the 'Boñga de China' (*Normanbya merrilli*) is excellent. As an all-round avenue tree, perhaps no species surpasses the Canary Island date. The royal palm is indeed excellent when from 5 to 10 metres tall, but it unfortunately grows so rapidly as to lose its greatest charm while it is still comparatively young. For the best effect palms should never be planted so close in the avenue that the leaves interlace. For massing, as solitary specimens on the lawn, or in the shrubbery, all palms may be utilized more or less. For a 'grove', particularly near water, none is more appropriate than the coco-nut palm. In planting a 'grove' for ornamental purposes be sure not to plant an 'orchard' or else much of the charm will be lost.

A paper in the *Annales du Jardin Botanique de Buitenzorg,* 1910, describes an investigation which shows that the latex in plants may contain a reserve of plant food as starch. An abstract of the paper in the *Gardeners' Chronicle* for October 26, 1912, states: 'By cultivating laticiferous plants in an atmosphere containing no carbon dioxide the formation of sugars is suppressed and the starved plants utilize the starch grains suspended in the latex. At all events, these grains become corroded just as they do when they are acted on by a diastatic enzyme in the normal course of the "digestion" of starch, that is, the conversion of starch to sugar.'

MARKET REPORTS.

London.—The West India Committee Circular, December 3, 1912; Messrs. E. A. de Pass & Co., November 22, 1912.

Arrowroot—4*d.* to 4½*d.*
Balata—Sheet, 3/4½; block, 2/7 per lb.
Beeswax—£7 15*s.*
Cacao—Trinidad, 72/- to 80/- per cwt.; Grenada, 59/- to 66/-; Jamaica, 55*s.* to 65*s.*
Coffee—Jamaica, 72*s* to 81*s.*
Copra—West Indian, £27 10*s.* per ton.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 14½*d.* to 20*d.*
Fruit—No quotations.
Fustic—No quotations.
Ginger—49*s.* to 65*s.*
Isinglass—No quotations.
Honey—No quotations.
Lime Juice—Raw, 1/- to 1/1½; concentrated, £18 5*s.* to £18 10*s.*; otto of limes (hand-pressed), 7/3 to 7/4½.
Logwood—No quotations.
Mace—Quiet.
Nutmegs—5*d.* to 9*d.*
Pimento—2⅛*d.* to 2$\frac{7}{16}$*d.*
Rubber—Para, fine hard, 4/6-; fine soft, 4/1¼; Castilloa, 3/9 per lb.
Rum—Jamaica, 2/1 to 6/-
Sugar—Crystals, 17/6 to 20/; Muscovado, 11 6 to 14/-; Syrup, 10/6 to 11/-; Molasses, no quotations.

New York.—Messrs. Gillespie Bros. & Co., November 29, 1912.

Cacao—Caracas, 15c. to 15½c.; Grenada, 14c. to 15c; Trinidad, 15c. to 15¼c. per lb.; Jamaica, 11½c. to 12½c.
Coco-nuts—Jamaica, select, $33·00 to $34·00; culls, $19·00 to $20·00; Trinidad, select, $33·00 to $34·00; culls, $19·00 to $20·00 per M.
Coffee—Jamaica, 15¼c. to 17c. per lb.
Ginger—8¾c. to 12c. per lb.
Goat Skins—Jamaica, 50c.; Antigua and Barbados, 46c. to 48c.; St. Thomas and St. Kitts, 43c. to 46c. per lb.
Grape Fruit—Jamaica, $2·25 to $2·75.
Limes—$5·00 to $5·50.
Mace—53c. to 57c. per lb.
Nutmegs—110's, 14c.
Oranges—Jamaica, $2 00 to $2 25.
Pimento—4¼c. per lb.
Sugar—Centrifugals, 96°, 4·05c. per lb.; Muscovados, 89°, 3·55c.; Molasses, 89°, 3·30c. per lb., all duty paid

Trinidad.—Messrs Gordon, Grant & Co., December 9, 1912.

Cacao—Venezuelan, $15·50 to $15·75 per fanega; Trinidad, $14 50 to $15·00.
Coco-nut Oil—$1·04c. per Imperial gallon
Coffee—Venezuelan, 16½c. to 17c. per lb.
Copra—$4·50 per 100 lb.
Dhal—$4·00.
Onions—$1·50 to $3·50 per 100 lb.
Peas, Split—$5·75 to $6·00 per bag.
Potatoes—English, $1·25 to $1·50 per 100 lb.
Rice—Yellow, $5·00; White, $6·50 to $6·75 per bag.
Sugar—American crushed, no quotations.

Barbados.—Messrs James A. Lynch & Co., Ltd., December 14, 1912; Messrs. T. S. Garraway & Co., December 16, 1912; Messrs. Leacock & Co., December 6, 1912.

Arrowroot—$6·75 to $9·00 per 100 lb.
Cacao—$12·00 to $12·50 per 100 lb.
Coco-nuts—$20·00.
Hay—$1·60 to $1·80 per 100 lb.
Manures—Nitrate of soda, $75·00; Cacao manure, $45·00 to $48·00; Sulphate of ammonia, $80·00 to $85·00 per ton.
Molasses—No quotations.
Onions—$2·00 to $6·00 per 100 lb.
Peas, Split—$6·40 to $6·75 per bag of 210 lb.; Canada, $3·00 to $4·75 per bag of 120 lb.
Potatoes—Nova Scotia, $2·75 to $3·00 per 160 lb.
Rice—Ballam, $5·10 to $5·30 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
Sugar—American granulated, $4·75 per 100 lb.

British Guiana.—Messrs. Wieting & Richter, December 7, 1912.

ARTICLES	Messrs. Wieting & Richter.
Arrowroot—St. Vincent	——
Balata—Venezuela block	No quotation
Demerara sheet	70c. per lb.
Cacao—Native	18c. per lb.
Cassava—	$1·00.
Cassava Starch—	$7·50 to $8·00
Coco-nuts—	$16 to $20 per M.
Coffee—Creole	17c. per lb.
Jamaica and Rio	20c. per lb.
Liberian	16c. per lb.
Dhal—	$3·50 to $4·00 per bag of 168 lb.
Green Dhal	$5 00
Eddoes—	60c. to 80c.
Molasses—Yellow	None
Onions—Teneriffe	——
Madeira	9c. to 10c. per lb.
Peas—Split	$6·25 to $7·00 per bag (210 lb.)
Marseilles	$3·75.
Plantains—	16c. to 48c.
Potatoes—Nova Scotia	$2·75
Lisbon	——
Potatoes-Sweet, B'bados	$2·64 per bag
Rice—Ballam	No quotation
Creole	$4 50 to $5·00
Tannias—	$1·68
Yams—White	$2 64
Buck	$2·40
Sugar—Dark crystals	$2·20 to $2·40
Yellow	$3·00 to $3·25
White	$4·00
Molasses	$2·30 to$ 2·60
Timber—Greenheart	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.
,, Cordwood	$1·80 to $2·00 per ton

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