A FORTNIGHTLY REVIEW

OF THE

IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

VOLUME X.

JANUARY TO DECEMBER, 1911.

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ERRATA IN VOLUME X.

Page 44, column 1, paragraph 7, after *Agricultural News*, add 'Vol. IX'.
„ 121, column 2, line 21, for Merchants Venturers read 'Merchant Venturers'.
„ 133, column 2, last paragraph but one, for *Hemeleia* read '*Hemileia*'.
„ 138, column 2, lines 7 and 8 of the short article, for *Rhyncophorus* read '*Rhynchophorus*'.
„ 183, column 2, last paragraph, for *Erisyphe* read '*Erysiphe*'.
„ 190, column 1, last paragraph, for *Puccinea* read '*Puccinia*'.
„ 197, column 2, line 9, for *Phytopthora* read '*Phytophthora*'.
„ 277, column 2, paragraph 9, for *psoralioides* read '*psoraloides*'.
„ 298, column 2, paragraph at foot, for show read 'shows'.
„ 315, column 2, paragraph 3, for Watts read 'Watt'.
„ 358, column 1, last line but 4, for McConnell read 'McConnel'.
„ 394, column 1, paragraph 3, for Fig. 14 read 'Fig. 15'.

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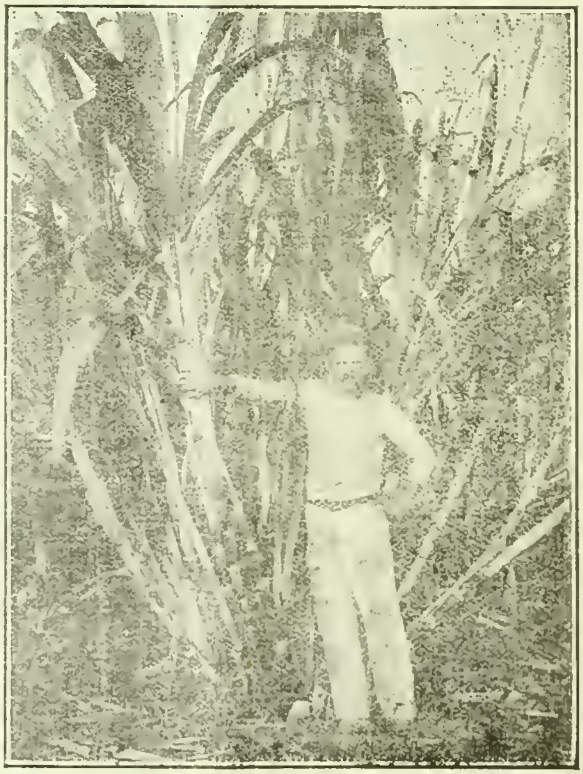

AGRICULTURAL NEWS.

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VOL. X. No. 227. BARBADOS, JANUARY 7, 1911. PRICE 1*d*.

CONTENTS.

The Use of Wind-breaks.

IN most parts of the West Indies, conspicuous examples can be easily found, of the great degree to which the growth of plants is retarded by exposure to constant winds. The larger trees, as regards the tips of the upper branches, are shaped to slope upwards from the windward to the leeward side, showing that the wind has had an action similar to that of pruning, on one side of the branches, only: while the herbage around them is scanty, and seems to be barely permitted to exist. Such are the conditions that obtain in regard to the ordinary, hardy plants. There is small wonder, then, that the agriculturist, when he is raising varieties of a delicate nature, and possibly of exotic origin, finds it necessary to provide protection for them, against the wind. It is these circumstances that have given an origin to the important subject of the planting of wind-breaks.

Wind-breaks, or shelter belts, as they are often termed, may be either permanent or temporary, according to the nature of the crop that they are designed to protect. For perennial crops, such as limes or cacao, plants that will form large trees are required. Annual crops, such as cotton and most kinds of ground provisions, do not necessarily demand large or long-lived plants, for purposes of protection.

The permanent wind-break, planted at the same time as the crop which it is intended to protect, grows up with this, generally at a quicker rate, so that when the plants of the latter have attained maturity, the wind-break is available for their protection. Among the plants more commonly used in the West Indies in this connexion are pois doux (*Inga laurina*), Madura, or Nicaragua shade tree (*Gliricidia maculata*)—a quickly growing plant, galba (*Calophyllum Calaba*)—which withstands sea-blasts well: savonnette (*Lonchocarpus violaceus*), white cedar (*Tecoma leucoxylon*)—used more particularly in Montserrat, while bamboos have also been employed for the purpose, although their great drying action on the soil forms an objection to their extended employment.

The temporary wind-breaks most commonly used are Guinea corn and pigeon peas. In cotton cultivation, one or the other of these may be planted at the head of the rows, on the windward side, if the best results are to be obtained. As in the case of the permanent wind-breaks, the protecting crop grows up with the main one, and the period of its existence is more or less that of the plants which it is designed to shelter. The advantage of wind-breaks of this kind is that they can be removed when the principal crop is harvested, leaving the ground entirely clear for such cultural operations as may be necessary. They possess disadvantages on account of the fact that their sheltering action extends to a short distance, only, to leeward of them, necessitating the taking up of valuable space, where the area of cultivation is large, by successive rows of shelter belts; and because they are of little or no use in storms or in very high winds.

It will be well to consider, at this stage, the general effects of wind-breaks. Reference has been made already to their directly protective quality, by which they prevent mechanical injury by wind. Among such damage is the breaking off of branches, and the removal of flowers and fruits, by which the productive capacity of the trees is lessened, and in the first instance, opportunities are given for invasion by disease. The chances of serious loss of flowers and fruits in this way are not usually great in cacao orchards; it is in citrus cultivations that greater harm is likely to accrue from this cause. In any case, the presence of a shelter belt, where this is required, lessens the stunting action of the wind, and thus removes one of the largest handicaps that have to be met by the plants, in their struggle for existence.

The ways in which wind-breaks are of use to plants are, however, generally secondary. They often serve to ameliorate the conditions under which the plants are existing, to such an extent as to enable them to attain a state of energetic healthfulness in which they resist successfully all attacks of diseases and pests; while much of the effort that would be otherwise required in combating untoward conditions is employed in producing good crops, of a useful quality. The agriculturist cannot afford to ignore these two most important aspects of the employment of shelter for plants against the wind.

The presence of belts of plants of a kind other than those which form the principal cultivations is of much use in the checking of epidemics of disease. These start in a certain place or places, and, often travelling with the wind, spread easily, because they can pass through an uninterrupted area of the very plant that is the object of their attack. If, however, a wind-break composed of a plant or plants on which a disease has little or no effect, occurs in its path, its course is interrupted, and the chances of safety of the plantations on the other side of the shelter belt are increased to a useful degree. This circumstance makes it important that wind-breaks should be chosen in consideration of their power to resist disease, and of the diseases to which they are most subject—a matter to which further reference will be made below.

One of the subsidiary results of the presence of the plants which form a permanent wind-break is that the existence of these in the soil lessens the washing that takes place at times of heavy rain, so that they possess a useful forest effect. The importance of this cannot be over-estimated, particularly where permanent crops are being grown on steep slopes, in regions of heavy rainfall.

Not the least among the advantages of the existence of wind-breaks is the assistance that this gives in conserving the water in the soil, and in decreasing transpiration from the leaves of plants. Where shelter belts are found, the force of the air currents is lessened, so that the rate at which moisture is carried away from the areas over which they travel is diminished to a useful degree. Wind-breaks serve also to temper the chilling effect of cool winds; this result is, however, of no great importance in the West Indies, except in the more mountainous islands. A minor matter, but one worthy of mention, is that they are said to encourage the presence of birds; though whether this is of advantage, or not, will depend on the circumstances of the special case.

Reverting to suitable wind-breaks for crops of one season, it seems that more attention may well be given to the feasibility of providing those which are of a permanent nature. Where such provision can be made, as will have been seen from what is said above, special advantages will accrue, in that the protective effect of belts of this kind will extend over a far larger area than that which can be sheltered by a temporary wind-break, and that such protective effect will be available during storms, in which the temporary belts, from their very nature, would cease to do the work that is required of them. It is recognized that there is little incentive, when ground is being opened for the growing of one-season crops, to plant permanent wind-breaks. Nevertheless, this course is followed in some districts, in the French West Indian islands, and the suggestion is made that its further adoption would be of advantage, and would make for its justification.

A final matter is to point out that care is required in the choice and planting of wind-breaks. The plants employed in them are often leguminous, because of their known property of assisting in adding nitrogen to the soil, and because the prunings from them are likely to be richer in nitrogen than those from ordinary plants. There should be the assurance that they are not subject to the diseases and pests that are most likely to attack the plants which they are designed to protect, and in planting them, due regard must be had to the conditions of the estate on which they are in use, or it may be found that they have been placed in such a position, in regard to the prevailing winds, as to render inadequate the protection from them. Care in these matters will give the agriculturist an asset which at once increases the living energy of his plants, protects them from disease, and conserves the soil and the water that are required for their needs.

SUGAR INDUSTRY.

THE ANTIGUA SUGAR FACTORY.

The following extracts are taken from the sixth annual report of the Directors of the Antigua Sugar Factory, Limited:—

Normal weather prevailed in the island during the season, the rainfall having been about 47 inches, but the cane crop on many estates still suffered from the severe drought of the previous year. This was not, however, felt by the factory as, owing to the widening of its connexions, its supplies of canes were larger than in any previous year.

The canes supplied have been as follows:—

	1907 tons.	1908 tons.	1909 tons.	1910 tons.
Contracting planters	28,046	26,912	20,576	24,065
Outside estates	8,689	12,905	14,646	20,712
Peasants	4,047	3,243	2,062	3,542
	40,782	43,060	37,284	48,319

The sugar made and the yield per cent. of canes during the past four years have been as follows:—

	1907.	1908.	1909.	1910.
Sugar made (tons)	4,230	4,695	3,995	5,390
Yield per cent. of canes	10·37	10·90	10·72	11·16

Owing to the short crop of the previous year, the writing down of the additions to the factory and railway (amounting to nearly £15,000) was suspended for that year, but in view of the very favourable results of the present year, as shown in the accounts, the Directors have decided to charge £3,000 to Revenue this year, against 'Additions and Extensions' and, if results should justify it, to continue to write off £1,500 per annum until the whole has been extinguished. After charging the above £3,000 and the usual £2,000 for the regular Sinking Fund, and crediting the contracting planters with £7,231 7*s.* 7*d.*, bringing up the price of their canes to about 18*s.* 1¾*d.* per ton, there remains £7,231 7*s.* 7*d.* to be credited to the 'A' shareholders, making a total at their credit, including interest, of £16,403 6*s.* 7*d.* Out of this, it is proposed to declare a dividend of 8*s.* per share, or £5,000, carrying forward for the present the balance of £11,403 6*s.* 7*d.*

Five thousand pounds of 'A' debentures have been paid off during the year, and a fifth 'B' debenture has, under the terms of the agreement, been cancelled.

The Report of the Royal Commissioners on Canada and the West Indies refers to the work of the company in the following gratifying terms:—

'We urge that every possible means be taken to introduce into the islands named improved methods of manufacture. The Central Sugar Factory in Antigua furnishes a striking argument in support of this recommendation. It would be difficult to use exaggerated terms respecting the benefits conferred by this factory on the peasant cultivators of cane and the sugar industry generally, of Antigua; and we could not fail to observe that recognition of these benefits was universal throughout the Leeward Islands.'

The Board have established a system of bonuses for labourers, under which each man who has worked continuously for not less than than two years is credited annually with 5 per cent. on his year's earnings. Of this, one moiety can be drawn out in cash, while the other remains at his credit and can only be drawn out (together with interest at 5 per cent. per annum) when he leaves the company's service, and then subject to his conduct having been satisfactory. It is hoped this will tend to make some provision for old age, and to promote thrift and good, steady work. It is intended to make an arrangement on somewhat similar lines, for the members of the company's staff.

The Board are making arrangements for further considerable additions to the factory. These are expected largely to increase the production of sugar from the existing supplies of canes and will also allow of taking in canes from other estates that desire to participate in the advantages offered by the factory.

The average price per ton of canes paid to contracting planters during the season was 12*s.* 1¾*d.*; that to outside estates and peasants 14*s.* 6¼*d.* The expenditure on these items was £14,612 9*s.* 9*d.* and £17,602 15*s.* 8*d.*, making a total of £32,215 5*s.* 5*d.*

The following details concerning the working of the factory are given here, in addition, on account of their interest:—

Canes crushed, tons	48,319
Sugar made ,, ...	5,390
Tons of cane per ton of sugar	8·95
'Indicated' sucrose in juice, tons	6,060·4
Recovery on 'indicated' sugar	88·8
Water in megass, per cent.	46·3
Normal juice lost in megass per 100 of fibre	71·1
Average composition of first mill juice:—	
Total solids, per cent.	21·15
Sucrose, ,, ,, ...	19·14*
Purity, ,, ,, ...	90·49
Total juice, including maceration water:—	
Total solids, per cent.	17·54
Sucrose, ,, ,, ...	15·22
Purity, ,, ,, ...	86·82
Fuel (including locomotives and workshops):—	
Coal (tons)	180
Wood (cords)	522

* Or 2·074 lb. per gallon.

FRUITS AND FRUIT TREES.

BUD MUTATION AND THE DETERIORATION OF CITRUS PLANTS.

The *Rural Californian*, for October 1910, contains an interesting article by Dr. J. Elliot Coit, which deals with the relation that exists between asexual or bud mutation and the deterioration in characters that is found to take place in citrus plants, particularly among the better kinds; that is those which may almost be termed artificial varieties.

The article, first of all, gives attention to the fact that crossing is the most powerful cause of variation, particularly when it takes place between male and female cells that are very unlike in character. It then goes on to mention the variation which arises from changes in environment, giving as an example the way in which the Washington Navel orange from Florida becomes, in California, more acid, and acquires better shipping qualities and a superior colour.

In regard to the first cause of variation, it is pointed out that this cannot possibly be effective in regard to most citrus varieties of plants, as these are usually propagated by asexual methods, particularly in the case of the better varieties; so that some other explanation than this must be found, to account for the differences that they are known to show from time to time.

In finding this explanation, attention is drawn to the variation to which de Vries has given the name 'mutation'. In explanation, it may be said that mutation differs from variation in the following ways: (1) in being more pronounced in character: (2) in appearing suddenly: and (3) in being capable of forming immediately the origin of new varieties which may have the power to transmit their characters to succeeding generations.

A full explanation of the phenomenon of mutation has not been arrived at, so far. A mental picture which will assist in obtaining some idea of its working may be obtained by giving attention to the fact that all plants are composed of cells; of these, only the vegetative cells need be considered in the present connexion. The vegetative cells are different from the sexual cells in that they usually divide in a simple way, giving rise to other cells which possess the characteristics of the original ones. This is why plants propagated by means of buds generally come true, as it is expressed. The way in which mutation has its effect is as follows It must happen sometimes that, for some reason which is not known, the dividing vegetative cells suffer confusion as regards their hereditary characters, so that the cells which they produce are different from the original ones in possessing a new combination of characteristics. Further, if this circumstance of mutation takes place in the cells which make up the growing point of a bud, it is easy to see that the branch which is formed by the growth of the bud will be wholly or partly composed of cells possessing the characteristics of the mutation, and in this way there is given rise to a bud mutation, or sport, as it is often termed. The practical importance of this is that if budwood is taken from such a shoot, trees will be obtained which possess the new characteristics.

As far as it has been possible to make observations on this matter, the conclusion is generally accepted that mutations take place entirely by chance; there is no means of foretelling their existence, or of guiding them consciously in any given direction. It will be interesting to consider, then, what results may be expected from mutation. These are (1) sports showing new characters which are neither objectionable nor valuable: (2) sports having characters which are unmistakably objectionable: and (3) sports which have a nature and properties superior to the variety of plant from which they originated.

As regards mutations which result in the production of inferior varieties, the natural occurrence of these cannot entirely account for the decadence that takes place in citrus orchards, and the extent to which the inferior varieties attain a distribution. It is in two ways that the practical work conducted in orchards assists this distribution. Firstly, those who are responsible for the cutting of budwood, to be sent out where there is a demand for it, rarely take note as to whether the material which they choose shows signs of mutation, or not. Secondly, the pruning that is carried out in the orchards seldom has any regard to the special characteristics of the branches that are being removed, or of those which are allowed to remain. If those who are responsible for the pruning were to accustom themselves to seeing quickly what branches are sporting toward inferior types, so that they may remove these wherever they were found, the deterioration consequent on mutation would be reduced, by this means alone, to a very large extent.

As will have been demonstrated by what has been said already, the existence of mutations is not altogether unfavourable to the agriculturist. There are those which give rise to superior characteristics, so that an opportunity is afforded of taking advantage of these, and obtaining better varieties of fruit and other trees. The difficulties in connexion with them are that, like all mutations, they take place by chance, and that it is hard to see immediately whether any given mutation is going to be of ultimate benefit, or not.

These matters go far towards accounting for the complaints that arise in relation to budwood that has been imported, for purposes of improvement, from other countries. It may have been sent in all good faith, but there was the circumstance that mutation was taking place, with the result that a product was obtained ultimately, which was very different from the expected one. The matter goes further. It has a very important application in relation to all plants that are propagated vegetatively; so that much remains to be known in relation to the matter, with reference to such plants, for the purpose of employing its existence for their improvement. Not the least of interest among these is the sugar-cane, with which up to the present the methods for improvement have been chiefly those requiring the use of seed.

A summary of the matters considered is given at the end of the article and is reproduced here, as follows:—

(1) That a part of the decadence in our orchards is due to a divergence, by mutation, into undesirable types.

(2) That these mutations are not like the variations caused by crossing, food-supply and environment, but are fortuitous and beyond prediction.

(3) That these mutations may be retrogressive, and may in time, if not checked by intelligent pruning and bud selection, cause our orchards to become a heterogeneous jumble of bad types.

(4) That they may occasionally be progressive, and if such instances are discovered, and the desirable sports propagated and studied, a wonderful improvement over our best existing types may be in store for the future.

FORTHCOMING AGRICULTURAL SHOWS.

It is intended to hold agricultural and industrial exhibitions in Antigua, St. Kitts and Montserrat on Thursday, February 23, Friday, February 24, and Wednesday, February 15, 1911, respectively. The purpose of the following article is to give some idea of the nature of these exhibitions.

ANTIGUA AGRICULTURAL AND INDUSTRIAL EXHIBITION.

The scope of this exhibition, which is under the distinguished patronage of His Excellency the Governor, Sir E. Bickham Sweet-Escott, K.C.M.G., and under the auspices of the Imperial Department of Agriculture and the Agricultural and Commercial Society, is larger than that of the agricultural shows held in Antigua in former years. It has been now extended to include such matters as dairy produce, cookery, laundry work, photography, artisan work and other subjects that are more indirectly connected with agriculture. The classes for stock include: horses, cattle, asses, mules, sheep, goats, pigs, poultry rabbits and guinea pigs. These are followed by classes which comprise bee keepers' exhibits, minor products, cotton, sugar-cane and its products, fruits and vegetables, plants and flowers, preserves, school exhibits, general estate exhibits, and miscellaneous exhibits, as well as those mentioned already.

In addition to the ordinary prizes, the following special prizes and challenge cups are offered for competition:—

(1) His Excellency the Governor's Challenge Cup, to be awarded for the best collective exhibit of stock in the classes detailed above. This becomes the property of the exhibitor winning it at three exhibitions.

(2) A Silver Challenge Cup, presented by the British Cotton Growing Association, for the best exhibit of Sea Island cotton, to be taken from a lot of not less than 50 lb., to be ginned in Antigua Each lot of 50 lb. is to be sent by a grower of not less than 10 acres. The cup is to be held by the winner for twelve months, or until the next exhibition, and will become the property of the exhibitor who wins it three times.

(3) A Challenge Cup, presented by the late Sir C. C. Knollys, K.C.M.G., for school exhibits. The cup will become the property of the school winning it three times consecutively.

(4) A Special Prize of £1, given by His Excellency the Governor, for the best equipage (horses and carriages), in four of the sections including: pairs of carriage horses over and under 14 hands, and single carriage horses over and under 14 hands, all to be judged in harness.

(5) A Special Prize of £1, given by Lady Sweet-Escott, for the best series of exhibits in the class including plants and flowers.

In addition to these, the First Prize for an exhibit of agricultural products, grown by a manager on the estate under his management, is a cup presented by the Colonial Secretary (the Hon. H E. W. Grant, C.M.G.).

ST. KITTS AGRICULTURAL AND INDUSTRIAL SHOW. This show, which is held under the auspices of the Imperial Department of Agriculture, and which is open to exhibits from the Presidency of St. Kitts-Nevis, includes classes of much the same kind as those for the Antigua Exhibition, described above, except that the number of sections on the industrial side is much smaller.

The value of the prizes is naturally highest in the classes for stock. The prize list does not show that there is the offer of any special awards, with the exception of diplomas from the Imperial Department of Agriculture in the classes for vacuum pan sugar and refined cotton seed oil. There is no doubt, however, that the award of diplomas will be extended in all cases where it is considered that exhibits show special worth.

MONTSERRAT AGRICULTURAL SHOW. The number and variety of the sections embraced by this are smaller than those of the exhibitions just described, although the prize list is drawn up on much the same plan. The special awards include prizes given by Sir E. Bickham and Lady Sweet-Escott, and six diplomas granted by the Imperial Department of Agriculture, for exhibits of exceptional merit.

Rice in British Guiana.

The last fortnightly report of Messrs. Sandbach, Parker & Co., of Georgetown, on the rice industry of British Guiana, dated December 24, 1910, gives information as follows:—

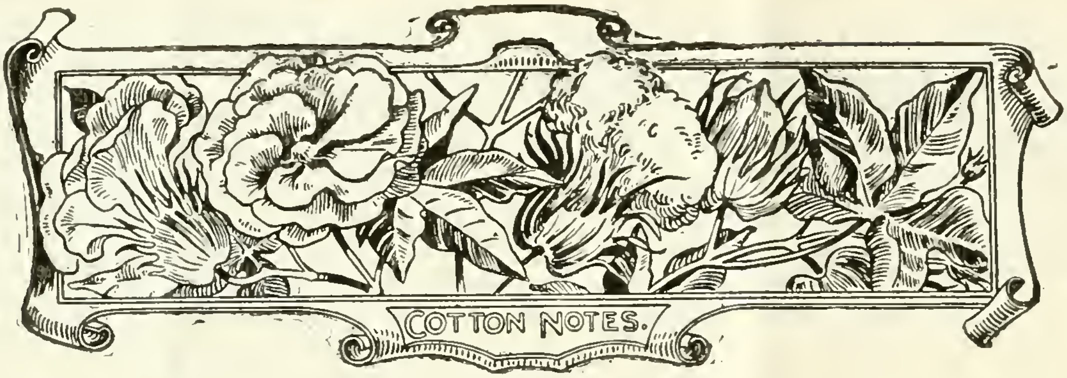
The weather during the fortnight has been hot, and suitable for reaping and milling.

Reaping of paddy is nearly finished and the end of the present month should see all cut.

Prices have advanced sharply and we look for further advances in the near future.

We quote to-day, f.o.b. Demerara, for good export quality:—

Nominally, 19*s*. 9*d*. to 20*s*. 9*d*. per bag of 180 lb. gross.
18*s*. 6*d*. to 19*s*. 6*d*. ,, ,, 164 ,, ,,



WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date December 5, with reference to the sales of West Indian Sea Island cotton :—

The sales of West Indian Sea Islands since our last report are confined to about 50 bales, chiefly oddments left over from last season, at 20*d.* to 22*d.*, and a few bales of new St. Kitts, the latter being on private terms.

American Sea Islands are firmly held by factors, but spinners are very indifferent buyers, and are awaiting developments.

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

The market has been very quiet throughout the week, with sales of only 38 bales, which include the crop of Extra Extra Fine, at 52c. In the absence of demand, factors have continued to hold for their previous prices, viz:—

Extra Fine Islands	at 40c. = 22*d.*	c.i.f. & 5	per cent.
Fully Fine	,, 37c. = $20\frac{1}{2}d.$	,, ,,	,, ,,
Fine	,, 35c. = $19\frac{1}{2}d.$	,, ,,	,, ,,

but to effect sales for quantity, they would be willing to accept 1c. lower.

A METHOD FOR COTTON SELECTION THROUGHOUT THE SEASON.

Circular No. 66 of the Bureau of Plant Industry of the United States Department of Agriculture was issued during last August, under the title of *Cotton Selection on the Farm by the Characters of the Stalks, Leaves and Bolls.* Much of the matter contained in this, applying more nearly to West Indian conditions, is extracted for the use of readers of the *Agricultural News*; it will be presented in this and the following numbers.

The plan of growing in a separate field the cotton that is to be used for seed has several advantages, but one of the most important is often overlooked. It is the education of the farmer himself, so that he can know his variety by its external characters, even in the earlier stages of growth. The result of many experiments in the acclimatization and breeding of cotton shows that the work of selection can be made much easier and more effective by giving attention to the external characters of the plants in the field, instead of waiting till the crop is ripe, and depending on the seed and lint characters alone.

DIVERSITY IN UNSELECTED FIELDS OF COTTON. In a neglected stock of cotton that has not been receiving any selection at all, the plants are not all equally inferior, but each individual plant is likely to be different from any of its neighbours. The differences between the individual plants of an unselected field correspond to the differences between selected varieties. Each plant of an unselected field might be said to represent a different variety, for it is generally possible by selection to establish a variety on the basis of the peculiarities of any individual plant. Selection is to be thought of as a process of narrowing the lines of descent, and thus securing a greater resemblance among the progeny. A seed produced by self-fertilization may be said to have only one parent, much as with plants propagated from cuttings.

If selection proves successful, the result is to establish the expression of the characters of the original selected plant in all of its progeny, so that all the individuals of the stock shall show only the one set of characters, instead of the characters of the whole miscellaneous group from which the original plant was selected.

DETERIORATION OF VARIETIES WITHOUT CROSSING. The general result that is secured through selection is to keep the characters of the inferior ancestors from coming into expression; but selection does not seem to have any power completely to destroy the characters of the inferior ancestors so as to prevent their continued transmission for any number of generations, and their subsequent reappearance in individual variations. The work of the breeder is never completely finished or absolutely successful. Though very high degrees of uniformity are attained by careful breeders, such uniformity is not a permanent condition. It has always to be preserved by further selection.

Each new variation constitutes, in effect, a new variety. The subsequent crossing of the different variations with each other, and with the parent type, produces hybrids just as if the variety had never been pure, or as if it had been mixed with seed of other varieties by intention or by accident.

WHY SELECTION MUST BE MAINTAINED. Selection, as applied to an improved variety of cotton, is simply a means of keeping undesirable characters out of expression. One of the principal objects to be gained by detailed study of heredity in cotton is to learn the method of selection that keeps the undesirable characters most thoroughly suppressed.

VALUE OF EXTERNAL CHARACTERS IN SELECTING COTTON. By using external characters in selection, it is possible to secure a large measure of protection against the inheritance and subsequent expression of the characters of degenerate individuals. Studies of degenerate variations of several different types of cotton have shown changes in the external or vegetative characters, as well as in those of the fruit and seed. It seldom, if ever, happens that a cotton plant makes a definite change in a single character and continues to resemble the parent variety in all other respects. Plants that are going to produce bolls, or seeds, or lint, different from those of the parent variety usually give notice well in advance by changes in the external vegetative characters, as well as in those of the fruit and seed.

Some of the most injurious variations are the easiest to throw out early in the season, if attention be given to the external characters. Peculiarities of individual plants that may appear to have no importance in themselves become very significant for purposes of selection.

SELECTION BY CHARACTERS OF STALKS AND LEAVES. Young plants of a well-selected, uniform variety, growing under the same conditions, follow very closely the same course of development. They have the same kind of leaves; the joints of the stalks are of the same length; and the branches develop at about the same rate and at the same height above the ground. A definite difference in any of these features is warrant for suspecting a plant and giving it closer examination. Another useful mark of distinction may be found in the hairs of the leaves, or those of the leaf stems and the branches. A difference in the habit of growth or in the length of the joints is very likely to be accompanied by a difference in the amount of hairiness.

The habits of branching have a very direct relation to the earliness of the crop. The main stalk of the cotton plant puts out two different kinds of branches. From the base of the stalk come the vegetative branches, or 'wood-limbs', and above these the true fruiting branches that bear the bolls. The vegetative branches do not bear any bolls of their own; but put forth fruiting branches like those of the main stem, though shorter and of later development. Plants that grow too rank and produce too many of the vegetative branches cannot begin to put on their crop as soon as smaller plants that produce fruiting branches closer to the ground. Even for cultural reasons, it would be good policy to pull out any unusually tall, rank-growing plants that do not begin to bear early in the season, if only to give better conditions for neighbouring plants that have begun to set their crop.

As has been stated, further information in connexion with the subject will be given in the next number of the *Agricultural News.*

TRIALS WITH GREEN DRESSINGS IN DOMINICA.

The following account of trials that have been made recently in Dominica, has been received from Mr. A. J. Brooks, Officer-in-charge at the Agricultural School:—

At the Agricultural School, the horse bean (*Canavalia ensiformis*) is generally grown for the purpose of green manuring, as this plant has given the best results, of all the plants previously tried at the school.

Seeds of two varieties of *Crotalaria verrucosa* and *C. striata* were recently received from Trinidad, through Dr. H. A. A. Nicholls, C.M.G., for the purpose of testing their suitability for green manuring.

A plot of land was divided into three equal sections for the trial; the first section was sown with horse beans, the second with *C. verrucosa*, and the third with *C. striata*.

The seed in all three sections germinated well, and continued to grow evenly. The following table gives the results obtained:—

	Canavalia ensiformis.	*Crotalaria verrucosa.*	*Crotalaria striata.*
Time taken to flower	43 days	78 days	158 days
Height	13 inches	24 inches	84 inches
Lateral spread	19 ,,	16 ,,	48 ,,
Length of tap root	6 ,,	12 ,,	6 ,,
Yield of green manure per acre	$16\frac{1}{5}$ tons	$30\frac{1}{4}$ tons	$35\frac{1}{10}$ tons
Yield when dried per acre	$2\frac{3}{20}$,,	$6\frac{9}{20}$,,	$6\frac{9}{20}$,,

From the tabulated results of this trial, it will be seen that the Crotalaria varieties gave much better returns than the horse beans. The horse bean plant is, however, a quicker grower and soon covers the ground. *C. striata* grew to an average height of 7 feet, and although it gave a greater return of fresh green manure, when dried slowly in the shade it gave the same yield as *C. verrucosa.* The last variety is, in the opinion of the writer, much more suitable for green dressing purposes, as it is a much more compact variety and bears numerous small leaves. As the tap root is twice as long as that of *C. striata* and of *C. ensiformis*, it opens the soil more thoroughly.

C striata produces long, tough stems, but very few leaves, and in consequence takes a much longer time to decay than either of the other plants tried.

Yerba Mate, or Paraguay Tea.—Yerba maté, or Paraguay tea, is the daily household beverage of the masses of Paraguay, and it is consumed to a great extent also in Brazil and Argentina. It has been introduced into Europe, where its use is increasing. This tea is the product of a plant belonging to the species Ilex, an evergreen shrub or small tree, well known in western Europe. The leaves of this plant are carefully toasted near the place where they are gathered, all the skill required in producing the tea being applied in the process of toasting. This is necessary in order to dry the leaves thoroughly and evenly, without scorching or affecting their flavour by smoke. After toasting, the leaves are sent to the mill, where they are ground to fine powder and packed solidly into bags for market. According to the United States Consul at Asunçion, the tea is prepared for drinking in Paraguay in the same manner as ordinary tea, and may be taken with sugar, cream, lemon or brandy. The universal manner of drinking it is by sucking it through bombillas from maté cups. A bombilla is a tube, which may be of the simplicity of a mere pipe stem, or an elaborately decorated silver or silver-mounted work of art. Maté cups vary in style from a simple little gourd to interesting specimens of local craftsmanship in silver. It is the custom to use a single maté cup, with its one bombilla, for an entire household, including all the visitors who may happen to be present, among whom it is passed like a pipe of peace. To refuse to partake would be a breach of etiquette. As an article of commerce, Yerba maté has steadily increased in importance, until it has become one of the leading exports of Paraguay, ranking fourth in value in 1909, when the exports amounted to £110,000. In July 1910, the entire product of the country for the year had been sold. (*Journal of the Royal Society of Arts*, November 25, 1910.)

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 subject dealt with in the editorial of the present issue is The Use of Wind-breaks. Neglect often occurs in the matter of providing these useful aids to agriculturists, especially in relation to crops to occupy the ground during one season, only.

An account of the last year's working of the Antigua Sugar Factory is given on page 3.

On pages 4 and 5 is presented an abstract of an interesting article that has appeared recently, on the effect of bud mutation in causing deterioration of citrus plants. Much of the disappointment that sometimes occurs when supposed superior varieties of citrus plants are imported into a new region is caused by decadence that has taken place, owing to mutations in the plants from which the propagating material was derived.

Attention is drawn to an article on page 5, which gives an account of agricultural shows that are to be held during next month.

The first of two articles describing a method for cotton selection throughout the season appears on page 6. The subject will be concluded in the next number of the *Agricultural News.*

The Insect Notes (page 10) contain articles describing a method of increasing the numbers of the black scale parasite, and a Cecidomyiid fly which damages mango leaves.

In the Fungus Notes, on page 14, is presented the first of two articles dealing with work that has been done in connexion with the bud-rot disease of palms, in India.

The Continuance of the Work of the Imperial Department of Agriculture.

The Imperial Commissioner of Agriculture has been informed, by the Secretary of State for the Colonies, of the decision of the Lords Commissioners of the Treasury to continue the maintenance of the Central Office of the Imperial Department of Agriculture, from Imperial funds, for a further period of ten years, from April 1, 1911.

This decision should be welcome, particularly from the fact that it secures the advantages to be derived from the assurance of continuity in the work of the Department.

Postponement of the Agricultural Conference, 1911.

Until December 21, 1910, it was anticipated that the delegates for the Agricultural Conference proposed to be held from January 11 to 18, 1911, would travel to British Guiana by the Royal Mail Steamer leaving St. Thomas on January 3. On that date, however, information was received to the effect that the route of the steamer had been altered, thus making it unavailable for the purpose.

The Imperial Commissioner of Agriculture promptly communicated with His Excellency the Governor of British Guiana, suggesting an alternative scheme, by which the delegates could arrive in Demerara on or about January 26, and leave about February 11. After full consideration and discussion of the matter, His Excellency suggested that the Conference should be postponed until such a time as steamer arrangements shall be in a more settled condition, and proposed that it might be held about the middle of April 1911.

Dr. Watts has concurred in this proposal, and every effort will be made to follow the course suggested. In pursuance of this, delegates are requested to continue the matters that they have in hand already for the Conference, so that these may be in an advanced stage of preparation, when they are required.

Notice of the exact date on which the postponed Conference is to be held, as well as of the arrangements in connexion therewith, will be given as soon as possible.

Cocoa-nut Bud-rot Disease in Jamaica.

The account of the proceedings at a recent meeting of the Board of Management of the Jamaica Agricultural Society, contained in the issue of the Journal of that Society, for November 1910, shows that a serious position exists in the island in regard to the bud-rot of the cocoa-nut palm.

Among matters submitted to the Board in relation to the subject was a copy of a memorial to His Excellency the Governor, from the Branch Society at Savanna-la-Mar, drawing attention to the state of the disease, and praying His Excellency to issue a proclamation or manifesto enjoining all growers of cocoa-nuts to destroy, or cause to be destroyed, all diseased trees under their control; such proclamation would be intended to have effect up to the time of any compulsory legislation that may be passed by the Legislative Council at its next session.

There were also before the Board memoranda from one of the Agricultural Instructors and from the Secretary to the Board, dealing with the subject. In the second of these, attention is drawn to a statement of the Director of Agriculture, in an Annual Report, to the effect that the question of legislation against infectious plant diseases, such as cacao pod disease and bud-rot of cocoa-nuts, is in urgent need of the serious consideration of the Government.

In the result, the Board resolved to ask the Governor for legislation to protect such products by a law similar in nature to the Contagious Disease Animal Law, and the matter was referred to the Staple and Minor Products Committee for suggestions in connexion with legislation, in order that a bill might be drafted.

The Barbados Goat Society.

In the *Agricultural News* for November 12, 1910, it was stated that a meeting had been held at the Head Office of the Department, on October 27, 1910, for the purpose of discussing preliminary matters in connexion with the proposed formation of a goat society in Barbados. Following on this, another meeting was held at the Planters' Hall, Bridgetown, on December 10, for the purpose of furthering the object.

At this, there were twelve persons present, including Dr. F. Watts, C.M.G., Imperial Commissioner of Agriculture, Mr. J. R. Bovell, I.S.O., Superintendent of Agriculture, Barbados; Mr. J. W. Parris, M.C.P., Mr. F. R. Parkinson, and others interested in the matter.

Dr. Watts took the chair, and addressed the meeting, stating the purpose for which it had been called A resolution was then brought forward by Mr. F. R. Parkinson to the effect that a society, to be known as the Barbados Goat Society, should be formed This was seconded by Mr. H. West, and after some discussion, which showed that it is desirable that Barbados should possess a goat society, the resolution was carried unanimously.

After the resolution had been passed, Dr. Watts drew attention to the desirability of forming a provisional committee for the purpose of drafting rules: he also suggested that it would be expedient for the society to be fostered by the Local Department of Agriculture. Dr. Watts then moved that Mr. J. R. Bovell be appointed Chairman of the provisional committee. This motion was agreed to, and the following were appointed members of that committee Messrs. J. W. Parris, H. West, C. E. Stoute, and Dr. L Shannon, with Mr. F. R. Parkinson as Secretary.

The meeting closed with some informal discussion as to whether the society should confine its attention to milch goats only, or whether other breeds, such as those used for providing meat, should receive its consideration.

After the drafting of rules has been completed by the provisional committee, another meeting will be held for the purpose of discussing these, and adopting such of them as appear to be required.

St. Vincent Agricultural Credit Society.

A credit society has been formed recently in St. Vincent, under the name of the Questelles and Clare Valley Agricultural Credit Society. For the purpose of its inauguration, a meeting was held between twelve peasant proprietors in the district and the Rev. F. Ellis, at which it was resolved to register the society, and rules for its conduct were passed.

The society was subsequently granted a loan of £25 by the Government, and at another meeting this was distributed among the members in order to assist them in the improvement and development of their holdings. According to an account in the St. Vincent *Times* for December 1, 1910, the society passed special votes of thanks to His Honour the Administrator for his co-operation and assistance, and to the Rev. F. Ellis, who has been appointed Secretary, for his valuable services. Meetings of the society will be held at Chauncey, once a quarter, for the purpose of transacting necessary business.

The Arrowroot (New Market Fund) Ordinance, St. Vincent.

A reference to this Ordinance was made in the *Agricultural News*, Vol. IX, p. 329. Since this, a copy of the Ordinance has been received, which shows that the commencement of the levy of export duty under the Ordinance was made on November 30, 1910. The rate of the duty is 6*d.* for every barrel not exceeding 2 cwt., net, and in like proportion for any greater or less quantity. This duty is levied independently of, and in addition to, any duty which may be imposed under the provisions of the Export Duties Ordinance, 1900, or any other Ordinance relating to export duty.

Paragraph 4 of the Ordinance states: 'The proceeds of the levy hereby enacted shall be applied towards increasing the consumption of Saint Vincent arrowroot in foreign lands by means of advertisement in such manner as may from time to time be determined by the Committee of Management appointed for the purpose by the Saint Vincent Arrowroot Growers' and Exporters' Association and the successors in office of such Committee, and in paying the necessary expenses in connexion therewith, including a salary not exceeding twenty-five pounds per annum to the Secretary of the Committee and a fee not exceeding one guinea to each of the members of the Committee for each meeting thereof which he may attend, not exceeding six in any one year.'

Unless the Ordinance is renewed, it ceases to be in force on December 1, 1912.

INSECT NOTES.

TO INCREASE THE NUMBERS OF THE BLACK SCALE PARASITE.

The black scale (*Saissetia nigra*) is well controlled in certain of the West Indian islands by the parasite *Zalophothrix mirum*, Craw., while in other islands the control exercised by this beneficial insect appears to be much less effective, especially in connexion with the occurrence of the black scale as a pest of cotton. (See *Agricultural News*, Vols. VII, p. 170, and IX, p. 170.)

In localities where the parasite is not sufficiently abundant to check the increase of the scale in cotton fields, it may be possible for a certain amount of assistance to be given with a view to remedying this condition of affairs.

The parasite occurs most abundantly on the black scale; but it is also a parasite of the two related scales, *Saissetia oleae* and *S. hemisphaerica*.

It is recommended that the following suggestions might be adopted in making a trial of producing the black scale parasite in increased numbers.

The black scale appears to make its best development on Sea Island cotton and Hibiscus. Plants of one or both of these should be chosen, and repeated introductions of black scale should be made until the branches are well covered. For this purpose, there should be an abundance of young scales crawling on the introduced material, which should be carefully tied to the branches of the plants to be infested, so that the young may easily leave the cut twigs and settle on the living ones.

It may happen that ants occur on the plants, and prevent the establishment of the scales. In such a case, care should taken that the plants being infested do not come into contact with any other plants, and that the branches do not touch the ground. Ants can be prevented from climbing the stems by wrapping the latter with strips of cloth soaked in corrosive sublimate solution (1 in 1,000), or by the use, in the same way, of any sticky substance over which the ants are unable to travel.

It would be well, also, when introducing the scales, not to introduce the parasite. In order to guard against this, the old, fully grown scales on the branches which are to be cut and transferred should be removed, two or three days before the transfer is made. This may be done with the blade of a pocket knife, and will result in liberating any eggs and young scales, which may be under the parent scales, and will remove the parasites.

When the scales are well established and there are many fully grown ones to be seen, the parasites should be introduced. The introduction of the parasites among an abundance of the host insect should result in a rapid development of vigorous individuals which might be used for distribution to other localities.

The foregoing suggestions are for trials where no well-infested plants are available for the purpose, and where it is presumed also, that the parasite occurs naturally in the island, though perhaps not well distributed.

It should be an easy matter to introduce the parasite from one island to another, by merely enclosing well-parasitized, scale-infested twigs, cut in convenient lengths and packed in a cardboard box in such a way as to prevent shaking about. From suitable material, the parasites continue to emerge for more than a week, and this period is sometimes much longer.

Many parasites are checked in their efficiency by the action of secondary parasites, that is, parasites on the parasite; but up to the present time, no parasite of *Zalophothrix mirum* has been recorded.

A CECIDOMYIID ON MANGO LEAVES.

In a former number of the *Agricultural News* (see Vol. VIII, p. 250), mention was made of a cecidomyiid fly, the larva of which was found under the bark of the twigs of the mango (*Mangifera indica*), in Barbados. Grafted mangoes seemed to be the most often attacked, the twigs infected with the maggot dying back from the tips: and as these are attacked and killed one after another, it often happens that young trees are killed outright.

The mango twig maggot is the larva of a small fly, to which the name *Asynapta mangiferae*, Felt, has been given. It is related to the flower-bud maggot of cotton (*Contarinia gossypii*, Felt), and to the red maggot of cotton (*Porricondyla gossypii*, Coq.).

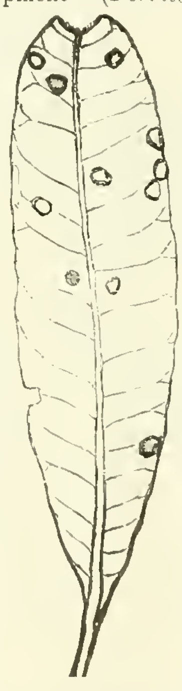

Fig. 1. Mango Leaf Attacked by Cecid Flies. (Natural size.)

A letter received recently by the Imperial Commissioner of Agriculture from Mrs. W. H. Patterson, forwarding specimens of mango leaves from St. Vincent, records the occurrence of a cecidomyiid larva attacking the mango in a different manner. The specimens of leaves show numerous small holes or spots, which give the impression of being the effect of a disease such as that caused by a species of the shot-hole fungus.

There seems to be no fungus present, however, and Mrs. Patterson states: 'the young leaves, shortly after bursting from the bud, are found to have semi-transparent patches, which reveal the presence of a cecid larva.'

The accompanying figure (Fig. 1) is a drawing, natural size, of a small leaf from the specimens received at the Head Office.

The examination of the dried leaves leads to the conclusion that the insect lives in the soft tissue of the leaf, between the upper and the lower epidermis, and it seems likely that the eggs may be deposited in the bud before it opens. The spots on the leaf are seen to be nearly circular in outline, about $\frac{1}{10}$- to $\frac{1}{8}$-inch (2·5 mm. to 3 mm.) in diameter, bordered with a dark-brown or blackish ring, the central portion being somewhat transparent. This central area appears to be composed of the two layers of epidermis, one of which is at first entire, the other being broken, probably showing where the larva of the adult made its way out. When the leaves are thoroughly dried, the transparent area is often traversed by a narrow slit, which results from the shrinking of that layer of epidermis which at first remained intact. Eventually, all the central tissue of spots may fall away, and leave a circular hole.

It will be of interest to learn whether the maggot causing the death of twigs of the mango in Barbados is the same as that causing the shot holes in the leaves of the mango in St. Vincent. The observations here recorded may be useful in leading to the discovery of other ways in which these minute insects injure West Indian plants.

RECENT AGRICULTURAL SHOWS.

The following is an account of three agricultural shows that have been held recently—the first two in Barbados, at the Pool plantation and at Queen's Park, respectively, and the third in the Virgin Islands. For the two first, the information required has been abstracted from the Barbados *Advocate* for December 9 and December 16, 1910. The account of the one in the Virgin Islands is made from a report supplied by Mr. W. C. Fishlock, Agricultural Instructor.

BARBADOS. SHOW AT POOL PLANTATION.

This was held on December 7, at the place mentioned, by permission of the Hon. F. J. Clarke, C.M G., M.A.,M.C.P. Fine weather was experienced, and the show proved itself to be one of the best that has been held.

The exhibit of stock included many excellent examples, more especially of young oxen. The goats, on the other hand, were disappointing for the greater part.

The first two classes inclnded food plants, comprising roots and tubers, and those of the general kinds. Among these, the collection of yams was not as large as usual, although some of those shown were of excellent quality. The exhibits of sweet potatoes, tanias and eddoes were satisfactory. Among the garden vegetables, the samples of legumes were among the best that have been shown. The standard of the tomatoes, artichokes, vegetable marrows, onions and christophines, however, left something to be desired.

Class III included fruit, and the best of these comprised bananas, shaddocks, grape-frnit and oranges; in regard to the bauanas, one exceptionally large bunch was shown. There were few exhibits of Sea Island cotton or honey, and what there were of the latter did not reach the usual standard.

The flowers and starches were of good quality. Much interest is taken in Class V, in which prizes are offered for inarched or budded mango plants, and for citrus budded on stocks of different varieties. Excellent samples of baskets, for nse in agricultnral work, were shown.

The part devoted to school exhibits included prizes for box and pot culture, and for plants grown in school gardens. The total number of exhibits in these two sections was about 160, and 48 of these were successful in gaining prizes. It is of interest that prizes were awarded, and won by one public elementary school, for inarched or budded mango plants.

After the prizes had been distributed, His Excellency the Acting Governor, Major J. A. Burdon, C.M.G., congratulated the prize winners, and expressed satisfaction with the work that is being done in connexion with the holding of such shows.

BARBADOS ANNUAL EXHIBITION, 1910.

This is commonly known as the Agricultural and Industrial Exhibition, and on this occasion it was held, on December 14, at Queen's Park. Its scope is larger than that of the ordinary agricultural show, in that the exhibits for which prizes are given are not confined to those which are of a directly agricultural nature.

Most noticeable among the live stock were the horses and the milch cattle. The best exhibits among the poultry were shown among fowls, ducks and pigeons; although there were some individual cases of excellence among the other classes.

Good exhibits of canes were sent; the display of vegetables, although above the average quality, did not attain as high a standard as was the case last year. Among the latter, the greatest excellence was shown by yams and pumpkins.

The standard of the horticultural produce brought to the exhibition was superior to that of the last few years. In the section including preserves, the different kinds of products were well represented; though there should be a much greater effort on the part of makers of such articles to supply such information as would make it easy to give and obtain orders.

The other parts of this exhibition included fancy work, an artisan section and an art section. Altogether, it was very successful, and satisfaction with what was shown was expressed by His Excellency the Acting Governor.

VIRGIN ISLANDS.

This show was held at the Experiment Station, Tortola, on December 14, under the auspices of the Imperial Department of Agriculture for the West Indies. It was the seventh of its kind, and received the direct encouragement of His Excellency Sir Bickham Sweet-Escott, K.C.M.G., who offered a first prize of £2 in the class for lots of cotton amounting to not less than 500 lb. Much interest was also evinced in the show on the part of His Honour the Commissioner, who gave a short address; and of Mrs. Jarvis, who kindly distributed the prizes. Useful assistance was also afforded by visitors from Antigua, St. Kitts and St. Jan, who gave help in the work of judging.

Although a larger number of exhibits has been received on some former occasions, the character of those shown was superior to any that have been seen before in Tortola. The number of articles entered was over 350, and competition was particularly keen in the cotton and live stock classes. In regard to the former, where prizes were offered for lots of cotton weighing not less than 500 lb., there were five entries, which included some excellent exhibits. As is stated above, a prize was offered in this class by His Excellency the Governor: this was awarded to John Chinnery of Jost-Van-Dycks. The competition was also keen for the prizes awarded for cotton in 10-lb. lots. The exhibits of starches, preserves and fancy work were also satisfactory.

Owing, probably, to the long drought experienced in the middle of the year, there was a poor representation of limes, sugar, sugar-cane and cacao.

It is a matter for encouragement that, although the weather was very unfavourable, there was a good attendance, and much interest was shown in the exhibits.

The number of prizes awarded was 170, having a total value of £24 12*s*. 6*d*.

Implemental Tillage in China. In view of the almost limitless possibilities which seem to exist in China, especially in the great plains of the north, for the use of agricultural machinery, it is with reluctance that one has to record the opinion that, under present conditions, there is really no opening for its successful introduction. The financial risk attending the purchase of such machinery for the Chinese has been proved in several instances, and British firms in China have to be careful how they repeat similar experiments. Certainly, British manufacturers desirous of introducing agricultural machinery into China would have to be prepared to share the risk with their agents to a much greater extent than they show any signs of doing at present. But the subdivision of farms amongst small peasant proprietors, who are extremely conservative in their methods, the cheapness of human labour, and the absence of effective organization of agriculture on the part of the Chinese Government, are among the conditions that discourage manufacturers from taking risks that experience has not justified. (*Diplomatic and Consular Reports*, No. 4556, Annual Series.)

GLEANINGS.

According to the *Hawaiian Forester and Agriculturist* for November 1910, forest products to the value of $51,161 were shipped from Hawaii to the United States in 1909. In 1908 and 1907, the values were $18,912 and $13,273.

The British Acting Consul-General at Mukden has reported that the soy bean harvest in Southern Manchuria is excellent, and that harvest prospects in Northern Manchuria are from 20 to 30 per cent. better than those of last year, while the beans are also of a very much better quality. (The *Board of Trade Journal*, November 3, 1910.)

According to recent telegrams, the exhibit of fruit from Dominica for the exhibition of the Royal Horticultural Society did not arrive in time for the opening, on account of delay to the R.M.S. 'Oruba'. A gold medal has, however, been awarded to the Dominica Permanent Exhibition Committee, and four individual awards were made, in addition.

With reference to the outbreak of the sugar-cane root borer that has taken place in certain districts of Barbados during the past year, it is of interest that the Superintendent of Agriculture for Barbados states, in a report for November 1910, that the attack of the root borer on canes at Seawell and Spencers estates does not appear to have increased to any extent.

A report by the Curator of the Botanic Station, Montserrat, for November 1910, gives information to the effect that a good crop of cotton was practically insured in the island by that time. Several shipments had been made already, and peasants were likely to reap a large crop. Caterpillars had given some trouble, but the flower-bud maggot had not been heard of, so far.

On October 3, 1910, the death took place of Dr. Melchior Treub, who has been Director of the Botanic Garden at Buitenzorg, Java, and Director of the Department of Agriculture for the Dutch East Indies since 1885. The work of Dr. Treub has included many botanical papers of note, as well as the editing of the *Annales du Jardin Botanique de Buitenzorg*, since the year just mentioned.

The Commissioner-General to the Imperial Japanese Government, for the Japan British Exhibition, states that as a result of the exhibition, many new markets have been opened up, and of Japanese exhibits alone over £60,000 worth have been sold. One of the greatest benefits which Japanese manufacturers have derived from the exhibition is the knowledge of what articles are best suited for export to England. (*Journal of the Royal Society of Arts*, November 11, 1910.)

Information has been received from the Agricultural Superintendent of St. Kitts to the effect that the sugar-cane crop has made considerable progress; high winds and heavy rains in the early part of November blew down the advanced canes in the northern districts, but there was little actual damage. A large proportion of the cotton has been reaped, and good returns are being obtained generally.

Colonial Reports—Annual, No. 653, states that the scheme for school gardens in Ceylon, which is being carried on in connexion with Government schools, now includes 224 such schools; of these 180 possess school gardens. The seeds and implements are provided by the educational department, and the gardens are visited as often as possible by the Superintendent of the school gardens and his assistants. Encouragement is given to the work of the pupils by the granting of money prizes to the most successful school in each district.

On account of the damage that is being caused to the public roads in Dominica, through cultivation carried on near them, a notice has been published in the Dominica *Official Gazette* for December 9, 1910, to the effect that: 'no cultivation requiring from time to time the weeding, clearing, or digging of the soil shall be carried on within 6 feet of the public road on the upper side, and 12 feet of the public road on the lower side.' Any person cultivating within such distances from any public road will be proceeded against under the provisions of the Public Road Act, 1888, for causing damage to it.

According to the London *Times*, a decree was published by the Italian Government on November 20, 1910, creating a Commission to examine the view that pellagra is produced by a protozoal infection, conveyed by an insect (see *Agricultural News*, Vol. IX, p. 213), and to formulate any changes in the existing law of protection that may be considered desirable. All the members of the Commission are medical men, except Prince Teano, Deputy, who was chiefly instrumental in directing the attention of the Italian Government to the work of the English Pellagra Investigation Committee. (*Nature*, November 24, 1910, p. 114.)

During December 1910, a Proclamation was made in Granada under the Plant Protection Ordinance, 1906, by which the importation into this Presidency of any banana plants, or of any material for planting, or articles connected therewith from Central and South America, and from Trinidad was prohibited. The same Proclamation prohibits absolutely the importation into the Presidency of all cocoa-nuts, cocoanut plants, or any material for planting or articles connected therewith from Cuba, Jamaica, Trinidad and all countries of Central and South America. Similar proclamations have been made recently in Antigua, Dominica and St. Lucia. (See *Agricultural News*, Vol. IX, pp. 364 and 380.)

His Honour the Administrator of St. Vincent has been pleased to appoint a Committee to consider and make recommendations regarding the proposals for reciprocity as outlined by the Royal Commissioners in Parts IV to VII of the first part of their Report on Trade Relations between Canada and the West Indies. The members of the Committee are: His Honour W. S. Shaw, Chairman; the Hon. Conrad J. Simmons; the Hon. J. G. W. Hazell; and Messrs. F. W. Griffith, Supervisor of Customs; W. N. Sands, Agricultural Superintendent; F. Corea; and M. Tatham, Secretary. (St. Vincent *Government Gazette* (Extraordinary), December 6, 1910.)

STUDENTS' CORNER.

JANUARY.

First Period.

Seasonal Notes.

Useful work of observation may well be conducted, at this time of the year, for the purpose of ascertaining the extent to which various plants, both wild and cultivated, are attacked by scale insects, and attempts should be made to identify these, as far as possible. Descriptions of scale insects are contained in Pamphlets Nos. 7 and 22, of the Department Series, and students are advised to consult these, with special reference to actual specimens that have been collected by them for identification. What circumstances in the life-history of scale insects tend to simplify the methods to be used for their control and to prevent them from spreading as quickly as they might, if such circumstances did not exist? Where are the eggs of the scale insect to be found? What insects often assist in the spread of scale insects, and what purpose leads them to have this effect?

Study the means by which the numbers of scale insects are reduced, in nature. How would you ascertain if any given collection of scale insects on a plant was being attacked by insect parasites? Discuss the existence of such parasites in relation to possible precautions to be taken in burning old cotton plants at the end of the crop season. Gain as much knowledge as you can about the fungi that attack scale insects; the chief of these that are known in the West Indies, at present, are described in the *Agricultural News*, Vol. VIII, pp. 299 and 411. It is not sufficient, however, merely to gain acquaintance with these descriptions; specimens of the fungi themselves should be collected and examined, as far as is possible. The fungi are most easily seen when they are producing spore-bearing bodies, and it is often noticed at this time that the scales in connexion with which they are existing are dead, for the greater part. What reason may be suggested for the purpose of explaining this? The student should satisfy himself as far as possible, that the mycelium of such fungi actually penetrates beneath the scale insect that has been attacked. For further information concerning fungi parasitic on scale insects, see *West Indian Bulletin*, Vol. XI, p. 1.

Make a careful study of a cane cutting, distinguishing its different parts, and comparing its structure with that of other stems, notably those of dicotyledons. To do this properly, the pieces of stem should be cut downwards, both through the centre and between this and the rind, as well as across the diameter. What are the uses of the different portions of the stem of the sugar-cane (1) to the plant, (2) to the sugar maker? Observations of the kind described may be extended usefully to include cuttings that have just sprouted. Examine several such cuttings, the sprouts from which are of different ages, and ascertain (1) what parts of the cuttings give rise to the sprouts, (2) what becomes of the material of which the original cutting was composed. Give a list of the advantages and disadvantages that arise from the circumstance that the sugar-cane is propagated vegetatively, for commercial purposes.

What are the chief signs of the presence of the following untoward circumstances, in regard to the sugar-cane: (1) insufficient drainage, (2) root disease, (3) the moth borer? State, in each instance, what you would do to put an end, as far as possible, to the existence of such circumstances. Describe exactly in what way the disease and the pest just mentioned interfere with the nutrition of the sugar-cane, as a plant.

The subject of the diseases of cotton will have attracted much attention on the part of those who are interested in the growing of this plant. A general account of such diseases is presented in the *Agricultural News*, Vol. VIII, p. 289, where several useful references in connexion with the matter are given. Where a disease is present to any extent, the amount of it in the different parts of the estate should be indicated simply on some form of plan, and the distribution of the disease in relation to the conditions that exist, particularly in regard to soil, drainage and the kinds of crops grown previously, should receive careful consideration.

In a field of cotton, many of the bolls are, first of all, seen to exhibit very small, reddish-brown spots, which become larger, forming small, round areas, the middle of which becomes dark in colour, while the edge remains reddish-brown. Later, small pustules, or swellings, appear in the centre of the spot, which becomes dirty grey, or bright pink, according to the number of spores which develops. Sometimes, several spots are seen to run together, so that irregular patches may be formed. What conclusions would you reach in such a case, as to the disease which is attacking the cotton, and what remedies against it would you propose to adopt?

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) What practical advantage accrues from the possession by certain plants of a cambium layer, and how does this advantage arise?

(2) Give an account of the composition of the air, with especial reference to the needs of plants and animals.

(3) Describe an experiment by which the effect of lime on heavy soils may be demonstrated.

INTERMEDIATE QUESTIONS.

(1) What kind of plant food is most likely to become deficient, in ordinary soils? Give an account of the methods that are employed to supply this deficiency.

(2) Give a description of the ways in which seeds are dispersed in nature, and state in what ways such dispersal is important to the agriculturist.

(3) State broadly how decaying organic matter is naturally employed in forming nitrates.

FINAL QUESTIONS.

(1) Give definitions of the soil in relation to (a) the plant, (b) the agriculturist.

(2) Write an account of the general considerations and practice with regard to weeds, on an estate.

(3) State fully the uses that are made of the by-products from an estate with which you are acquainted, and make any suggestions as to their more economical employment.

A review of a paper in the *British Medical Journal*, No. 2569, p. 771, gives the results of work undertaken recently, by a French investigator, in order to gain information as to the effect of baking bread on any disease germs that it may contain. Several kinds of the latter were added to dough, which was then baked. It was found that the baked bread contained none of the living germs, so that it is considered that bread, on leaving the oven, may be counted as a germ-free article of diet.

FUNGUS NOTES.

THE BUD-ROT DISEASE OF PALMS IN INDIA.

PART I.

The results of a most thorough examination into the cause of bud-rot in a district at the delta of the Godavari River, on the east coast of India, have just been published in the *Memoirs of the Department of Agriculture in India*, Vol. III, No. V. The work was conducted by Dr. Butler, M.B., F.L.S., Imperial Mycologist to the Government of India, who was also responsible to a large extent for the organization of the systematic campaign that has been undertaken to eliminate the disease as far as possible. The information given in this and the next number of the *Agricultural News* is taken from the paper referred to above, in which Dr. Butler presents an interesting account of the work.

The disease appeared about the year 1890, and extended regularly in all directions from the point originally attacked, until, in 1910, it covered the whole of an area, approximately circular, with an average radius of 25 miles. Although the spread of infection has been very regular, yet it has been more marked along certain lines than elsewhere. These lines correspond generally with those of the main directions of communication in the district.

The portion of the country infected possesses a very dense population engaged in agricultural pursuits, the crops grown being of a very various nature. The district is one of the richest in the Madras Presidency. The palms grown are the Palmyra (*Borassus flabellifer*), cocoa-nut, areca-nut (*Areca Catechu*) and date. Of these, the Palmyra is by far the commonest and of the greatest economic importance, on account of the extraordinary number of uses to which its various parts can be put. It is also much the most susceptible to the disease, though the cocoa-nut and areca-nut are also attacked to some extent, the last mentioned being very slightly susceptible.

As is well known, diseases of a similar nature are of general occurrence in almost all parts of the tropics, and the general tendency is to believe that the disease in the New World is of bacterial origin. The Indian disease has definitely been proved to be due to *Pythium palmivorum*, Butl., and Dr. Butler is of the opinion that some of the forms of the disease found in the eastern tropics will prove to be identical with it, while the form in the New World is more probably due to a different organism.

SYMPTOMS. The first external sign of the disease, visible from below, is usually the withering of the central shoot, which is followed by the death of the expanded leaves surrounding it. These leaves turn pale and wither, and at the end of ten or twelve days are dry and of a yellowish-brown colour. The leaves die slowly from the centre outwards, and eventually all fall off and only a bare pole is left. More rarely, the first indication is the death of one of the expanded leaves near the central shoot; the disease spreads inwards, killing the central shoot, and then slowly completes the destruction of the whole crown, as in the first case. The final stage is not reached until two or three years after the death of the central shoot.

The fungus actually commences its attack on the outside of the folded leaf sheaths forming the covering surrounding the central bud. This is most likely to happen when the outer leaves have been removed, and in consequence a soft, green inner sheath has been exposed. In any case, this stage of the disease only becomes visible when the outer leaves have been removed. The attacked area first appears as a spot on the sheath, varying in size from a diameter of 6 inches to one when it is scarcely visible. The spots are white at first, but soon show small brown marks, which run together until the whole is brown; they then turn reddish, and are usually sunken, with a raised rim. On the hard outer sheaths, the final colour is often black. The fungus travels in a horizontal direction, from the outer to the inner side of the sheath. It then infects sheath after sheath, and finally attacks and kills the terminal bud, when the central shoot withers. Thus, at the time that the first symptom visible from below has become evident, the tree is practically dead, as no further growth can take place. The leaves penetrated by the fungus in its progress to the central bud are rarely killed. The reason is that the path of the fungus, through all but the very soft central leaves, is practically cylindrical, and approximately of the same diameter throughout. The amount of tissue destroyed in this way is so small that the leaves are not visibly affected.

By the time the fungus has penetrated to the soft central tissues, a general rot has usually set in, and the whole bud has been reduced to a decaying mass. This makes it a difficult matter to determine the true cause of the disease, when it has progressed beyond the initial stages. The rate at which the fungus penetrates the sheaths increases as it nears the centre. The whole time occupied from the date of infection to the death of the central shoot is usually from five to ten months. The progress of the disease is often assisted by the presence of small boring beetles, whose tunnels are followed by the mycelium of the fungus. The spots on the outermost leaf sheaths are usually hard, and either free from the parasite or covered by a mycelial web. A similar mass of mycelium is often formed between two leaf sheaths that are not in very close contact with one another. A copious growth of mycelium of this nature is a peculiar character, for a species of this genus.

In addition to attacking the leaf sheaths, the fungus may also occur on the expanded blades and on the petioles. On the leaf blades, the spots rarely attain more than 1 inch in diameter, and are frequently smaller. They are straw-coloured in the centre, with a dark-brown margin. Sometimes, a line of such spots occurs, running across the leaf segments, one spot on each. This is due to the fungus having penetrated the leaf while its segments were still folded in the bud. The line of infected tissue in this case is above the tip of the growing point. The latter is not affected until the fungus has spread downwards, vertically, in the soft, young tissues.

In the case of cocoa-nuts, it is usually found that no fruit is formed, once the disease has penetrated so far as to be visible from below. When young nuts do appear after this stage, they always wither and fall off before attaining maturity. The falling of the nuts in this way has also been noted in Trinidad in connexion with the bud-rot disease in that island. (See *Agricultural News*, Vol. IX, p. 251.)

SPREAD OF INFECTION. Spores of parasitic fungi may be carried from one host to another by wind, by animal agencies such as insects and birds, or by man. In this case, it is probable that very little infection is spread by wind, since the spores of the fungus are not formed on the outer leaf sheaths, but arise frequently on the mass of mycelium formed between two adjoining sheaths. Occasionally, when two such leaves are disturbed by the removal, for some economic purpose, of the outer one, spores may be liberated and carried by the wind to healthy trees, but this happens comparatively rarely. Other spores might be set free when the old leaves of badly infected trees die and fall apart. On the whole, however, this method of spread is probably not very effective.

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:—

Varied opinions have been expressed by Mincing Lane experts on the condition of the trade in drugs and spices, or medicinal products during the month of November, which on being summed up have resulted in a fairly satisfactory verdict, in comparison with the closing months of recent years. When, however, the prospects are looking somewhat brighter and the season of Christmas is close at hand, the country is, at the time of writing, for the second time in one year, subject to the disturbance consequent on a general election, and the consequent interference with trade, generally. With regard to special products, there is nothing to report in connexion with West Indian trade, though it may be interesting to note that Eucalyptus oil is in great demand, as it always is at this cold-catching time of the year, and further that the very high price of glycerine is not only maintained, but the curious fact is stated, that the dynamite quality of the article is selling at a higher rate than that demanded for chemically pure quality.

The following are the details referring to West Indian products: —

GINGER.

Very little interest has been taken in this article; practically no Jamaica has been offered. On the 2nd of the month some 40 bags of washed rough Cochin, slightly mouldy, were disposed of at 50*s.* per cwt. Out of 18 cases of Calicut offered, 8 only were sold, at 77*s.* 6*d.* for medium cut. On the 23rd of the month, 172 bags of washed rough Cochin were offered, and bought in at 55*s.* per cwt.

NUTMEGS, MACE AND PIMENTO.

Nutmegs were steady throughout the month. On the 23rd, a large consignment of 460 packages was brought forward and sold at ¼*d.* per lb. advance on previous rates. At auction on the 2nd, mace was in good demand; West Indian was represented by 66 bags, which sold at the following rates: fine pale 2*s.* 3*d.* to 2*s* 4*d.*, good 2*s.* 2*d.*, fair 2*s.*, and ordinary 1*s.* 10*d.* to 1*s.* 11*d.* Fair bold Java fetched 2*s.* 4*d.*, and curly palish 2*s.* 2*d.* per lb. At the end of the month there was a general advance in price of 2*d.* per lb., 134 packages being sold at 2*s.* 6*d.* for fair palish, 2*s.* 3*d.* to 2*s.* 4*d.* for pale and reddish, 2*s.* 2*d.* to 2*s.* 3*d.* for fair reddish, and 1*s.* 7*d.* to 1*s.* 10*d.* per lb. for broken. There was but little demand for pimento at the beginning of the month. On the 23rd, however, 292 bags were brought forward and all bought in at 2⅜*d.* per lb. It was stated that sales had been effected privately.

In arrowroot, the market has been very quiet. Privately, some sales of St. Vincent have been effected at prices up to 2*d.* per lb.

SARSAPARILLA.

At the first auction on the 3rd of the month the offerings were as follows: Grey Jamaica 2 bales, Lima-Jamaica 28 bales, and native Jamaica 8 bales. The two bales of grey Jamaica which were of fair quality realized 1*s.* 6*d.* per lb. Only 16 bales of Lima-Jamaica found purchases at from 10*d.* to 10½*d.* per lb. for coarse to fair. Six bales out of the 8 offered of native Jamaica were sold, fair bright red fetching 11*d.* to 11½*d.*, dull red 10*d.*, and mixed red and yellow 9*d.* per lb. A fortnight later sarsaparilla was in good supply amounting to 21 bales of grey Jamaica, 37 of Lima-Jamaica and 31 of native Jamaica; the whole of the grey Jamaica was sold, fair fetching 1*s.* 6*d.* and slightly rough 1*s.* 4*d.* to 1*s.* 5*d.* per lb. Ten bales only of Lima-Jamaica found customers at 10*d.* per lb. for fair and slightly rough, while of native Jamaica only 8 bales were sold, fair red fetching 10*d.* to 10½*d.* per lb., and dull red and yellow 9*d.*

OIL OF LIME, LIME JUICE AND KOLA.

At the first auction in the month West Indian oil of lime, both distilled and expressed were brought forward but none sold, the reserve prices being 1*s.* 4*d.* for distilled and 5*s.* 6*d.* for expressed. At the end of the month these prices had slightly declined, the quotations being for fair quality distilled 1*s.* 3½*d.* to 1*s* 4*d.*, and in larger quantities down to 1*s.* 1*d.* per lb.; hand pressed was still quoted at 5*s.* 6*d.* For lime juice there was a steady demand during the month, for concentrated West Indian, at £18 5*s.* Kola has been almost neglected. At auction on the 16th, 1 bag only, of mouldy Dominica, was brought forward and disposed of at 2¾*d.* per lb.

ST. VINCENT AGRICULTURAL AND COMMERCIAL SOCIETY.

The following account of a meeting of the St. Vincent Agricultural and Commercial Society, held on December 7, is taken from the St. Vincent *Sentry* for December 9, 1910.

The advisability of ensuring the timely destruction of old cotton bushes after the annual crops, as a safeguard against the spread of fungoid pests, was further considered (having been discussed at two previous meetings). A unanimous conclusion was arrived at, that the Government be asked to legislate for the destruction of old cotton bushes at the end of the crop, also old isolated cotton trees found in towns and villages, in yards and gardens, and perhaps other trees and plants, which, harbouring cotton pests, are a source of danger to growing crops in the neighbourhood. It was further the desire of the meeting that the Government be asked to submit a copy of the draft Ordinance to the Society before it is discussed in the Legislative Council, and give leave to the Society to make any recommendations and suggestions with respect to details.

The two delegates to the recent Mail Conference at Barbados, the Hon'ble J. G. W. Hazell and Mr. J. E. Sprott, submitted their report. It included the resolution forwarded to the Secretary of State for the Colonies and the Postmaster General: also a copy of the minutes of the Conference, printed in book form from the report of the Barbados *Agricultural Reporter*. The delegates commented on the unanimity that prevailed throughout the proceedings, on the interest that was generally evinced in the meetings, both by the delegates and the public; and they quoted the remarks of the Chairman of the Conference, who said that not within his memory had such a representative meeting been held in the West Indies.

With reference to the eighth Agricultural Conference, which it is proposed to hold at British Guiana from the 12th to the 21st January, the Society accepted an invitation sent by the Imperial Commissioner through His Honour the Administrator, to send one or more delegates from this island. It was understood that Mr. Sands would attend the Conference as official representative of this colony; and Mr. F. Corea was elected to represent the Society at the Conference.

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR December 6, 1910; Messrs. E. A. DE PASS & Co., December 9, 1910.

ARROWROOT—St. Vincent, 2*d.* to 3¾*d.*
BALATA—Sheet, 3/6; block, 2/9 per lb.
BEESWAX—No quotations.
CACAO—Trinidad, 53/- to 62/- per cwt.; Grenada, 49/6 to 54/-; Jamaica, 47/6 to 53/-.
COFFEE—Jamaica, 58/6 to 70/-.
COPRA—West Indian, £26 10*s.* per ton.
COTTON—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 20*d.* to 22*d.*
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—Common to good common, 51/- to 54/- per cwt.; low middling to middling, 55/- to 58/-; good bright to fine, 59/- to 65/-.
HONEY—No quotations.
ISINGLASS—No quotations.
LIME JUICE—Raw, 8*d.* to 1/-; concentrated, £18 2*s.* 6*d.* to £18 7*s.* 6*d.*; Otto of limes (hand pressed), 5/6. nominal.
LOGWOOD—No quotations.
MACE—Firm.
NUTMEGS—Quiet.
PIMENTO—Common, $2\frac{3}{16}$*d.*; fair, 2¼*d.*; good, $2\frac{5}{16}$*d.* per lb.
RUBBER—Para, fine hard, 6/0½, fine soft, 5/3½; fine Peru, 5/11 per lb.
RUM—Jamaica, 1/6 to 6/-.
SUGAR—Crystals, 14/6 to 18/-; Muscovado, 12/- to 14/6; Syrup, 10/- to 15/-; Molasses, no quotations.

New York,—Messrs. GILLESPIE BROS. & Co., December 9, 1910.

CACAO—Caracas, 11¼c. to 12c.; Grenada, 11¼c. to 11½c.; Trinidad, 11¼c. to 11¾c. per lb.; Jamaica, no quotations.
COCOA-NUTS—Jamaica, select, $33·00 to $34·00; culls, $16·00 to $17·00; Trinidad, select, $33·00 to $34·00; culls, $16·50 to $17·00 per M.
COFFEE—Jamaica, ordinary, 13½c.; good ordinary, no quotations; washed, 14½c. per lb.
GINGER—9c. to 12c. per lb.
GOAT SKINS—Jamaica, 56c.; Barbados and Antigua, 50c. to 52c.; St. Croix, St. Thomas and St. Kitts, 48c. to 50c. per lb.
GRAPE-FRUIT—$1·25 to $2·50 per box.
LIMES—$4·00 to $4·50.
MACE—39c. to 44c. per lb.
NUTMEGS—110's, 9¾c. to 10c. per lb.
ORANGES—Jamaica, $1·25 to $2·50 per box.
PIMENTO—3¾c. 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 24, 1910.

CACAO—Venezuelan, $12·25 per fanega; Trinidad, $11·90 to $12·25.
COCOA-NUT OIL—$1·12 per Imperial gallon.
COFFEE—Venezuelan, 18c. per lb.
COPRA—$4·75 per 100 lb.
DHAL—$3·70.
ONIONS $4·25 to $4·50 per 100 lb.
PEAS, SPLIT—$6·20 to $6·25 per bag.
POTATOS—English, $2·00 to $2·10 per 100 lb.
RICE—Yellow, $4·30 to $4·35; White, $4·60 to $4·65 per bag.
SUGAR—American crushed, $6·20 per 100 lb.

Barbados,—Messrs. LEACOCK & Co., December 2, 1910; Messrs. T.S. GARRAWAY & Co., December 19, 1910; Messrs. JAMES A. LYNCH & Co., December 24, 1910.

ARROWROOT—St. Vincent, $4·00 to $4 60 per 100 lb.
CACAO—$11·00 per 100 lb.
COCOA-NUTS—$22·00.
COFFEE—Jamaica and ordinary Rio, $15·00 to $16·00 per 100 lb. scarce.
HAY—$1·40 to $1·50 per 100 lb.
MANURES—Nitrate of soda, $65·00; Cacao manure, $42·00 to $48·00; Sulphate of ammonia, $70·00 to $75·00 per ton.
MOLASSES—No quotations.
ONIONS—$5·50 per 100 lb.
PEAS, SPLIT—$6·30 to $6·40 per bag of 210 lb.; Canada, $3·50 to $3·60 per bag of 120 lb.
POTATOS—Nova Scotia, $2·40 to $2·75 per 160 lb.
RICE—Ballam, $5·00 to $5·30; Patna, $3·50 to $3·80; Rangoon, $2·90 to $3·00 per 100 lb.
SUGAR—No quotations.

British Guiana.—Messrs. WIETING & RICHTER, December 24, 1910; Messrs. SANDBACH, PARKER & Co., December 23, 1910.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	$9·00 per 200 lb., wanted	$9·00
BALATA—Venezuela block	32c. per lb.	Prohibited
Demerara sheet	78c. per lb.	None
CACAO—Native	11c per lb.	10c. to 11c. per lb.
CASSAVA—	96c.	No quotation
CASSAVA STARCH—	$6·50	No quotation
COCOA-NUTS—	$10 to $16 per M.	$10 to $16 per M., peeled and selected
COFFEE—Creole	14c per lb.	16c. per lb.
Jamaica and Rio	19c. per lb.	18c to 19c. per lb.
Liberian	10c. to 11c. per lb.	12c. per lb.
DHAL—	$3·80 to $4·00 per bag of 168 lb.	$3·80 to $4 00 per bag of 168 lb.
Green Dhal	$4·00	——
EDDOS—	$1·20	——
MOLASSES—Yellow	None	——
ONIONS—Teneriffe	——	——
Madeira	5c. to 6c.	6c.
PEAS—Split	$6·25 to $6·50 per bag (210 lb.)	$6·50 to $6·60 per bag, (210 lb.)
Marseilles	$4·25	No quotation
PLANTAINS—	20c. to 48c.	——
POTATOS—Nova Scotia	$2·75	$2·75
Lisbon	——	No quotation
POTATOS-Sweet, Barbados	$1·68 per bag	——
RICE—Ballam	No quotation	$4·80
Creole	$4·40 to $4·75	$4·35 to $4·75
TANNIAS—	$2·16 per bag	——
YAMS—White	$2·40	——
Buck	$2·64	——
SUGAR—Dark crystals	$2·20 to $2·40	None
Yellow	$2·80 to $3·00	$2·65 to $2·80
White	$4·00	$4·00 to $4·25
Molasses	$2·10 to $2·30	None
TIMBER—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$3·50 to $5·75 per M.	$4·00 to $6·00 per M.
,, Cordwood	$1·80 to $2·00 per ton	No quotation

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The Pamphlets are written in a simple and popular manner and the information contained in them is especially adapted to West Indian conditions. They contain, amongst other subjects, summaries of the results of the experiment work on sugar-cane and manures, the full official reports of which have only a limited circulation. The number issued up to the present time is sixty-four. 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*.;
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Seedling Canes and Manurial Experiments at Barbados,
- in 1903-5, No. 40, price 6*d*.; in 1904-6, No. 44, price 6*d*.;
- in 1905-7, No. 49, price 6*d*.; in 1906-8, No. 59, price 6*d*.;
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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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The 'Agricultural News' contains extracts from official correspondence and from progress and other reports; and, in fact, any information indicating what is going on in each colony, and the progress made in Agricultural matters throughout the West Indies.

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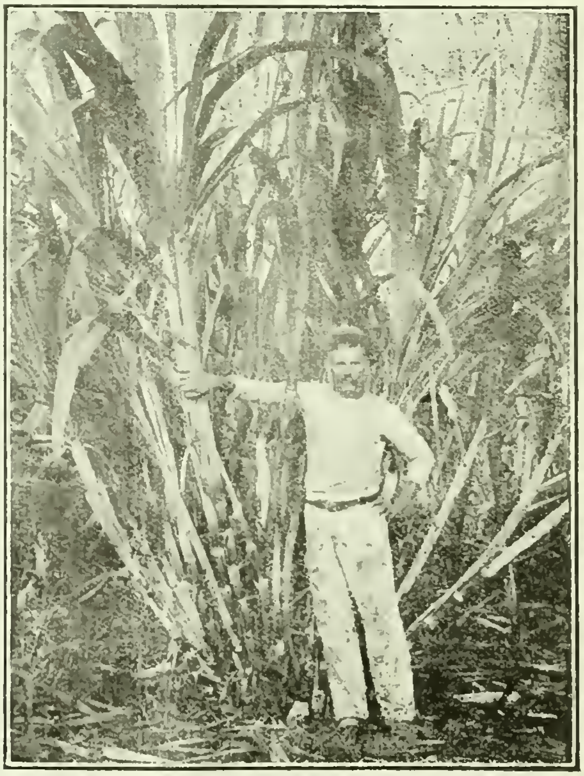

AGRICULTURAL NEWS.

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

VOL. X. No. 228. BARBADOS, JANUARY 21, 1911. PRICE 1*d*.

CONTENTS.

Some Relationships of Departments of Agriculture to Commerce.

THE many ways in which an agricultural department takes part in, or has an influence on, the different concerns in a community or country cause its growth and progress to be guided in an intimate manner by the conditions which surround it. Such a department passes through the stages of evolution proper to itself, and each of these stages, if its aims are in sympathy with the requirements of the country which it is supposed to serve, is influenced directly by the nature of those requirements and the work that has been done in order to fulfil them.

This manner of regarding the growth of an agricultural department does not, however, afford a complete view of the nature of its work and responsibilities: nor does it give an adequate idea of the extent to which it has done its part in assisting planters. In its own evolution, it has been necessary that it should take part in one or more of the stages of the evolution of other concerns that are of common interest. This share may have been of a temporary nature, but one which is none the less important, because of the necessity for it to be taken at the particular time, and the need for the existence of such a department for the purpose.

It is work of this kind that is most quickly forgotten, and for which credit ceases to be given, as the special circumstances of the case become more remote in time. This should not, however, discourage those who are likely to become responsible for it. They must be willing to do what is required of them, at the proper opportunity; what is more difficult, they must know when the stage is reached at which the usefulness of their activities in the matter ceases; and be ready, then, to place the results of their labours in the hands of others, for the proper commencement of another degree in the extension of whatever line of activity may have required their temporary assistance.

In returning to the consideration of the ordinary growth of an agricultural department, it is unnecessary, now, to review in detail the degrees in which this usually takes place. There are many examples which may be used to indicate how such an institution, from being a means for undertaking agricultural experimentation and the introduction of plants, has acquired a rapidly increasing share in such matters as education, the development of old industries and the acquisition of new ones, the making of agricultural improvements, the administration of financial assistance, the introduction of legislation required in connexion with agriculture, and many others, up to the stage at which it becomes an authority for reference, and a source of advice, for the Executive. In the present instance, all these may be left for treatment in their proper connexion, and attention may be given to the special purpose for which this article is written.

There is adequate evidence to show that those who have undertaken the responsibility of giving advice in agricultural matters have recognized to an increasing degree that part of their labours should have an immediate reference to the commerce of the countries which they serve. This has been the case particularly in the West Indies, where so to speak, agriculture is commerce. A large part of the work of most of the agricultural officers in these islands is directed toward giving assistance in connexion with agricultural shows, and with the labours of permanent exhibition committees. Agricultural loans and banks, and schemes of land settlement—matters of direct or indirect commercial interest—are all included in the view which they take of their work. An interesting and pertinent example of the connexion of the efforts of agricultural departments with mercantile concerns is the participation of the Imperial Department of Agriculture, in the proceedings of the British Cotton Growing Association—the latter a commercial agency working with a special object. If it is required, recent evidence as to the commercial usefulness of the agricultural worker and, through him, of the agricultural department, is furnished in a broader way by the frequency with which the former appeared as a witness before the late Royal Commission on Trade Relations between Canada and the West Indies.

The relationship between the work of departments of agriculture and the interests that belong more directly to commerce is becoming closer, particularly in tropical countries, as time progresses. That is to say, the efforts of such departments are continually being made to serve more intimately those interests, so that they are now prepared to undertake work that has been usually regarded as existing in the province of the producer or buyer, alone—work that was undreamed of, as part of their labours, less than a decade ago. This is not required so much in relation to old, well established industries as in the case of those that are being inaugurated, or which have, so far, reached only a small growth. As regards the former, the producer has only to bring forward that which he has for disposal; in the case of new products, markets where these may be sold have to be found, and ways must be devised for extending such as exist already. It will be of interest to render special consideration to the kind of activity that has just been indicated.

In giving assistance in finding and extending markets for various kinds of produce, the work of an agricultural department must be indirect. From its very nature, it cannot take the place of an agent between the seller and the buyer. It must occupy a position in which its work can be undertaken in a dispassionate manner, and without bias, so that it may engage the confidence of the consumer as well as of the supplier. A useful way in which this position may be attained, in a special instance, is suggested in the report* of the recent Royal Commission on Trade Relations between Canada and the West Indies, which recommends the appointment of a Trade Commissioner 'fully conversant with the circumstances of the West Indies, to represent the West Indies in Canada, who could advise the producers of the West Indies and bring them into communication with Canadian buyers.' The suggestion is made, further, that it is desirable, 'in order to secure the advantages of the existing organization, that the office should be in close association with the Imperial Department of Agriculture.' Thus the Department would be provided with an intermediary, for the purpose of serving the commercial interests of the West Indies in Canada, who would have the advantage of its advice and recommendations.

This recognition of an extended use of an agricultural Department in a commercial direction forms an illuminating example of the broad modern aspect of the work of such institutions. Some of these extensions will be permanent; while others will be only temporary, as has been indicated—being merely required for fostering a scheme at its commencement. In any case, they form steps in the evolution of agricultural departments, and serve to give a hint as to the many possible directions in which their usefulness may be developed.

* Part I [Cd. 5369], par. 182.

SUGAR-CANE VARIETY EXPERIMENTS IN ANTIGUA.

The following report of a paper read recently by him in Antigua has been forwarded by Mr. H. A. Tempany, B. Sc.:—

At a meeting of the Agricultural and Commercial Society, Antigua, held on November 9, 1910, Mr. H. A. Tempany, B.Sc., Superintendent of Agriculture, Leeward Islands, gave an account of the experiments which were conducted in Antigua during the season 1909-10, by the Department of Agriculture, with different varieties of sugar-cane.

The trials were the eleventh series which had been made in Antigua, and had been carried out on the same lines as in previous years. The experimental plots had been in fields of certain estates, viz. Cassada Garden, Bendals, Blubber Valley, Tomlinsons, Thibous, The Diamond, Friar's Hill, Ffryes, Big Duers, and the canes under investigation had received the same care and attention as those on the remaining portions of the estates, so that the results from these would be directly comparable with crop results.

The rainfall for the year had been moderately favourable, and the distribution fairly good, but the growing crop received something of a check owing to the absence of rain during the months of March and September. The total output of sugar from the whole island was 13,415 tons; this was greatly in excess of the previous season's crop of 8,600 tons.

The varieties experimented with were forty-three in number and were practically identical with those grown in the previous season.

Of the plant canes, the following fourteen had given the best results:—

Name of cane.	Sucrose, Pounds per gallon.	Pounds per acre.
1. Sealy Seedling	2·09	7,300
2. B.4596	1·88	7,290
3. B.208	2·30	6,540
4. B.393	2·22	6,400
5. D.625	1·83	6,360
6. D.1111	1·84	6,360
7. B.156	1·99	6,140
8. White Transparent	2·18	6,060
9. B.306	2·14	5,940
10. B.1355	2·13	5,680
11. D.116	1·88	5,610
12. D.132	1·92	5,560
13. B.3096	1·95	5,540
14. B.1528	2·04	5,500

The results were good, and compared favourably with the average returns for the past nine years. Sealy Seedling, which had for a number of years taken a leading place in these experiments, and was well known as a valuable cane, headed the list for the past season. It was very closely followed by B.4596—a cane introduced into Antigua somewhat recently—which had given excellent results on every occasion, and had come first in numerous experiments; this might be recommended to planters for careful trial in Antigua.

White Transparent had taken a somewhat unusually prominent place in the season 1909-10; it was retained in the experiments for purposes of comparison, as it was generally regarded as the standard cane of Antigua.

B. 1355, B. 3696 and B. 1528, varieties of recent introduction, had once more given fairly good results.

Comparing the results from each station by the method employed in the past by Dr. Francis Watts, it was found that:

B.4596	stands among the first fourteen canes on	7	stations
D.625	,, ,, ,, ,, ,, ,, ,,	6	,,
B.208	,, ,, ,, ,, ,, ,, ,,	6	,,
B.147	,, ,, ,, ,, ,, ,, ,,	5	,,
B.156	,, ,, ,, ,, ,, ,, ,,	5	,,
B.306	,, ,, ,, ,, ,, ,, ,,	5	,,
B.393	,, ,, ,, ,, ,, ,, ,,	5	,,
B 1753	,, ,, ,, ,, ,, ,, ,,	5	,,
B.3696	,, ,, ,, ,, ,, ,, ,,	5	,,
D.95	,, ,, ,, ,, ,, ,, ,,	5	,,
D.1111	,, ,, ,, ,, ,, ,, ,,	5	,,

The yields from ratoon canes had not been as great as the season under review would have warranted, and in all probability this was due to the presence of the root disease (*Marasmius sacchari*). The ratoon canes were those which had been reaped during the previous season as experimental plant canes, and were forty-two in number; B.1528 had given the best returns, and appeared to be a good ratooning variety; while of the newer varieties, B.1753 B.4596, D.1452 and B.3696 had taken good positions. The following were the best fourteen among the ratoon canes:—

Name of cane.	Sucrose, Pounds per gallon.	Pounds per acre.
1. B.1528	2·16	3,440
2. B.156	2·14	3,340
3. B.1753	1·96	3,240
4. B.147	2·01	3,230
5. B.4596	1·94	3,230
6. D.109	2·12	3,120
7. D.1452	2·20	3,020
8. B.109	2·07	3,020
9. B.208	2·33	3,020
10. B.3696	1·98	2,900
11. B.306	2·15	2,900
12. B.376	1·93	2,880
13. Sealy Seedling	2·04	2,880
14. D.116	1·95	2,860

Dr. Watts's method of comparison for the ratoon variety results afforded the following information:—

B.4596	has come within the first fourteen on	7	stations
B.156	,, ,, ,, ,, ,, ,, ,,	6	,,
B.1528	,, ,, ,, ,, ,, ,, ,,	5	,,
Sealy Seedling	,, ,, ,, ,, ,, ,,	5	,,
D.1452	,, ,, ,, ,, ,, ,, ,,	5	,,
B.1753	,, ,, ,, ,, ,, ,, ,,	4	,,
B.109	,, ,, ,, ,, ,, ,, ,,	4	,,
B.208	,, ,, ,, ,, ,, ,, ,,	4	,,
B.306	,, ,, ,, ,, ,, ,, ,,	4	,,

Mr. Tempany concluded by thanking the planters and estate owners for the active assistance they had rendered to this Department, which had enabled the sugar-cane experiments to be carried out, once more, with success.

FRUITS AND FRUIT TREES.

THE COLONIAL FRUIT SHOW.

The following extracts are taken from an account of the recent Colonial Fruit Show contained in the *West India Committee Circular* for December 20, 1910. Reference was made to the success of Dominica fruits and fruit products, at this show, in the last number of the *Agricultural News*:—

Through the courtesy of the Council of the Royal Horticultural Society, the collection of citrus fruits and lime products shown by the Permanent Exhibition Committee at the fourteenth Colonial Fruit Show on December 1, 2, and 3, at the Royal Horticultural Hall, Vincent Square, Westminster, were allowed to remain on exhibition at the Society's fortnightly flower show on December 6. The fruit, which included limes, shaddocks, oranges, breadfruit, and lime products, was set out in baskets, samples selected at random from the cases for competition being placed on plates in the foreground for the judges, who as already announced, met specially on December 2, to judge the Dominica exhibits, which arrived too late for the opening day. Among the exhibitors in this section were: The Permanent Exhibition Committee, the Botanic Station, the Dominica Fruit Growers' Association, and the following estates: Castle Comfort, Wall House, Gleau Manioc, Everton, Sylvania, Corona, St. Aroment, Ancaster Park, and La Haut: and the following awards were made:—

The Permanent Exhibition Committee of Dominica, for the collective exhibit, the Gold Medal of the Royal Horticultural Society.

The Botanic Station, for citrus fruits, the Silver-gilt Hogg Memorial Medal.

St. Aroment Estate, for lime products, Silver-gilt Knightian Medal.

Everton Estate, for citrus fruits, Silver Banksian Medal.

Wall House Estate, for limes, Silver Banksial Medal.

Other West Indian exhibitors at the show were the West Indian Produce Association, of 4, Fenchurch Buildings, who, if rumour speaks correctly, are to increase their operations very considerably after Christmas; the Jamaica Agency, of Gamage Buildings, Holborn, and the Roseau Valley Fruit Company. The West Indian Produce Association showed, as usual, almost every imaginable kind of West Indian produce, for which they were justly awarded a Gold Medal. The Jamaica Agency gained a Silver Knightian Medal for citrus fruits, and the Roseau Valley Fruit Company a Bronze Banksian Medal for colonial preserves. The Jamaica Agency has for some time past made a speciality of carefully packed boxes of grape fruit, mangoes, etc. A plentiful supply of literature was distributed by the Permanent Exhibition Committee of Dominica, and the sample bags of fruit marked boldly 'Dominica Limes' again turned the numerous visitors into advertising agents for that delicious fruit.

The arrangement of the West Indian section was entrusted as before to the West India Committee, whose chief clerk, Mr. Osmond, was indefatigable in his efforts to make the exhibition a success

The exhibition was opened by Sir Edward Grey, and it was certainly the most successful of a long series. Among the numerous visitors were: His Honour Douglas Young, the Administrator of Dominica; Sir Owen Philipps; Mr. R. Rutherford, Deputy Chairman of the West India Committee; Lady Dorothy Neville; Sir Daniel Morris; Sir Albert K. Rollit, Lady Burton; Lieut.-Col. F. C. Trollope; Mr. E. L. Marshall; Mr. H. F. Previté; Mr. Forster M. Alleyne; Mr. D. Macintosh; Mr. W. G. Freeman and Mr. R. Rust.

SOME METHODS OF TRANSPORTING BANANAS.

In the *Journal d'Agriculture Tropicale*, No. 74, reference was made to an account, in the *British and South African Export Gazette*, of a method of transporting bananas without the employment of refrigerating chambers. The investigations mentioned were undertaken in order to find a cheap way of carrying bananas from South Africa, in view of the expensive nature of cool storage, during so long a voyage as that to England. Trials were made by the firm of Messrs. Cockburn, Hemelryck & Co., of London, and consisted in carrying the bananas in pulverized peat. The account stated that, after several unsuccessful attempts, satisfactory results were obtained. Experiments had demonstrated the necessity for picking the fruits as soon as they had lost their green appearance, and of packing them in a special kind of peat which had been completely freed from all earthy matter. The preserving action of the peat was stated to consist in its possession of absorbent properties, by which it protects the fruit from external moisture, and from the decay that results from the presence of this.

The issue of the same paper for October 1910 makes reference to the above account, and goes on to describe experiments of a similar nature that have been undertaken recently with bananas from the Cameroons, and from Togo. A first consignment in peat, unfortunately however, containing only five banana fruits among several kilogrammes of fresh kola, was sent in December 1909, from the Cameroons to Hamburg. On arrival, the fruits were found to be in good condition, and remained in this state for several days. Equally satisfactory results have been obtained by the administrator of the plantations of Bibundi, in the Cameroons, who has succeeded in exporting bananas, which arrived in good condition for the Hamburg market. It is estimated by one authority that it will be possible to export bananas in peat, on a commercial scale, from the Cameroons and Togo to Hamburg, at a net profit of between ½*d.* and 1*d.* per fruit.

The same article finally points out that, according to the *Natal Agricultural Journal* for March 1910, in Natal, where methodical experiments in connexion with the export of bananas have been conducted for several years, it is considered that well-dried maize husks are superior to peat as a medium for transporting bananas to Europe. Consignments of the fruit, large enough to be of commercial importance, made during last season, confirm the results of the experiments. It seems that the insulating and absorbing qualities of maize husks, together with efficient ventilation of the fruits during the voyage, assure better conditions of transport than those which arise from the employment of cool storage.

THE CERTIFICATION OF MILK.

A movement was begun some time ago, and is gradually assuminga definite and established form, for placing on the market milk certified by an outside authority to be free from all impurities, disease germs, and other risks to the consumer. Pasteurization, sterilization, and other methods of artificial treatment form no part in the plan. The scheme consists of preventive and not of curative measures. It insists upon such provisions as will ensure wholesome milk at the outset and avoid risk of contamination in the course of its circuitous passage from the cow to the consumer's table.

The Moundsmere Manor Farm in Hampshire, on which the practicability of the system is being demonstrated, is an important object-lesson. The ordinary cowsheds are clean and well ventilated, but are in no way more elaborate than those on an average farm. The distinguishing feature consists in the provision of a milking shed. This building is kept absolutely free from litter and every kind of material that would generate dust or harbour disease germs. The cows are placed in the shed half an hour or an hour before milking, and turned out either to the field or to the ordinary sheds, as the case may be, when milking is finished. Every cow has the udder and hindquarters thoroughly cleaned before being milked, as a safeguard against the contamination of the milk. The same scrupulous care is taken as to the cleanliness of the milkers, who wear overalls and wash their hands before starting to milk, and are strictly forbidden to place their heads against the flanks of the cows while milking—wise precautions against the risk of contamination which are well understood and now observed in the management of many herds. The milk is removed without delay to the adjoining dairy, where it is strained, cooled, bottled and sealed, the whole period of exposure not exceeding twenty minutes. The bottles are sent up to town in cases by train and delivered to the consumers, so that there is no risk of contamination after the milk is bottled. The effect of handling the milk in this pure atmosphere is shown in the quantity of bacteria in the milk. Certified milk must not contain more than 10,000 bacteria per cubic centimetre, whereas the bacteria in ordinary milk may be anything up to or over a million. The tuberculine test is rigidly employed; the animals are tested twice a year, and those that react are removed from the farm.

It may be thought at first sight that such a scheme would present many difficulties, but there is little doubt that these will be overcome in time. There is, of course, the initial outlay on the farm buildings and the apparatus necessary for the cooling and bottling of the milk and for the transit of the bottles, and there is also the additional expense of the certification, which is borne by the producer. For these reasons it will not be possible to sell the milk at the usual price. The price retail will be 8*d.* per quart, to start with, and less if fairly large quantities be taken daily, so that at present it will only be within the means of the fairly well-to-do classes. The introduction of the system need occasion no alarm either in producing or consuming centres. It is not conceivable that any Government would impose conditions that would deprive the poorer classes of their milk supply. On the other hand, it is a public duty to see that the milk is distributed as free from impurities and disease germs as possible, and the system promulgated points a useful lesson in the direction in which the authorities should aim in improving the conditions of production and distribution. (*The Times* Weekly Edition, November 18, 1910.)

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture, accompanied by Mr. A. G. Howell, Chief Clerk, left Barbados on January 16, by the S.S. 'Parima', for Antigua, in order to confer with His Excellency the Governor of the Leeward Islands on official matters. It is expected that Dr. Watts and Mr. Howell will return by the S.S. 'Sobo' on February 5, 1911.

Camphor in German East Africa.—In a recent number of *Der Pflanzer* (1910, 86) some information is given regarding the results of a long series of distillation trials carried out at the Biological Agricultural Institute at Amani with cuttings from the camphor trees grown in that district. The total number of trees available is about 3,500, mostly three-and-a-half years old with a few one year older. These were cut back to the extent of about one-third of their growth. This cutting back produced no ill effects, and at the end of the ensuing rainy season the trees had regained their original size when cut.

The results of the distillation trials are of interest as confirming experience in Ceylon and elsewhere that the leaves are richer in camphor than the wood. In the present experiments young twigs and leaves yielded, on the average, about 1·2 per cent. of distillate, of which 0·8 to 0·9 per cent. was camphor, and 0·3 to 0·4 per cent. oil. The latter still retained camphor which could be recovered in working on a large scale, so that the yield of camphor in these experiments is estimated at 1 per cent. Woody branches, on the contrary, yielded only 0·158 per cent. of distillate, consisting of 0·061 per cent. camphor and 0·097 per cent. oil. In growing camphor trees, therefore, it is pointed out that the planter's main object should be to encourage leaf formation. It was found advantageous to carry on the distillation in dry weather, as then the raw material was drier to start with and the actual distillation could be carried out more quickly. No certain difference could be detected in the yield of camphor obtained from leaves and twigs collected from trees grown at different altitudes. (*Bulletin of the Imperial Institute*, Vol. VIII, No. 3.)

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date December 19, with reference to the sales of West Indian Sea Island cotton :—

The sales of West Indian Sea Islands are confined to 20 bales of Barbados at $20d.$ to $20\frac{1}{2}d.$

The stock is exhausted, but spinners are not eager to purchase, the demand for fine yarns being limited, particularly for lace purposes, as lace is rather going out of fashion.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending December 17, is as follows:—

The market has remained very quiet throughout the week with sales of only 50 bales off in preparation at 34c. In the absence of demand Factors are continuing to hold, for our previous quotations, which we have only to repeat, viz.:

Extra Fine Islands at	40c. = $22d.$	c.i.f.	& 5	per cent.
Fully Fine	,,	37c. = $20\frac{1}{2}d.$	,,	,,	,,
Fine	,,	35c. = $19\frac{1}{2}d.$	,,	,,	,,

but to effect sales for quantity, we think they would concede 1c. to 2c. from their asking prices.

A METHOD FOR COTTON SELECTION THROUGHOUT THE SEASON.

The first part of an article on this subject, consisting of extracts from Circular No. 66 of the Bureau of Plant Industry of the United States Department of Agriculture, which was issued during August 1910, was given in the last number of the *Agricultural News*. The present article furnishes the rest of the information that is of more particular interest to cotton growers in the West Indies.

SELECTION BY BOLL CHARACTERS. If the farmer is engaged in the selection of a big-boll variety of upland cotton, such as the Triumph, most of the degenerate plants are very easy to recognize, because they have small bolls. This fact becomes most apparent in unselected fields about the middle of the season, soon after the earlier bolls have reached full size, but before they begin to open. A little search will show that some of the plants are producing only small bolls. Some small bolls can be found, of course, on normal large-bolled plants, just as small or defective apples can be found on a large-fruited tree. Plants that appear in a big-boll variety, but produce only small bolls, no longer represent the variety, but are to be looked upon as definite variations away from the variety. The plants that depart from the characters of the parent variety are mostly very inferior; but even if they are not inferior, they ought to be taken out of the variety to avoid a further increase of diversity through the formation of hybrids.

The shapes, colours, and surfaces of the bolls also afford differences, of very little importance in themselves, but very useful as indicators in selection to maintain uniformity. Indeed, it is possible in a great majority of cases to judge the quality of the lint correctly in advance by looking at the bolls of a plant, after one is sufficiently familiar with the variety. Plants with shorter bolls are likely to have shorter lint, while narrower bolls indicate less abundant lint. Any pronounced difference in the shape of the bolls can be taken to indicate that the plant is a variation or a hybrid that ought to be removed, and the same is true of differences in the colour or in the character of the surface of the bolls.

Selection by boll characters is not as effective as selection by leaf and stem characters, because the inferior plants have already flowered, and there has been an opportunity for their pollen to be spread about the field. Nevertheless, if the boll selection be made early enough, much of the spreading of pollen in the latter part of the season can be avoided. An advantage of boll selection is the opportunity that it gives to become better acquainted with the leaf and stem characters of degenerate plants, and better ability to detect such plants early in the season in following years. If selection is deferred until the crop is ripe, the external differences of the plants will have become much less apparent.

SELECTION BY SEED AND LINT CHARACTERS. More time is required for the last selection, in which attention is given to the fertility of the plants and to the characters of the lint and seed. The labour will have been greatly lessened by the previous roguing out of all the plants that gave external evidence of tendencies to depart from the uniform type of the variety, either in the habits of growth, in the characters of the leaves, or in the size and shape of the bolls. Plants that show themselves deficient in fertility, or in earliness, in comparison with their neighbours, can also be omitted from the last selection. The examination of the lint is thus narrowed down to the plants that have appeared satisfactory in all other respects. Many planters have made a practice of noticing differences in lint, and are already well qualified to perform this kind of selection.

The length and abundance of the lint are compared in the field by the familiar process of straightening it out from the sides of the seed, either by pulling between the thumb and finger or by using a small comb. One or more samples of the combed out lint from different plants can be held between the fingers of the left hand and thus carried along for ready comparison. The strength of the lint is judged in the field by breaking the combed out strands while held between the thumbs and first fingers of the two hands. Any plant is rejected that shows itself distinctly inferior to its neighbours in length, strength, or abundance.

USE OF PROGENY ROWS IN SELECTION. Selection of a high-grade variety of cotton can be somewhat simplified and also rendered more effective if the farmer is willing to take the additional precaution of saving the seed of each selected plant separately, in order to plant a part of it in a separate row the following season.

The use of the progeny rows* enables an additional precaution to be taken to guard the purity of a good stock by holding over a part of the seed from which each of the progeny rows has been planted. If any of the rows should prove to be of exceptional merit, it is possible to go back to the reserved seed of the parent of the best row, and sow it in a separate, isolated plot, in the next season, as the foundation of a special strain, descended from a single superior plant.

Planters of Sea Island cotton are accustomed to the plan of narrowing their selection down to a single superior plant. They multiply the seed from this plant for two or three years in separate seed plots, to secure enough for field planting. The very high quality and unusual uniformity of the Sea Island cotton are to be ascribed largely to the method of selection that has been followed.

CONCLUSIONS. The full possibilities of improving the cotton crop cannot be realized until the work of selection is carried out on every farm, and becomes established as a regular part of the care of the crop. The only adequate alternative is the purchase of selected seed from a careful neighbour, who maintains his selection and produces a uniform crop.

One of the most important advantages of the plan of raising cotton for seed in a separate field or plot, is that the farmer is likely to give the plants more attention, and thus become more familiar with the characteristics of the variety that the plants represent. Such familiarity is necessary in order to qualify the farmer or the breeder to establish and maintain the uniformity of the variety by selection.

Though much of the undesirable diversity of the crop can be ascribed to the mixture of varieties, it is not possible to keep any variety uniform without continued selection. Spontaneous changes to inferior characters occur even in the most uniform varieties; and if such variations are not removed, the uniformity of the stock is gradually destroyed.

A farmer who knows his variety well enough can make use of the external characters for the removal of inferior plants early in the season, when this work can be done more easily and efficiently than by waiting for the lint and seed characters at the end of the season.

Attention to the external characters makes it possible to detect degenerate plants—those that will produce small bolls and inferior lint, even before they have begun to flower. The roguing out of such plants early in the season guards the uniformity of the crop by preventing the cross-fertilization of good plants with pollen of inferior individuals.

The cotton plant is extremely susceptible to influences of soil and climate. Each variety shows a wide range of differences under different conditions, and the proportion of degenerate plants—those that make definite changes away from the characters of the variety—is also influenced by the conditions under which the plants grow.

The popular idea that persistent selection will bring about a continued improvement in a pure-bred variety is now questioned in the scientific world, but this does not affect the agricultural importance of selection as a means of preserving the uniformity and productiveness of varieties.

* See *Agricultural News*, Vol. IX, p. 70.

PRIZES FOR PEASANT COTTON-GROWING, ST. LUCIA.

The following summary of the report on the recent cotton-growing competition, held under the auspices of the St. Lucia Agricultural Society, is taken from a report of a meeting of that Society, held on December 14, which is given in the *Voice of St. Lucia*, December 17, 1910. The judges were Mr. J. C. Moore, Agricultural Superintendent, and Mr. R. C. Niles, Schoolmaster at the Agricultural School:—

Mr. J. C. Moore handed in his report on the examination of cotton plots in the island, entered for competition under the prize scheme of the St. Lucia Agricultural Society in 1910.

According to the report, ninety-six plots had been examined. Of these:—

4	plots	ranged	from	3	to	5	acres.
17	,,	,,	,,	1	,,	$3\frac{1}{2}$	,,
14	,,	,,	,,	$\frac{1}{2}$	,,	$\frac{3}{4}$	acre.
26	,,	,,	,,	$\frac{1}{20}$	,,	$\frac{2}{5}$	,,
25	,, too small, or poor, to be marked						
10	,, with no cotton at all.						

The total area of cotton examined was about 56 acres. The work of examining the various plots was done between October 17 and December 12 by Mr. J. C. Moore and Mr. Niles.

The report contained, besides, a detailed account of the marking, in which were indicated in numerical order the names of persons who appeared to come within the range of merit to qualify as possible prize winners.

The Chairman, in warmly thanking Mr. Moore in the name of the Society, said that the able report which they had before them showed that Mr. Moore must have given himself a great deal of trouble, judging from the number of plots examined, and also taking into consideration the distance that had been travelled over. He asked that the honorarium of £10 which had been voted at the general meeting of September 2 last, as a fee to the judges, be paid to them for their services. This was agreed to.

Coastal Steamer Service for Trinidad and Tobago.—The Commercial Intelligence Branch of the Board of Trade are notified by the Crown Agents for the Colonies that tenders are invited for the performance of a coastal steamer service round and between the islands of Trinidad and Tobago, by two vessels of not less than 850 tons and 500 tons gross register, respectively, steaming at a rate of not less than 9 knots an hour. The contract will be for a period of not less than five, or more than fifteen, years, from March 19, 1913. Tenders will be received by the Colonial Secretary, Port-of-Spain, Trinidad, up to December 30, 1911.

The maximum rates of freight and of passage to be charged by the contractors will be specified. Subject to certain restrictions, the contractors will be at liberty to use the steamers for their own work, when not engaged in the work to be performed. Facilities as regards the use of wharves and jetties will be afforded by the Government of Trinidad.

Tender forms, with copy of proposed contract time table and schedules of maximum freight and passage rates, may be obtained from the Crown Agents for the Colonies, Whitehall Gardens, London, S.W. (*The Board of Trade Journal*, November 24, 1910.)

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. X. SATURDAY, JANUARY 21, 1911. No. 228.

NOTES AND COMMENTS.

Contents of Present Issue.

The editorial of the present number treats of Some Relationships of Departments of Agriculture to Commerce. It shows how the energies of such departments may be expended in many diverse ways, even though the particular phases of such expenditure in various directions may often be temporary.

A presentation of the results of recent sugar-cane variety experiments in Antigua is made on page 19.

The second of the articles describing a method for cotton selection throughout the season is given on pages 22 and 23, as was promised in the last issue.

The Insect Notes, on page 26, contain an account of an insect pest of cacao in Uganda. The blocks for Figs. 2 and 3 have been used by permission of the United States Department of Agriculture.

On page 27, a review is given of the report on the Botanic Station, etc., St. Vincent, for 1909-10.

The Fungus Notes are presented on page 30. They contain the second, and concluding, article dealing with work that has been done recently in connexion with the bud-rot disease of palms in India.

The results of the Intermediate and Final Examinations, held in connexion with the Courses of Reading of the Department, on November 7, 1910, are given on page 31.

Sugar Importation into Japan.

Diplomatic and Consular Reports No. 4511 Annual Series deals with the trade of Japan during the year 1909. Among other matters, to some of which reference has been made already in the *Agricultural News* (Vol. IX, pp. 313, 329 and 408), it shows that the total imports of sugar into that country during 1909 had a value of £1,364,600. The greater portion of this was drawn from Java, which provided an amount worth £1,226,500, or over £524,000 less than in the preceding year. Of the other countries for which definite figures are given, the Philippines come next with £46,000, closely followed by Hong Kong (export sugar) with £31,600.

The greatest efforts are being made at the present time to extend the sugar industry of Formosa, so that in a few years it may happen that Japan will be able to obtain all the sugar and sugar-cane products required by her from her own possessions, including Formosa. That these efforts exist is shown by the fact, among others, that the exports of sugar from Formosa to Japan during 1909 were 121,000 tons, as against 46,000 tons in the preceding year.

The Trade of India, 1909-10.

A review of the trade of India for the year ending March 31, 1910, by the Officiating Director-General of Commercial Intelligence, has been issued recently. An article on this appears in the *Journal of the Royal Society of Arts*, for November 18, 1910, from which the following matters of more general interest are taken.

The trade during the year showed a marked improvement, and there are signs that the depression that has existed in India for some time is coming to an end. During 1909, large advances took place in the total value of imports into the United Kingdom, France, Germany, Belgium and the United States, and the amount of the exports is much higher in the case of all but the last-mentioned country. An exceptionally favourable monsoon was experienced in 1909, so that the total outturn exceeded the estimates, in the case of jute, by 14 per cent.; other increases above the estimates were as follows: cotton 22 per cent., wheat 26, rice 43, the chief oil seeds 24 and 44 per cent. The opinion is given that the restoration of industrial activity in India, and the development of internal trade, can only be assured by a continuance of general agricultural prosperity in that country.

The amounts of beet and cane sugar imported into India increased by about 4·4 per cent. in quantity, and 5·5 per cent. in value. The supply of beet sugar is obtained chiefly from Austria-Hungary, while cane-sugar chiefly comes from Java and Mauritius. The statement is made that the potentiality of India as a sugar producer is decreased by the following circumstances, among others: the difficulty of concentrating cultivation around central factories; and the nature of the demand, which is practically restricted to that for molasses and low grade sugar, produced in wasteful and primitive ways.

The exports that show the greatest advances are wheat and wheat-flour, pulses and millets, seeds, raw cotton and raw wool: the only decreases of any account occur in regard to raw jute, indigo and coffee. As regards cotton, reckoning on the average of the three years ended 1908-9, the share of this product was 30 per cent. of the total value of raw materials exported from India: while in 1909-10 the proportion came to $37\frac{1}{2}$ per cent., so that raw jute was supplanted by raw cotton, in its former place as the most important article exported.

Of the chief countries that trade with India, the United Kingdom occupies the first position, and the total value of this trade rose from £75,000,000 to £81,000,000. Next come the principal foreign countries in the following order: Germany, China, United States, Japan, Belgium, France, Java and Austria-Hungary.

The general revival of the trade of India is reflected to some extent in the fact that, while the net imports of silver decreased considerably, those of gold exceeded $16\frac{3}{4}$ million pounds sterling, which is the highest total ever recorded, and that there was an increase of 7·7 per cent. in the aggregate tonnage of shipping entering and clearing at Indian ports, over the quantities for the preceding similar period.

Practical Agriculture and Sanitation and Hygiene in Grenada Schools.

According to the Grenada *Government Gazette* for December 15, 1910, Rule 128 of the Grenada Primary Education Code, which defines the conditions under which bonuses may be given to head teachers from any special sum voted from public revenue for such purposes, has been amended by the addition of provisions having a general effect, as follows.

A special bonus, as a lump sum of money, shall be paid to the head teacher of a combined school for efficient instruction in Practical Agriculture and Sanitation and Hygiene, provided that, where classes contain less than twelve pupils, the amount to be paid shall not exceed one-half of that which would otherwise be awarded.

Necessary conditions to the making of the grant will be the possession of a school garden, of a standing satisfactory to the Board of Education, and the teaching of the subject by a properly qualified teacher. It is left to the discretion of the Inspector of Schools, in cases where no gardens exist, to permit the qualifications to be fulfilled by the giving of adequate instruction with plants in boxes, tubs, or pots.

The teaching of agriculture may now be undertaken by teachers who gained First Rank in the examination held after the Courses of Lectures delivered under the auspices of the Imperial Department of Agriculture, in 1900. Other teachers will have to qualify themselves at an annual examination held for the purpose, of which due notice will be given; such examination will be held under the direction of the President of the Board of Education.

The rule made by the Board of Education on May 21, 1909, which was passed by the Legislative Council on August 6, of the same year, is hereby rescinded.

Rubber Planting in Cochin-China.

An account of the measures that are being taken by the Government of Cochin-China for the purpose of encouraging the rubber industry in that country appears in the issue of the *Dépêche Coloniale* for November 15, 1910. The grant of concessions, for plantations having soil consisting of the so-called 'red earth' have been recently subjected to new regulations. Such concessions are now only made in certain provinces on the undertaking that the land is used for the planting of rubber. All holders of concessions are bound to plant, each year, at least one-tenth of their holdings, if these are less than 500 hectares (1,250 acres) in area, and one-twentieth if the area is greater than this. The minimum number of trees per hectare is 120, and the planter only enters into complete possession of the land granted to him when half of this is growing rubber trees.

The Distribution of Weeds.

A short note on the various methods by which weeds may be distributed is given in *Nature* for October 27, 1910. This contains an interesting instance of a way in which such distribution may take place, in connexion with the exhibition of commercial activity.

It appears that, a few months ago, an advertisement resembling a paper butterfly was distributed in various countries, including Australia. Affixed to this was the burr of the burdock (*Arctium Lappa*), which apparently was attached for purposes of novelty and attraction. The *Agricultural Gazette of New South Wales*, for August 2, 1910, has the following statement with reference to this: 'The Chief Quarantine Officer for Plants has informed the Under-Secretary for Agriculture of a most extraordinary method whereby an objectionable weed might be broadcasted throughout the State. It appears that, as an advertising medium, some printed paper, representative of a flying insect, has been sent to Australia, and the genius who invented this particular style of advertisement, in an endeavour to make it more realistic or uncommon, had attached to each specimen the burr or seed of the noxious weed burdock (*Arctium Lappa*). The authorities in Western Australia had called the attention of the Director of Quarantine to the use to which the burr of this noxious weed was being put. It is needless to say that business firms stopped the issue of the advertisement under notice as soon as they knew there was a serious objection to its use.'

This forms a notable illustration of the unsuspected ways in which harmful plants may be introduced into a new country, and furnishes an argument for the exercise of vigilance in regard to this matter, especially where agriculture is the staple industry of a country.

INSECT NOTES.

AN INSECT PEST OF CACAO IN UGANDA.

In a previous number of the *Agricultural News* (Vol. IX, p. 42), certain insect pests known in Uganda were mentioned. The following notes on the cacao fruit fly are prepared from an account recently received from Mr. C. C. Gowdey, Entomologist to the Government of Uganda.

It may be mentioned that fruit flies occur in the West Indies, but are not often sufficiently abundant to cause much damage. Up to the present time, however, cacao has not been known to be attacked by these insects, and it may be of interest to record the fact that such attacks are known elsewhere.

The fruit flies belong to the order Diptera, and the family Trypetidae. The Mediterranean fruit fly (*Ceratitis capitata*)—a most important pest in many parts of the the world—and the Mexican orange worm (*Trypeta ludens*) are near relations of the cacao fruit fly of Uganda (*Ceratitis punctata*). The Mediterranean fruit fly and the Mexican orange worm were discussed, and figures were given in the *Agricultural News*, Vol. VII, p. 410.

The accompanying figures are reproduced here in order to convey to readers of the *Agricultural News* an idea of the general appearance of insects of this kind.

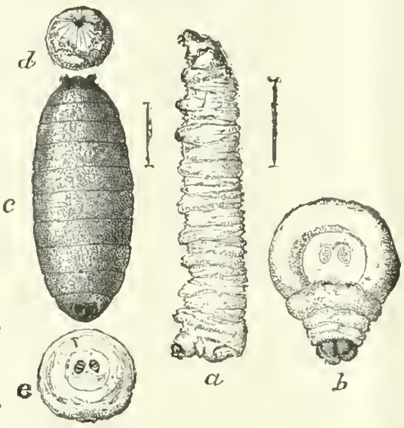


Fig. 2. Mexican Orange Worm. (*Trypeta ludens.*) a, larva, c, puparium.

Description and life-history. The cacao fruit fly attacks the ripening pods of cacao, the eggs being laid under the peel of the pod in a puncture made by the short ovipositor.

The eggs are colourless, and so very minute that it is possible to find them only when the actual deposition has been observed. The young larvae emerge from the eggs in from twelve to fifteen days, and immediately begin tunnelling into the pod, and feed on the pulp surrounding the seeds, preventing the normal development of these. The maggots, as the larvae of Diptera are generally called, are footless, colourless, twelve-segmented grubs with prominent, dark-coloured mandibles. They are very active, leaping great distances. When fully grown, they measure about ½-inch in length. Full growth is attained in from fifty-five to sixty days; in an exceptional case it required only forty-five days. The maggot now undergoes a metamorphosis, resulting in the formation of a puparium. This metamorphosis takes place in the soil at a depth of about 2 inches, at the base of the trees. The puparium varies in colour from white to pale brown; it is barrel-shaped, and the segmentation is still apparent. The puparial stage, which is the inactive period, lasts from fifteen to seventeen days. From the puparia, the adults emerge and the life-cycle begins again. The ground colour of the adult is yellowish-white; eyes red, purplish in some lights; thorax beautifully striped and spotted; abdomen, except basal segment, spotted and with black bristles at apex; wings with fuscous bands and dark spots. The life-cycle requires from seventy-seven to ninety-two days for completion. The adults feed on any sweet substance which may be available.

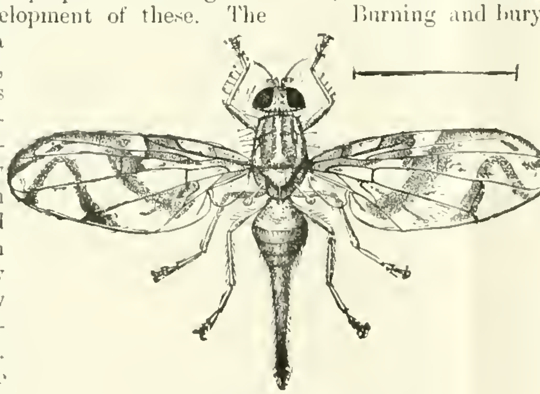


Fig. 3. Mexican Orange Worm. (*Trypeta ludens.*) Adult female.

Number of generations. There is no sharply defined season between the broods; their appearance is continuous. Breeding is carried on without interruption as long as food is available, since in Uganda there is not a range of temperature sufficiently great to make a period of hibernation imperative.

Food plants. The eggs are deposited in several varieties of fruit, including the mango, guava, melons, and passion-fruit. There is usually, therefore, some kind of fruit available for the insect throughout the year, allowing an uninterrupted succession of broods. Instances are on record, however, in which the succession of fruit was broken and yet the appearance of the fly was continuous. This fact may be accounted for either by assuming that the insects have unknown wild food plants, or that any one or all of the stages can exist longer without food than is at present known. In either case, the circumstances are beyond control, and necessitate a means of destruction of the flies as soon as they appear on cultivated fruits.

Control measures. The fact that the adult fly feeds on sweet substances makes possible the use of a poison bait as a means of control. The most satisfactory poison bait is prepared by using the following:—

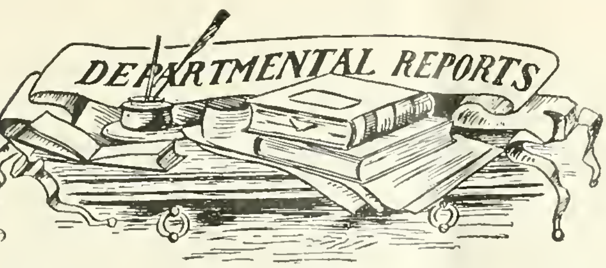
Sugar	3 lb.
Arsenate of lead	¼ lb.
Water	5 gallons.

This mixture may be applied by means of a syringe or sprayer, and should be kept thoroughly stirred, to prevent the arsenate of lead from settling. A thin film of this solution of poison and sweetness, spread over the leaves of the plant when the adult flies are abundant, has been found very useful.

Burning and burying the infested pods are also recommended. If the latter course is adopted, the pods should be covered by at least 2 feet of earth.

It does not seem that the Uganda cacao fruit fly is at all likely to be introduced into the West Indies, but it would be well for cacao planters and others to realize the possibility of such an introduction; while the recognition that a pest of the character of the one under discussion is known to attack cacao should make it possible to recognize and to check similar attacks, if they should be experienced.

An interesting illustration of the increasing importance that is being attached to the control of insects by parasitic forms of them is given in the *Entomological News* for January 1911 (Vol. XXII, No. 1). It is stated there that two investigators attached to the Bureau of Entomology of the United States Department of Agriculture are being sent to Panama, during this month, for the purpose of searching for parasites of the citrus white fly (*Aleyrodes citri*), and of the cotton boll weevil and allied species.



REPORT ON THE BOTANIC STATION, AGRICULTURAL SCHOOL, LAND SETTLEMENT SCHEME, AND OF THE GOVERNMENT VETERINARY SURGEON, ST. VINCENT, 1909-10.

At the beginning of this report, it is shown that the amount expended from local funds on the Agricultural Department, St. Vincent, during 1909-10, was £707 15*s.* Besides this, £58 4*s.* 2*d.* was spent during the year, from the unexpended balance on March 31, 1909, of the Imperial Grant-in-aid. The sum of £14 12*s.* 6*d.* was received from the sale of plants, seeds and produce at the Botanic Station.

The accounts of the condition of the garden and of the nurseries show that the usual work in these has been continued. In regard to the former, interesting facts concerning several useful and ornamental plants that are growing there are given. The distribution from the nurseries included 4,864 economic plants, comprising cacao, nutmegs, cinnamon and grafted mangoes, and miscellaneous plants to the number of 6,917. In addition to these, quantities of various kinds of produce and vegetable seed were sent out.

The rainfall at the Botanic Station was 105·45 inches, and this was well distributed. The average rainfall at this station for the past sixteen years is 105·31 inches. A table giving the monthly rainfall for the past eleven years, as well as the average for each month, shows that June is the wettest month, and April the driest. A matter of interest is that an average of over 3·75 inches was received during each month of the year, in the eleven years under consideration.

The report on the Botanic Station includes an interesting account of the progress that has been made in the matter of the introduction of implemental tillage in St. Vincent. The details in connexion with the introduction are given as Appendix I to the report. It may be stated that information on this subject has been presented in the *Agricultural News*, Vol. IX, pp. 3, 35 and 124.

One of the most striking features of the report is an account of the cotton industry of St. Vincent, in which it is shown that the total estimated value of the industry since 1903-4—the year in which Sea Island cotton growing was introduced—has been £118,571: of this amount, £26,775 is credited to the year under review. The years for the largest amounts of cotton to be exported were the two previous ones, namely 1907-8 and 1908-9; in the former of these the value of the industry was £30,787, and in the latter £29,878. In the total amount mentioned above, the value of the part contributed by Sea Island cotton is estimated at £110,991, although a separate record for this has only been kept during the last six years. The yield of Sea Island lint per acre in 1909-10 was greater than that in the two preceding years, namely 141 ℔.; it did not, however, come up to the yields of 1905-6 and 1906-7, which were about 174 ℔. The increase in yield during the period under report is attributed to the favourable nature of the ripening season, and to the more thorough cultivation of the crop. The work of the Central Cotton Ginnery has been continued, with very useful results. A final matter of interest is that an Ordinance was passed during the year to further regulate the purchase of cotton, and having for its object the suppression of cotton stealing.

In the starch industry, the chief concern is arrowroot, which attained a total export value of £32,801 in 1909. This starch is being superseded by other kinds, and a limited demand has caused a serious lowering of prices. In order to enable producers to obtain a fair price for arrowroot, arrangements have been made for the collection of a tax of 6*d.* per barrel by the Government on all exportations, with the object of providing funds which shall be employed in obtaining new markets for this product.

The cacao industry shows steady progress; 241,294 ℔. was exported in 1909, as against 218,644 ℔. in the preceding year. This is the largest quantity since 1897, when it was 264,102 ℔.

The expenditure on the Agricultural School was £540 3*s.* 1*d.*, so that £44 16*s.* 11*d.* was saved from the vote of £585 from Imperial Funds.

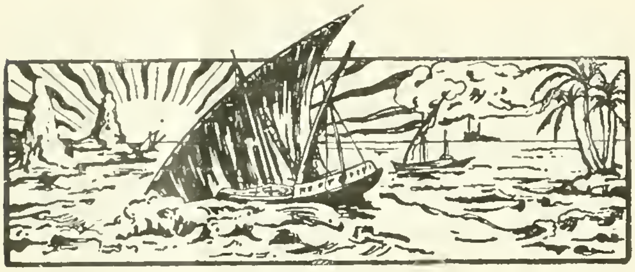
The reports on the half-yearly examinations of the pupils, held by the Imperial Department of Agriculture, show that satisfactory work is being done at the school, and it is interesting to note that the book prize awarded by the Imperial Commissioner of Agriculture to the boy who passes the best examination in the schools at Dominica, St. Lucia and St. Vincent has always been won by a candidate from the last-mentioned institution.

The report on the Agricultural School concludes with several miscellaneous matters of interest, chiefly relating to insect pests and insect control by parasites.

As is usual, a report is made by the Agricultural Instructor on the Land Settlement Scheme and Agricultural Instruction. This consists mainly of a general account of the routine work of this officer. It shows, among other matters, that the distribution of economic plants, free from the Botanic Station to allottees under the Land Settlement Scheme, was 3,504, by far the largest proportion of these being cacao. In regard to implemental tillage, the importation of mechanical cultivators by planters is mentioned, and the opinion is given that satisfactory results will be experienced as a consequence of this.

The concluding part of the report is taken up by an account of the work of the Government Veterinary Surgeon during the year under review. The cost of this was £581 2*s.* 7*d.*; while £14 18*s.* 1*d.* was received for exportation certificates and vaccination of stock. The number of ears examined at the laboratory was 564, and there were, in addition, 265 blood smears made from ears taken to police stations in the country. The number of head of stock fully treated with anthrax vaccine was 4,879, including 3,898 cattle, 123 horses 27 mules, 130 asses, 189 sheep, 273 goats and 239 pigs. Difficulty is being experienced in ensuring that the first inoculation will be followed by a second, in all cases. The number of certificates for the importation of stock that were issued was 392, as against 215 in 1908-9. This part of the report concludes with eleven tables giving interesting statistical information.

Reference has been made already to Appendix I, containing an account of the introduction of implemental tillage into St. Vincent. This is followed by two further appendixes dealing respectively with the regulations made during the year, under the authority of the Cattle Diseases Prevention Act, 1869, and with an extract from the Annual Report of the Inspector of Schools, for 1909-10, having reference to object lessons and agricultural teaching in elementary schools in St. Vincent.



GLEANINGS.

During the month of December, 1910, 15,275 cane cuttings, 1,500 lime plants, and 77 miscellaneous plants were distributed from the Antigua Botanic Station.

The report on the Agricultural Department of the Gold Coast for 1909 shows that trials with the sugar-cane seedlings B.147 and B.208 are being conducted at the Agricultural Stations at Coomassie and Tamale.

The Agricultural Instructor, Tortola, reports that the condition of the cotton crop in the Virgin Islands is good; cotton stainers have done some damage, but no trouble is being experienced with caterpillars. Sugar-canes and limes are making fair growth.

A report from Havana, issued in October 1910, states that the total production of sugar in Cuba during the year was 1,804,349 tons; the amount for 1909 was 1,513,582 tons. The quantity of sugar that had been shipped from Cuba to the United Kingdom by the end of September was 119,418 tons; that to the United States was 1,565,084 tons.

It is announced for general information that Mr. F. Cecil Laurie, of Bridgetown, Barbados, is prepared to provide and pack seedling cane plants, and all fruit, root, vegetable and flower plants procurable in Barbados, for export to all parts of the world. Correspondence should be addressed to Mr. Laurie at Dayrell's Road, St. Michael, Barbados.

It is reported by the Curator of the Botanic Station, Montserrat, that a good cotton crop is practically assured in that island; half of this had been reaped by the end of November last. Good yields are being obtained, both on estates and small holdings, the cotton from which has been cleaned more effectively than has been the case in past years.

A report received from the Agricultural Department, St. Kitts, shows that the condition of the sugar-cane crop in that island is good on the whole, an improvement having resulted from the rain received during December. It is stated, further, that the greater part of the cotton crop has been reaped, with good results, and that there is every prospect of a large output.

The following appears among the agricultural notices in the St. Lucia *Gazette* for December 21, 1910: 'Planters who experience any difficulty in controlling insect pests or diseases in their plantations, or in obtaining the necessary spraying materials and appliances for use, are invited to communicate with the Agricultural Superintendent, who will advise, and if necessary lend a suitable spraying machine.'

With reference to the third paragraph above, the Agricultural Instructor, Tortola, also reports that the Cotton Factory was opened for the purchase of seed-cotton on November 4. As the season is late in the Virgin Islands, cotton has been coming in slowly; up to the time of writing, seed-cotton equal to about 10 bales of 200 lb. had been bought, and this appeared to be of excellent quality.

The growth of the sugar-cane crop of Antigua during last month was fair, on account of the greater rainfall; nevertheless, according to a report by the Curator of the Botanic Station, the crop is decidedly late. The flower-bud maggot of cotton appeared in some of the fields in the middle of the month, and is spreading to some extent, but not sufficiently to prevent the assurance of a good first crop of cotton, on most of the estates.

The Agricultural Board of Grenada is making arrangements for ensuring an early supply of Hevea seed, for planting during this year, by placing an order with growers in Ceylon before April 30, next. Planters who intend to obtain seed for the coming season, through the Board, are therefore requested to inform the Superintendent of Agriculture as to the number required by them, before March 31, 1911, after which date no orders can be taken.

It is announced that a work entitled *Cane Sugar*, by Noel Deerr, the author of *Sugar and the Sugar-Cane*, will be issued during the present month. The volume will contain over 600 pages, and will deal with the sugar-cane from an agricultural and manufacturing point of view, and with the analysis of sugar-house products. A chapter on the fermentation of molasses will be also included. The price of the book is stated to be £1 2s.

According to a report by the Superintendent of Agriculture, Barbados, for December last, the condition of the sugar crop is fairly good; although in some districts, where the rainfall has been below the average, the ratoon canes are showing unsatisfactory growth, and many of them are suffering from root disease. Cotton is being picked as quickly as labour conditions will allow; picking is being retarded to some extent by slight showers.

According to the *Journal de St. Petersbourg*, of November 13, the cotton produced in Turkestan is to some extent displacing American cotton, not only at Moscow, but also on the Petersburg and Narva markets. Everything points to an increase in the supplies of cotton from this source, and to meet this eventuality the Committee of the Moscow Bourse has decided to organize at Moscow a Central Cotton Depot, at which all Turkestan cotton may be warehoused, and thence distributed. (*The Board of Trade Journal*, December 8, 1910.)

Rice is by far the most important export of Indo-China, as well as the chief food of its inhabitants. The total quantity of rice and paddy of all sorts exported in 1909, as given by the Customs, was 1,081,897 tons, valued at £5,913,024; of this, 3,352 tons were re-exported after temporary admission for milling at Saigon. The area under rice cultivation in Cochin-China has increased from about 2,000,000 acres in 1888 to about 3,800,000 acres at the present time; in Tonquin about 2,000,000 acres are said to be under rice. (From *Diplomatic and Consular Reports*, No. 4596 Annual Series.)

STUDENTS' CORNER.

AGRICULTURAL EXAMINATIONS.

On another page of this issue of the *Agricultural News*, the results are presented of the Intermediate and Final Examinations held in connexion with the Courses of Reading of the Imperial Department of Agriculture, on November 7, last. It is the purpose of the present article to deal with the questions and answers in the former of these examinations, with the object of giving candidates assistance in their future work.

Dealing firstly with the paper in general agricultural science in the Intermediate Examination, it may be said that fairly good answers were obtained, generally, to the first two questions, which had reference to the addition of nitrogen to the soil, and the relation of plants and animals to the atmosphere. In regard to the former, the work in practice was usually made to refer to the employment of green dressings, but it was rare that any account was given of the ways in which the best conditions may be brought about for nitrogen fixation by soil organisms. Most of the candidates understood that the question had no reference to nitrifying bacteria. Question 3 should have been approached in a broad manner, starting with the consideration of the kinds of tillage that are given with the fork, and with the hoe and rake, and passing from these to the mechanical implements that are employed to do the work. Questions 4 and 5 required descriptive answers, and these often showed too much of the direct influence of the text-book; the latter part of question 5, referring to the ensuring of pollination in the case of some given agricultural product, was answered badly. The replies to question 6 were disappointing, except in one case—the only one in which an adequate working out was given of the problem to decide which was the cheaper manure; the latter part of the question, which had to do with the other considerations than price that would have to be taken into account, in deciding which of the manures to use in any given instance, was answered incompletely, in most cases, as there was very little reference to the needs of plants, and the possible effects of the manures on the soil.

Questions 7, 8 and 9 received fair answers, generally: as regards the first, however, no candidate showed that he had a proper knowledge of what is meant by the albuminoid (or nutritive) ratio of foods. The descriptions of fungi given in answer to question 10 were mostly good; there was neglect, however, to make the descriptions illustrate the general life-history of fungi. Fair knowledge was shown in connexion with the two last questions; but it was a matter for some surprise, in view of the attention that has been given recently to the subject, that very few candidates mentioned the control of insects by means of fungus and insect parasites.

In considering the paper on special crop subjects, it is not possible to go into much detail, because of the large number of questions that had to be set in order to cover the ground. The answers given in the sugar industry section generally showed fair practical knowledge; this was particularly the case with questions 1, 2, 5, 8, in the general part, 2, in muscovado sugar, and 1 and 2 in vacuum pan method. In regard to the first question of all, it was noticeable that candidates generally understood that it was necessary to consider the previous history of the land, in devising means for preparing it for sugar-cane planting. The first half of question 3, in the general part of sugar industry, produced some good answers; the second half, where examples were required, was dealt with weakly in nearly all cases. Question 4, asking for an account of the moth borer of sugar-cane, needed more detail than was generally given; this remark is also generally applicable to the descriptive answers given in connexion with the other special subjects. The question on drainage (No. 7) was usually dealt with adequately, though a lack of knowledge was shown in regard to the signs that are exhibited when land requires draining.

The questions on cacao obtained fair answers, generally, from those who took the subject. As has been indicated, however, the descriptions in questions 2 and 4 were often weak. Good accounts of the usual methods for drying cacao were obtained, but little was known, on the part of several candidates, as to any improvements on these. The descriptions of arrangements for carrying out pruning on a cacao estate often did not include a reference to the way in which labour would be obtained and organized for the purpose. With reference to question 5, it should be remembered that, among the advantages of the grafting of cacao, are the production of plants which bear early and the obtaining, where grafting is carried out according to a consistent plan, and for a sufficient time, of a uniform product from the estate; so that fermenting and curing are simplified, and the estate obtains a good name for its cacao. The remaining three questions were dealt with well, in several instances; though it was expected that more would be known about possible improved methods of cacao cultivation.

The part of the paper dealing with limes was only taken by one candidate; so that there was not much evidence obtained as to sources of weakness in connexion with the subject. A few remarks of a general nature may be made, however. Question 2 refers to actual observations on the part of the candidate; so that in the absence of these, it should not be attempted. In answering question 3, the best plan would be to suggest a lime nursery of definite dimensions, and to make the facts of the answer apply to this. The manufacture of citrate of lime was hinted at in question 4. Question 8 should serve as a subject for thought on the part of those who are engaged practically in lime cultivation.

In regard to cotton, it should be noted that reference is made, in question 1, to the manurial requirements of this plant in the West Indies, and not in any definite part of these islands. What has been said about weakness in description applies equally to questions 2 and 4 of this paper. In regard to question 3, only a few of the candidates included the consideration of the manuring and preparation of the land, after the removal of the cotton crop. Only one or two good answers were evoked by question 5; candidates should understand that it is an easy matter for the examiner to detect any lack of adequate practical work in connexion with the subject; there was a notable want of actual figures in the answers that were given. It is necessary, in answering question 6, to remember that the best kind of cotton seed selection commences with selection of the plants. Fair answers were obtained to questions 7 and 8, though there was a great deal of uncertainty, in regard to the former, as to the real reasons for concluding that the type of cotton described was the best one for the West Indies.

Two candidates took the provision crop section, about which little need be said except that, in this stage of the examinations, descriptions must be strong in detail, and that a knowledge of the subsidiary products and by-products of the various crops is essential.

It may be remarked, in conclusion, that a practical knowledge of the subjects was generally exhibited by candidates in all parts of the examination, and that less reliance was shown on mere work with text-books than was the case in the Intermediate Examination of the previous year.

FUNGUS NOTES.

THE BUD-ROT DISEASE OF PALMS IN INDIA.

PART II.

SPREAD OF INFECTION (Continued). Insects and birds are probably responsible for a larger share in the spread of the disease than are air-borne spores. The reproductive bodies of this particular parasite are comparatively large, and could only be carried by large insects. Two kinds of beetle, which are sufficiently large for the purpose, occur commonly on palms. These are the rhinoceros beetle and the palm weevil. Scorpions may also be concerned in this method of distribution. Birds are common on the tops of palm trees and might conceivably carry portions of the mycelium and sporangia on their feet. The beetles, however, are more important, since they penetrate to the heart of the crown, and probably emerge from the pupal stage within the decaying mass which originally formed the crown of diseased trees. Neither of the two methods mentioned up to the present is likely to be nearly as important as the last, namely the agency of man.

As has been stated above, the Palmyra palm in particular is of great value on account of the numerous uses to which its parts can be put. In order to obtain the leaves, climbers ascend the trees frequently and remove the outer leaf sheaths, exposing the inner soft ones. Now, it has already been pointed out, that masses of mycelium often occur between consecutive sheaths, portions of which might adhere to a climber's knife, or his person, and infect the next healthy tree on which he was working. Besides the mycelium itself, all kinds of small pieces of infected material would be conveyed in this way. Two facts indicate that this method of spread is the most usual. In the first place, there is evidence that in some localities the disease has followed definite lines of communication; in the second, cocoa-nuts which are but rarely attacked are but seldom climbed.

THE CAUSATIVE FUNGUS. This belongs to the most primitive group of the fungi—the Phycomycetes—(see *Agricultural News*, Vol. IX, pp. 94 and 110), and is a member of the genus Pythium, which is closely allied to Phytophthora. The mycelium of the fungus may form a mass on the surface of the diseased spots, but naturally, the part of it which is responsible for the damage is that occurring within the tissues of the host. The mycelium itself is unable to penetrate the cells but occurs in the inter-cellular spaces, while the hyphae can push their way between adjoining cells. The fungus obtains its food-supply by means of haustoria. These are small finger-like processes, either straight or bent, which are given off from the hyphae; they possess the power of dissolving cellulose and penetrating the cells of the epidermis and parenchyma. They are, however, unable to enter the lignified vessels of the vascular bundles, or the fibrous cells. The mycelium itself consists of a continuous branched tube which is only divided up by cross walls in the neighbourhood of the reproductive organs. These are of two kinds: sporangia borne terminally on the main hyphae, or on long or short lateral branches, and resting spores which may be formed terminally on large hyphae, or in an intercalary position.

The sporangia are typically pear-shaped, being attached by the broad end, and having a small protrusion or papilla at the narrow end. Germination may take place in four ways, two of which are intermediate between the two extremes. The first method is that typical of the genus, by means of which it is separated from that of Phytophthora. In this case, the apex of the papilla swells up into a vesicle possessing a very thin wall into which the protoplasmic contents of the sporangium pass in a uniform mass. Here the mass segments into a number of biciliate, free-swimming zoospores (see *Agricultural News*, Vol. IX, p. 94), which break through the wall of the vesicle and escape. In some cases, for various reasons, some of the zoospores fail to escape, but instead germinate inside the sporangium; when their germ tubes reach the sporangial wall, they penetrate it by means of a cytase such as is excreted by the haustoria. In the last form of germination, the zoospore formation is entirely done away with, and the unopened sporangium puts out one or several germ tubes, as does an ordinary conidium of one of the higher fungi. The zoospores themselves, when liberated, swim for about an hour, then come to rest, round themselves off, and put out a germ-tube, which may cause a fresh infection.

The resting spores are spherical, thick-walled and yellowish when old. They germinate and form a tube whose growth is always limited by the production of a terminal sporangium. Resting spores are most commonly produced in dry weather; sporangia when the air is moist.

It is probable that infection, either by means of portions of mycelium or of sporangia, usually takes place through the stomata. In a few instances, hyphae have been observed running in the cuticle of the epidermal cells, but they have hardly ever been found traversing the cell cavity.

A curious feature of this fungus is the power which it possesses of entering into a dormant condition, particularly in dry weather. It was observed that a sudden reappearance of the disease would occasionally occur in a village in which all the attacked trees had been most carefully destroyed some time previously. The distribution of these cases was often such as to preclude the possibility of their having been infected from the trees which had been destroyed. The facts could only be explained on the supposition that the trees had been attacked for some time, but that after a certain stage the fungus had become dormant during several months, and had then recommenced its activities, and completed the destruction of the terminal bud.

PREVENTIVE MEASURES. A most carefully organized campaign has been instituted to prevent the spread of the disease, and to reduce its virulence in the infected area.

In order to do this, arrangements were made to inspect as far as possible every tree in the district, and to destroy all the diseased palms. The inspection has to be repeated every few months, as new cases continually arise and have to be destroyed as soon as possible. This necessitates the employment of a definite staff of officials, and the expenditure of considerable sums of money. This expenditure seems to be thoroughly justified by the results so far obtained, especially when it is remembered that the spread and increase of the disease might mean the financial ruin of a very large district.

The destruction of the trees is conducted as follows. A palm climber ascends the diseased tree and cuts off the top, which is then completely burned. The leaves are usually sufficiently dry to burn easily without other fuel. The pole of the tree is permitted to stand.

The similarity of the symptoms of this disease to those of bud-rot in Ceylon is interesting (see *Agricultural News*, Vol. IX, p. 254), and it may possibly prove, as is stated above, that some of the Eastern forms of bud-rot are due to this organism. In any case, it is satisfactory to learn that the cause of this disease is definitely known in one country, and that the general evidence is fully substantiated by infection experiments with the causative fungus, which were successful in every case, and were conducted with material that was, in most cases, microscopically pure.

RUBBER FROM THE WEST INDIES AND BRITISH GUIANA.

The following summary describing samples of rubber from the West Indies and British Guiana examined at the Imperial Institute during 1909, appears in *Colonial Reports*—Annual, No. 656, dealing with the work of the Institute during the year, and is reproduced here for purposes of record:—

West Indies.—Specimens of rubber from Tobago, St. Lucia and Dominica have been examined.

A sample of *Castilloa elastica* rubber from Tobago was in the form of a square black sheet about ⅛-inch thick; the material was clean, dry, and well prepared. It contained 91·1 per cent. of caoutchouc, and was valued at 4*s.* 4*d.* per lb., with fine hard Para at 5*s.* per lb. This rubber would be easily saleable, and would realize a higher price if it could be prepared lighter in colour.

Further specimens of Castilloa rubber from Tobago were stated to have been prepared by a new centrifugal process, and were much paler than the preceding sample. The specimens were excellently prepared, but a little weak, and were valued at 6*s.* 10*d.* and 6*s.* 11*d.* per lb., with fine hard Para at 8*s.* 10*d.* per lb.

A small cake of *Castilloa elastica* rubber from St. Lucia was almost black, but was clean, well prepared, and of good quality. It contained 88·6 per cent. of caoutchouc and 9·1 per cent. of resin; it was valued at about 3*s.* 6*d.* per lb., with fine hard Para at 4*s.* 3½*d.* per lb. The amount of resin was rather high, but this defect may possibly disappear as the trees become older.

A specimen of Castilloa rubber from Dominica, which contained 84 per cent. of caoutchouc, was also valued at 3*s.* 6*d.* per lb., with fine hard Para at 4*s.* 3½*d.* per lb.

A sample of Para rubber from Dominica consisted of three biscuits of light coloured, clean, well-prepared rubber, exhibiting good elasticity and tenacity. It contained 93 per cent. of caoutchouc, and was valued at 4*s.* 3*d.* per lb., with fine hard Para at 4*s.* 3½*d.* per lb., and plantation Para biscuits at 4*s.* 4*d.* to 4*s.* 11*d.* per lb. The rubber compared favourably with plantation Para rubber from the East, and there is no doubt that the Para tree will furnish excellent rubber in Dominica.

British Guiana.—The investigation of *Sapium Jenmani* rubber has been continued. Two samples of this material shown at the International Rubber Exhibition in London (1908) were examined. One sample consisted of thin biscuits of very fine, pale amber rubber, excellently prepared, and much superior in physical properties to the specimens of this material examined in 1908. It contained 93·7 per cent. of caoutchouc, and was valued at 4*s.* 3*d.* per lb., with fine hard Para at 4*s.* 3½*d.* per lb., and plantation Para biscuits at 4*s.* 4*d.* to 4*s.* 11*d.* per lb. There is no doubt that *Sapium Jenmani* rubber is of excellent quality, and that if carefully prepared it will realize very satisfactory prices in the market.

The second sample consisted of a block of scrap rubber, dark brown externally, but lighter within, and fairly clean and dry. It was of good quality, but inferior to the preceding specimen. It contained 88 per cent. of caoutchouc, and was valued at 3*s.* to 3*s.* 3*d.* per lb., with fine Para at 4*s.* 3½*d.* per lb.

AGRICULTURAL EXAMINATIONS.

The second Intermediate Examination and the first Final Examination in connexion with the Courses of Reading established by the Imperial Department of Agriculture were held in November last, commencing on the seventh of the month, in Antigua, Barbados, Grenada, St. Kitts and St. Lucia. Twelve candidates presented themselves for the Intermediate Examination, of whom eight satisfied the examiners, seven being in the second class, and one in the third. In the Final Examination, the number of candidates was seven, of whom two failed, while of the others, one gained a first class, three a second class, and one a third class. The list of successful candidates, with reference to both examinations, is as follows:—

Centre.	Name.	Intermediate.	Final.
Antigua	à Court, L. W. D. H.		2nd class
	McDonald, G. W. B.	2nd. class	
	Shepherd, C. H. E	2nd ,,	
Barbados	Cozier, J. L.		2nd ,,
	Field, J. H.	2nd ,,	
	Kirton, J. G.	3rd ,,	
	Peterkin, E. M.	2nd ,,	
Grenada	Phillips, C. A. O.		1st ,,
St. Kitts	Owen, A. E.	2nd ,,	
	Walwyn, H. H.		3rd ,,
St. Lucia	Arrindell, W. M.	2nd ,,	
	Maturin, C. W.	2nd ,,	
	Niles, R. W.		2nd ,,

The oral examinations, in connexion with the intermediate and final stages, were conducted in the different islands by:—

Mr. A. St. G. Spooner ,, R. S. D. Goodwin ,, J. Roden ,, H. A. Tempany, B.Sc.	Antigua
The Hon. F. J. Clarke, C.M.G. ,, ,, G. L. Pile Dr. Longfield Smith Mr. J. R. Bovell, I.S.O.	Barbados
The Hon. J. T. de la Mothe Mr. W. G. Lang ,, G. G. Auchinleck, B.Sc.	Grenada
,, A. D. C. Adamson ,, C. Forbes Todd ,, W. R. Dunlop ,, F. R. Shepherd	St. Kitts
The Hon. E. G. Bennett Mr. J. C. Moore	St. Lucia

Rice in British Guiana.

The last fortnightly report of Messrs. Sandbach, Parker & Co., of Georgetown, on the rice industry of British Guiana, dated January 6, 1911, gives information as follows:—

The weather during the fortnight has been fairly dry and milling has been steady.

The local demand has been very strong and prices have advanced considerably.

Shipments to West Indian islands amounted to 1,350 bags during the fortnight.

We quote to-day, f.o.b. Demerara, for good export quality:—

Nominally, 20*s.* 6*d.* to 21*s.* 6*d.* per bag of 180 lb. gross.
19*s.* to 20*s.* ,, ,, 164 ,, ,,

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR, December 20, 1910; Messrs. E. A. DE PASS & Co., December 23, 1910.

ARROWROOT—St. Vincent, 2*d.* to 3¾*d.*
BALATA—Sheet, 3/9; block, 2/10 per lb.
BEESWAX—No quotations.
CACAO—Trinidad, 53/- to 62/- per cwt.; Grenada, 49/6 to 54/6; Jamaica, 48/- to 54/-.
COFFEE—Jamaica, 62/- to 110/-.
COPRA—West Indian, £26 per ton.
COTTON—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 20*d.* to 20½*d.*
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—Common to good common, 52/- to 55/6 per cwt.; low middling to middling, 56/- to 59/6; good bright to fine, 60/- to 65/-.
HONEY—26/- to 30/-.
ISINGLASS—No quotations.
LIME JUICE—Raw, 10*d.* to 1/1; concentrated, £18 2*s.* 6*d.*; Otto of limes (hand pressed), 5/6, nominal.
LOGWOOD—No quotations.
MACE—Firm.
NUTMEGS—Quiet.
PIMENTO—Common, 2$\frac{3}{16}$*d.*; fair, 2¼*d.*; good, 2$\frac{5}{16}$*d.* per lb.
RUBBER—Para, fine hard, 5/11, fine soft, 5/11½; fine Peru, 5/9 per lb.
RUM—Jamaica, 1/6 to 6/-.
SUGAR—Crystals, 14/- to 17/6; Muscovado, 11/- to 14/6; Syrup, 10/- to 14/7½; Molasses, no quotations.

New York.—Messrs. GILLESPIE BROS. & Co., December 30, 1910.

CACAO—Caracas, 11½c. to 12c.; Grenada, 11½c. to 11¾c.; Trinidad, 11¼c. to 12c. per lb.; Jamaica, 10¼c. to 10½c.
COCOA-NUTS—Jamaica, select, $30·00; culls, no quotations; Trinidad, select, $32·00 per M; culls, no quotations.
COFFEE—Jamaica, ordinary, 13½c.; good ordinary, 13¾c.; washed, 15c. per lb.
GINGER—9c. to 12c. per lb.
GOAT SKINS—Jamaica, 52c.; Barbados and Antigua, 49c. to 51c.; St. Croix, St. Thomas and St. Kitts, 46c. to 48c. per lb.
GRAPE-FRUIT—$1·50 to $3·00 per box.
LIMES—$5·00 to $5·50.
MACE—39c. to 44c. per lb.
NUTMEGS—110's, 10c. per lb.
ORANGES—Jamaica, no quotations.
PIMENTO—3⅞c. 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., January 7, 1911.

CACAO—Venezuelan, $12·25 per fanega; Trinidad, $11·90 to $12·25.
COCOA-NUT OIL—$1·08 per Imperial gallon.
COFFEE—Venezuelan, 15c. per lb.
COPRA—$4·50 per 100 lb.
DHAL—$3·60.
ONIONS—$4·25 to $4·50 per 100 lb.
PEAS, SPLIT—$6·00 to $6·10 per bag.
POTATOES—English, $1·90 to $2·00 per 100 lb.
RICE—Yellow, $4·30 to $4·35; White, $4·60 to $4·65 per bag.
SUGAR—American crushed, $6·20 per 100 lb.

Barbados.—Messrs. T. S. GARRAWAY & Co., January 9, 1911; Messrs. JAMES A. LYNCH & Co., January 9, 1911.

ARROWROOT—St. Vincent, $3·75 to $4·60 per 100 lb.
CACAO—$11·00 per 100 lb.
COCOA-NUTS—$22·00.
COFFEE—Jamaica and ordinary Rio, $14·00 to $16·00 per 100 lb. scarce.
HAY—$1·20 to $1·50 per 100 lb.
MANURES—Nitrate of soda, $65·00; Cacao manure, $42·00 to $48·00; Sulphate of ammonia, $75·00 per ton.
MOLASSES—No quotations.
ONIONS—$4·50 to $5·50 per 100 lb.
PEAS, SPLIT—$6·00 to $6·40 per bag of 210 lb.; Canada, $3·50 to $3·60 per bag of 120 lb.
POTATOES—Nova Scotia, $2·25 to $2·75 per 160 lb.
RICE—Ballam, $4·45; Patna, $3·50 to $3·80; Rangoon, $2·90 to $3·00 per 100 lb.
SUGAR—No quotations.

British Guiana.—Messrs. WIETING & RICHTER, January 7, 1911; Messrs. SANDBACH, PARKER & Co., January 6, 1911.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	$9·00 per 200 lb., wanted	$9·00
BALATA—Venezuela block	No quotation	Prohibited
Demerara sheet	81c. per lb.	72c. to 80c.
CACAO—Native	11c. per lb.	10c. to 11c. per lb.
CASSAVA—	$1·08	No quotation
CASSAVA STARCH—	$6·50	No quotation
COCOA-NUTS—	$10 to $16 per M	$10 to $16 per M., peeled and selected
COFFEE—Creole	15c per lb.	16c. per lb.
Jamaica and Rio	19c. per lb.	19c. per lb.
Liberian	10c. to 11c. per lb.	12c. per lb.
DHAL—	$3·50 per bag of 168 lb.	$4·00 per bag of 168 lb.
Green Dhal	$4·00	——
EDDOS—	$1·20	——
MOLASSES—Yellow	None	——
ONIONS—Teneriffe	—	——
Madeira	5c.	6c.
PEAS—Split	$6·00 to $6·25 per bag (210 lb.)	$6·25 per bag (210 lb.)
Marseilles	$4·25	No quotation
PLANTAINS—	20c. to 40c.	——
POTATOES—Nova Scotia	$2·75	$2·75
Lisbon	——	No quotation
POTATOES—Sweet, B'bados	$1·80 per bag	——
RICE—Ballam	No quotation	$4·80
Creole	$4·75 to $5·00	$4·50 to $5·00
TANNIAS—	$2·64 per bag	——
YAMS—White	$2·64	——
Buck	$2·64	——
SUGAR—Dark crystals	$2·20 to $2·40	None
Yellow	$2·80 to $3·10	$2·65 to $2·70
White	$4·00	$4·00 to $4·25
Molasses	$2·10 to $2·30	None
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 sixty-four. Those mentioned in the following list are still available; the rest are out of print.

SUGAR INDUSTRY.

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

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CONTENTS.

Plants and Heavy Manuring.

MUCH attention has been given by investigators to problems connected with the manurial requirements of plants. They have devised elaborate experiments for the purpose of finding out the proportions in which various manures should be applied to the soils in which the plants grow, in order that these shall flourish to the best effect, and give the most economical returns. The consideration of the action of manures, in so far as these are supposed to feed the plant, has been the chief guide to the experimenter, in making his plans and devising the tests to be conducted by him. The importance of this part of agricultural investigation justifies eminently the care that has been bestowed upon it. The question may be asked, however, as to whether or not this is the only aspect of manuring, in relation to the plant, that has to be taken, if a fair appreciation of the connexion between the two is to be gained.

The answer to this is that there are other aspects to be taken in regard to the subject; for one thing, it has been long concluded that the provision of plants with an adequate supply of food generally increases their power to withstand the attacks of pests and diseases. There has not been much regard, however, for the other side of the subject; that is, the possible aggravation of disease through the use of excessive amounts of certain manures. It is the present purpose to consider recent work that has been done in this connexion, and to deal with the outcome of this in a general manner.

Investigations * in connexion with the die-back of citrus trees, in Florida, are being conducted at the Agricultural Experiment Station in that State, and it is the results of these that furnish much of the material which follows. The experiments were suggested by the circumstance that the effects of this disease were increased in intensity when large quantities of artificial manures were employed, the amount of these required to bring on the disease being somewhere near the maximum quantity that the plant could endure. The problem was suggested, therefore, as to whether the injury is brought about by the degree of concentration of the manure in the soil, as a whole, or whether

* See *Report on the Florida Experiment Station*, 1908-9.

it is due to the poisonous action of one or more of its constituents. Experiments to solve this problem were undertaken, as well as to determine the maximum amounts of manures for citrus trees of different sizes, in known quantities of soil.

Before the work that was done is described, it is pointed out that the term maximum quantity of manure means the largest amount that can be applied to a plant, and at the same time allow it to live and thrive. This varies naturally under different conditions, notably those of availability of the manure and the state of the soil. Other maxima exist, in regard to any given manure, depending upon the other manures with which it may be applied: the usual effect of these is to enable the plant to thrive when given larger amounts of the original manure—higher maxima are obtained. There is a third maximum, in regard to mixed manures: this is the largest amount of the mixture that can be used without killing the plant. It is a maximum that may depend on two conditions: the maximum of some one of the ingredients, or on the total concentration of the manure: that is to say this concentration may reach such a degree as to cause the cells of the roots to collapse and become useless, even before the quantity of any one of the ingredients has reached a proportion in which it is poisonous.

The account of the investigations gives a description of two experiments. There were four lots, each of three budded orange plants, in the first trial, three of which were treated with certain amounts of sulphate of potash, superphosphate and nitrate of soda, respectively; while the fourth lot did not receive any manure. The amounts of the manures mentioned, when added together, equalled the quantity that had caused the plants to die, in a former experiment, when they were applied as a mixed manure. Observation of the plants from day to day, showed that those which had been treated with nitrate of soda first exhibited signs of dying; while later, crimping of the leaves took place where the other manures had been applied, and they were somewhat dwarfed, but normal in colour. The plants that had received no manure grew well. The result of the experiment was to indicate that the harm in the mixed manure had been the quantity of nitrate of soda that it contained.

The second experiment was really an extension of the first. Four lots, each of three budded orange plants, were taken, as before, three of which were treated with the manures mentioned above, in pairs, so that no two pairs were alike, while no manure was given to the fourth. Thus one lot received nitrate of soda and superphosphate, the second sulphate of potash and nitrate of soda, and the third sulphate of potash and superphosphate, the quantities being the same as those in the former experiment The first plants to exhibit falling leaves were those which had received sulphate of potash and nitrate of soda: later, all these plants died back to the bud. Injury was next shown by those manured with nitrate of soda and superphosphate, though not to the same extent. Some injury was shown in the third case, where no nitrate of soda was used: the leaves were crimped, one plant was partly defoliated and no new growth was being produced by it; the other two, however, were growing new tissue. The unmanured plants made good growth.

The conclusions to be derived from this experiment must be taken in connexion with the results given by the first. The most obvious matter is that the greatest amount of injury was caused where nitrate of soda was present. The least harm was done by the mixture of sulphate of potash and superphosphate: though even here, there were indications that the concentration of the manure had nearly reached the maximum. When the results of using superphosphate and nitrate of soda are compared with those where the latter manure was employed alone, it is seen that the harmful effect of nitrate of soda is decreased to some extent by the presence of superphosphate. Finally, referring again to the trial with superphosphate and potash, there were unmistakable indications that the amount of the mixture applied was greater than that which could be endured easily by the plants.

It is evident that the results of these experiments have relation solely to the application of manures in large amounts. In the tropics, more attention is given to the provision of humus and the maintenance of the soil in a good state of tilth, than to high manuring with artificial manures.

This does not detract from the suggestive interest of work of the kind just described. Little is known concerning the effect of manures on the sap and tissues of plants, or on the organisms, beneficial and otherwise, in the soil, and much investigation will be required before practical information can be given concerning these. This is particularly the case in relation to the connexion between the manurial treatment of plants and the incidence of disease.

SUGAR INDUSTRY.

THE SUGAR MARKET, 1910.

The following interesting facts concerning the state of the sugar market in 1910 are taken from the fortnightly report dated January 3, 1911, issued by Messrs. Gillespie Bros. & Co.:—

We take the opportunity of rapidly summarizing the course of the market during the past year.

At the beginning of last year, it was beginning to be fully realized that the beetroot crop was but a small one, and as the Continent practically required nearly the whole output, British refiners had to depend much more than usual on cane sugar.

Comparatively little beetroot sugar was imported from the Continent into England, but prices for the first three months of the year continued to advance, until at the end of March, beetroot was sold at 14*s.* 9*d.*, f.o.b. Hamburg, basis 88°.

For the next six months our refiners supplied themselves by extensive purchases of Cuban and Java sugars, in addition to which they, of course, received shipments from the British West Indies, Natal and British India.

Towards the end of August, speculators became less confident, in consequence of the increased acreage planted on the Continent, and an easier tendency appeared. New crop for October to December delivery was sold very freely at from 11*s.* 7½*d.* to 12*s.* 6*d.* and when during September and October, reports of fine weather indicated that the crop might be a large one, a rapid decline took place.

In October, when estimates of the beetroot crop appeared, ranging from 7,350,000 tons to 7,700,000 tons, the downward movement became more rapid, and the price of new crop beetroot fell to 8*s.* 7½*d.*, f.o.b.

Since that date, the crop estimates have been further increased, and it is now supposed that the European crop will total about 8,000,000 tons, or nearly 2,000,000 tons over the last campaign.

Notwithstanding these figures, prices of beetroot have not further declined, and indeed to-day's value, being about 9*s.*, shows some recovery from the lowest point. This seems to indicate that fabricants are in a strong position to hold their stocks, and expect a better market during the next six months.

For the purposes of comparison, we quote to-day 88° beet as follows: January 8*s.* 11¼*d.*, March 9*s.* 0½*d.*, May 9*s.* 2*d.*, October to December 9*s.* 5¼*d.*; the quotations for prompt at this date in previous years having been as follows: 1910, 8*s.* 11¼*d.*; 1909, 10*s.* 1*d.*; 1908, 9*s.* 10½*d.*; 1907, 8*s.* 9¾*d.*; 1906, 8*s.* 2*d.*; 1905, 14*s.* 8½*d.*; 1904, 8*s.* 4¾*d.*; 1903, 8*s.* 0¾*d.*; 1902, 6*s.* 6*d.*

The Cuban crop turned out to be fully equal to the expectations entertained about a year ago, the outturn being practically 1,800,000 tons. The coming crop promises well, but is not likely to come up to the bumper crop of last year. Should there be any material falling off, it seems possible that a recovery in prices generally would speedily follow, as stocks in the United States do not appear to be heavy, and it is to be expected that, both there and in Europe, the present low range of prices will have the effect of increasing consumption.

Undoubtedly the high prices ruling until the last few months have resulted in preventing the normal increase of consumption, which is usually witnessed, and Messrs. Connal estimate that there has been a falling off in the world's consumption during the past year of about 83,000 tons.

The total quantity of sugar available for 1910-11 as compared with the two previous seasons is as follows:—

	1910-11, tons.	1909-10, tons.	1908-9, tons.
Beet (Licht)	8,057,000	6,170,000	6,470,000
Cane & U.S.A. Beet (Willet)	6,324,000	6,072,000	5,461,000
Stocks August 31	1,098,240	1,012,440	1,076,000
	15,479,240	13,254,440	13,007,000

Crystallised West India has sold well during the whole year, but prices are now, of course, much below the average of the past season.

We quote as follows: Low to good yellow: 1911, 14*s.* 3*d.* to 15*s.* 6*d.*; 1910, 15*s.* 9*d.* to 17*s.* 3*d.*; 1909, 14*s.* 3*d.* to 15*s.* 6*d.*; 1908, 16*s.* 9*d.* to 18*s.*; 1907, 15*s.* 6*d.* to 17*s.*; Fine bright to choice: 1911, 15*s.* 9*d.* to 18*s.*; 1910, 17*s.* 6*d.* to 18*s.* 9*d.*; 1909, 15*s.* 9*d.* to 17*s.* 3*d.*; 1908, 18*s.* 3*d.* to 19*s.* 9*d.*; 1907, 17*s.* 3*d.* to 18*s.*

Nearest nominal quotations of Refining West Indian descriptions—Muscovado: 89°—1911, 8*s.* 9*d.* to 9*s.*; 1910, 12*s.* 1½*d.*; 1909, 10*s.* 1½*d.*; 1908, 9*s.* 7½*d.*; 1907, 8*s.* 10½*d.* Centrifugals: 96°—1911, 10*s.* 1½*d.* to 10*s.* 3*d.*; 1910, 13*s.* 3*d.*; 1909, 11*s.* 1½*d.*; 1908, 11*s.* 1½*d.*; 1907, 10*s.* 3*d.*

DEMERARA SEEDLING CANES IN LOUISIANA.

In the field, except in seasons of extreme drought, D. 95 has generally exceeded in tonnage to the acre the D. 74. Both these canes require more frequent and intensive cultivation than the common ribbon cane. In fact, they need garden tilth for their full development. Under such conditions, both plant cane and first ratoons are almost certain to considerably exceed the ribbon cane in tonnage to the acre. Both are more difficult to cut for the mill than the ribbon cane, hence they require a larger force of cutters to deliver the same daily tonnage. Both the seedling canes are much less damaged by light frosts than the ribbon cane; and after severe frosts the D. 74 lies better and keeps better in windrow than either of the other varieties. Both are better storm resisters than the ribbon cane, taking the average West Indian hurricane. Unfortunately, D. 74 is liable to break before it will bend, in the most furious storm; and fortunately, D. 95 will bend under such conditions without being prostrated on the ground as the ribbon cane always has been, and always will be, in even ordinary autumnal tempests. D. 95 appears to ratoon much better than D. 74, and probably even a little better than the striped cane.

But where D. 95 comes most into favour and shows up best is in the factory. It may not demonstrate as high or quite as high sucrose percentage as D. 74; but it so far exceeds the latter in purity of juice as probably to overcome that advantage of D. 74.

One of the most admirable and advantageous characteristics of D.95 is its general tendency to reach a fair or even a high degree of maturity, on rank new ground planted in cane for the first time and in our reclaimed marsh lands. It will flourish and ripen in land where the first crop of ribbon cane thus located would be unfit and unprofitable for working at the mill if it were hauled there free of charge. (From *The Louisiana Planter*, December 3, 1910.)

FRUITS AND FRUIT TREES.

SHIELD BUDDING FOR THE MANGO.

On pages 100 and 101 of the last volume of the *Agricultural News*, extracts were given from Bulletin No. 20 of the Hawaiian Agricultural Experiment Station which describes the propagation of the mango by shield budding. Through the courtesy of Mr. P. J. Wester, of the United States Department of Agriculture, the following extracts, supplying further information in connexion with the subject, are enabled to be given here, from an illustrated article written by him in a recent number of the *Rural New Yorker*:—

Shield-budding of the mango has been with partial success practised in Florida for at least six years by experimenters in the propagation of this fruit; the writer first experimented with this method with some success in 1904 The percentage of successful buds was, however, so low that he did not then feel justified in calling this method to the attention of the public, and the experimental work was temporarily suspended.

However, experimentation has been continued by a few men interested in the problem; in some instances meeting with remarkable success. The success achieved by Mr. Orange Pound, Cocoa-nut Grove, Fla., deserves special mention, not only for the difficulties that he has successfully surmounted, but for the public-spirited way in which he has placed his data at the disposal of the writer for publication for the information of other mango growers. It is not too much to say that Mr. Pound's discovery marks an epoch in the mango industry, not only in Florida, but in other parts of the world. Mr. Pound recently obtained, with this method, over 85 per cent. of healthy trees among a lot of 300 plants budded—a most gratifying result.

Success depends on the prime condition of the stock plant and that the sap is flowing freely; the buds should be selected from well-matured wood that is still green and smooth, of the first, second and third flushes from the terminal bud, and cut rather large, 3 to 5 cm. long ($1\frac{1}{4}$ to nearly 2 inches).

The lower, thick part of the leaf stem at the bud should not be trimmed off, but allowed to remain on the bud until it is shed voluntarily. If the leaf-stem, or petiole as it is called, is cut too near the bud, fungi frequently gain entrance through the wound, and destroy the bud. It is possible that the leaves can to advantage be trimmed off the bud-wood while it still remains on the tree, and the bud-wood be used after the petioles have dropped, and the leaf scars are well healed. It appears to be equally satisfactory to push the buds up or downward. To facilitate the insertion of the bud, it is well to trim off the edge of the horizontal cut. In tying the bud, allow the remnant of the petiole to stick out between the strands of the tape, and protect it and the bud from the sun and rain with a square piece of wax cloth, held in place by one of the strands of the tape above the bud.

It is essential that the buds should be inserted at a point in the stock where the bark is about the same age as the bud-wood, *i.e.*, green and smooth, and the work done when the plant is in flush. When the union has been effected, which will be in the course of two or three weeks, the stock should be pruned off about 6 inches above the bud. The buds are sometimes very dilatory about starting, and in order to force them out the plants should, after the buds have taken, frequently be gone over, and all adventitious buds rubbed off.

In top working old seedling trees, the same principle obtains. Part of the main branches are then pruned off to 1 to 2 feet from the trunk, and the resulting sprouts are budded and treated in the manner already described. As the buds increase in size the native top is gradually removed; care should be taken, however, not to prune the tree too severely at one time, as it is then apt to become permanently injured, and die from such treatment.

In, to some extent, employing another method called by the originator slice-budding, matured bud-wood sufficiently old to have turned brownish or greyish is also used in top-working seedling trees planted at stake. The bark of the part of the stock where the bud is inserted, or more correctly, placed, should exhibit the same character. For all practical purposes this is identical with the chip-budding method employed in the propagation of pecans. The work is performed by cutting a slice or chip of bark and wood from the stock in the same manner as if the removed part was to be used as a bud; a shield bud just large enough to make a snug fit is now cut from the bud-stick and placed on the cut, and tied in the usual way.

In using either of the methods of budding described above, the stock should at the time of budding be girdled 6 to 9 inches above the bud.

CANADIAN TRADE IN THE WEST INDIES AND BRITISH GUIANA.

The Weekly Reports of the Department of Trade and Commerce, Canada, have recently presented the results of investigations in parts of the West Indies and British Guiana as to the opportunities for further expansion of the provision trade of Canada in those places. The reports received so far, refer to Barbados, Grenada, Montserrat and Trinidad, as well as to British Guiana, and the more important parts of them will be presented in this article.

BARBADOS. The Annual Report of the Comptroller of Customs showed that during 1909 there was a falling off in almost every item of import, when comparison was made with the figures for the preceding year. There was no lessening, however, of the imports of fish, which amonnted to £68,827 in valne, as compared with £66,827 and £45,469, for the two previous years. It is not possible to say what proportion of this was sent from Canada, for fish from Canada and Newfoundland, when shipped through New York, is credited in the returns to the United States.

The share of Canada in the imports of lard and cotton seed oil, fruit and vegetables, and tea and sugar, is small; while it takes no part in the supply of beef, bacon and hams. The decline in amount of importation, mentioned above, also applies to hay, and was more noticeable in the imports from Canada than from those of any other country. The quantity of oats imported has been practically unaltered, however, during the last few years. Considerable changes have taken place in this trade, the largest share of which was in the hands of Holland, in 1908, being valued at £17,325 out of £24,314: in 1909 it fell to £7,135, during which year an amount, value £6,065, was received from the Argentine Republic. Another change took place during the first nine months of 1910, so that Holland resumed its first place; the amount received from Denmark, Holland and Great Britain was 1,551,779 ℔., out of a total of 3,704,658 ℔.; but as the oats credited to Great Britain actually came from Holland, the latter country is now responsible for about half of the supply of oats to Barbados. This is interesting, in view of the fact that, a few years ago, the whole trade was in the hands of the United States; its share in the above total was 1,178,719 ℔., that of Canada being 948,287 ℔.

Two of the commodities to share in the shrinkage were flour and grain other than oats, of which an amount to the value of £20,000 less was imported in 1909 than in 1908, the share of flour being £18,000. The statistics show that the greatest lessening in imports has been in regard to the amount of these commodities obtained from the United States; it is £17,000. During the last few months of 1910, the Argentine Republic sent to Barbados 2,000 barrels of flour of a medium to lower grade, which is said to answer the requirements better, and to be cheaper than similar flour from the North; and the opinion is expressed that the former is likely in the future to compete seriously with that from Canada and the United States.

GRENADA. Canada takes part in only just over 2 per cent. of the trade of Grenada, according to Customs receipts; its share is probably greater however, for shipments of flour are largely credited to the United States. In this colony, too, there was a decreased importation during 1909.

As compared with most of the other imports, fish shows a slight decrease, only. Nearly all the dried fish used in Grenada comes from Canada, and the greater part of it is received through Barbados. A recommendation is made that greater attention shonld be given to the direct shipment of fish to Grenada.

Reference is made to the increase in population in Grenada, and to the way in which cacao has supplanted ground provisions; the conclusion from this is that the trade of Grenada is worthy of development from the Canadian side.

MONTSERRAT. Here the conditions—as regards the raising of ground provisions—are opposite to those which obtain in Grenada. The increased extent to which such provisions are being raised is lessening the demand for food stuffs, the bulk of which is obtained from Canada. The figures for the last three years, to 1909, show that there has been a gradual increase in the amount of imports from Canada, the values being: 1907 £2,753, 1908 £3,151, 1909 £3,456. The import trade of Montserrat with the United States is small, the only food stuffs being salted beef and pork, lard and oleomargarine.

TRINIDAD. The supply of flour is almost exclusively obtained from the United States, and the proportion from Canada is increasing yearly in quantity, for as in the case of Barbados, complaints are no longer made in regard to Canadian flour. In the case of oats, the imports from Canada have doubled, while those from Holland and Denmark have decreased, though these still have a large share in a field that was once occupied almost exclusively by Canada. Canada has the largest share in the imports of peas and beans; as is the case with rice, the amounts of these do not increase with the growing population, because the supply of local vegetables is becoming larger, on account of the opening up of the country and the provision of easier means of communication.

The first place in the import trade of Trinidad with Canada is occupied by fish, 6,259,984 ℔. having been received from that country, out of a total amount of 7,513,804 ℔. As regards corn, none of this comes directly from Canada; what little may be obtained from that country is forwarded through the United States. It is a curious fact that a certain amount of Canadian meat reaches Trinidad through England; there is need for making a special effort to obtain a much larger direct trade in this, and attention is drawn to the necessity for the placing of such goods, as well as of others, in strong, well-made, attractive packages.

BRITISH GUIANA. The tables of imports show that the importation of food stuffs into this colony is fairly steady. As far as fish is concerned, smoked and tinned fish, and pickled mackerel, show a decrease, but there is an increase in the case of dried cod and herrings, which chiefly come from Canada. There is also a growing demand for Canadian butter; while the importation of Canadian cheese is small, but regnlar. Holland again shows its supremacy in the matter of supplying oats, the value of which for 1909 was $92,993; in this year, Holland supplied two-thirds of the demand for oats, while in the previous year the largest share was held by Canada, and in the one before by the United States.

There has been a large increase in the imports of flour into British Guiana, partly on account of high prices, and partly because of the low price in the colony. Attention is drawn to a remark by the Comptroller of Customs, in his report, to the effect that when the prices of these are normal, rice does not take the place of flour. The importation of Canadian fish is stationary and there is an increasing demand for tinned fish. The supply of grain from Canada is steady, as far as is shown by the figures. Nearly all the trade in tea and condensed milk is held by Great Britain, which has supplanted the United States in regard to the latter commodity. A final matter of chief interest is that Canada possesses the greater part of the trade in potatoes and ground provisions, having obtained about two-thirds of the amount for the past two years.

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 :—

There being no West Indian Sea Island in stock, we have no sales to report.

American Sea Islands continue slow of sale, and although factors in Charleston are holding firmly for previous prices, buyers are quite indifferent.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending January 14, is as follows:—

The sales of the week were limited to two small Planter's Crop Lots at 42c. and 55c., which were referred to in our last circular.

The market remains very quiet, with apparently no demand. The factors are showing anxiety to sell and would make concession to dispose of quantity, but in the meantime are holding nominally at previous prices, viz.:

Extra Fine Islands	at	40c. = 22*d*.	c.i.f. & 5 per cent.
Fully Fine	,,	37c. = $20\frac{1}{2}$*d*.	,, ,, ,, ,,
Fine	,,	35c. = $19\frac{1}{2}$*d*.	,, ,, ,, ,,

COTTON SEED MEAL AS HUMAN FOOD.

The *Experiment Station Record* of the United States Department of Agriculture for November 1910, (Vol. XXIII, p. 566) gives an abstract of a paper which appears in the *Texas Station Bulletin*, 128, p. 5, describing work that has been done in connexion with the use of cotton seed meal as food for human beings. Extracts from this are presented here as follows:

For several years systematic attempts have been made to use cotton seed meal as food for man and on this account the author studied the composition of cotton seed flour and a number of food materials made from it, the analytical data being reported in connexion with a discussion of the general problem of cotton seed as a food stuff.

The table which follows shows the composition of the cotton seed flour and bread:—

	Cotton seed flour, per cent.	Cotton seed bread, per cent.
Water	7·21	24·98
Albuminoids	48·25	14·13
Fat	12·16	4·85
Sugars and starches	22·85	51·98
Fibre	3·95	1·95
Ash	5·58	2·11

All the cotton seed bakery products, as can be expected, are much richer in protein than those made with ordinary flour. Cotton seed bread contains about 50 per cent. more protein than ordinary bread. The difference would be less if the two contained more nearly the same quantity of water. Four or five parts of flour to one part cotton seed meal was probably used for this bread. Cotton seed gingerbread contains three times as much protein as ordinary gingerbread. Cotton seed ginger snaps contains nearly three times as much protein as ordinary ginger snaps

In his discussion the author draws attention to the fact that cotton seed has more or less proved harmful when used as food for domestic animals, particularly pigs, but he is of the opinion that the quantities likely to be used would not prove harmful to man. Nevertheless, he cautions against using too large amounts. His summary and general conclusions follow:—

'Cotton seed flour is richer in protein than meat, and resembles meat more than it does wheat flour, rice, corn meal, or other vegetable food. Cotton seed flour could be used as a meat substitute.

'Cotton seed flour, alone or mixed with wheat flour, can be used to prepare bread, ginger cakes, pudding, cakes, etc., which are appetizing.

'We have no reason to believe that cotton seed flour will not be a wholesome human food, when used in small amounts to replace meat, or to reinforce a diet poor in flesh foods.

'Cotton seed flour, being rich in protein, should not be consumed in such quantity as to make the diet one sided, and too rich in protein. One must be careful not to overeat it.

'Cotton seed meal may be used as a meat substitute, in the proportion of 1 oz. of meal to 2 oz. of meat.

'Cotton seed meal can be used to reinforce the diet of those whose diet is deficient in protein.

'Cotton seed meal should always be mixed with flour or meal, and with not less than four parts flour or meal, to one of cotton seed meal.

'Cotton seed meal may not agree with some people. Every man must learn from his own experience what food agrees with him, and what does not.

'Mouldy or damaged or inferior cotton seed meal should be avoided, because it may cause sickness.

'Only experience and experiments can tell us the part which cotton seed meal should play in nutrition, and under what conditions it may prove unwholesome.'

For purposes of comparison the following details of the composition of ordinary wheaten flour and bread, taken from Church's *Food*, are given here:—

	Ordinary flour, per cent.	Ordinary bread, per cent.
Water	13·0	43·4
Albuminoids	10·5	10·4
Fat	0·8	0·3
Sugars and starches	74·3	42·7
Fibre	0·7	1·7
Ash	0·7	1·5

THE WORK OF THE AGRICULTURAL DEPARTMENT IN GRENADA.

A copy of a progress report on the Agricultural Department, Grenada, for the quarter September to November, 1910, has been received from Mr. G. G. Auchinleck, B.Sc., Superintendent of Agriculture. This was laid before the Grenada Agricultural Board at a meeting held on December 14, 1910, and adopted. It is of all the greater interest, as it is the first report of the kind to be made in accordance with the instructions issued by the Board at a meeting on September 9, last.

Much of the work has been concerned with the fitting up of the laboratory for various agricultural investigations. These have included the physical analysis of soils, analyses of pen manure, and the examination of samples of lime juice. An interesting result, in connexion with the last-mentioned matter, is that it has been found that the yield of juice, and its acidity, is greater from thin-skinned lime fruits than from those with thick skins. Other analytical work has included the examination of samples of drinking water.

A large number of plant specimens have been subjected to microscopic examination, mainly in connexion with fungus diseases and scale insects.

Among the more important reports that have been issued by the Department are included that on a Prize-holdings Competition in Carriacou (see *Agricultural News*, Vol. IX, p. 391), a General Agricultural Report on that island, a Report on the Carriacou Lime Industry, and the Annual Report, for 1910, on the Botanic Station and Agricultural Instruction.

Candidates have offered themselves in all stages of the examination in connexion with the Courses of Reading of the Department. The numbers of these were as follows: Preliminary two, and the same number in the Intermediate and Final stages.

The work of the Superintendent of Agriculture has included several visits to the country districts, in furtherance of the serving of the needs of planters who are not resident near St. George's.

An area near the Botanic Station, known as the Spout Lands, has been handed over to the Department for the purpose of extending that station. Although the fertility of the soil in this area is not great, the acquisition of these lands should add to the usefulness and attractiveness of the station. Another increase of area has been an extension of the northern boundaries of the gardens; this will give more room for the carrying out of experiments with economic plants.

Among the definite experiments that have been undertaken are those in the hybridization of cotton varieties. Trials have also been made for the purpose of gaining information in regard to the germination of Hevea seed. Another matter of interest has been a practical enquiry as to the possibility of growing green dressings under the shade of cacao. This has not yet been concluded; the results are negative, so far.

Among the plants that have been tried or established are alfalfa, varieties of pine-apples, onions, the Bambarra ground nut (*Voandzeia subterranea*), the Guayule rubber plant (*Parthenium argentatum*), Soy bean (*Glycine hispida*), the Perini fibre plant (*Hibiscus radiatus*), and one or two varieties of pasture grasses.

The question of making Jippi-jappa hats was recently brought before the Economics Committee, and since this a great deal of interest has been evinced in the matter. The result has been that 500 roots of the plant used for making the hat (*Carludovica jamaicensis*) have been ordered from Jamaica, and are expected to be available shortly for planting.

The Officers of the Department in Grenada have, during the time under report, kept in touch with the Agricultural Society, and have attended its meetings regularly.

'TROPICAL LIFE' PRIZE ESSAY.

Particulars regarding the essay competition in connexion with cacao fermentation and drying, organized by *Tropical Life*, were given in the *Agricultural News*, Vol. VIII, pp. 204, 220 and 237. In connexion with this, the following announcement, contained in *Tropical Life* for December 1910, is of interest:—

It has been found desirable, owing to unforeseen circumstances, to postpone the final date for the reception of essays on the above subject, as it is absolutely necessary that the requirements laid down in connexion with the offer of a prize be fulfilled. In fairness to the firms subscribing towards the prize, the position will be carefully considered, and when the points in question are settled, the particulars, etc., as to the date fixed upon will be announced.

The following gives full details of the subject on which the essay is to be written. Papers sent in, therefore, must be able to treat the matter from a scientific as well as from a practical point of view, as the main object is, as stated, to obtain exact particulars of the biological as well as the chemical changes that take place in the bean during the process of fermentation.

The essay should record precisely and in full detail the changes resulting from the processes of fermentation and drying that take place in the bean from maturity in the pod to the time of putting the cured beans into bags for market. Biological as well as chemical changes should be noted. The action of maximum, minimum and optimum temperatures, and of checks producing differences of times in the fermentation and drying processes should be noted for every stage. The differences due to such variations on the resultant cured bean should be clearly traced. The possibility should be discussed of producing at will by such variations, and independently of the natural character of the bean, varieties of taste and of colour, both internal and external, so as to simulate the different kinds of cacao known on the market. Alterations that might be made in ordinary methods so as to improve the quality of the cacao should be explained. Waste products should be considered, and their potential value indicated.

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 the present number, the editorial deals with Plants and Heavy Manuring. It contains a description of experiments that have been conducted in relation to the high manuring of plants, and discusses briefly the possible effect of the application of manure in large quantities.

Page 36 contains an article in which a description is given of the propagation of the mango by shield budding, as well as by other methods.

A summary of information relating to Canadian trade with the West Indies, contained in some of the recent Weekly Reports of the Department of Trade and Commerce, Canada, is presented on page 37. The reports from which the information has been obtained are as follows: No. 351 (Barbados), No. 354 (Grenada), No. 355 (Montserrat), Nos. 344, 346 and 347 (Trinidad), No. 360 (British Guiana).

An article on page 39 contains a short account of work that has been conducted recently by the Agricultural Department in Grenada.

The Insect Notes, on page 42, deal chiefly with a summary of entomological information contained in the *Agricultural News* and *West Indian Bulletin* during last year.

The Students' Corner (page 45) gives an account of the recent Final Examination held in connexion with the Courses of Reading of the Department. It should be read with the papers set at that examination.

Practical Agriculture and Hygiene in Grenada Schools.

The lines on which the teaching of these subjects is to be conducted in the future in Grenada were indicated in the last number of the *Agricultural News.* The following matters in connexion with them, which are taken from the Report on the Primary Schools, Grenada, for the year 1909-10, given in the Grenada Government Gazette for December 15, 1910, are therefore of interest.

During the year, theoretical work in connexion with agriculture was conducted by most of the teachers with success: the fact that no grants were made, however, for this subject has caused the school gardens to fall practically into disuse. It is pointed out that, nevertheless, there is no reason why instruction based on experiments in boxes and pots should not be carried out. A matter of some significance, in the latter connexion, is that the papers sent up in the pupil teachers' examination in this subject were often excellent, and showed more accurate work than that in ordinary subjects of instruction.

The teaching of sanitation and hygiene is meeting with encouraging results, and in many schools it is not confined to those standards, only, in respect of which a grant is made. The opinion is given that the subject is popular among the pupils, and that the teaching of it is becoming of practical use.

The Behaviour of Superphosphates in Soils.

An abstract is given, in the *Experiment Station Record,* Vol. XXIII, p. 24, of a paper describing experiments that were carried out in two series for determining what happens to superphosphates in the soil. The object of the first of these was to find the rate and extent of the fixation of soluble phosphoric acid in the soil, while that of the second was the ascertaining of the extent to which the roots of plants can assimilate the phosphoric acid fixed in the deeper layers of the soil.

The trials showed that, when soluble phosphates are applied to soil, whether this is calcareous or poor in lime, they become fixed in a form which is insoluble in water, but nevertheless readily available to plants; the solubility of such phosphoric acid gradually decreases, and there is no danger that when it is applied in the usual way, it will be washed out of the soil.

For the purpose of obtaining the best results, the condition of superphosphate for manure should be as fine as possible, and the effect is increased by deep harrowing or ploughing.

The second set of experiments was conducted in pots: it showed that, even where there was no increase of yield from applications of superphosphate, more phosphoric acid was taken up by the plant than where the manure had not been applied. It was found that, as regards basic phosphate, the amount in the drainage water was lower than that indicated by its solubility, being about 3 parts in one million in calcareous soils, and 2 parts in a million in soils derived from granite rocks.

The Distribution of Weeds.

A note on this subject was given in the last number of the *Agricultural News*, in which a peculiar method of the distribution of weeds was described. Additional interesting information on the subject is contained in the *Textile Mercury* for December 24, 1910.

Mention is made of sub-tropical water plants, first of all, that are occasionally found growing in collections of warm water near Lancashire cotton mills, such collections of water being formed through the manipulations at some of the stages in cotton-spinning. It appears that the seed from which such plants grow are brought into England with imported cotton.

Not only cotton, but wool also, is a seed carrier. In illustration of this, eighteen exotic plants were exhibited at the December meeting of the Linnean Society, which had been selected from about 200 observed near the river Tweed and one of its tributaries. The plants are found growing in a locality where the chief industry is weaving, and the seeds had been brought in with imported wool. The plants include natives of the Mediterranean region which have become naturalized in Australia, and it is the prickly fruits of these that cause deterioration in value of the fleeces. It is a matter of some interest that, although all these plants die in winter, fresh importations of wool renew the planting material for them in the following year.

Trade and Agriculture of Brazil, 1909.

No. 4575 of the Annual Series of the *Diplomatic and Consular Reports*, dealing with the trade of Brazil during 1909, has just been received. It shows that the value of imports and exports combined, during the year, was £100,836,000, which is an increase from 80 million pounds for 1909, the value for 1907 being nearly 95 million pounds sterling. The high figure for the year under report was reached mainly on account of increased exports of every kind, while the total of each product, with the exception of cacao, realized a higher price than in the previous year.

The report goes on to deal with agriculture, stating that a Federal Department of Agriculture was created in 1909; one of the chief measures of this department has been the making of arrangements for agricultural instruction, and the formation of various bureaux for the conduct of its work.

The fact that one of the chief sources of revenue of the states of Brazil is the tax on exports, and the circumstance that this is levied chiefly on agricultural produce, together with the condition that the sources of federal revenue are the duties on imports, cause the Brazilian planter to have no inducement to export his crops to foreign markets, because of the increased cost of production. Agriculture has therefore to be encouraged by the granting of bounties, the lowering of railway charges for carrying agricultural produce, and the development by the Government of cold storage and experiment station schemes.

The following were the values of the chief agricultural exports of the country during 1909: rubber £18,926,061, coffee £33,475,170, cacao £1,598,959, tobacco £1,339,336, cotton £591,814, sugar £689,266, Paraguay tea £1,657,787.

A matter of interest is that, in regard to rubber, the extent of the natural forests of the Amazon valley, covering one million square miles and producing the finest Para rubber, is still unknown, and there is the possibility that only a fraction of the rubber in these forests has been exploited The Brazilian Government, nevertheless, favours measures for the encouragement for the planting of Hevea on a large scale. Little seems to be effected, however, in the direction of protecting the forests that exist already.

Bonuses for Stock Importation, St. Lucia.

At a special general meeting of the St. Lucia Agricultural Society, held on December 30, 1910, it was unanimously decided that a grant of £40 should be made to Mr. G. M. Peter, on the importation by him of a thoroughbred pedigree stallion, and on condition that the animal is approved by the society.

The grant is further subject to the following conditions: (1) that the animal is guaranteed to remain in the island for four years, at the service of the public; (2) that the animal must have completed his third year, and must not be over eight years old; (3) that the animal be over 15 hands; (4) that the St. Lucia Agricultural Society contribute the sum of 10*s*. toward each service fee, the owner of the mare paying 20*s*.; (5) that Mr. Peter agrees to move the stallion to the districts of Soufrière, Vieuxfort and Dennery, provided that ten guaranteed mares are ready for service in each of those places.

Machinery for Threshing Ground Nuts.

In the *Agricultural News*, Vol. IX, p. 124, an announcement was made concerning the Ellis Keystone Grain and Peanut Thresher. Since this time, enquiries have been made concerning the machine by the *Natal Agricultural Journal*, and the results of these are presented in the November number of that publication, p. 567.

It appears that, if the plants are not too large and damp, and mixed with grass, the different machines will thresh and clean the following number of bushels of ground nuts per hour: No. 1, 30 to 40; No. 2, 40 to 60; No. 3, 60 to 80. To run them, the first of these requires a 4 h.p. gasolene engine; the second a 4 h.p. steam or a 6 h.p. gasolene engine; and the third steam or gasolene engines of 6 or 8 h.p.

In reply to the question as to whether the machines will deal with soy beans, it is stated that there is an uncertainty as to if they are capable of doing this. The price list shows that the cost of them runs from $115 for a No. 1 Champion thresher and cleaner, with a 20-inch cylinder, to $230 for a No. 3 thresher and cleaner, with a 28-inch cylinder, f.o.b. Pottstown, Pa., U.S.A. An attachment for dealing with grain may also be obtained, the price of one suitable for the No. 1 thresher being $30.

INSECT NOTES.

A SUMMARY OF ENTOMOLOGICAL INFORMATION IN THE AGRICULTURAL NEWS AND WEST INDIAN BULLETIN IN 1910.

In a recent number of the *Agricultural News* (Vol. IX, p. 410), a brief report was given on the insect pests in the West Indies during 1910. It may be of interest to refer to the information relating to Entomology which has been published during the same period. This will be done in the present article, and in one to be published in the next number of the *Agricultural News*.

It will be seen, by consulting the article already mentioned, that the year has been one singularly free from serious outbreaks of insect pests of any kind in these islands, and consequently there has not been so large a proportion of the Insect Notes dealing with these topics as in certain past years.

In previous volumes, articles have appeared which, taken together, outline a brief course in elementary entomology. During 1910, an article in five parts on the Acarina, or mites, has been issued, in which these insect allies have been discussed in a manner similar to that observed in treating the groups of true insects.

In Part I, the classes of the Arthropoda are mentioned, and the general characters are given of the orders of the Arachnida, one of which, the Acarina, forms the subject of the entire article.

Among the Acarina are to be found the red spiders, poultry and bird mites, ticks of cattle, dogs and poultry, the mites causing itch, scab and mange, and the gall mites which attack various plants.

Examples of pests of plants in this division are the red spider (*Tetranychus telarius*), and the cotton leaf-blister mite (*Eriophyes gossypii*). The pests attacking domestic animals are the poultry mites of the family Gamasidae, the cattle ticks of the family Ixodidae, and the mange and scale mites of the family Sarcoptidae. The most important of these are the cattle ticks, which are the transmitters of Texas or red water fever. The itch mites attack man at times, as do also the larval forms of certain of the Trombididae, known as bête rouge and harvest bugs.

The following is a list of the articles, with references, published as Insect Notes in previous volumes of the *Agricultural News*, on the Natural History of Insects and the Orders of Insects, with references to those on the Acarina, or mites, just mentioned:—

The Natural History of Insects.	
Part I. Introduction	Vol. VIII, p. 346
" II. Structure and growth	" " " 362
" III. Growth (concluded) senses and circulation	" " " 378
" IV. Respiratory and nervous systems	" " " 394
" V. Digestion and reproduction	" " " 410
Orders of Insects.	
Orthoptera.	
Grasshoppers	" VI, " 218
Crickets	" " " 106
Odonata.	
Pondflies	" " " 266
Hemiptera	" VII, " 138
Lepidoptera	" " " 234
Coleoptera	" " " 250
"	" " " 266

Orders of Insects (*Continued*).

Diptera	Vol. VII, p. 314
"	" " " 330
"	" " " 346
Siphonaptera	" " " 346
Hymenoptera	" VIII, " 234
Acarina	
Part I.	" IX, " 202
" II.	" " " 218
" III.	" " " 234
" IV.	" " " 250
" V.	" " " 266

In dealing with insect pests with reference to the crops attacked, the first number of the year contained a report on the insect pests for the preceding year, 1909, (see p. 10) and the last number of the year (p. 410) presented a similar report on the pests in 1910. In both of these mention is made of the root-borer of sugar-cane (*Diaprepes abbreviatus*). This pest was abundant in restricted districts in Barbados at the end of 1909 and has increased in the severity of its attack on its reappearance at the end of 1910. An article on the root-borer on p. 58 gives an account of the insect, and suggests estate practice calculated to reduce the numbers of the pest.

Under the title Lady-birds and Weevil Borers, the root borer is mentioned again, as is also the weevil borer (*Sphenophorus sericeus*) of the sugar-cane, and illustrations of these insects in the adult condition are reproduced. In this article, the use of the term lady-bird designates other than beneficial insects, and it is pointed out that weevils such as the weevil borer and the root borer ought not to be called lady-birds, that term belongs to a family of predaceous insects which are highly beneficial, from their insect eating habits.

The frog-hopper (*Tomaspis postica*), which is a pest of sugar-cane in Trinidad, is described on p. 316. This account mentions the damage resulting from the attacks of this pest, the life history, methods of control, and natural enemies.

The pests of cotton dealt with in the insect notes during the year were treated of in articles entitled the Flower-Bud Maggot (*Contarinia gossypii*), p. 129; Plant Bugs Injurious to Cotton Bolls, p. 394; and A Cotton-eating Beetle, p. 314. The flower-bud maggot made its appearance again in Antigua in 1909-10, but the attacks were less severe than in previous years. Early planting seems to be the measure to adopt, to prevent severe attack by this pest. The plant bugs injurious to cotton bolls include several species of Hemiptera, which injure the bolls by means of their sucking mouth parts: the punctures made in feeding induce diseases which result in the loss of the bolls. Under the caption A Cotton-eating Beetle, mention is made of the occurrence of *Hopatrinus gemellatus* in Anguilla.

As has been stated, this article will be concluded in the next number of the *Agricultural News*.

DEPARTMENT NEWS.

Mr. F. W. South, B.A., Mycologist on the Staff of the Imperial Department of Agriculture, left Barbados on January 29, by the S.S. 'Spheroid', for Grenada, for the purpose of carrying out investigations into the fungus diseases of crops in that island. Mr. South is expected to return to Barbados by the R.M.S. 'Berbice', on Wednesday, the 8th instant.

STATE AID FOR AGRICULTURAL RESEARCH.

In the course of his Report to the Board of Agriculture and Fisheries on the Distribution of Grants for Agricultural Education and Research during 1908-9 and 1909-10, Mr. Middleton refers to the improved prospects of agricultural research owing to the passing into law of the Development and Road Improvement Funds Act of 1909, and discusses some of the general considerations which bear on the question of State aid for the investigation of agricultural problems.

A public department, he points out, when authorizing the expenditure of money on research, is bound to take into consideration the probable value of the work to the State. It cannot rest satisfied with the assurance that sooner or later all accessions to knowledge will benefit the country. The taxpayer of to-day naturally wishes to see a return for his contribution, if not in his own lifetime, at least in that of his children. It is obvious, therefore, that as a matter of elementary justice, the question of time must receive consideration from any department entrusted with the expenditure of State funds for research. This obligation may make it difficult to resist the demands of those who call for early results; but, on the other hand, these demands must be resisted if the State is to avoid squandering its resources. Nothing is more certain than that much of the best work, and the work which most deserves the aid of the State, is of a kind which cannot be hurried, or than that no genuine scientific worker can grind out results to order.

As a preliminary question it may be asked—What is Research? What may be included and what must be excluded when the time comes for discriminating between the various claimants for assistance from funds provided for the improvement of agriculture? A certain class of agriculturist holds that all that there is to learn about agriculture must be learned on a farm; another class, now perhaps more numerous, but not more logical, supposes that when any agricultural product is transported to a laboratory, it becomes then, but not till then, a subject for research. But in fact the 'expert' agriculturist laying out manurial plots on a farm, or the chemist analysing agricultural products in his laboratory, may be no more engaged in research than the farm labourer, or the miller carrying out his routine tasks. In order that work may become research, it must satisfy one or both of two conditions: (1) it must, as a result of observation or experiment, result in the collection of fresh facts; (2) it must involve an examination of the facts collected, or phenomena observed, and the reduction of them to a form in which they constitute an addition to knowledge. (The *Journal of the Board of Agriculture*, November 1910.)

ELECTRICITY IN AGRICULTURE.

Sir Oliver Lodge, who has for some years been investigating the application of electricity to agriculture, gave some interesting information on the subject in a lecture delivered at the Midland Institute, Birmingham, on November 14, 1910. Of the problems which were receiving, and yet awaiting attention, Sir Oliver placed the absorption of nitrogen by plant life as one of the chief. The action of nitrifying bacteria in the soil, the influence and function of leguminous plants in the rotation of crops, the whole process of the absorption, elaboration and assimilation of sap, the chemical changes going on in the laboratories of the leaf under the influence of sunshine, and the discharge of electricity from plant surfaces under the action of ultra-violet light all these had been recognized, though as yet very imperfectly studied, for a few years. But there were others which were coming to the front, of perhaps equal importance with these, and which, in combination with them, would affect the power of the British nation to feed itself, and to lessen the amount of imported food. Discoveries lay ahead ready to be made in the direction of the reclamation of barren soils, the influence of strong sunshine and of heat upon soils, and in preparing it for seed, and now in the curious effect not only of burning, but of poisoning or disinfecting the soil, and thereby increasing its fertility. This last process was coming to be understood now as having the effect of destroying the opponents or devourers of the useful and co-operating bacteria, which enabled the latter to multiply to a prodigious extent, and the soil became far more fertile than before. In addition, there was the problem of the electrification of the air above the growing plant. Such electrification always existed, but by artificial means it could be intensified, the plant stimulated, and the action of feeble sunshine accelerated and assisted by high-tension electricity, purposely conveyed to the atmosphere above the plants. Only recently had it been possible to supply electricity of the kind desired in a fairly easy, and permanent and engineering manner.

His son, Sir Oliver added, had devised an apparatus for applying electricity to growing crops in a practical engineering manner, and an agricultural electrical discharge company had been started on a small scale at Gloucester, and had sent out apparatus to many parts of the world—to Germany and Austria, to Java and Sweden, as well as to Scotland for experiments by Mr. Lowe, of Balmakewan, who was testing the whole process, scientifically and financially, for a period of five years. Dr. Priestley, of Bristol, a scientific chemist and botanist, was also giving careful attention to the testing of results. A 2 h.p. engine was sufficient for a 20-acre plot. (*The Field*, November 19, 1910.)

Preservation of Labels and Plant Stakes.—Plant stakes and labels are often the cause of much trouble in gardens, owing to the way in which they rot and break off, and the consequent labour and expense of having to renew them. A frequently practised method is that of tarring the portion that goes into the ground to prevent decay, or that of charring the ends; but neither can be said to be quite satisfactory, fungi and moisture often finding a way in, especially just above the surface soil. A correspondent to *Möller's Gärtner Zeitung* mentions a simple plan which he saw described in some old horticultural work, which appears to be practicable, simple and inexpensive. When the stakes are thoroughly dry they are placed with their lower ends to soak in lime water for several days, after which they are taken out and allowed to dry. They are then painted over with dilute sulphuric acid and put in the sun to dry. This results in the formation in the treated wood of calcium sulphate, or gypsum, which is almost insoluble in water, and fairly hard. It might be thought that the sulphuric acid would prove injurious to plant roots, but this is not so, as all the free acid enters into combination with the calcium, and we know that gypsum is beneficial to plants. It cannot, of course, be claimed yet that this treatment of labels and stakes for use in gardens has proved a good preservative, as it would require several years to test it, but it certainly looks like serving the purpose admirably, and every gardener and forester knows the value of a stake or label that would do duty for a number of years. The treatment might also prove useful for gate posts, the principals of fences, etc.; in fact, for all wood that is liable to decay from damp, etc. (*The Field*, November 5 1910.)

GLEANINGS.

The distribution of plants from the Dominica Botanic Station for December 1910 was as follows: limes 4,350, spineless limes 750, cacao 415, grafted cacao 145, Para rubber 1,000. The total for the month was 6,869 plants.

A report received from the Agricultural Superintendent, St. Kitts, shows that the plants distributed from the Botanic and Experiment Stations during December 1910 were 17,000 cane cuttings and 300 lime plants.

The planting of seedling canes, in connexion with the trials that are being made there, has been conducted recently at the Experiment Station, Tortola when the varieties put in, were D.95, B.6450 B.1753, B.6388, B.109, B.147, B.306, B.208, Sealy Seedling and two local kinds.

Official returns issued by the Government of Ceylon show that the exports of rubber during the month of September and the three months ended September, 1910, were 3,131, cwt. 8,936 cwt, respectively. The similar figures for 1909 were 1,249 cwt. and 3,529 cwt.

The Acting British Consul at Bangkok, Siam, reports that an Exhibition of Agriculture and Commerce will be held there this year, commencing on April 3. At this, there will be sections for the agricultural, forest, mineral, and industrial produce of Siam, as well as an international section for agricultural and industrial machinery.

The *Proceedings of the Agricultural Society of Trinidad and Tobago* for December 1910, shows that the amount of cacao shipped from Trinidad during that month was 4,154,175 lb. The total quantity for the year was 57,839,074 lb., as compared with 51,575,109 lb. and 47,632,438 lb. for 1909 and 1908, respectively.

In regard to the International Rubber and Allied Trades Exhibition (see *Agricultural News*, p. 396), it is announced that the proprietors of *Grenier's Rubber News*, Kuala Lumpur, Federated Malay States, are offering a trophy valued at 25 guineas for the best sample of rubber sent to the exhibition from Ceylon, the Malay States, or Java.

Dry weather was experienced in Barbados at the end of the year, when the rainfall for December, as measured at the Meteorological Station was 2·54 inches, which was 4·29 inches less than the average of the month in the past ten years. The number of days on which rain fell was twelve, and the heaviest fall took place on December 4, when 1·20 inches was registered.

A note appeared in the *Agricultural News*, Vol. IX, p. 281, on the manufacture of cloth from banana fibre, in China. Since this, the *Board of Trade Journal* for October 13, 1910, states that the Commercial Intelligence Branch has been informed by the Colonial Office that, as a result of an examination of a sample of the cloth at the Imperial Institute, the weft only has been found to be composed of banana fibre; while the warp consisted of ramie fibre.

A report received from Montserrat states that, while the general average of the cotton crop is good, few or none of the estates are producing large crops. A scarcity of labourers for cotton-picking exists on the windward side because of the possession by a large number of peasants of cotton grounds in New Windward and Blakes districts. The statement is made, further, that the area of cotton in Montserrat is likely to be increased this year.

Information has been received from the Agricultural Superintendent, St. Vincent, that three thoroughbred mares have been imported recently, under the bonus scheme of the Government. In addition to these, the Agricultural Superintendent has obtained a pure-bred Ayrshire bull and a three-quarter bred Zebu, for a local stock raiser, from Canada and Trinidad, respectively. All the animals are stated to belong to very fine types of the breeds represented by them.

The *Bulletin Agricole*, Mauritius, No. 11, p 142, notes that experiments made at the Central Institute for Agricultural Experiments, Sweden, lead to the conclusion, in the same way as similar trials in Germany, that the milk of cows fed on the soy bean tends to become lowered in its content of fatty matters. No changes in the appearance or taste of the milk have been observed, but it has been found that the butter from the milk of cows fed on large quantities of this bean, in summer, possesses a pronounced taste of the food.

A copy of *Plants Indigenous to Victoria*, Vol. II, by A. J. Ewart, D.Sc, Ph. D., F.L.S., Government Botanist and Professor of Botany and Plant Physiology in the Melbourne University, has been received for the use of the Department. The issue of the work, which continues Baron von Müller's *Plants Indigenous to Victoria*, published in 1862, is a small one of 481 copies. It may be obtained from the Department of Agriculture, Public Offices, Melbourne, for 10s, with postage 9*d*. Application should be made to the Secretary for Agriculture, Melbourne.

The *Board of Trade Journal* for December 8, 1910, announces that the Ninth International Agricultural Congress will be held at Madrid from May 1 to 6, 1911, under the patronage of H.M. the King of Spain. The Congress will be divided into eight sections, and the subjects for discussion include the organization of co-operation and agricultural credit, reafforestation, diseases of fruit trees, animal nutrition, and the application of green manures. The subscription for societies or private persons who wish to participate in the Congress is 20 pesetas (about 15*s.*). Application for admission must be sent, before March 15, to the Secretary of the Organizing Committee of the Congress, Society of Spanish Agriculturists, 12, Campoamor, Madrid.

STUDENTS' CORNER.

AGRICULTURAL EXAMINATIONS.

In the last number of the *Agricultural News*, a review was given of the questions and answers in the recent Intermediate Examination held in connexion with the Courses of Reading of the Department. It is intended in the present article to deal with the questions and answers in the Final Examination. in the same manner.

Like the Intermediate Examination, the Final stage is divided into two parts, one dealing with general subjects and the other with such special subjects as might be offered by candidates. The first part was subdivided into four parts dealing with subjects under the following heads: A. Production of Plants; B. Production of Animals; C. Construction on Estates; D. Economics of Planting. This plan enables the questions which treat of the different parts of the work to be classified definitely, and at the same time makes it possible for them to be set in a broad manner, so that each candidate can base his answers on his own experience, no matter what the subjects of the questions attempted by him may be. In the arrangement of the special subjects, the lines adopted for the Intermediate Examination were followed; so that this paper contains: Sugar Industry: General, Muscovado Method and Vacuum Pan Method; Cacao; Limes: Cotton; Provision Crops.

Three questions were set in each of the four parts of the general paper, six of which, only, were to be attempted, while questions had to be chosen from all the parts. The candidate was warned that the questions must be answered in relation to the special crop subjects offered by him; that is to say his answers were required to refer directly to the estate work in which he had been employed. In part A, the best answers were obtained to the first and third questions; with regard to the first, however, some candidates did not understand that the answer was not meant to include an account of transpiration by plants. Some of the answers to question 3 were good, while question 2, dealing with the ways in which the chances of the introduction of fungus pests into an estate may be lessened, was rarely attempted; it is necessary to understand that answers to this should have reference to legislation against the introduction of plant diseases into a colony, as well as to the precautions that should be observed on estates, in regard to the same matter.

Part B of the general paper, which had to do with Production of Animals, included questions which dealt with the ways in which stock is useful on estates; the use of estate products for feeding animals, and means for supplementing these; and the special characteristics of any estate animal that might be chosen. The best answers were obtained to the first question; although few of these could be termed good, on account of their incompleteness. Some knowledge was usually shown of the use of estate products for stock-feeding, though there was a weakness in the direction of knowing how these have to be supplemented. Few answers were obtained to question 3, and none of these could be called thorough, in any sense of the word; it appears that there should be much more interest on the part of candidates in regard to the extent to which various breeds of animals possess characteristics which fit them specially for the kind of work that is expected from them.

As has been stated, the next part of the paper dealt with Construction on Estates. The first question required an account of a piece of machinery or a mechanical instrument in use on estates; the second, a description of the way to make a simple plan of a small estate, with drawings; while the third had reference to the cheap provision and the usefulness of fences. Some good answers to the first were obtained, showing, among other things, that there is an increased interest in implemental tillage. It is a matter for regret that no attempts to answer the second were made; candidates are advised to give attention to simple methods of surveying and plan-drawing, which may be feasible. One or two thorough answers were obtained in connexion with the points of usefulness of fences, and some of the candidates showed that they had given intelligent consideration to methods by which these may be provided cheaply, under conditions with which they were familiar.

Attempts were received to all the questions given under the heading Economics of Planting. The first one asked for an account of the way in which labour is provided for use in the conditions under which the candidate had worked, as well as suggestions for methods whereby it appears that the supply of this could be made more regular; it evoked at least one fairly good answer. Some of the descriptions of the way in which the chief product on an estate on which the candidate had lived is prepared and packed for export, written in answer to question 2, showed that the candidates possessed a good knowledge of the subject. Question 3 is of much importance, and may be given here in full as follows: State what records should be kept on an estate in relation to (a) plants, (b) animals, (c) the produce of its main crop. What are the uses of these records? The matters included in a complete answer to this question are of the greatest concern to a properly conducted estate, and candidates should find it of much benefit to place themselves in a position to be able to provide such an answer.

It will be seen that these questions should be approached in a broad manner, and that in giving answers to them the familiar conditions of estate practice should be kept well before the candidate's mind. He is required to answer them from experience, and to show that he has dealt with the subjects with which they are connected in an intelligent and practical manner.

It is not intended to deal with the questions set in the Special Subjects in such a detailed manner as has just been adopted for those in the General Subjects; the particularized nature of the answers required prevents this from being done in the space at command. Three questions were set in each of the seven parts, answers to only three of which, altogether, were expected. For those answers, the questions had to be chosen from both of the special subjects offered by the candidates, and from those only; candidates offering two sugar subjects were permitted, however, to select a question from each of these, and the third from their other special subject. An important matter that was brought to the notice of candidates was that two hours were given for answering the three questions; this was because it was expected that they would be answered in as detailed a manner as possible; so that candidates would require for the purpose all the time that was given.

With regard to the Final Examination, generally, it may be said that candidates require a wider outlook on their subjects and a broader way of dealing with them; though the answers were not discouraging, considering the fact that this is the first of the examinations in this stage. The circumstance that an examination has now been held, together with the assistance given in the *Agricultural News* and by officers of the Local Agricultural Departments and others, should speedily bring about an improvement in the standard of the answers received in future Final Examinations.

FUNGUS NOTES.

TWO DISEASES OF CITRUS TREES IN FLORIDA.

Of recent years a disease known as scaly bark has caused considerable damage to sweet orange trees in Florida, and has been in consequence the subject of careful study extending over the last few years. Professor Fawcett, Plant Pathologist on the Staff of the Florida Experiment Station, has recently published a full account of the disease, its cause and treatment, in the *Annual Report of the Florida State Experiment Station* for 1910. A second disease known as scab or verrucosis is also described in the same article, by this author. The two diseases will be considered below.

SCALY BARK. The disease occurs principally on sweet orange trees, but it may be found on old trees of the grape-fruit and lemon. It appears first most commonly, on twigs varying in age from nine to eighteen months; it may, however, commence its attack on much older branches, though it is very rarely found on twigs less than six months old. The attacks most generally commence between June and December, a period which corresponds closely to the rainy seasons in Florida. The first noticeable stage of the disease consists of the appearance, on the epidermis of the branch attacked, of circular or oval spots from 1 to 4 mm. in diameter. The spots consist in some cases of a slightly raised ring, composed of small pustules appearing like breaks in the epidermis; in other cases the spots commence as lemon-coloured areas of approximately the same size as in the mature condition. The bark of infected areas turns rusty in colour, so that at the end of eight or ten months the spots are of this colour, have a well defined margin, and are from 10 to 20 mm. in diameter. Later the bark becomes brittle, cracks, and forms small flakes. The spots are at first separate, but increase in number and become joined together, and finally, at the end of two or more years, the branch is ringed, and dies. These symptoms are frequently accompanied by exudations of gum. On older branches and main stems the disease is rarely fatal, and merely causes a rough irregular appearance of the bark. Even on the smaller branches the action of the disease is slow, though in many cases it is hastened by subsequent infection by spores of *Colletotrichum gloeosporioides*, the wither-tip fungus of citrus plants. The spores germinate and grow on the diseased spots, and the resulting mycelium secretes a poison which causes the death of the branches.

The disease can also attack the fruit, on which it usually commences to appear in the months of July and August, when the green fruits are about ½-inch in diameter. The spots occur on the rind only. They are from 2 to 3 mm. in diameter at first, but extend to a diameter of 5 or 10 mm. They occur most frequently in the form of rings or bands similar to those on small branches; they may also commence as round, yellowish areas. Later, the rings become sunken and brown, while the central portion remains green. Eventually, the fruits turn yellow prematurely, the spots become brown throughout, and the fruits drop.

It has been shown by means of carefully conducted infection experiments that the disease is due to a fungus, *Hormodendron* sp., whose mycelium and spores occur partly on the surface of the diseased areas.

On different culture media the fungus forms a dark-green or black mycelium, consisting of septate hyphae, with strongly marked constrictions at the septa. The spores are borne on upright conidiophores. They are more or less circular, dark in colour, and occur in chains or branched chains. Branches arise from any segment near the end of the conidiophore, and also give rise to chains of spores.

Four lines of treatment have been recommended for this disease. The first consists of top-working infected trees to immune varieties of citrus. In the second, the tops of the trees are cut off, so that only the trunks and basal portions of the main branches are left. The trees are then washed with a mixture of equal parts of carbolineum and water in which soap has been dissolved, the mixture being carefully painted all over the bark. This is done about the month of February. At the end of the following growing season a strong, healthy growth may be expected. In the third case, the trees are carefully pruned, and sprayed with a 1-to-5-per cent. emulsion of carbolineum in soap and water. Experiments on the effect of spraying with this solution have, however, not progressed sufficiently to give any very definite results. The last line of treatment consists in spraying the trees for two or three years with Bordeaux mixture, made up on the 5-5-50 formula. Spraying should be carried out three times each year—once before the flowers open, once when the fruit has set, and once when it is about half-grown. In Florida, it was found that this treatment has an injurious effect on the fungoid parasites of the scale insects, so that these should be reintroduced into the trees after the final spraying in each year, to prevent damage by the insects. If this point is attended to, spraying proves successful. It would appear, from the results of the experiments in these various lines of treatment, that at present, heading back and treating with carbolineum, and spraying with Bordeaux mixture, are the most successful methods.

SCAB. This disease attacks lemons, sour oranges, satsumas and grape-fruit, in Florida. It is rarely found on sweet orange trees.

The attack commences on young leaves in the form of light-brown or cork-coloured spots. These become depressed on one side and raised on the other. They are of a dark-brown or sometimes pinkish colour. The separate spots coalesce until an irregular corky scab is formed, while the leaves become twisted and contorted. The fungus may also occur on the fruit, which then presents a warty appearance.

The disease has been proved by inoculation experiments to be due to a fungus, *Cladosporium citri*. It can be prevented by the use of Bordeaux mixture. This should be sprayed on to the trees early in the year, before growth commences. A second application may be made later if the disease appears on the young fruits. As is stated above, care must be taken, when using this mixture, that a watch is kept on the scale insects, and if necessary, that measures are employed to prevent their undue increase.

In connexion with the two diseases described above, matter of some interest is furnished by Mr. C. K. Bancroft in a paper, published in the *Annals of Botany*, Vol. XXIV, No. XCIV, April 1910. The author found that a large number of different host plants were subject to a leaf disease due to a species of Hormodendron. This fungus he found to be identical with *Cladosporium herbarum*, a common saprophyte. His investigations further led to the conclusion that the Hormodendron form was parasitic, and occurred in the summer; while the Cladosporium form was a saprophyte, and occurred in the winter. At a low temperature, the last-mentioned form reproduces itself, while at a high temperature it gives rise to the Hormodendron spores. It would be interesting to discover if any parallel to this is furnished by the scaly bark and scab fungi of Florida.

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:—

A diminution of business generally, in the drug and spice markets, begins to be perceptible as soon as the last month of they ear is entered upon, and becomes more apparant as the month advances. In view of the holidays and stock-taking, buyers are content with making small purchases, sufficient to carry them over to the New Year. The last drug auction of 1910 was held on December 15, and the first one of 1911 is fixed for January 12. Throughout December, however, though the purchases were not large, prices, generally were well maintained, and a belief prevailed that the New Year would open very satisfactorily.

GINGER.

This article maintained a firm position throughout the month, and improved rates have been obtained for Jamaica, especially towards the close of the month. The following are the details: On the 7th of the month the offerings consisted of 8 cases of bold Calicut, and 252 bags of washed rough. The first were bought in at 92*s.* 6*d.* and the latter at 54*s.*, good brown rough being held at 65*s.* per cwt. Privately, some sales were made of rough Cochin at from 53*s.* to 54*s.* per cwt. At auction on the 21st, good washed Cochin sold at 52*s.* 6*d.* to 55*s.*, and good Calicut commanded prices up to 65*s.* Jamaica also commanded much firmer prices than had hitherto prevailed. The increased exports from Jamaica, from the beginning of April to the end of October last, of 15,255 cwts. against 12,934 cwt. in the same period of 1909 have been favourably commented on.

NUTMEGS, MACE AND PIMENTO.

The dealings in none of these articles call for any remark, except that in the middle of the month there was a slight advance in mace, good pale West Indian fetching from 2*s.* 4*d.* to 2*s.* 5*d.*, fair 2*s.* 2*d.* to 2*s.* 3*d.*, and ordinary 2*s.* to 2*s.* 1*d.* per lb.

ARROWROOT.

A quiet tone has pervaded this article. At the early part of the month, some 200 barrels of St. Vincent were disposed of at prices from 2*d.* to 3¾*d.* per lb., the higher price being for fine manufacturing. Attention has been drawn in commercial circles to the fact that the combination of St. Vincent exporters not to sell below 2*d.* has come into operation this month.

SARSAPARILLA.

At auction on December 1, 24 bales of grey Jamaica were offered, 20 of which were sold at the following rates: fair 1*s.* 5*d.*, slightly mouldy 1*s.* 2*d.*, and damaged 1*s.* Native Jamaica was represented by 8 bales, most of which was sold, fair to good bright red fetching 10*d.* to 10½*d.* per lb. One bale of native red Jamaica realized 9*d.* per lb., and 11 bales of Mexican were bought in at 9*d.* per lb. A fortnight later, the offerings at auction were: grey Jamaica 3 bales, Lima-Jamaica 29 bales, and native Jamaica 27 bales; 1 bale of grey Jamaica fetched 1*s.* 5*d.*, and the other 2 1*s.* 4*d.* per lb. for slightly mouldy. The Lima-Jamaica was all bought in, 17 bales at 1*s.* per lb., and the remaining 12 at 10½*d.* to 1*s.* per lb. Four bales only of the native Jamaica found buyers, 2 of good red fetching 11½*d.* per lb., 1 of fair red 10*d.*, and 1 of dull 9*d.* per lb.

KOLA, LIME JUICE AND OIL OF LIME.

Kola has been in demand throughout the month; at the beginning, 8 bags of bright dried St. Lucia were all disposed of at 3¾*d.* to 4*d.* per lb., and a fortnight later, 4 bags of dried, and 3 barrels of dark West Indian, were brought forward, and disposed of at from 3¼*d.* to 3½*d.* per lb. for the first, and 3½*d.* for the second. At the early part of the month, concentrated lime juice was firm at £18 2*s.* 6*d* Of oil of limes, some 60 packages from Dominica were said to have arrived about the middle of the month, and the following prices were quoted: hand pressed 5*s.* 6*d.*, fair white distilled 1*s.* 5*d.*, and other qualities ranging from 8*d.* to 1*s.* 3*d.* At the beginning of the month, 2 barrels of West Indian oil of bitter orange were brought forward, and 1 was sold at 4*s.* 9*d.* per lb.

Rice in British Guiana.

The last fortnightly report of Messrs. Sandbach, Parker & Co., of Georgetown, on the rice industry of British Guiana, dated January 18, 1911, gives information as follows:—

The weather during the fortnight has been showery and milling, as a consequence, has been interrupted.

Very little paddy now remains in growers' hands and exorbitant prices are being asked for it. The local demand is very good, and with a continuance of showery weather we expect a further increase in price.

Shipments to West Indian islands during the fortnight amounted to 1,866 bags.

We quote to-day, f.o.b. Demerara, for good export quality :—

Nominally, 23*s.* 6*d.* to 24*s.* 6*d.* per bag of 180 lb. gross.
„ 21*s.* 6*d.* to 22*s.* 6*d.* „ „ „ 164 „ „

Potato Meal in India.—The development of new industries in India is always interesting, and the experiments in the manufacture of potato meal made by Colonel Rennick, a Kulu planter, in the hills beyond Simla, have now become a practical success, the Army Authorities having already purchased several thousand tins as emergency army rations. Colonel Rennick has recently transferred his operations from Kulu to Narkanda, a village some 40 miles beyond Simla, on the well-known Hindustan and Tibet road, constructed by Lord Dalhousie about half a century ago, with the object of fostering trade with Tibet. Machinery has been procured from England, and the various buildings, works, and barracks are now approaching completion. The spot is in the centre of a tract under potato cultivation, with a radius of about 10 miles; while firewood is obtainable from an extensive forest called Baghi, and the railway is at a convenient distance. The potatoes, after being boiled, and peeled by hand labour, are then crushed by the engine-driven machines, prepared by a patent process, and packed in hermetically sealed tins, each containing a pound of meal, which will cost about a rupee, and serve roughly for a week's consumption—2 oz. being more than sufficient for a good meal. As a new and useful addition to the kitchen stores, it is anticipated that the potato-meal tin will find favour in many a camp. (*Journal of the Royal Society of Arts*, December 16, 1910.)

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR, January 3, 1911; Messrs. E. A. DE PASS & Co., January 6, 1911.

ARROWROOT—No quotations.
BALATA—Sheet, 3/10; block, 2/11 per lb.
BEESWAX—£7 12*s.* 6*d.*
CACAO—Trinidad, 50/- to 62/- per cwt.; Grenada, 50/6 to 54/6, Jamaica, 48/- to 54/-.
COFFEE—Jamaica, 62/- to 62/6.
COPRA—West Indian, £26 per ton.
COTTON—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, no quotations.
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—Common to good common, 52/- to 55/6 per cwt; low middling to middling, 56/- to 59/6; good bright to fine, 60/- to 65/-.
HONEY—No quotations.
ISINGLASS—No quotations.
LIME JUICE—Raw, 11*d.* to 1/-; concentrated, £18 2*s.* 6*d.* to £18 7*s.* 6*d.*; Otto of limes (hand pressed), 5/6, nominal.
LOGWOOD—No quotations.
MACE—Firm.
NUTMEGS—Quiet.
PIMENTO—Common, $2\frac{3}{16}d.$; fair, $2\frac{1}{4}d.$; good, $2\frac{5}{16}d.$ per lb.
RUBBER—Para, fine hard, 5/6, fine soft, 4/10; fine Peru, 5/4 per lb.
RUM—Jamaica, 1/6 to 6/-.
SUGAR—Crystals, 14/- to 17/-; Muscovado, 11/- to 13/6; Syrup, no quotations; Molasses, no quotations.

New York.—Messrs. GILLESPIE BROS. & Co., January 13, 1911.

CACAO—Caracas, $11\frac{1}{2}$c. to 12c.; Grenada, $11\frac{5}{8}$c. to $11\frac{7}{8}$c.; Trinidad, $11\frac{3}{4}$c. to 12c. per lb.; Jamaica, no quotations.
COCOA-NUTS—Jamaica, select, $30·00 to $31·00; culls, $17·00 to $18·00; Trinidad, select, $30·00 to $31·00; culls, $17·00 to $18·00 per M.
COFFEE—Jamaica, ordinary, $13\frac{1}{2}$c. to $13\frac{3}{4}$c.; good ordinary, 14c.; washed, $15\frac{1}{2}$c. per lb.
GINGER—9c. to 12c. per lb.
GOAT SKINS—Jamaica, 53c.; Barbados and Antigua, 48c. to 50c.; St. Croix, St. Thomas and St. Kitts, 45c. to 47c. per lb.
GRAPE-FRUIT—$2·00 to $3·00 per box.
LIMES—$6·00 to $6·50.
MACE—40c. to 46c. per lb.
NUTMEGS—110's, $9\frac{3}{4}$c. per lb.
ORANGES—Jamaica, no quotations.
PIMENTO—$3\frac{7}{8}$c. per lb.
SUGAR—Centrifugals, 96°, $3·67\frac{1}{2}$c. per lb.; Muscovados, 89°, $3·17\frac{1}{2}$c.; Molasses, 89°, $2·92\frac{1}{2}$c. per lb., all duty paid.

Trinidad.—Messrs. GORDON, GRANT & Co., January 21, 1911.

CACAO—Venezuelan, $12·75 per fanega; Trinidad, $12·50 to $13·00.
COCOA-NUT OIL—$1·07 per Imperial gallon.
COFFEE—Venezuelan, 15c. per lb.
COPRA—$4·60 per 100 lb.
DHAL—$3·50.
ONIONS—$4·25 to $4·30 per 100 lb.
PEAS, SPLIT—$6·00 to $6·10 per bag.
POTATOES—English, $1·90 to $2·00 per 100 lb.
RICE—Yellow, $4·35 to $4·40; White, $4·60 to $4·65 per bag.
SUGAR—American crushed, $6·20 per 100 lb.

Barbados.—Messrs. T. S. GARRAWAY & Co., January 23, 1911; Messrs. JAMES A. LYNCH & Co., January 23, 1911.

ARROWROOT—St. Vincent, $4·50 to $4·60 per 100 lb.
CACAO—$11·00 per 100 lb.
COCOA-NUTS—$22·00.
COFFEE—Jamaica and ordinary Rio, $13·50 to $15·00 per 100 lb. scarce.
HAY—$1·50 to $1·60 per 100 lb.
MANURES—Nitrate of soda, $65·00; Cacao manure, $42·00 to $48·00; Sulphate of ammonia, $75·00 per ton.
MOLASSES—No quotations.
ONIONS—$5·00 to $5·50 per 100 lb.
PEAS, SPLIT—$5·85 to $6·10 per bag of 210 lb.; Canada, $3·60 per bag of 120 lb.
POTATOES—Nova Scotia, $2·00 to $2·75 per 160 lb.
RICE—Ballam, $4·50; Patna, $3·50 to $3·80; Rangoon, $2·90 to $3·00 per 100 lb.
SUGAR—No quotations.

British Guiana.—Messrs. WIETING & RICHTER, January 19, 1911; Messrs. SANDBACH, PARKER & Co., January 18, 1911.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	$9·00 to $9·25 per 200 lb.	$9·00
BALATA—Venezuela block	No quotation	Prohibited
Demerara sheet	81c. per lb.	72c. to 80c.
CACAO—Native	11c. per lb.	10c. to 11c. per lb.
CASSAVA—	96c.	No quotation
CASSAVA STARCH—	$6·50	No quotation
COCOA-NUTS—	$10 to $16 per M	$10 to $16 per M., peeled and selected
COFFEE—Creole	15c. per lb.	16c. per lb.
Jamaica and Rio	19c. per lb.	19c. per lb.
Liberian	10c. to 11c. per lb.	12c. per lb.
DHAL—	$3·25 per bag of 168 lb.	$3·50 per bag of 168 lb.
Green Dhal	$4·00	——
EDDOS—	$1·20	——
MOLASSES—Yellow	None	——
ONIONS—Teneriffe	——	——
Madeira	5c.	6c.
PEAS—Split	$5·75 to $6·00 per bag (210 lb.)	$6·10 per bag (210 lb.)
Marseilles	$4·50	No quotation
PLANTAINS—	20c. to 48c.	——
POTATOES—Nova Scotia	$2·75	$2·75
Lisbon	—	No quotation
POTATOES—Sweet, B'bados	$1·80 per bag	——
RICE—Ballam	No quotation	$4·80
Creole	$5·00 to $5·50	$5·00 to $5·25
TANNIAS—	$1·82 per bag	——
YAMS—White	$2·40	——
Buck	$2·64	——
SUGAR—Dark crystals	$2·10 to $2·20	None
Yellow	$2·80 to $3·00	$2·65 to $2·70
White	$4·00	$4·00 to $4·25
Molasses	$2·10 to $2·30	None
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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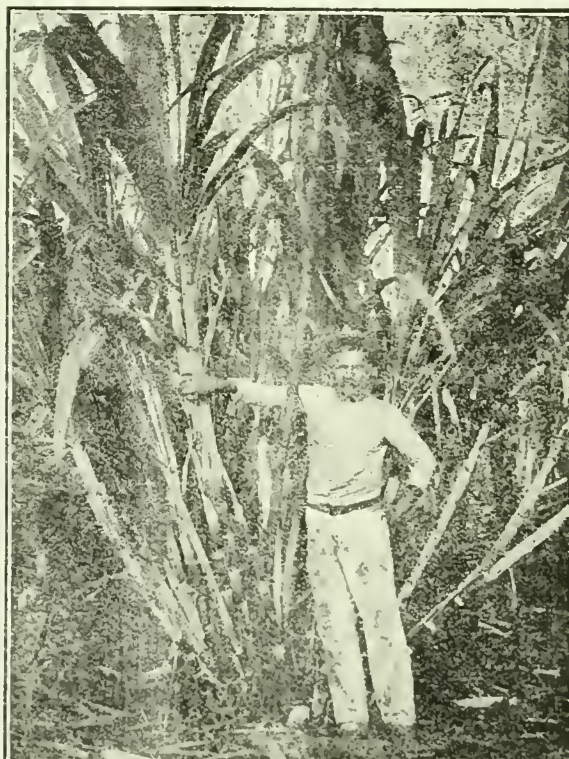


AGRICULTURAL NEWS.

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

Vol. X. No. 230. BARBADOS, FEBRUARY 18, 1911. **Price 1d.**

CONTENTS

The Acclimatization of Stock in the Tropics.

THE largely increased interest, of recent years, in tropical agriculture, is causing more attention continually to be given to various problems that have arisen in connexion with the development of lands in countries near the equator. A matter of considerable importance among these is the introduction and acclimatization of useful animals in such lands, especially where those animals do not exist already. In relation to this subject, a valuable paper* was presented at the First International Congress of Tropical Agriculture held last year at Brussels, which gives the results of the experience of a veterinary officer in the Belgian army, who has spent much time in work of the kind in the Congo Free State.

It is pointed out by this authority, first of all, that the chief climatic characteristics of the tropics are the uniformity of the temperature and humidity of the atmosphere, as well as their higher value; the uniformity of the atmospheric pressure; and the fact that the wet and dry seasons, or seasons of heat and cold, become more definitely differentiated as one passes from the equator. There are, of course, variations of a local nature, due to the influence of altitude, the nature of the soil, the neighbourhood of the sea, the prevailing winds, and the rainfall system; these are, however, matters for consideration in each special case.

In regard to the introduction of stock into such regions, the conditions may be broadly divided into two kinds: those where the country has been developed already to a very great extent, as in the West Indies; and those where there has been little or no development, as in the larger part of Africa. In either case, the acclimatization of an animal will be the gaining of that physiological state in which the organism has become adapted to the conditions of its new habitat. During such adaptation, the equilibrium of the living conditions, and the power of resistance of an animal, are upset and decreased, on account of the struggle made by it against the unaccustomed circumstances during the period of acclimatization. In this struggle, the two factors to consider are the climate, including all the conditions produced by it, and the individual animal itself. In regard to the first, it has

**L'Agronomie Tropicale*, 1910, p. 101.

been the custom to attach an undue importance to the effects of the climate properly termed, alone, and not to give due attention to all the circumstances that are included under the wider definition of the term. As far as meteorological conditions are concerned, it is evident that these cannot be altered by man, although he can provide the animals with such shelter as will assist in minimizing any evil effects from them.

Recent research has caused a very large consideration to be given to the minute organisms that are known to produce various diseases, and to the means of their transmittal, as well as to the best methods for combating the diseases. In relation to the animals attacked by these, other observations and investigations have tended to show that the most deeply seated changes, resulting from their introduction into a new habitat, take place in the alimentary system; while there is evidence, on the other hand, that there is usually little alteration in the powers of reproduction.

The period of the year at which animals should be introduced into new countries depends mainly on the available food-supply. Where food is plentiful, the best time for this is at the cool or dry season; where, however, dependence is to be had on locally produced forage alone, the wet season is preferable, as then the animals will meet with the new conditions, under the best circumstances of nutrition. A difficulty arises, in regard to newly opened lands, in that the local grasses during the wet season attain a rank growth in which their nutritive value is comparatively small. In the article to which reference has been made, attention is drawn to the interesting fact that the continued raising of stock in a district increases the grazing value of such grasses, as the constant cropping and treading down of the plants causes them to grow less rankly, and to cover the ground much more thickly. This power of grazing animals to improve the pasturage in new countries is a matter of the greatest importance, in relation to the settlement of these. With reference to such countries, the difficulties that have been pointed out already do not complete the list; there are others, notably the likelihood of the stock being introduced into places where disease is epidemic, when the lower pastures in the valleys are sought during the dry season; and added to this there is the likelihood of loss through the consumption of unknown, poisonous plants.

The opinion of the author is given that the question of the provision of food is perhaps the most important in acclimatization, more particularly as the organism during this process requires a large amount of energy for adaptation to the new conditions, so that sufficient nourishment is a matter of necessity, if it is to survive in the most useful state. As has been indicated, the next matter of importance has to do with the presence of the minute forms of life that cause disease, including the ways in which these pass from animal to animal. In many cases, these are not only dependent for their presence on the climate, in the restricted sense of the word, but the character of this is often such as to make it less easy for the animals to resist their attacks. The introduced animals can do this chiefly through an acquired immunity, and the treatment which man is enabled to accord to them as a result of his study of the pathological conditions. Other useful factors in the fight against such diseases are the circumstance that animals introduced when young into the region where they are present often show an increased resistance to some of them; the discovery of serums, the injection of which confers immunity on the treated animals; and the fact that new means are continually being found of destroying the intermediate hosts that harbour the parasites of disease.

Returning to the question of the introduction of animals into tropical regions, this resolves itself into a consideration as to whether the superiority of the strains shall be maintained by importation of fresh animals from time to time, or whether this shall be done by continual selection and careful breeding of the material already at hand. In examining this matter, regard must be had to the fact that the conditions in the new country will probably be better fitted to an animal of a coarser type than that which is introduced, as well as to the circumstance that superior types of animals, in their struggle to survive in their new surroundings, will tend to degenerate, as they gradually lose the power to transmit their special characteristics to their descendants. The opinion is given that the best course is to commence with a type that has not undergone rigid selection for particular characters, and to select this in the country of its adoption with special reference to the qualities that it will be required to show in its new environment. The opinion is expressed again that, in relation to all such work, the question of the supply of sufficient food is of primary importance in the acclimatization of the chosen breeds of animals. In giving these conclusions, the fact of the usefulness of the introduction of highly specialized strains under favourable conditions is not forgotten, and it must be remembered that this will be a matter of common feasibility in countries which have been settled for a long time, and where dependence is not had upon the local production of forage alone. There are added to this the advantages that accrue from the careful intermixture of new blood with that which is already present in the country, or district.

It is fully understood by the author that these ideas do not receive universal acceptance, and he quotes two examples on which objections are sometimes based. These refer to the introduction of merino and mutton-producing sheep into Australia and New Zealand, and the absence of deterioration in them since this took place. The objections are answered by the author by reference to the fact that the wool-producing power of the merino is an innate character, and that the special quality of sheep producing mutton has been obtained by constant selection over a very long period, so that these particular properties are not likely to disappear quickly under a change of surroundings.

In fine, the broad conclusions that are brought forward in the consideration of the matter are: that success in acclimatization depends on the provision of a sufficient quantity of food, and the introduction of animals that are not too highly specialized: that it is likewise bound up with the extent to which means are found for combating disease; and lastly, that the meteorological conditions of a country, except in special instances, have less to do with success or failure in acclimatization than the problem of providing sufficient nourishment suitable to the introduced animals.

SUGAR INDUSTRY.

WAX FROM THE SUGAR-CANE.

A short note on work that has been done in connexion with the extraction of wax from the sugar-cane was given in the *Agricultural News* for November 13, 1909, p. 360. Further particulars of the investigations are given in the *Kew Bulletin*, No. 9, 1910, p. 355, and the article in which they appear is reproduced here:—

SUGAR-CANE WAX.—We are indebted to Professor G. Barger, Professor of Chemistry at the East London College, for the following review of Mr. A. Wijnberg's book in Dutch on 'The Wax of the Sugar-cane, and the Possibility of its Technical Production', which has been presented to Kew by Professor G. van Itersen, of Delft.

The book under review is a dissertation from the newly founded botanical laboratory (Prof. G. van Itersen) of the Technical High School at Delft, and deals in an exhaustive manner with the possibility of commercially utilizing the wax coating of the sugar-cane. In addition, there is an account of the chemistry and biological significance of vegetable waxes in general.

The botanical part of the investigation completely confirmed the results of de Bary's investigations: the origin and structure of the wax coating is illustrated by drawings of microscopical preparations.

Chemically, the wax of the sugar-cane was examined as long ago as 1840 by Avequin (*Ann. Chim. Phys.* (ii), Vol. 75, p. 28), and an analysis of it was made by the celebrated chemist Dumas. The material for this examination was obtained by carefully scraping the outside of the cane, a process which is of course not applicable on a large scale. The author of the present treatise has therefore used another method, starting from the so-called 'filter dirt', a waste product of the Java sugar industry. When the cane is crushed, and subsequently extracted with hot water, nearly all the epidermal wax passes into the crude juice, where it remains suspended, until the juice is purified by the addition of lime and subsequent boiling, when the wax is carried down in the precipitate formed. Thus on filtration the wax is found in the so-called 'filter dirt' which remains in the filter press, and which may contain 10 per cent. or more of wax.

By extracting fresh filter dirt with ligroine (light petroleum) a complicated mixture is obtained, consisting mostly of fats (glycerides of oleic and linolic acids), and about 30 per cent. of wax. If the filter dirt has fermented for some time, the fats have disappeared and the ligroine extract consists mostly of the wax, which is more resistant to bacterial action. The wax may be separated from fats by crystallization from ligroine, in which it is less soluble; it then consists chiefly of myricyl alcohol and a substance of the formula $C_{33}H_{68}O$.

The crude cane wax, thus obtained, melts above 80° and is still dark-coloured. It may be bleached by means of chlorine, when it is, however, attacked to some extent. The colouring matter may also be removed by adding fuller's earth or a similar substance to the melted or dissolved wax, and allowing to settle. The product, refined by this mechanical process, closely resembles the valuable Carnauba wax, obtained from the Brazilian palm *Copernicia cerifera*. It would appear that the latter wax can be replaced in most cases by cane wax, so that there ought to be a market for the latter article. The author advises sugar works to keep their filter dirt and let it ferment, with a view to ultimate extraction. The extraction of the crude material is being started in Java, where, it is calculated, more than 4,000 tons of wax should annually be obtainable. At present, it is impossible to estimate the commercial value of cane wax with any degree of accuracy. Since it is much harder than beeswax, and closely resembles Carnauba wax, it is thought that it might be almost as valuable as the latter article, which is worth at least 11*d.* per ℔. The author estimates the cost of producing refined cane wax on the large scale at 2*d.* to 3*d.* per ℔.

In the development of a chemical industry the utilization of waste products is often of great importance; whether the wax of the sugar-cane can be utilized technically remains to be seen; but in any case, Mr. Wijnberg's book is a most important contribution towards the solution of the problem.

The *Agricultural Gazette of New South Wales*, 1910 p. 219, gives the results of the examination of bare patches of land on which attempts had been made to grow grass for five years. It was found that the soil in these patches contained more than ·25 per cent. of manganese, while where the grass grew well there was none. The opinion is expressed that manganese compounds in the soil become poisonous to plants on account of oxidation.

FRUITS AND FRUIT TREES.

THE GRAPE-FRUIT IN CANADA.

A circular has been issued recently by Messrs G. Vipond & Co., of Montreal, Canada, dealing with the status of the grape-fruit in that country and making suggestions for its larger export from the West Indies. Attention is first drawn to the recent lowering of prices of this fruit and the consequent larger demand; so that from being an article of luxury, it is becoming one for every-day consumption by all classes. This demand is increasing to such an extent that the firm feels fully justified in stating that any dealer in grape-fruit in Canada will require to have access to a full stock during the whole of the year. In taking measures to increase such demand, attention must be given to careful grading and packing, and the use of attractive packages.

Messrs. Vipond have placed their Jamaica business on an organized and established basis, and the first importation of grape-fruit and oranges under the new arrangement arrived in Canada in October. Distribution of this shipment was made in car lots in Montreal, Toronto, Winnipeg and Regina as well as in several smaller cities. This initial shipment has been followed by larger weekly ones, and it was expected that during November and December, about 15,000 boxes of fruit from Jamaica, largely grape-fruit, would be distributed in the Northern United States and Canada.

Special attention is drawn to the necessity of care on the part of exporters in forwarding the fruit, especially as the prices obtained depend mostly on this, and as freight has to be paid for the bad fruits which depreciate the value of the shipments, as well as for the good ones.

The firm invites increased exports of grape-fruit from the West Indies, and suggests that those who wish to forward consignments of the fruit, and who are not resident in Jamaica, Cuba or the Bahama Islands, should cable or write direct to its office in Montreal, giving full particulars as to quantity, quality, etc., of the output.

In connexion with the issue of this circular, it is of interest that the *Jamaica Telegraph and Guardian* for December 3, 1910, contains particulars of an interview with Mr. George Vipond, who was recently visiting Jamaica. It was stated by Mr. Vipond that the demand for grape-fruit in Montreal, supplied by his firm, had increased to about 1,000 boxes a week. In regard to Jamaica oranges, the complaint was made that the adoption of improved methods of packing was required, as many of those obtained from Jamaica did not arrive in a sound state and with a good appearance. It was his opinion that, with improved steamship service from Jamaica, the fruit trade should be easily increased to a large extent.

In conclusion, Mr. Vipond gave it as his opinion that Canada requires all the fruit that is grown in the greater part of the British West Indies, and pointed to the large demand for Canadian products on the part of the West Indies, referring to the importance of this in connexion with the proposals for trade reciprocity between these two parts of the Empire.

THE DEMAND FOR BANANAS IN EUROPE.

An article in the *Daily News* for January 3, 1911, draws attention to the threatened shortage in Jamaica bananas, caused by the bad weather that has been experienced during the past season. It is stated, however, that compensation for part of this lessened production will be probably obtained from an increased supply from the Canary Islands and Central America.

The article goes on to state that the demand for bananas, both in England and on the Continent, has increased enormously of late, and the Managing Director of Messrs. Elder & Fyffe is responsible for the statement that the larger supply of fruit from the Canary Islands and Central America will only be sufficient to satisfy the home demand. It will be the Continent which will suffer from the shortage, as the fruit is only allotted to buyers there, after orders have been filled for the United Kingdom. This condition of affairs is illustrated by the fact that, on one recent occasion, nearly 9,000 bunches were required by Continental buyers, who could only be satisfied to the extent of about 5,000 bunches, or little more than one-half of the demand.

The increased demand for bananas in Europe is arising chiefly from the realization of the value of the fruit, during the last year or two, by the people of Holland, Germany, Norway and Sweden.

There is not only an increasing want for the fruit in these countries, however, that in the United Kingdom is rapidly becoming larger. In support of this fact, there is the circumstance that Messrs. Elder & Fyffe imported, last month, 100,000 bunches more than in the corresponding month of 1910. The increased supply comes chiefly from Central America, and although that from the West Indies has decreased temporarily, the additional fruit arriving from the first mentioned source is likely to keep the rates steady, so that the price of Central American bananas in the United Kingdom will probably remain at the same level.

LIVE STOCK.

TOGGENBURG GOAT BREEDING IN ENGLAND.

An article in *Farm Life* for November 5, 1910, gives an account of a stud farm for Toggenburg goats, which is kept at Basingstoke by Mr. W. A. Wilcox, who has rapidly attained a leading position among goat breeders in England, and is at the present time the owner of four stud animals, accepted by the Committee of the British Goat Society for service during the season of 1910-11.

After describing several of the stud goats on the farm, the article gives an account of the boxes that are provided for these. Each of them is 6 feet wide and 12 feet deep, and has a height of 9 feet at the highest point, to $5\frac{1}{2}$ feet where the roof is lowest. The floors are of cement, covered with sand, and there is a corridor at each end of the box, to assist ventilation. The doors of the boxes are double, and provided with bars to prevent the animals from climbing over them. Sleeping accommodation is provided in the form of platforms, raised $1\frac{1}{2}$ feet from the ground. In the case of the rams, each box holds one animal; while the number of ewes accommodated in each is three, except at the time of kidding, when a goat is allowed one to itself. All the boxes are provided with hay racks, over the heads of the animals. The doors are opened during the day, and closed at night.

The goats are dry-fed exclusively in winter, and partially in summer. During the former period, they are fed three times a day, and have the run of a paddock, in which shelter from rain is provided. The plan followed in summer is to allow the goats to run over about 8 acres of ground, which is changed from year to year. This change of pasture is recognized as being a vital point, as goats do not thrive on one small plot of ground.

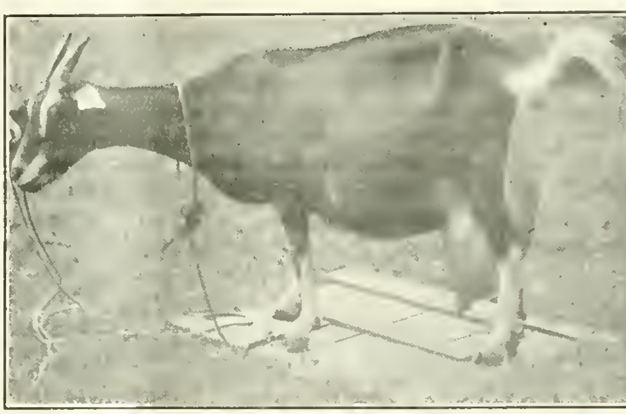


FIG. 4. HALF-BRED TOGGENBURG GOAT.

The opinion is given that Toggenburgs will be the most desirable kind of goats to breed, for some time at any rate. They are very rare in England, on account of the fact that the Board of Agriculture will not allow them to be imported from Switzerland, because of the prevalence of foot-and-mouth disease in that country.

After drawing attention to the fact that Toggenburg goats remain in milk longer than any other breed, it is pointed out that, in England, if a breeder possesses two good examples of the breed, one of which kids in spring and one in autumn, he can reckon upon a supply of 3 quarts of milk every day, all the year round. The average Toggenburg produces ten kids a year, and there is a ready sale for these when three months old, in that country, at £5 each.

A description is given of a crate suitable for sending goats to shows. This is made of bicycle tubing; its length is 5 feet, its width $2\frac{1}{2}$ feet, and its weight only 35 lb. It is provided with receptacles for hay and corn, and can hold three of the animals.

It is the opinion of the breeder mentioned that, in England, a stud of twenty pure Toggenburg goats will yield a profit of £200 a year, allowing for a few losses, the sources of income being the kids, the milk and the stud fees. It is his opinion, also, that a capital of at least £300 to £350 is required by those who are desirous of taking up the breeding of Toggenburg goats on any fair scale.

TOGGENBURG GOATS IN GRENADA.

Information has been received from the Superintendent of Agriculture, Grenada, in connexion with the progeny of one of the pure-bred Toggenburg rams imported from Switzerland last June, by this Department, for Mr. T. B. C. Musgrave of Grenada. This ram was only available for service for a short period as, unfortunately, he died a few weeks after being landed in the Colony, but from the following list it will be seen that advantage was taken of his presence in the island:—

Sire.	Dam.	Pedigree of dam.	Number and sex of kids.
Imported full-bred	Bruce	$\frac{1}{2}$-bred Toggenburg	2 ewes
,, ,, ,,	Pauline	$\frac{3}{4}$-bred; grand-daughter of Bruce, daughter of Wallace	1 ram 1 ewe
,, ,, ,,	Nenny	$\frac{1}{2}$-bred; daughter of West's goat and Bruce	2 ewes
,, ,, ,,	Chance	$\frac{1}{2}$-bred	in kid
,, ,, ,,	Native ewe; property of Mr. J. E. D. Carberry		1 ewe

It will be observed that seven kids were born, up to the date of the letter from the Superintendent of Agriculture, namely December 20, 1910, and that six of these are ewes. The one ram kid should turn out well, as his dam is by 'Wallace', which is a pure-bred ram from the pure-bred pair of Toggenburgs imported by this Department in April 1903.

THE HALF-BRED TOGGENBURG GOAT.

The subject of the illustration (Fig. 4) is the half-bred goat 'Chamy', owned by Mr. R. F. Parkinson, Junior, of Barbados. This is the result of a cross between the Toggenburg and Anglo-Nubian strains, but shows little of the marking belonging to the latter, the chief indication of its partly Eastern origin being the possession of a long udder, in the place of the characteristically spherical milk-bag of the Toggenburg.

The photograph from which the above illustration was made was taken a few hours before the goat gave birth to kids. After kidding had taken place, she was milked, when she gave 5 pints. Nineteen months afterwards, when she was more than five weeks in kid, she gave $1\frac{3}{4}$ pints.

As regards Anglo-Nubian goats, it should be explained that these are descended from the Nubian and the common English goat. Nubian goats are considered to be among the least wild; they are excellent milkers, and very prolific. The chief distinguishing characters of the breed are the absence of horns and beard, short hair and a blunt nose. An example of an Anglo-Nubian goat was 'Black Rock', imported into the West Indies by the Imperial Department of Agriculture in 1902.

It may be mentioned that an article on the Toggenburg goat in Barbados appeared on page 117 of the last volume of the *Agricultural News*.

COTTON NOTES.

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, a few small lots of West Indian Sea Islands have been sold, chiefly from the Leeward Islands, at from 20*d.* to 22*d.* Buyers are, however, very indifferent and we expect a dragging market.

A further report from Messrs. Wolstenholme and Holland, dated January 30, states:—

About 250 bales of West Indian Sea Island cotton have been sold since our last report, chiefly St. Vincent 20*d.* to 22*d.* with a few bales at 23*d.*

The fine trade continues indifferent and buyers will only operate very sparingly.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending January 28, is as follows:—

There has been some demand during the past week, resulting in the sale on private terms of several planters' crops, aggregating upwards of 100 bales, included in which are the crops, 15 to 55 bales Special, 50 bales Robt. Bee, 15 bales Corona. There is some further demand for planters' crops at prices below the views of the planters.

The market for odd bags classing Fine to Extra Fine remains very quiet, with Factors still holding at our quotations, refusing to sell at any further concession in price.

We quote viz:—

Extra Fine Islands at	36c. = 20*d.*	c.i.f.	& 5	per	cent.
Fully Fine ,,	34c. = 19*d.*	,,	,,	,,	,,
Fine ,,	32c. = 18*d.*	,,	,,	,,	,,

THE BRITISH COTTON GROWING ASSOCIATION.

A report, dated January 12, 1911, has been received from the British Cotton Growing Association, from which the following extracts are taken :—

The eighty-third meeting of the Council of the British Cotton Growing Association was held at the Office of the Association, 15, Cross Street, Manchester, on Tuesday, the 10th instant.

In the absence of the Earl of Derby, G.C.V.O. (President), Mr. J. Arthur Hutton occupied the Chair.

WEST AFRICA. A cable has been received from Lagos stating that the climatic conditions continue favourable, and the crop prospects are excellent. The picking of the crop will commence this month. During the past year the Association has conducted some experiments on a small scale with Nyasaland Upland seed; the results of these experiments have been eminently satisfactory, and a small sample which has recently been received from Northern Nigeria has been very favourably reported on by Liverpool brokers. If these experiments prove successful, there is reason to believe that it may revolutionize the cotton-growing industry in West Africa, as this class of cotton is very hardy and realizes a considerably higher price than Middling American.

The purchases of cotton in Lagos during 1910 amount to 5,626 bales, as compared with 11,875 bales in 1909 and 5,225 bales in 1908.

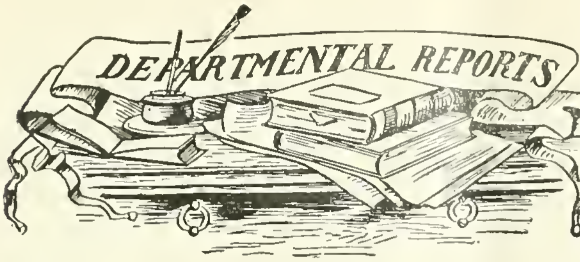
Considerable progress is being made with the extension of the Northern Nigerian Railway; the Baro-Kano section is now opened for traffic a distance of about 111 miles, and lines have been laid down to a distance of 210 miles, with the exception of a bridge which is under construction at mile 200.

NYASALAND. Very satisfactory reports continue to be received from this Protectorate, both in regard to native cultivation and also as to cotton cultivated by European planters.

The principal drawback to the development of cotton-growing in Nyasaland is the difficulty of transport, but it is hoped that arrangements may be made for the railway to be extended to Lake Nyasa, and also in a southerly direction from Port Herald to some navigable point on the Zambesi river.

UGANDA. A report has been received stating that the output of cotton in this Protectorate for the twelve months to March 31 next will be between 10,000 and 12,000 bales of 100 lb. each, as compared with 6,000 bales for the corresponding period of last year.

SUDAN. Arrangements have been made for the Union Castle Mail Steamship Company to run a direct service of steamers to British East Africa, through the Suez Canal, by which means the cotton from the eastern side of Africa will reach Liverpool much more expeditiously than previously, and satisfaction was expressed that the Steamship Company had also consented to make Port Sudan a port of call for their steamers. It was mentioned that the scheme for developing cotton-growing in the Sudan was proceeding favourably, and Mr. Macgillivray is at present in the Sudan making the necessary arrangements.



REPORTS ON THE BOTANIC STATION, AGRICULTURAL INSTRUCTION AND EXPERIMENT PLOTS, GRENADA 1909-10.

At the commencement of this report, the various important changes that have taken place in the Grenada Agricultural Department, during the season under review, are signalized. The chief of these has been the organization of an Agricultural Board, which directs the activity of the local Department of Agriculture, in consultation with the Imperial Commissioner of Agriculture. Another change was the appointment of Mr. G. G. Auchinleck, B.Sc., as Superintendent of Agriculture, in place of Mr. R. D. Anstead, B.A., who has resigned to take up agricultural work under the United Planters' Association of Southern India.

The gardens have been placed under the care of the Agricultural Instructor, who has carried out work in them having for its object the improvement of their appearance and the better exhibition of the interesting plants that they contain.

The rainfall at Richmond Hill, which is situated between the dry southern belt and the moist central and northern uplands of Grenada, was, during 1909, 80·54 inches; this is higher than the average for the past nineteen years, which is 78·48 inches; it also exceeds that of any year since 1901, with the exception of 1906, when it was 83·27 inches. The range of the precipitation over the island is illustrated by the fact that, during 1909-10, it was 37·56 inches at Point Saline in the Parish of St. George, and 178·15 inches at Belvidere in St. John's.

Although a large stock of plants for distribution is not kept at the station, these are raised as they are required, and an examination of the list on page 5 of the report will show that this distribution takes no small place in the work of the station. Plants are both sent out free, and sold, and there is a fair demand for them; this tends to show that a condition of greater diversification of crops in Grenada should be obtained in the future.

Experiment plots are maintained for the purpose of conducting trials with food crops such as yams, sweet potatoes, Guinea corn, maize and ground nuts as well as with green dressings.

A portion of the report that is of particular concern is an account of the prize-holdings competitions, which have been enabled to be held through the interest of several of those who are engaged in agricultural pursuits in the island. Substantial prizes are offered for good work on the holdings, and useful progress appears to have been made, for the greater part.

As far as the general agricultural conditions in Grenada are concerned, a record crop of cacao has been obtained, and the plants are fairly healthy in most districts; although a certain amount of damage from pests continues to be suffered. The chief danger appears to be from the spread of the mealy bug, with the associated black blight. Other pests are thrips, beetles and certain fungi, which however are kept in check. What has been said about cacao cannot, unfortunately, be repeated in regard to spices and kola, as low prices are being obtained for these, on account of the small demand. Special attention is drawn in the report to the necessity for the extension of the cultivation of ground provisions, and it is pointed out that Sea Island cotton would be very likely to do well in certain parts of the island.

Carriacou receives attention in the report, and interesting notes are given in relation to the agricultural conditions in that island, as well as to the work that has been done already in the direction of the amelioration of these.

A section of the report gives the proposals of a Committee of the Board of Agriculture for a scheme of experimentation in connexion with black blight. This has been submitted to the Imperial Commissioner of Agriculture, and returned by him, with suggestions for a systematic course of experiments with this important pest.

The usual report on agricultural instruction is included. This shows that the ordinary work of the Agricultural Instructor, which is carried out particularly in relation to the interests of the peasantry, has been continued. It also refers to the fact that the duties of this officer have been made to include the charge of the Botanic Garden, as has been stated already. An interesting feature of the report is the indication that the existence of the prize-holdings competitions assists materially toward increasing the efficiency of the work done by this Officer in country districts.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture, accompanied by Mr. A. G. Howell, Chief Clerk, returned to Barbados on February 5, 1911, by the S.S. 'Sobo', from Antigua, after a visit to that Presidency to confer with His Excellency the Governor of the Leeward Islands on official matters.

Mr. F. W. South, B.A., Mycologist on the Staff of the Imperial Department of Agriculture, returned to Barbados on February 9, by the R.M.S. 'Magdalena', from Grenada, where he had been making investigations in regard to the fungus diseases of crops in that island.

Rice in British Guiana.

The last fortnightly report of Messrs. Sandbach, Parker & Co., of Georgetown, on the rice industry of British Guiana, dated February 6, 1911, gives information as follows:—

The weather during the fortnight has been very wet, and mills have been almost at a standstill.

The local demand continues good, and with light deliveries of rice to town as a consequence of the wet weather, we look for a firm market.

Shipments to the West Indian Islands during the fortnight amount to 1,050 bags.

We quote to-day, f.o.b. Demerara, for good export quality :—

Nominally, 21*s.* 6*d.* to 23*s.* 6*d.* per bag of 180 lb. gross.
" 21*s.* 6*d.* to 22*s.* 6*d.* " " " 164 " "

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. X. SATURDAY, FEBRUARY 18, 1911. No. 230.

NOTES AND COMMENTS.

Contents of Present Issue.

The editorial gives a review of the subject of the Acclimatization of Stock in the Tropics—a matter that is of increasing interest, both in those parts which have been settled for some time, and in those which are being exploited at the present moment.

The subject-matter on page 53 is confined to various points of information concerning Toggenburg goats, and an illustration is included of an animal which is a cross between the Toggenburg and Anglo-Nubian breeds.

An account of the eighty-third meeting of the British Cotton Growing Association is contained on page 54.

The greater part of page 55 is taken up with a review of the report on the Botanic Station, etc., Grenada, 1909-10. The issue of this report completes the series published by this Department for that season.

Under the heading Insect Notes, on page 58, a conclusion is made of the articles commenced in the last issue of the *Agricultural News*, presenting a summary of entomological information contained in this journal and the *West Indian Bulletin* during last year.

An interesting paper, which describes a method recently adopted for studying problems in soil fertility, is abstracted on page 59.

The Fungus Notes (p. 62) deal with The Secretion of Poisons by Fungi and the Green Muscardine Fungus of Frog-hoppers.

Publications of the Imperial Department of Agriculture.

Vol. XI, No. 2. of the *West Indian Bulletin* has just been issued. The first article in this consists of a Report on the Prevalence of Some Pests and Diseases in the West Indies, for the year 1909-10, by F.W.South, B.A., Mycologist, and H.A. Ballou, M.Sc., Entomologist on the Staff of the Department. This is completed by an index consisting of two parts, dealing respectively with the diseases and pests; each part treats of its subject from the side of the diseases or pests, and from that of their distribution, so that the index is particularly handy for purposes of reference, and contains a large amount of useful information, in itself. This is followed by An Account of the Report of the Royal Commission on Trade Relations Between Canada and the West Indies, to which is appended a Memorandum by the Imperial Commissioner of Agriculture for the West Indies on the Development of a West Indian Fruit Trade.

The remaining articles in this issue are by W. N. Sands, Superintendent of Agriculture, St. Vincent. The first of these presents a report by Mr. Sands on his recent work in Canada, in connexion with the Canadian Exhibitions, as the representative of the Imperial Department of Agriculture. The second gives the results of investigations conducted by Mr. Sands into the position occupied by British West Indian limes in the New York Market.

The *West Indian Bulletin* may be obtained from the agents for the publications of the Department, price 6*d.*, post free 8*d.*

It may be mentioned that the Report on the Botanic Station, etc., St. Vincent, for 1909-10 has just been issued, while the similar report for Grenada will be distributed shortly. The price of these is, respectively, 6*d.*, post free 8*d.*, and 3*d.*, post free 4*d.*, and they are obtainable from the agents for the publications of the Department.

The Yield of Camphor from Different Parts of the Plant.

Experiments that have been conducted in Jamaica and Antigua, and in the Federated Malay States, notes on which have been given in the *Agricultural News*, Vols. VIII, p. 328, and IX, p. 233, have shown that the youngest parts of the plant give the greatest yield of camphor.

In connexion with this result, it is of interest that a note in the *Planters' Chronicle*, for December 17, 1910, based on information contained in *Der Pflanzer* (1910, 6, 86), states that experiments made at the Biological Agricultural Institute at Amani, German East Africa, showed that young twigs and leaves are richer in camphor than the wood. The trials were carried out with about 3,500 trees, mostly three and a half years old, a few being older than this. The trees were cut back to about one-third of their height, without ill effect.

The investigations showed that the young twigs and leaves yielded on the average about 1·2 per cent. of distillate, containing 0·8 to 0·9 per cent. of camphor and 0·3 to 0·4 per cent. of oil, from the latter of which camphor could still be obtained, on a large scale; the yield of camphor is therefore estimated at 1 per cent. The results were very different with woody branches, as these yielded only about 0·16 per cent. of distillate consisting of 0·06 per cent. of camphor and nearly 0·1 per cent. of oil. The advice is therefore given that, in growing camphor trees, large leaf formation should be aimed at as far as possible.

Other matters of usefulness that were discovered were that it is best to distil during dry weather, and that there is no definite difference between the yield of camphor from leaves and twigs, whether these are collected from low or high altitudes.

The Effect of Light on the Development of Fruits and Seeds.

An abstract of a paper in the *Experiment Station Record* of the United States Department of Agriculture, Vol. XXIII, p. 723, gives the results of experiments which were undertaken recently for the purpose of studying the effect of light on the development of fruits and seeds. For the purpose, the fruits of several species of plants were exposed to diffused light; while others were kept in complete darkness, by enclosing them in paper bags, those for the former purpose being double, and those for the latter, black.

It was found that light is absolutely necessary for the commencement of the development of the fruit. If, however, the embryo had been permitted to grow for a short time, development was found to take place in darkness; though the amount of dry matter in a fruit produced under these conditions is smaller than that in one which is developed normally. Another light effect is that, as the amount of this is decreased, the proportion of ash in the fruit appears to become greater.

Corn Ear Characters and Yield.

The *Bulletin of the Ohio Experiment Station*, No. 212, p. 37, presents the results of five years' experiments, having for their object the determination of the connexion between the different characteristics of corn and the yields. One of the results obtained showed that the seed from long ears gave greater returns per acre than that from shorter ears. This lessened yield is the result of employing seed from short ears, as that from medium ears gave results like those obtained when long ears were used. As regards shape, again, cylindrical ears showed themselves superior, in the definite connexion, to those which taper.

For the first planting, better yields were obtained with seed from bare-tipped ears than with that from those which were well covered. In the second year, however, with seed selected from that obtained already there was a difference in favour of the well covered tips—a difference which was greater still in the third year. As regards the produce of seed from the different kinds of tips, it was found that seed from those which were well covered gave a larger percentage of well covered ears, than that from incompletely covered ears.

Among other results, the outcome of former investigations was confirmed, in that the heavier ears gave more produce than those which were lighter. A further matter of interest is that the smallest yields were obtained from the seeds which germinated earliest; the latter were those containing the greatest percentage of starch. Lastly, it may be mentioned that good yields were found to be correlated with good germinating power.

Calcium Cyanamide and Nitrate of Lime.

On page 280 of the last volume of the *Agricultural News*, information on this matter is presented, and references are given to notes that have appeared recently, from time to time on the same subject, in this publication.

In continuation of the matter, it is of interest that a leaflet has just been published by the Aberdeen and North of Scotland College of Agriculture, which describes field experiments with these manures, for the purpose of making comparison of them with nitrate of soda and sulphate of ammonia. In the result, it was shown that both forms of manures can be usefully employed in growing Irish potatoes.

As was found in the other investigations, however, to which reference is given above, there was little to choose between the different manures, in the special connexion wherein they were employed.

Trade of Samoa, 1909.

It is shown, in *Diplomatic and Consular Reports* No. 4543 Annual Series, that the total exports of this German possession during 1909 were valued at £151,068; of these the chief were copra, value £129,003, and cacao, value £20,309.

The report states that the rubber plantations which have been started are doing well, and that if success is obtained in this direction, there will be a great increase in the area occupied by the plant. This is particularly the case on account of the fact that the Government now controls all the lands owned by the natives, and there are large tracts owned by Europeans. The immigration of small settlers is not encouraged, however.

Much progress is being made in cocoa-nut planting, the trees being placed for the greater part between cacao trees that exist already. This planting of cacao land in cocoa-nuts has been brought about chiefly through the appearance of a cacao canker which, while it can be kept in check by constant attention, causes a large amount of damage if it is neglected.

INSECT NOTES.

A SUMMARY OF ENTOMOLOGICAL INFORMATION IN THE AGRICULTURAL NEWS AND WEST INDIAN BULLETIN IN 1910.

The following article concludes the information that is being given, under the above title, in this and in the last number of the *Agricultural News*.

The sweet potato weevil (*Cylas formicarius*) is mentioned on p. 42, and an illustration is given by which it should be possible to recognize this pest if it should appear in these islands. It is known to occur in the United States and in British Guiana, but at the present time it is not reported from the Lesser Antilles.

Cacao pests in Jamaica are dealt with on p. 330. The insects included in this account are ants, which destroy the cacao flowers, a wood-boring beetle and the girdler weevil of the orange (*Praepodes vittatus*), which also attacks cacao.

Cocoa-nut insect pests are considered on p. 26, where accounts and illustrations of scale insects, white fly and weevils are to be found.

A short article on the cow-pea curculio (*Chalcodermus aeneus*, Boh.) which appeared on p. 378, gives an account of a pest which does not occur in the West Indies, but may eventually be introduced.

The notes on the pests of domestic animals are two, one on the screw worm (p. 122), and one on ticks (p. 157), the latter with special reference to the method of freeing pastures from ticks by a system of rotation. The former of these mentions the remarkable occurrence of the maggots of an insect related to the screw worm in a flying fish just caught from the sea. An article on house-flies and disease (p. 298) calls attention to the part played by these insects in the transmission of typhoid and other diseases.

Papers on insecticides include two on carbon bisulphide, Part I, p. 74, Part II, p. 90, two papers on lead chromate, p. 159 and p. 314, and a general article on insecticides, p. 282. The last of these discusses stomach poisons, contact poisons, fumigants and repellents. The first gives a general account of carbon bisulphide and of its use as an insecticide. The notes on lead chromate deal with a new insecticide which, though not as poisonous as many of the better-known substances, has the advantage of not being injurious to plants to which it may be applied.

Beneficial insects form the subject of insect notes as follows: Lady-birds and Weevil borers, p. 106; Natural Enemies of Sugar-cane Pests, p. 138; The Black Scale and its Parasite, p. 170, and The Introduction of the St. Vincent 'Jack Spaniard' into Montserrat, p. 378. The first of these was referred to earlier in the present article when considering the root-borer of the sugar-cane. The notes on natural enemies of sugar-cane pests refer to the endeavours in Hawaii to establish natural enemies which shall control the sugar-cane borer (*Sphenophorus obscurus*), and give the results of a visit to New Guinea (Papua) in search of parasites.

The occurrence of the black scale, and its control by the parasite (*Zalophothrix mirum*), are dealt with on p. 170, and there is also on the same page reference to other natural enemies of cotton pests. The Jack Spaniard (*Polistes annularis*) seems to have been successfully introduced into Montserrat from St. Vincent, according to the note on p. 378.

Experiments with scale insects were carried out in Grenada with reference to a better control of these pests and the concomitant black blight, and results are presented on p. 362.

A report on Uganda insect pests, p. 42, gives a brief account of certain African insects which are of interest because of their similarity to West Indian forms.

The Brussels Congress of Entomology, at which Sir Daniel Morris represented the Royal Colonial Institute and the Imperial Department of Agriculture, was reported on at p. 298.

A method of detecting the presence of eel worms in cane fields was suggested on p. 314. This consists in growing plants known to be susceptible to attack, and examining their roots from time to time.

The papers on entomological subjects which have appeared in 1910 in the *West Indian Bulletin* are four in number, two of these: Legislation in the West Indies for the Control of Pests and Diseases on Imported Plants (Vol. X, No. 3, p. 197), and The Disinfection of Imported Plants (Vol. X, No. 4, p. 349), are closely related since they both deal with the diseases and pests of imported plants. Another was entitled Notes on Lime Cultivation (Vol. XI, p. 39), and the last was on the Nomenclature of Scale Insects (Vol. XI, p. 35). The article on legislation gives an account of the various legislative enactments and proclamations in the West Indies which have had for their object the prevention of the introduction of diseases and pests from foreign countries and neighbouring islands. That on disinfection of imported plants deals with the treatment to be given to such plants, and discusses the several substances which might be used, with accounts of the properties of each and the method of application.

The paper on nomenclature of scale insects is a revision of the technical names in accordance with recent studies by eminent authorities in order that the names, both technical and common, that have been in use in the West Indies may be compared by readers of the publications of the Department with those that have recently been generally adopted.

The paper entitled Notes on Lime Cultivation contains accounts of experiments recently carried out in Montserrat, and gives an historical review of the pests and diseases recorded, together with remedial measures adopted for their control, and an estimate of the value of natural enemies of certain pests.

In South India and Ceylon, mangoes are attacked by a weevil (*Cryptorhynchus mangiferae*), which is closely related to the sweet potato weevil, scarabee, or jacobs (*Cryptorhynchus batatae*). The insect breeds in the stone of the fruit; the eggs are laid on young fruits and the larvae feed on the stone until they are fully developed, when they eat through the pulp and pass the pupal stage in the soil. In regard to this pest, a writer in the *Florida Fruit and Produce News*, 1910, No. 40, p. 2, mentions the danger that it may be introduced into other countries, where it is unknown, with mango seed, and suggests that, as the insect is believed to hasten the maturity of the fruit and to cause it to fall from the tree, competent inspection should be made of all such imported seed.

A METHOD OF STUDYING PROBLEMS IN SOIL FERTILITY.

In the *Journal of Agricultural Science* for September 1910 (Vol. III, p, 297), a method is described by which it appears that certain problems in soil fertility may be studied in a convenient manner. Particulars are given of work that has been actually conducted so far with the aid of the method described; this refers to the action of leguminous plants in assisting in increasing the amount of nitrogen in the soil.

The devising of the method arose from the fact that the attention of the writer of the article was called to the circumstance that oats made better growth than was the case ordinarily, if they were sown with field peas. The idea was strengthened in the mind of the writer by further observations and enquiry, so that it appeared evident to him that when legumes and non-legumes are raised together the latter receive an advantage because they are supplied with nitrogen compounds, which are provided either by the decay of the roots of the legumes or from the passage of soluble material out of those roots into the surrounding soil.

After giving examples showing the extent to which the two kinds of plants are often sown together, the writer draws attention to the importance of the matter, giving the opinion: 'that if it should be demonstrated that non-legumes could be provided with an abundant supply of nitrogen even in poor soils, by being grown together with legumes under proper conditions, it would become practicable not only to dispense with all or a portion of the nitrogenous manures employed for certain crops, but also to secure non-legumes with an increased proportion ot protein in the dry matter.'

The apparatus employed in the investigation consisted of two earthenware pots, one smaller than the other, the latter being placed inside the former. The outer pots had a capacity of about 5 gallons, the smaller ones were made of a very porous flint mixture, while some were glazed and others left unglazed.

In the trials, the smaller pots were placed inside the larger, and both were filled with white quartz sand to which was added the essential mineral food required by plants, together with a small amount of water that had been shaken up with soil in order to provide the bacteria necessary to enable the leguminous plants to form nodules.

The invention and arrangement of this apparatus arose from the idea that if leguminous plants allow soluble nitrogen compounds to be given off from their nodules and roots, these compounds would pass through the porous walls of the unglazed inner pots and supply nitrogen to the non-legumes that were growing in it. This would not be the case, on the other hand, if such passage did not take place, so that if the non-legumes were not given nitrogen they would starve for want of this element.

The procedure was, therefore, to plant such leguminous plants as field peas in the outer pots while oats were grown in the inner pots, some of which were glazed and some unglazed; no nitrogen was given in either case, and the moisture conditions were kept uniform.

In the result, it was found that where unglazed inner pots were used the oats made the best growth and were of a deeper colour than those in the glazed inner pots. In the words of the author: 'every indication was...supplied that soluble nitrogen compounds were diffusing through the unglazed porous wall and were being utilized by the oats.' It was found subsequently, that when the oats growing in glazed and unglazed pots were weighed and analyzed, the latter gave not only a much larger amount of dry matter and nitrogen than the former, but that the dry matter contained nearly twice as much nitrogen as that from the oats grown in the glazed pots.

It is pointed out that this method of experiment may be employed in a similar manner for studying the influence of various crops on the bacteria contained in soils; here the crops would be grown in the outer pots, while nothing would be raised in the inner, the soil from which would be examined bacteriologically and the results compared, in the glazed and unglazed pots. Other investigations might include the study of various manures in their effect on certain groups of soil bacteria; for that of the effect of crops on one another, both when grown continuously and in rotation; and for investigations in regard to the supposed toxic effect of excreta from the roots of plants.

The article concludes with a description of the material for making the porous inner pots. This consisted of clay, mixed with 25 per cent. of hard coal and the same proportion of soft coal, fired in the usual way. For providing controls on the glazed pots, those coated with asphaltum paint were employed, as tests in the laboratory had shown that they were impervious to diffusible salts.

AGRICULTURE IN HAWAII, 1908-9.

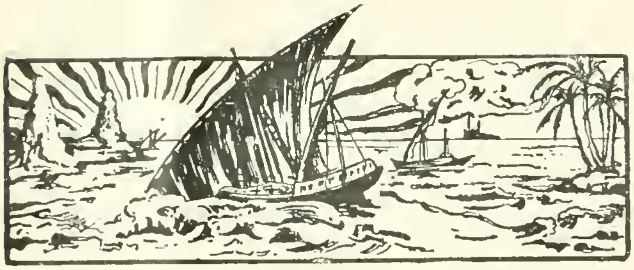
Among the matters dealt with in *Diplomatic and Consular Reports*, No. 4601 Annual Series, which was issued in November last, there is an account of the Agriculture of the territory of Hawaii from which the following information is taken.

The chief industry, namely sugar production, has progressed to such an extent that more than $70,000,000 is invested in it, and the area devoted to sugar-cane is 213,000 acres, of which about one half is irrigated The yield per acre is nearly twice as great on irrigated lands as on those which are not irrigated. In 1908, 125,123 short tons of sugar was obtained from 101,379 acres, which gives an average of 5·14 tons per acre. The production for 1907 and 1906 was 440,017 and 429,213 short tons, respectively.

In regard to other chief industries, the output of rice is valued at about $2,500,000; most of it is consumed in the territory. The outturn of coffee is variable; last year, an amount worth $238,083 was exported from about 4,500 acres. The rubber industry has not passed beyond the experimental stage; on the six principal plantations there are now about 1,600 acres, containing about 600 Castilloa trees, 66,700 Hevea trees and 444,450 Ceara trees.

Among the new industries, the greatest progress is being shown by the pine-apple industry, the exports in connexion with which have increased from 2,000 cases during 1900-1 —the first year under the protective tariff—to 411,000 cases for 1908-9. Other matters of interest are the flotation of new tobacco companies, renewed activity in regard to the sisal industry, and the steadily growing production of honey, the present value of the last being about $70,000.

A paper in the *Journal d'Agriculture Tropicale*, No. 106, p. 99, describes observations which support the conclusion that the abortion of the flowers of *Coffea arabica* is due to faulty nutrition of the plant. Among the particular causes, in this connexion, there are stated to be the provision of too much shade, together with too heavy applications of green dressings and artificial manures, as well as too thorough pruning where the shade is heavy.



GLEANINGS.

It is reported from St. Kitts that the prospects of the sugar-cane crop that is being taken off at present are generally good. The young canes, too, are making good progress, on account of the rain received during January.

A report received from the Curator of the Botanic Station, Montserrat, states that cotton-picking is completed on the Leeward side, while it is being still continued at Windward, where there is a prospect of a second crop being obtained. On some estates, the preparation of land for the next cotton crop is well advanced.

The Superintendent of Agriculture, Barbados, reports that, on the whole, a good cotton crop will have been reaped in that island. He states further, that the bacterial disease of cotton known as black arm and angular leaf spot seems at present to be stayed, as does also the attack of root borer in the sugar-cane.

The Field for November 12, 1910, states that the expenditure on the construction of the Canadian National Trans-Continental Railway during the last fiscal year was \$20,000,000. The total expenditure so far has been \$72,000,000, and for this 1,100 miles has been graded, and 800 miles of track laid.

The *Morning Post*, for December 23, gives a telegram from Jamaica which states that the Atlantic Fruit Company, which has hitherto been connected with that island, has acquired a concession of 100,000 acres of banana land in Nicaragua, and will develop this with West Indians, thus creating another rival to Jamaica.

The amount of cotton exported from Peru, in 1909, was 47,641,776 lb., valued at £1,284,590, while the area under cultivation was 125,000 acres. It is estimated by the Director of the Lima Experimental Station for Cotton, that the exports from the present crop will be 55 million pounds, as the conditions during the season have been very favourable.

With regard to the list of examiners in the recent Intermediate and Final Examinations, given in the *Agricultural News*, Vol. X, p. 31, Mr. J. C. Moore, Agricultural Superintendent, St. Lucia, has pointed out that there was an error in stating that the Hon. E. G. Bennett officiated in that capacity in this island. The actual examiner was Mr. G. Barnard, who kindly assisted Mr. Moore in the oral examinations.

Professor Annett, of the University of Liverpool, has recently elaborated a quick and certain method for the diagnosis of anthrax, which does not rely entirely on the microscopical examination of stained specimens, but involves the use of an incubator, Petri dishes and agar tubes. It is extremely simple, and furnishes, it is claimed, absolutely certain diagnosis in three hours. The apparatus costs about £40. (The *Colonial Office Journal*, Vol. IV, p. 246.)

Particulars have been received, from Messrs. H. C. Mc. Kinlay & Co., of 59, Mark Lane, London, E.C., relating to a fibre-cleaning machine made by Messrs. John Downham & Co., Bury, near Manchester. This is known as the Patent Double Drum Decorticator or Extractor, No. 1, and it is claimed that the machine will not only crush and unravel the leaves, but will cleanse and wash the fibre, so that this comes from the machine ready for drying and baling. Information concerning this and other similar machines may be obtained by applying to either of these firms.

An account of a meeting of the Board of Management of the Jamaica Agricultural Society held on December 17, 1910, contained in the *Journal of the Jamaica Agricultural Society*, Vol. XIV, p. 431, shows that at this meeting the opinion of the Staple and Minor Products Committee in connexion with legislation against the bud rot disease of cocoanuts was submitted. In the end, it was agreed that the Government should be informed that legislation was considered necessary by the Board, both to make it compulsory to destroy trees affected with the disease and to make it illegal to allow débris from fruits to accumulate on the roadside.

An improved cultivator, which has been patented by Messrs. J. F. Alderman & Kerr, of Thorney, Cambridgeshire, is described in the *Farmer and Stock Breeder* for December 26, 1910, where it is claimed to be the first combined cultivator and digger brought into practical use. The machine is preferably worked on cables from stationary engines, or it may be operated by any other suitable mode of traction. It is stated that by means of this machine 18 acres, and more, of land can be broken up and prepared for sowing, per day.

Der Tropenpflanzer, Vol. XIV. p. 417, contains an account of experiments that have been made recently in the direction of shipping pine-apples in pulverized peat, from the Cameroons to Hamburg. The fruit was found to be in fairly good condition on arrival, and the opinion is expressed that the use of pulverized peat may enable pine-apples to be shipped in vessels that are not provided with cool storage. These trials are of interest in view of similar work that has been done with bananas; this was described recently in the *Agricultural News*, Vol. X, p. 20.

The *Experiment Station Record* for December 1910 (Vol. XXIII, p. 623) gives a short extract of a paper describing experiments, in which the effect of magnesium and calcium carbonate on nitrifying bacteria in the soil was investigated. It was found that, with a sandy loam soil containing a rather high percentage of magnesia, the addition of magnesium carbonate to the extent of more than 0·25 per cent. stopped the action of the bacteria, while favourable results were obtained with calcium carbonate up to 2 per cent. It is indicated by these results that nitrifying bacteria are affected by the lime-magnesia ratio in the soil (see *Agricultural News*, Vol. IX, pp. 95 and 204) much in the same way as some green plants are supposed to be influenced.

STUDENTS' CORNER.

FEBRUARY.

LAST PERIOD.

Seasonal Notes.

Discuss the advisability of the formation of nurseries for the propagation of planting material for the sugar-cane. Note that, among other advantages, the possession of such nurseries gives the planter comparative independence, for a time at any rate, in relation to other sources of supply. Nurseries may also prove useful because the plants in them will give hints as to the presence of diseases and the comparative susceptibility of different kinds of sugar-cane to these. The possessor of such a nursery, too, is afforded the best chance of selecting and planting exactly the kinds of cane that may appear to him to be best for the conditions in which he has to work. A nursery forms a place that can be kept always ready for the reception and growing of propagating material for new canes, and the common possession of such an aid to estate work in an island or district enables the planters to co-operate towards the improvement of the varieties grown, especially in that it facilitates the interchange of planting material among them.

The present time is suitable for taking note of the varieties of cane that are specially adapted to the conditions in which you live, and together with this there is the consideration of the best means to employ for cultivating those varieties in that district. Observation should not be confined to the practices on the estate with which one is familiar; others should be visited, and careful notice should be taken of any modification of methods which may be possibly adopted with advantage on the estate on which the observer works.

The various means which may be employed for the production of a soil-conserving mulch in sugar-cane and other cultivations are of much importance. They include the use of plant remains such as trash, the thorough breaking up of the uppermost layer of the soil to form what is called a dust mulch, and the spreading of pen manure on the soil so that it will not only form a source of plant food, but will prevent much of the water in the soil from being drawn to the surface and evaporated. In Barbados, more particularly, a special kind of mulch is often formed by taking the fine soil from the drains and spreading it over the areas between them. It is obvious that, where different kinds of mulches are employed, useful opportunities will be given to the student to observe and compare the effects of the different methods.

It is commonly recognized that, at this period, in regard to cotton cultivation, a matter of much importance is the destruction of the old plants, particularly in the effort to reduce the extent to which leaf-blister mite is present, and to lessen the chances of its being carried over to the plants of the new crop. The seed-cotton from the plants that were chosen in the field will now be subjected to further selection in order to obtain the best seed for the next crop, in pursuance of the policy of maintaining the superiority of the strain, as well as for purposes of improvement, where this is requisite. It must be remembered that such selection cannot result in improvement to an indefinite extent. Its results are limited to the stage which is occupied by the best plants in the field. What selection really does is to increase the number of plants bearing the desirable characteristics, and therefore to make larger the proportion of good cotton in the whole crop.

It may be well to mention, at this time, the necessity for the proper drying of cotton, either for ginning or storage. Imperfectly dried cotton is worked up with difficulty, both in the ginnery and the mills, and when such cotton is stored, it suffers gradual deterioration and may be even destroyed through spontaneous combustion.

It is a useful plan to take samples of the seed-cotton coming from the different fields and to examine these, especially in relation to the different conditions in those fields, as regards character of soil, supply of water, modes of tillage and manuring, and the origin of the seed from which the cotton was raised in the different cases. This should give much useful information as to the effects of various conditions on the cotton plant.

Questions for Candidates

PRELIMINARY QUESTIONS.

(1) Name some common plants in which starch is produced in quantity, and state in what part of the plant the starch is stored.

(2) How does milk of lime assist in clarifying cane juice? What is the result of using an excess of lime?

(3) State definitely the difference between the meanings of the terms Pollination and Fertilization, in respect to flowers.

INTERMEDIATE QUESTIONS.

(1) Describe carefully the appearance of a good sample of concentrated lime juice. Give details as to the preparation and testing of such a sample.

(2) Give an account of methods of extracting starch from starch-producing plants.

(3) How is the power of soils to absorb heat related to (a) the characteristics of the soils, (b) their suitability for growing plants?

FINAL QUESTIONS.

(1) Give details as to the methods and cost of providing a square 10-acre field with (a) a living fence, (b) any other kind of fence.

(2) Discuss broadly the different uses of water to plants.

(3) What steps would you take in order to satisfy yourself that an insect pest, under given conditions, was being parasitized by another insect, or other insects?

Imported Para Rubber Plants and Disease.—At a meeting of the Board of Agriculture of British Guiana, held on December 21, 1910, it was stated by Professor J. B. Harrison, C.M.G., that Para rubber plants which had been received recently from Ceylon had been found by the Government Botanist to be infected with a fungus (*Botryodiplodia elasticae*), common in Ceylon, which destroys *Hevea brasiliensis.* Professor Harrison stated, further, that he had submitted a report on the matter to the Rubber Committee, and it had been recommended unanimously that the importation of cuttings and stems of rubber should be subjected to the same inspection as that of sugar-cane. This was necessary, more particularly as, when a new industry like the rubber industry is being started, it is of the utmost importance that every care should be taken to prevent the introduction of disease from other countries.

The consideration of the proposals in connexion with the matter was postponed until advice could be received on several legal points.

FUNGUS NOTES.

THE SECRETION OF POISONS BY FUNGI.

It has been known for some time that certain fungi possess the power of secreting various poisons from the tips of their hyphae. These poisons kill the cells of the host in their immediate neighbourhood, somewhat in advance of the tips of the hyphae, which subsequently in the course of their growth, reach these dead cells, and feed on them in a saprophytic manner.

A good example of this is the secretion of oxalic acid by the hyphae of the Botrytis stage of species of Sclerotinia. These fungi attack tulips, lilies, and various other host plants. They are partly saprophytic, but are enabled to live practically as parasites by means of this character. Very many fungi give rise to crystals of calcium oxalate, apparently as a waste product, these crystals either being stored inside the hyphae of the fungus, or being formed on the outside of the hyphal wall. It would seem that, in the case of Botrytis, calcium is either not absorbed to the same extent, or is used for some other purpose, so that the acid which is formed, as in several other fungi, is not neutralized, and, consequently, is secreted. In this case, however, it serves a useful purpose, since it kills the cells of the host plant and enables the hyphae to attack them, the latter being unable to penetrate living cells.

A much more remarkable instance of this secretion of poison is furnished by a fungus known as *Stereum purpureum*. This causes a disease known as silver leaf, affecting plums, peaches, apples, pears, laburnums and the Portugal laurel. Some recent work on this fungus, by Mr. Spencer Pickering, has been published in the *Twelfth Report of the Woburn Experimental Fruit Farm*; a short account of this paper appears in the *Gardeners' Chronicle*, No. 1246, November 12, 1910. The mycelium of the fungus lives in the branches, only, and does not appear to extend to the leaves. It secretes a poison, however, which is carried to the leaves of the host plant by way of the wood and the leaf veins; this is produced in sufficient quantities to cause a material alteration in the appearance of the leaves, namely, to turn their colour from green to a silvery or ashen grey. The yield of infected trees is much reduced, and eventually branches are killed, and the trees slowly die. Death does not always occur, however, as infected trees sometimes recover, at any rate so far as to be free from the silver leaf symptoms. The cause of the silvery colour is the separation from one another of the surface cells of the leaf, so that spaces are formed which are filled with air. These cause the silvery appearance, on the same principle as the white colour of pounded ice is produced; among the particles of this, air is entangled. In the case of the leaf, between the adjacent cell walls of two healthy cells is a portion known as the middle lamella, which binds the two together: this is dissolved by the substance secreted by the mycelium of the Stereum, and thus the silvery appearance is brought about.

The middle lamella is composed of a substance known as calcium pectate, which can be destroyed by acids. This suggests that, possibly the poison secreted by the fungus is oxalic acid as in the case of Botrytis. If this is so, a dressing of lime, or of calcium nitrate, might prevent to some extent the damage inflicted on the leaves, since these substances, if absorbed by the roots and present in the water carried in the wood, would neutralize the acid, with the formation of calcium oxalate.

Stereum purpureum is a wound parasite, and its spores gain an entrance only through wounds. Consequently, soft-wooded varieties of the plants mentioned are usually found to be more susceptible to the disease than the hard-wooded varieties, since the former are more easily injured. The fructifications are formed on the surface of dead branches only, and it is not until this stage is reached that a diseased tree is capable of infecting others in its vicinity.

Another fungus which possesses this power of secreting a poison is the wither-tip fungus of citrus trees, *Colletotrichum gloeosporioides*, found in Florida and other places. It kills the young twigs and branches, which it attacks by means of the poison. As in the case of Stereum, the poison is also carried in the wood to the leaves, which are turned yellow.

The power possessed by some fungi, of killing parts of their host situated at some distance from the actual invading mycelium, may possibly furnish an explanation of the cause of more than one disease at present but little understood.

THE GREEN MUSCARDINE FUNGUS OF FROG-HOPPERS.

In the *Proceedings of the Agricultural Society of Trinidad and Tobago*, Vol. X, pp. 467 to 482, appears a second short paper by Rorer on the green muscardine fungus of frog-hoppers in Trinidad. The first paper by the same author on this subject is referred to in the *Agricultural News*, Vol. IX, p. 350.

The fungus has been identified by Dr. Roland Thaxter of Harvard as *Metarrhizium anisopliae*, Sorokin. It is identical with a species frequently found in Russia and France. In the former country it attacks the cockchafer of wheat, *Anisoplia austriaca*: in the latter it has occurred on silk worms. It has also been found on a weevil (*Cleonus punctiventris*) that attacks sugar beets, and has been observed on several other insects in different countries.

The fungus is a somewhat peculiar one, which has been given a number of different names, and has been placed in many different genera, but at present is usually consigned to a specially created genus of its own.

Such infection experiments as have been undertaken, both in the field and in the laboratory, have led to the belief that it may be possible to employ it as a means of assisting in the control of the frog-hopper in Trinidad, though former experiments in Russia with the cockchafer of wheat were not successful on a field scale. The chief difficulties to be overcome are the provision of a sufficiently large number of spores, and their distribution throughout the fields. Rorer appears to think that it will be possible to produce the spores in the quantity required, and that their distribution can be effected by either of two methods. The first means is the employment of a machine such as is used for distributing dry insecticides and fungicides. This would blow a cloud of spores into the air, and these would be distributed over the field by the wind. The other means is by catching a large number of adults with light traps at night, inoculating them with the fungus, and setting them free the next day.

It seems probable that as the frog-hoppers are most active in the rainy season—the time most favourable for the growth of the fungus; this may render of considerable value the means of controlling the insects.

EXPORT TRADE OF FIJI, 1909.

The main exports, and the staple products of the Colony continue to be sugar, copra and green fruit.

The quantity and value of the principal exports during the past five years are given in the following statement:—

Year.	Sugar. Quantity, tons.	Sugar. Value, £.	Copra. Quantity, tons.	Copra. Value, £.	Green fruit. Value, £.
1905	58,488	539,594	10,200	125,892	28,996
1906	38,523	347,198	9,772	143,683	97,678
1907	66,597	602,820	11,290	182,788	79,891
1908	66,149	647,306	12,931	154,488	62,217
1909	60,825	607,969	15,880	226,599	98,491

The figures show a decrease in the export of sugar for 1909 of 5,324 tons as compared with 1908. This deficiency was due, to a certain extent, to the short crop at Labasa, occasioned by the prolonged crushing season in 1908, during which year the mill at that centre was closed for crushing purposes in order to renew machinery and enlarge the mill. The cane just left over for inclusion in the 1909 output was very considerably less, both in quantity and quality, than it would have been under ordinary circumstances.

The output of copra during the year was exceptionally high, showing an increase as compared with 1908, in the value of the quantity exported, of £72,111. This was due mainly to the greater demand and the consequent higher market price of that product which obtained throughout the year. The quantity exported exceeded that of the previous year by 2,949 tons.

A considerable increase has taken place also in regard to the exportation of green fruit. This item consists chiefly of bananas exported to Australia and New Zealand.

The following statement shows the quantities of bananas exported during each of the past five years:—

Year.	Bunches.	Cases.
1905	313,829	—
1906	604,617	191,640
1907	462,139	192,591
1908	356,180	145,110
1909	585,713	188,577

After deducting the three principal items of export from the value of the total exports of the colony, the value of the minor products exported during each of the last four years amounted to:—

Year.	£.
1906	9,799
1907	12,157
1908	13,321
1909	13,752

The principal minor exports were: molasses (£5,682), turtle shell (£2,381), hides and pelts (£1,333), and maize (£932).

The following table shows the value of the total imports and exports for the past five years:—

Year.	Imports. £	Exports. £
1905	442,852	706,403
1906	609,496	603,410
1907	643,007	881,364
1908	662,654	878,393
1909	636,250	947,136

(*Colonial Reports*—Annual, No. 657.)

TO DESTROY FOWL TICKS.

The following is taken from a report by a Committee of the Agricultural Society of Trinidad and Tobago, which was appointed to enquire into the question of fowl ticks. The report appears in the Journal of the Society, Vol. X (December 1910), p. 496.

To rid a badly infested fowl house of these pests is a difficult undertaking, and if the building is old or badly constructed, so that it affords an abundance of hiding places for ticks, it is often cheaper to replace it by a new and suitable structure. Never use the old material for the new building, nor erect a new fowl house on the site of the old, or near it. If the lumber from the old house is good enough for some other purpose, store it out of reach of the fowls.

A jet of flame from a blast lamp is probably the most effective means which can be used to destroy ticks in an infested fowl house. Pass the flame slowly and carefully over every crack and crevice, and force it in as far as possible After this has been thoroughly done, paint the whole inside of the fowl house with tar and lard oil (2 oz. of oil to 1 gallon of tar). Aim at sealing all cracks with this preparation. It will adhere well, and will remain sticky for a considerable length of time. Some prefer to heat it before applying. The floor should be cleaned, and lime freely used on it. If necessary, reconstruct the roosts on lines above indicated. Destroy the old nesting boxes, and care for the new in the proper manner. Adult ticks will be found on the fowls only by night. Only a small portion of the pests would be found each night by searching on the bodies of the birds, and this procedure would disturb the flock too much. The larvae remain on the hosts for several days, and can be found in the daytime. Here hand dressing, if a somewhat slow process, is effective when properly done. Oils thoroughly rubbed in are the best remedies. They will clog the breathing pores of the creatures, and so destroy them.

Kerosene oil and sweet oil give most satisfactory results. Kerosene oil and cocoa-nut oil in equal proportions have proved very efficacious. A mixture consisting of sweet oil (2 parts), 10 per cent. solution of caustic potash (4 parts) and kerosene (6 parts) is highly recommended from Australia as a dip. Careful dusting with Keating's powder by means of a blower pushed along under the feathers so that the powder will reach the skin—will also answer well for this purpose. Among the numerous insect powders on the market, this brand has proved the most reliable. The fresher it is, the better.

All these preparations deteriorate rather quickly in our climate. Fowls which are infested should never be placed in a new fowl house. They should be kept separate, and treated until entirely free from parasites. If some members of a clean stock become infested, they should at once be segregated and given attention; the fowl house in which they have roosted should be inspected and tarred.

Fowl ticks can be exterminated, but painstaking care must be exercised in order to accomplish their destruction. Unremitting vigilance is the poultry raiser's greatest safeguard against these pests.

It is reported by H.M. Embassy at St. Petersburg that the second preliminary estimate published by the Ministry of Finance gives the production of white sugar in the Russian Empire, during 1910-11, at 113,639,180 poods, which is just over 1,825,000 tons.

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR, January 31, 1911.

ARROWROOT—2*d.* to 2¾*d.*
BALATA—Sheet, 3/11; block, 2/10 per lb.
BEESWAX—£7 12*s.* 6*d.*
CACAO—Trinidad, 58/- to 67/- per cwt.; Grenada, 53/6 to 57/6; Jamaica, no quotations.
COFFEE—Jamaica, no quotations.
COPRA—West Indian, £25 10*s.* per ton.
COTTON—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 20*d.* to 23*d.*
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—54/- to 56/6.
HONEY—No quotations.
ISINGLASS—No quotations.
LIME JUICE—Raw, 11*d.* to 1/-; concentrated, £18 2*s.* 6*d.* to £18 8*s.* 9*d.*; Otto of limes (hand pressed), 5/3, nominal.
LOGWOOD—No quotations.
MACE—Firm.
NUTMEGS—Quiet.
PIMENTO—Quiet.
RUBBER—Para, fine hard, 5/2, fine soft, 5/1; fine Peru, 5/3 per lb.
RUM—Jamaica, no quotations.
SUGAR—Crystals, 14/6 to 17/6; Muscovado, no quotations; Syrup, 9/1½ to 14/-; Molasses, no quotations.

New York.—Messrs. GILLESPIE BROS. & Co., January 27, 1911.

CACAO—Caracas, 11¾c. to 12½c.; Grenada, 11⅞c. to 12¼c.; Trinidad, 11¾c. to 12¼c. per lb.; Jamaica, 10⅝c. to 11c.
COCOA-NUTS—Jamaica, select, \$28·00 to \$30·00; culls, \$16·00 to \$17·00; Trinidad, select, \$28·00 to \$30·00; culls, \$16·00 to \$17·00 per M.
COFFEE—Jamaica, ordinary, 13¼c.; good ordinary, 13½c.; washed, 15c. per lb.
GINGER—9c. to 12c. per lb.
GOAT SKINS—Jamaica, 51½c.; Barbados and Antigua, 40c. to 50c.; St. Croix, St. Thomas and St. Kitts, 45c. to 47c. per lb.
GRAPE-FRUIT—\$2·50 to \$3·00 per box.
LIMES—\$5·50 to \$6·00.
MACE—39c. to 48c. per lb.
NUTMEGS—110's, 10¼c. per lb.
ORANGES—Jamaica, no quotations.
PIMENTO—3⅞c. per lb.
SUGAR—Centrifugals, 96°, 3·42c. per lb.; Muscovados, 89°, 2·92c.; Molasses, 89°, 2·67c. per lb., all duty paid.

Trinidad.—Messrs. GORDON, GRANT & Co., February 4, 1911.

CACAO—Venezuelan, \$13·50 per fanega; Trinidad, \$13·00 to \$13·75.
COCOA-NUT OIL—\$1·04 per Imperial gallon.
COFFEE—Venezuelan, 15c. per lb.
COPRA—\$4·75 per 100 lb.
DHAL—\$3·30.
ONIONS—\$4·25 per 100 lb.
PEAS, SPLIT—\$6·00 to \$6·10 per bag.
POTATOES—English, \$1·80 to \$1·90 per 100 lb.
RICE—Yellow, \$4·30 to \$4·35; White, \$4·65 to \$4·70 per bag.
SUGAR—American crushed, \$5·50 to \$5·60 per 100 lb.

Barbados.—Messrs. T. S. GARRAWAY & Co., February 6, 1911; Messrs. JAMES A. LYNCH & Co., February 6, 1911.

ARROWROOT—St. Vincent, \$4·50 to \$4·60 per 100 lb.
CACAO—\$11·00 to \$13·00 per 100 lb.
COCOA-NUTS—\$20·00.
COFFEE—Jamaica and ordinary Rio, \$13·50 to \$15·00 per 100 lb. scarce.
HAY—\$1·50 to \$1·60 per 100 lb.
MANURES—Nitrate of soda, \$65·00; Cacao manure, \$42·00 to \$48·00; Sulphate of ammonia, \$75·00 per ton.
MOLASSES—No quotations.
ONIONS—\$5·00 to \$6·00 per 100 lb.
PEAS, SPLIT—\$5·85 to \$6·10 per bag of 210 lb.; Canada, \$3·60 to \$3·90 per bag of 120 lb.
POTATOES—Nova Scotia, \$2·00 to \$2·50 per 160 lb.
RICE—Ballam, \$4·60; Patna, \$3·50 to \$3·80; Rangoon, \$2·90 to \$3·00 per 100 lb.
SUGAR—No quotations.

British Guiana.—Messrs. WIETING & RICHTER, February 6, 1911; Messrs. SANDBACH, PARKER & Co., February 3, 1911.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	\$9·00 to \$9·25 per 200 lb.	\$9·00
BALATA—Venezuela block	No quotation	Prohibited
Demerara sheet	81c. per lb.	72c. to 80c.
CACAO—Native	11c. per lb.	10c. to 11c. per lb.
CASSAVA—	96c.	No quotation
CASSAVA STARCH—	\$6·50	No quotation
COCOA-NUTS—	\$10 to \$16 per M	\$10 to \$16 per M., peeled and selected
COFFEE—Creole	16c. per lb.	16c. per lb.
Jamaica and Rio	19c. per lb.	19c. per lb.
Liberian	10c. to 11c. per lb.	11c. per lb.
DHAL—	\$3·25 per bag of 168 lb.	\$3·25 per bag of 168 lb.
Green Dhal	\$4·00	——
EDDOS—	\$1·20	——
MOLASSES—Yellow	None	——
ONIONS—Teneriffe	——	——
Madeira	5c.	6c.
PEAS—Split	\$5·75 to \$6·00 per bag (210 lb.)	\$6·00 per bag (210 lb.)
Marseilles	\$4·50	No quotation
PLANTAINS—	20c. to 48c.	——
POTATOES—Nova Scotia	\$2·75	\$2·75
Lisbon	——	No quotation
POTATOES—Sweet, B'bados	\$1·20 per bag	——
RICE—Ballam	No quotation	——
Creole	\$5·00 to \$5·50	\$5·00 to \$5·25
TANNIAS—	\$1·82 per bag	——
YAMS—White	\$2·40	——
Buck	\$2·64	——
SUGAR—Dark crystals	\$2·10 to \$2·20	None
Yellow	\$2·80 to \$3·00	\$2·65 to \$2·75
White	\$4·00	\$4·00 to \$4·25
Molasses	\$2·10 to \$2·30	None
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 Practice of Economy on Estates.

IN the present days of serious competition and low prices, a full recognition is being given to the importance of effecting the major economies on estates. The nature of these is well recognized, and they have become part of the natural routine in the work of the estate. There are others, however, whose existence is not obvious, which are the outcome of careful thought and consideration, in the light of what may be termed more purely formal knowledge. The purpose of this article is to indicate briefly the nature of some of these economies.

A larger proportion of the expenditure of an estate than is commonly recognized consists in the continual replacement of small articles. Where no inventory is made of such articles, and where the lists, even if they exist, are not checked every few months, losses are occasioned through careless use, and through the misplacing of the articles, because, as these are not regularly entered as estate property, the cost of buying them from time to time is considered to be a small matter. The keeping of accurate records of the purchase of such articles, and the consequent knowledge of the economy effected by the careful storing of them, will not fail to give the practical agriculturist an idea of the expense that carelessness in this respect has caused him in the past.*

In the matter of the larger articles, such as the implements employed in cultivation, although these cannot be lost outright, neglect of care for them shortens seriously their period of usefulness, and lessens their efficiency. When these are put aside for a season, the parts which have to bear the greatest wear and tear, more especially, should be dried, cleaned, and covered with an application of heavy lubricating grease. Attention may also well be given to those portions of them that do not receive direct wear, and here the care will consist in keeping such parts properly painted.

Some of the largest, but least obvious economies can be effected in regard to the animals employed by the agriculturist. Animals are required by him for the provision of energy, or for giving food products. In either case, the policy should be followed of treating

*See also *Agricultural News*, Vol. IX, p. 127.

the animals in such a way that the food absorbed by them is used as little as possible in doing useless work. Chief among the precautions to be observed in this way will be to see that the animals are stalled as near as possible to the places where they are wanted, and that they are properly protected against inclement weather. In regard to the former consideration, energy and therefore food, are wasted where it is necessary to take the animals on the estates long distances to be worked, or in the case of cows, to be milked. In the latter connexion, animals subjected to untoward conditions of weather must use energy in order to overcome the possible evil effects of those conditions. An interesting illustration of the extent to which the food and energy of an animal may be wasted in this way is supplied by the fact that, with cows, for every pound of rain evaporated from the body, there is consumed more than three-quarters of a pound of solid substance, reckoned as fat which might have gone to form milk.

In continuation, as regards animals, a large amount of the food is often wasted in providing energy for doing useless work, in connexion with ploughing and hauling. In both of these, care should be taken that the animal is attached to the implement or vehicle in such a way that as large a proportion as possible of the power given by it shall be used directly in the work that is required of it. Generally speaking, as regards ploughing, the line of the traces should be one and the same with a line passing through their place of attachment and the centre of greatest pressure on the mould board. With reference to haulage, in the case of a very smooth road such as that formed by a line of rails, the plane of the traces should be parallel to the surface of this; where the road is not smooth, however, the effect of the friction and the fact that the wheels are continually endeavouring to mount up out of the surface into which they have sunk, will make it necessary for the traces to slope downwards and backwards. Another matter of importance that is not usually recognized, as regards vehicles travelling over ordinary roads, is the distribution of the load on the carriage. It is most usually, but not always, the case that the heaviest part of the load should be placed over the hind wheels, because firstly, the front wheels make a firm track for the hind wheels carrying the heavier weight; secondly, the hind wheels are generally the larger, so that they sink a smaller distance into the road, and use less of the energy of traction than would be consumed by the front wheels, with the greater part of the load on them; and thirdly, such distribution of the load enables the vehicle to be turned with greater ease and less damage to the road.

So far, attention has been given to the animal, its mode of attachment, and the load on the vehicle which it draws. It is plain, however, that much more might be done toward the improvement of the roads themselves, on which the animals have to work. Bad roads mean constant expenditure in providing extra food for a continual waste of energy, and they also bring about unnecessary injury to animals, vehicles and implements. In the amelioration of such conditions, attention should be given to the provision of smooth and rigid roads with easy inclines, and where it is not possible to provide anything but a rough road, the conditions should be bettered as much as may be by the use of vehicles having large wheels with wide tires. It may be useful to mention here that a cheap and effective implement known as the road drag* is much employed in the United States for the economical improvement of roads in agricultural districts. In any case, to whatever extent the improvement of a road may have been effected, attention to its proper drainage is a matter of the first importance, if its best condition is to be maintained.

While mention is being made of roads in connexion with agricultural economics, it may be opportune to attend to the fact that much more use may well be made of means for overhead transport and portable railways. The latter are of particular application on estates already possessing permanent track for purposes like that of cane haulage, and where wide cultivation is practised. They can be made to connect with the permanent lines, and form a means of effecting the carriage of estate products from the fields, and of manures to the cultivated areas, with no necessity for transfer, and with the greatest economy in the provision of energy for traction.

Another matter to which a large amount of attention may well be given is the practice of economy in the construction of buildings on estates. There is often a great waste of material when these are being erected, on account of a lack of knowledge as to the relation between the size of the stuff used and the stresses that it can support, so that useless expenditure occurs in the provision of unnecessary material. In the same connexion, useful consideration might well be given to the greater employment of round buildings† in the place of those which are square or oblong. These are the most

* Described most recently in *Press Bulletin* No. 33 of the University of Nebraska Agricultural Experiment Station.

† See *Agricultural News* Vol. IX, p. 153.

economical in construction, as they enclose the greatest area with the smallest provision of material, and where it is necessary continually to remove produce from one part of the building to another, as in places where stock is fed, economy is effected in the shorter distance which such produce has to be conveyed. In the West Indies, round buildings have a particular advantage in that they most readily resist high winds and hurricanes.

The subject may be extended almost indefinitely, among other matters that have a more obvious connexion with it being economical methods of keeping manures; the constant provision of good drainage, especially for increasing the available moisture in the soil; the provision of wind-breaks* for making plants grow better, preventing the falling of fruit, and conserving the soil moisture: and the utilization of waste products from the estate. Though these and others equally important cannot be dealt with here, it is hoped that what has been said may suggest useful lines of thought in connexion with the practice of economy on estates.

SUGAR FROM SHREDDED CANE.

Much interest has been evinced lately in the process by which sugar-cane is shredded and dried, and exported from its country of origin to factories where the sugar is extracted. The results of the trials have been eagerly awaited, and it may be said at present that success for the process appears to be indicated.

A statement to this effect occurs in the *American Sugar Industry and Beet Sugar Gazette* for January 1911, which quotes from the *Madison Journal* (Wisconsin) for December 20, 1910. More information is given, however, in the *Louisiana Planter* for January 21, 1911, where an anonymous article is presented, from which the following facts are taken.

The experiments are described as constituting an attempt to procure white sugar directly from the sugar-cane without the use of bone-black filters. They have been carried out at the factory of the United States Sugar Company at Madison (Wisconsin). As is well known, the shredded and dried cane was prepared at Nipe Bay, Cuba; this was done by first of all subjecting the cane to the action of two closely placed sets of circular saws, on shafts revolving in opposite directions, which cut the cane into shreds about the size of a toothpick. The cane was then sent on to a drying oven, through which it was carried by travelling belts, remaining there until all the moisture, except 6 or 7 per cent., was removed. The dried cane finally passed over screens, which separated the 'pith' from the 'fibre', the two products then being baled separately.

When the shredded cane arrived at the factory, two kinds of attempts were made to deal with it. In the first, the diffusion process was employed, but was found to be too slow to be of practical use, apparently because the water pressure in the cells packed the cane so tightly that circulation could not take place. The remedy was tried of reversing the direction of the water pressure, without success. In these trials, the pith alone was used; but as the fibre is less likely to pack together and stop the flow of the diffusion water, it is thought that the method may be employed successfully for this, and trials are to be made.

Great success is said to have been obtained with the second method, in which the sugar was extracted from the dried cane by means of centrifugals. The first part of the process consisted in shredding the baled cane again by subjecting it to the action of saws, on to which it was fed from an endless moving platform. The effect was to tear the cane into shreds, which were sucked up into a wide tube and fell into a mixing vat: here the first cane is mixed with water, while later, it is treated with the last water that has been used for the exhausted cane.

The next stage in the process was the extraction of the sugar. For this, the mixture was fed into centrifugals where the sugar is extracted with such speed that in less than two minutes the amount in the pith is reduced from 55 or 60 per cent. to ·01 per cent. or less. The similar reduction for the fibre takes place in about three minutes. A useful feature of this method of treatment is that it leaves the residue of megass dry enough to be packed for shipment to the paper mills.

The juice coming from the centrifugals has a dark brown colour and is very dirty, testing between 11° and 14° Brix; its purity should be about 89·5 per cent., but was found to be actually 72·5 to 74·4 per cent.

The first stage in the purification of the juice, which is known as raw juice, is to mix it with 2 to 3 per cent. of lime, added in the form of milk of lime of about 25° or 30° Beaumé. After the mixture has been subjected to the action of carbon dioxide, the juice is pumped through filter presses in which it loses the calcium carbonate that has been formed, as well as a large proportion of the impurities. The juice passing from the first filter possesses an alkalinity of about 0·7 per cent., a purity of about 74·1 to 75·9 per cent., while the Brix has been reduced to about 7° or 8°. A second carbonatation is now carried out, making the characteristics of the juice as follows: alkalinity 0·2 to 0·3 per cent., purity 74·6 to 76·5, Brix between 6° and 7° (on account of the addition of water containing sugar, from the filter presses), colour light yellow.

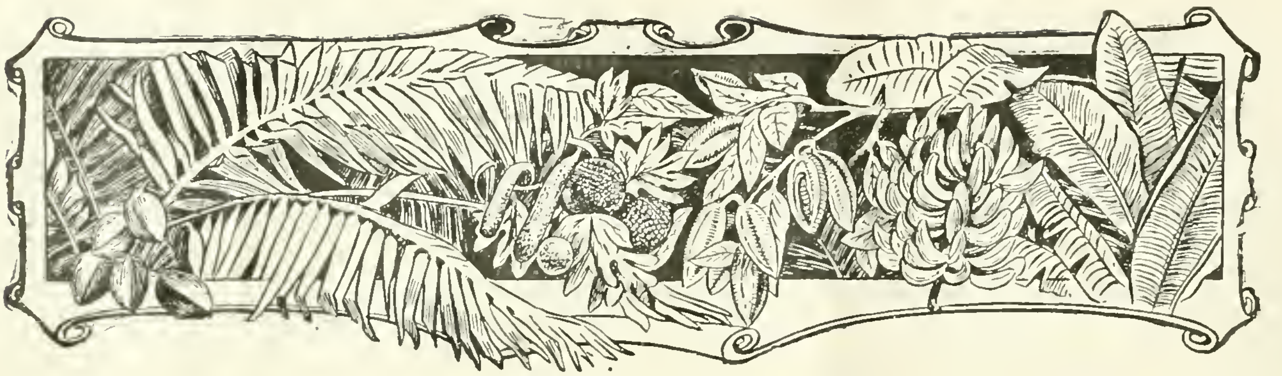
The juice is now sulphured, with the result that it is bleached and its purity is increased, the alkalinity becoming ·01 to ·02 per cent and the purity 75 to 76·8. The final result is to produce a juice having a Brix of 5° to 6·5°, in which state it runs into the evaporators.

In the evaporators, the density becomes about 60° Brix; the juice from them is passed through thick juice filters and sand filters of the kind used in beet sugar manufacture. It has now the following qualities: purity 76·7 to 77·5 (estimated at 95·0 per cent. for normal cane), and alkalinity less than ·002 per cent. Such juice produced a massecuite having a light brown colour, a Brix of about 92·8°, and a purity of 74·5 (estimated at 92·2 to 92·8 for normal cane).

The sugar obtained in this way possessed a very light canary-yellow colour; it was reboiled and formed a very white sugar when separated from the mother liquor in the centrifugals. It is a matter of importance that this sugar is hard, with a high lustre and a grain suitable for marketing purposes.

Future work will include the enlargement of the drying plant at Nipe Bay, and the installation of continuous centrifugals at Madison in the place of the sugar centrifugals that have been used so far. In this way, the capacity of the plant will become 100 tons of dried, or 300 tons of standing, cane per day of twenty-four hours. The first actual manufacturing season will commence at some time during this month.

*See *Agricultural News*, Vol. X, p. 1.



FRUITS AND FRUIT TREES.

THE MANGOSTEEN IN DOMINICA.

Mr. J. Jones, Curator of the Botanic Gardens, Dominica, has forwarded the following note on the mangosteen in that island. The acclimatization of this plant that appears to be taking place in Dominica would seem to be a matter for encouraging the growing of the mangosteen on a larger scale in the West Indies:—

At the Point Mulâtre estate, Dominica, two fine mangosteen trees, thirteen years old, are now fruiting for the first time. One specimen is bearing several dozen fruits, and the other a single fruit. There are now known to be four bearing mangosteen trees in Dominica. As quite a number of estates possess a few young specimens of this interesting tree, it is probable that in the course of a few years the fruit will be fairly well known in the island, and may, in the course of time, be available for export.

One point in this connexion is worthy of notice. The seedlings raised from trees established in the West Indies show much greater vigour, and thrive better, than did the original imported plants. This is probably due to acclimatization. With this increased vigour, and with great care in growing and selecting land and position, it may be possible to bring trees in fruit during their ninth or tenth year.

The first imported mangosteen plant took many years to come into bearing. The plant at the Botanic Station required sixteen years. Now, trees have fruited at thirteen years. The vigour of some of the younger specimens is such as to warrant the expectation stated above.

COFFEE AND COFFEE DISEASE.

An article in *L'Agriculture Pratique des Pays Chauds*, No. 91, p. 337, gives a short account of some of the efforts that are being made in the French colonies against *Hemileia vastatrix*—the most destructive fungus pest of coffee. In Réunion, it seems, these are chiefly concerned with the employment of solutions containing sulphate of copper, which are applied three times in quick succession, at intervals, without waiting for the appearance of the disease—a treatment that has met with encouraging success during the two or three years in which it has been tried. Added to this, for the better success of the method, planters are paying more attention to the use of manures for increasing the power of resistance of the trees, and are receiving useful assistance through the employment of judicious pruning. In the Comoro Islands, efforts to combat the disease have been restricted so far to the introduction, to some extent, of Liberian coffee (*Coffea liberica*), mainly because the production of coffee is regarded as a secondary industry.

It is in Madagascar where the most conclusive results have been obtained through the introduction of resistant varieties. Liberian coffee grows successfully, but its special characteristics lessen the interest in it. The greatest success has been obtained with *Coffea congensis*, var. *Chalotii*, and then with *C. canephora*, var. *opaca*, and *C. javanica*.

The Manchester Fruit Market.—Manchester has for some considerable time been the second soft fruit market for the United Kingdom. But until 1894, no market was established in Manchester for green fruit, merchants obtaining their supplies from Liverpool. With the inception of the ship canal an effort to establish a green fruit market succeeded, and since that time trade has yearly increased, until Manchester has become one of the foremost markets in the country. Goods are sold by auction by three firms of brokers, who collectively handle over 1,000,000 packages of oranges, apples, lemons, grapes, etc., representing a turnover of more than £500,000 per annum. The sales (which are held twice weekly) are attended by buyers from all parts of the country, and at a recent sale day some 40,000 packages of fruit were sold. Eleven steamers are employed to bring fruit from the Mediterranean. Large supplies of apples and pears also arrive from America and Canada by the regular lines of steamers. Manchester is admittedly the best market in England for Spanish onions, and favourably compares with other markets for oranges, lemons, etc. American and Canadian shippers are waking up to the advantage of shipping apples to Manchester. Very satisfactory prices have been obtained this season as compared with those in other markets, and there is every prospect of prices further advancing. (The *Chamber of Commerce Journal, Trade Review*, January 1911.)

SPONGE CULTURE.

The United States Bureau of Fisheries has recently published a bulletin entitled *A Practical Method of Sponge Culture*, by H. F. Moore, Scientific Assistant, United States Bureau of Fisheries. This paper was presented before the Fourth International Fishery Congress, held at Washington, U.S.A., on September 22 to 26, 1908, and was awarded the prize of $100 in gold offered by Hayes Bigelow for the best demonstration, based on original investigations and experiments, of the commercial possibilities of growing sponges from eggs or cuttings.

The following points from this bulletin are given here, as being likely to prove of interest in the West Indies, where it would seem possible that sponge culture might be taken up in certain localities with a prospect of a profitable return. It may be mentioned, by the way, that a list of sponges identified from the St Vincent Grenadines was given in the *Agricultural News*, Vol. IX, p. 307.

In discussing the conditions and needs of the sponge fisheries, the author states that it is not likely that any new sponge fishery district with possibilities of great commercial importance will ever be discovered, although new beds and new regions may come into productiveness; and that the present method of harvesting sponges is likely to deplete the sponge beds to such an extent that they may no longer be profitable to work.

The demand for sponges in the United States is growing rapidly, and has become already very great The importation of foreign sponges during the three years from 1905 to 1907 averaged an annual valuation of about $531,000 The domestic production during the three years 1906 to 1908 was valued at an average of $658,000, and the greater part of the sponges was put to use in the United States.

The previous trials in sponge culture are recounted in the bulletin, and the possible lines of experiment discussed at some length. In this connexion, the following methods of propagation are considered: grafting, growing from eggs, growing from degenerative bodies and dissociated tissues, and growing from cuttings. From a practical point of view, only the last of these was found to be of value.

The growing of sponges from cuttings is a fairly simple operation. Any healthy sponge, whatever its shape or size, may be used for seed. In collecting and transporting sponges for planting, care must be exercised to keep them from injury. Any bruising or abrasion of the surface of the sponge is injurious, and contact with fresh water, or water of a less degree of salinity than the open ocean, is fatal to them. Seed sponges which are being kept a short time for planting purposes may be strung on a rope stretched between stakes in such a manner that the sponges are suspended just clear of the bottom of the water.

It has been found by experiment that cuttings about $1\frac{1}{2}$ by $2\frac{1}{2}$ by 3 inches, or of approximately the same volume as would be given by these dimensions (viz. about 10 to 11 cubic inches) are the best for planting. The cutting is best done with large knives kept sharp by whetting on a coarse whetstone, a ragged cutting edge being preferable to a smooth one. The sponges are not ordinarily injured by exposure to the air during the time necessary to make the cuttings. It is a good plan, however, to take them from sea-water and as soon as possible to return the cuttings to this. The water in which sponges or the cuttings are being kept should be changed, if in tubs or similar receptacles, about once an hour, the stale water being replaced by fresh sea-water of full saline strength.

The finding of suitable material for the attachment of the planted sponges has been one of the greatest difficulties found in the experiments. After extensive trials, cement discs and triangles for the substratum, and lead and aluminium for the metals to hold the cuttings in place until the organic attachment is brought about by the growth of the cuttings, have been found most serviceable.

These discs are 10 inches in diameter and about $1\frac{1}{4}$ inches in thickness. They may be made with a short spindle of lead rod (or wire), $\frac{1}{4}$-inch in diameter, which projects $2\frac{1}{2}$ inches from the centre on one side, or with two holes through the disc, diametrically opposite each other and about 2 or 3 inches from the centre.

By means of a stiff steel point which fits on the top of the spindle the cuttings may be impaled on it where they form an attachment to it, and to the disc, by the process of growth. In planting, the discs are dropped outward from a small boat, care being taken that they will be right side up when in position on the bottom.

When the plain discs with the two holes are used, the cuttings are fastened in place by means of an aluminium wire which pierces the cutting, and passes through the holes, the ends being twisted together on the reverse side of the disc.

It is estimated that cuttings of the size indicated above will increase in size to give marketable sponges in four years, and that about 4,840 cuttings per acre of bottom can be successfully grown. The cost of the entire operation of procuring the seed sponges, making the cuttings, providing the discs and planting an acre amounts to some $230. The sponges to be harvested at the end of four years should be worth about $968, allowing for a mortality of about 20 per cent. The discs and spindles would be available for replanting, and this would really reduce the first cost of the undertaking.

The culture of sponges would seem worthy of experimental trials in those islands of the Lesser Antilles where comparatively shallow water offers seemingly favourable opportunity. In the shallow water, more especially, in certain localities of Barbados, Antigua, Barbuda, the Grenadines and the Virgin Islands, there may be found conditions under which sponges can be grown, and a profitable industry started.

BRITISH GUIANA AND THE CANADIAN EXHIBITIONS, 1910.

Particulars of the prizes that have been gained by different Colonies and Presidencies in the West Indies, at the recent Canadian Exhibitions, have been given in the *Agricultural News*, Vol. IX, pp. 343 and 412. To make the record complete, the following list of awards to British Guiana, taken from the *Journal of the Board of Agriculture of British Guiana*, for January 1911, is presented here:—

Gold Medal: Permanent Exhibitions Committee, for general exhibit.

Gold Medal and Diploma: the Hon. B. Howell Jones, for sugars.

Silver Medal and Diploma: T. Earle, Esq., for cacao.

Silver Medal and Diploma: Colonial Chocolate and Confectionery Co., for confectionery.

Diplomas: Messrs. Sprostons, Limited, for greenheart; the Consolidated Rubber and Balata Estates, Limited, for balata; the Demerara Development Company, for citrate of lime; Messrs. Sandbach Parker & Co., for general exhibits; Messrs. Wieting & Richter, Limited, for rice and sugar; the New Colonial Company, Limited, for sugar; Messrs. Booker Bros., McConnell & Co., Limited, for molascuit.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date February 13, with reference to the sales of West Indian Sea Island cotton :—

Since our last report, about 30 bags of West Indian Sea Island cotton have been sold at 20*d.* to 21*d.* Buyers continue absolutely indifferent, and we think it will be some time before there is any demand for quantity.

The pressure to sell American Sea Islands is so great, that we do not think English spinners will enter the market for quantity, unless a concession of 2*d.* per lb off current rates be entertained. Spinners have stocks in hand from last season's crops of both American and West Indian growths, and cannot effect sales of yarn.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending February 11, is as follows:—

The Factors, becoming more concerned at the absence of demand, and realizing that they could not secure their asking prices, decided to make some concession to meet the views of buyers, resulting in sales of about 1,000 bales, on a basis of Fully Fine 32c

The buying has been for England, France and the Northern mills. At this decline the Factors hope that the demand will become general, admitting of their selling more freely.

The supply of Extra Fine is small, and it is probable that the stock of this grade will soon be disposed of.

The larger portion of the stock consists of the lower grades, tinged and off cotton.

We quote viz:—

Extra Fine Islands at	33c. = $18\frac{1}{4}d.$	c.i.f. & 5	per cent.
Fully Fine ,,	32c. = $17\frac{3}{4}d.$	,, ,,	,, ,,
Fine ,,	30c. = $16\frac{3}{4}d.$	,, ,,	,, ,,

COTTON-GROWING IN ALGERIA.

Great efforts are being made by the Algerian Government to encourage the planting of cotton. In 1908, four years after the first experiments had been started, a crop grown on irrigated land in the district of Orleansville was sold at Havre at $8\frac{3}{4}d.$ per lb., representing a net profit to the grower varying from £5 10*s.* to £12 10*s.* per acre, whilst an offer of $9\frac{1}{4}d.$ to $9\frac{3}{4}d.$ for the same consignment was subsequently received from Liverpool; more recently a first shipment of 10,000 kilos. [22,000 lb] has realized 1*s.* $2\frac{1}{2}d.$ to 1*s.* 3*d.* per lb. at Liverpool. The crops gathered on these lands have varied from 1,200 to 25,000 kilos. of raw cotton, yielding from 380 to 800 kilos. of ginned cotton per hectare [330 to 700 lb. per acre] which, at the prices last quoted, with the addition of by-products at market prices, would produce a gross return of from 1,100 to 3,000 fr. per hectare [£22 to £48 per acre]; the cost of cultivation, in the case of the grower who shipped the above consignment, was 557 fr. per hectare [£9 per acre]; in some instances it is more, but it has never reached 1,000 fr [£16 per acre], so that it is estimated that the net profit on cotton-growing on these lands amounts to between 850 and 2,000 fr. per hectare, or approximately from £14 to £32 per acre. This calculation is based on abnormally high prices, but with ordinary prices the yield would still be very large. Experiments, which have been continuously successful, have also been conducted on lands impossible of irrigation; at Philippeville, 17 acres under Mississippi and 11 acres under Egyptian Mitafifi have yielded 154 cwt. and 85 cwt. of raw cotton, respectively, whilst at Bona 130 cwt. and 133 cwt. of these respective varieties have been obtained from two plots of ground each containing about 15 acres, giving an estimated net profit of £11 an acre. In comparison with these figures, it is pointed out that in the United States of America the average net profit to the cotton grower, calculated over a period of twenty years, is between £1 18*s.* 6*d.* and £2 13*s.* 6*d.* per acre, whilst in Egypt it has been shown not to exceed £1 15*s.* On the above grounds, local agriculturists have been strongly urged to plant their ground with cotton, and several hundred additional acres are now in course of cultivation. (The *Board of Trade Journal*, December 1, 1910, p. 441.)

Cotton Manufacture in India.—Sixty years ago, the first cotton spinning and weaving mill was projected in India. Ten years later the number had increased to twelve, containing 338,000 spindles. According to the Bombay Millowners' Association returns to June 30 last, there were 243 mills, with 20 others in course of erection. The number of spindles had risen, in round numbers, to 6,200,000, and the looms to 82,700; the hands employed had increased to 234,000, and the cotton consumed to about 2,000,000 bales. The capital in the industry exceeds £12,000,000.

For the year ending March 1910, the product of the Indian cotton mills was 627,361,000 lb. of yarn and 228,723,000 lb., or 962,463,000 yards, of woven cloths. There were exported 227,400,000 lb. of yarn and 91,100,000 yards of cloth. In eleven years, the production of cloths had increased 133 per cent. by weight and 193 per cent. by length. But imports of piece-goods increased 63 per cent. nearly all coming from the United Kingdom. (The *Textile Mercury*, January 28, 1911.)

THE IMPERIAL DEPARTMENT OF AGRICULTURE IN THE WEST INDIES.

A paper with this title was read, with lantern illustrations, by Sir Daniel Morris, K.C.M.G., late Commissioner of Agriculture for the West Indies, at a meeting of the Royal Colonial Institute, held at the Whitehall Rooms, Hôtel Métropole, on January 10, 1911. The chair was taken by the Right Hon. Lord Brassey, G.C.B. Sir Daniel prefaced his paper by drawing attention to the possession by the British of some of the richest portions of the tropics, the extent of the area being about 3,000,000 square miles, or 1,920 million acres, with a population of about 300 millions, and an estimated value of exports of not less than 230 million sterling. In regard to the portion of this area known as the West Indies in its widest sense, that is comprising the West Indies, the Bahamas, Bermuda, British Honduras and British Guiana, it was stated that the area is 109,836 square miles, with a population estimated at 2,300,000, and a total trade having a value of about 22 million pounds. Further, in regard to the West Indies it was pointed out that this total trade had increased, in exact figures, from £15,647,816 in 1903 to £21,429,301 in 1909. Sir Daniel gave as the causes of this increased prosperity: (1) the revival of confidence in the sugar industry as the result of the abolition of bounties; (2) the increase in the production of cacao in Trinidad, Grenada and Jamaica; (3) the development of the American fruit trade in Jamaica; (4) the introduction of Sea Island cotton into St. Vincent, Barbados and the Leeward Islands; (5) the extension of the cultivation of limes in Dominica and of rice in British Guiana.

Coming to the subject of the paper, namely the work of the Imperial Department of Agriculture in the West Indies, it was pointed out first of all that this Department was created on the recommendation of a Royal Commission, made in 1897. For the purpose of this creation, funds were voted by Parliament on August 2, 1908, on the motion of Mr. Joseph Chamberlain, and the average amount that had been expended up to 1908 was at the rate of £17,100 per annum, of which about £5,000 was required for the Head Office, the remainder being used for grants-in-aid of Botanic and Experiment Stations and agricultural education in the individual colonies. The account proceeded to a description of the wide activities of the Imperial Commissioner of Agriculture both in connexion with the larger and the smaller colonies, and pointed out that, as far as the larger colonies possessing their own departments of agriculture are concerned, Trinidad had taken advantage of the services of the Mycologist, in 1906, while the Government of British Guiana had made application for the services of the Entomologist, in 1908.

After giving an outline of the general duties of the Department, and stating that the details of its working have been presented regularly for discussion at the several West Indian Agricultural Conferences that have been held, the lecturer pointed out that, among the experiments carried on by the Department, those with sugar-cane had proved of great service in the West Indies, and that their usefulness had extended to other countries, such as the Southern United States, Australia, Natal and Mauritius. In the same connexion, reference was made to the developments in the direction of the establishment of sugar factories in Antigua, with a prospective factory in St. Kitts, owing mainly to the efforts in the former instance of Sir Gerald Strickland, K.C.M.G., late Governor of the Leeward Islands, and Dr. Francis Watts, C.M.G., the present Imperial Commissioner. The sugar industry, further, was showing the good fruits of the recommendation of the Royal Commission to which reference has been made, namely that less dependence should be placed in the West Indies on that industry, and that a greater diversification of agricultural interests should be brought about. In illustration of this, the value of sugar-cane products had declined during the past few years, while as has been seen, the total exports had increased.

As an example of a case where the greatest good had resulted from a scientific investigation conducted by an Officer of the Department, Sir Daniel referred to the work of Mr. Maxwell-Lefroy, the first Entomologist on the Staff, in connexion with the moth borer of the sugar-cane—work that had placed planters in possession of a full knowledge of the life-history of this pest, as well as of the means of controlling it.

The industry second in importance to sugar, namely cacao production, had also greatly benefited by the work of the Department. Later, reference was made to limes and lime products, which form the material of an industry not as old as the sugar and cacao industries, but one which has been established for some years, and is making good progress, notably in Dominica, Montserrat and Jamaica. In this relation, reference was made to the useful work that is being done by the West India Committee in extending the interest in limes and lime products, in the United Kingdom.

For the purpose of showing the possibility of the development of new industries in the West Indies, attention was drawn to rice-growing in British Guiana, the cultivation of Sea Island cotton, the increased exports of limes and lime products, and the greater interest that is being taken in tobacco-growing, particularly in Jamaica, as well as to the establishment of rubber plantations, more especially in British Guiana, Trinidad and Tobago. The development of the second of these, namely the growing of Sea Island cotton, had been initiated by the importation by the Imperial Department of Agriculture of the best seed from the Sea Islands, in 1903. The growth of the industry is shown by the fact that, while 7,600 acres was planted in 1904, the area in 1908 was 24,000 acres, and there was the further circumstance that the total exports of cotton from the West Indies, including Marie Galante, now amount to 15,000,000 ℔., with a value, in lint and seed, of £800,000. In connexion with this matter, Sir Daniel referred to the valuable assistance that has been received from the British Cotton Growing Association, as well as from the interest of manufacturers in Lancashire, through whom most useful guidance for dealing with the crop had been obtained in the West Indies.

After referring to the work of distribution of planting material from Botanic Stations in the West Indies, the lecturer gave a review of what has been done in connexion with education and with the co-ordination of the efforts of scientific workers in different parts of the colonies. The success of the Department in this and other work had led to the formation of Departments of Agriculture in other parts of the world, on much the same lines—a policy that was showing itself worthy of continuation

In conclusion, the lecturer made special reference to the valuable assistance that has been given by the Royal Gardens at Kew, with the aid of the Imperial Institute, as well as by the West India Committee and the West India Club, finally quoting opinions as to the usefulness of the work of the Department, expressed by members of the recent Royal Commission, and stating that, with the guarantee of its continued maintenance for a further period of years, it will do much toward the general advancement of the West Indies.

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 subject of the editorial is The Practice of Economy on Estates. The matter could not, of course, be treated in a complete manner: the article is rather intended for the purpose of suggesting lines of thought that may be pursued in connexion with the question.

It is followed by an abstract of an account of the experiments that have been made in the United States, in extracting sugar from sugar-cane shredded in Cuba, and exported after being dried.

An interesting article on sponge culture appears on page 69. It shows that compensation for the depletion of the sponge banks that is threatened in most parts of the world may be made, to a large extent, by the employment of judicious planting.

Page 71 presents an abstract of a paper of much interest, read recently by Sir Daniel Morris, K.C.M.G., late Imperial Commissioner, and dealing with the Imperial Department of Agriculture in the West Indies.

Some useful facts in connexion with the leguminous plant *Sesbania aculeata*, used as a green manure, are given on page 73.

The Insect Notes, on page 74, present facts of interest concerning the moth borer of sugar-cane, in its special relation as a pest of Indian corn, in the United States.

On page 78, the Fungus Notes summarize the most recent information concerning some diseases that are known to attack both rubber and cacao trees to a serious extent.

Index and Title Page.

The Index and Title Page of Volume IX of the *Agricultural News* are 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.

It has been endeavoured to make the index more detailed in nature than has been the case in the past. This applies particularly to the portion dealing with Insect Pests and Plant Diseases, with the result that this possesses the nature of a dictionary of the common and scientific names, in addition to being useful as an index, in accordance with the first intention.

Postponement of the Agricultural Conference, 1911.

A note was given in the *Agricultural News* for January 7, 1911, p. 8, announcing the postponement, until the middle of April, of the Agricultural Conference, originally proposed to be held in January of this year.

Since the matter has been given fresh attention, the Imperial Commissioner of Agriculture has received information from His Excellency the Governor of British Guiana to the effect that it will not be found convenient to that Colony to hold the Conference in April, as was suggested.

It is probable, therefore, that the Conference will take place toward the end of the year: the question is being given further consideration, and this is as definite a statement as can be made at present, under the circumstances.

Machines for Gathering Stones.

A short note on trials with machines for gathering stones, presenting information from the *Natal Agricultural Journal* for August 1910, p. 207, was given in the last volume of the *Agricultural News*, p. 348.

Further information is contained in the issue of that Journal for December 1910, p. 685, in which it is stated that the inventors of the machine found best for the purpose, Messrs. J. & R. Forgan of Port Pirie, South Australia, are prepared to supply the machines in any quantities for £50 each (f.o.b. Port Adelaide).

The following description of the machine is given in the latter-mentioned issue of the *Natal Agricultural Journal*. 'The machine is built on a V-frame of T-section steel. The bodies or tines are fitted with our patent automatic spring relief draft, this being a close-coiled expansion spring 14 inches long by $1\frac{1}{2}$ core by $\frac{3}{8}$ steil, which is adjustable to any tension, and has a roller attachment that works up and down on the body, taking the tension off the tines when jumping, thereby preventing strain on the implement or horses. In addition to being a gatherer, this machine is easily converted into a cultivator of thirteen tines, cutting 7 feet, by taking out two bolts in each body, removing the gathering attachments, and fixing on a cultivator share. The machine clears 10 feet when used as a stone-gatherer, is very strongly built of steel throughout, and is light of draft.'

Abnormal Rainfall in St. Lucia and Dominica.

A letter dated February 7, 1911, has been received from Mr. J. C. Moore, Agricultural Superintendent of St. Lucia, stating that an excessive rainfall for the time of the year has been experienced recently in St. Lucia; 15·53 inches was received at the Botanic Station, and 15·24 inches at the Experiment Station, Union, between January 1 and February 6. Greater amounts than these have been recorded in the interior of the island, but complete returns are not yet available. The rains were accompanied to a large extent by high winds.

The effect of this has been to cause the destruction of cacao flowers, and excessive blackening of the pods, as well as to increase the difficulties of drying, in cases where artificial means are not employed. Further, Mr. Moore states that the reaping of the sugar-cane crop will be seriously delayed, in the absence of improvement in the weather.

A communication from Mr. J. Jones, Curator of the Botanic Station, Dominica, dated February 15, 1911, reports that very heavy rains fell in the South Windward District of that island on the night of February 7. The effect was to produce many landslips with considerable damage to cultivations, notably at Stowe and Geneva estates. At the former place, about 15 acres of lime plants has been swept away, together with the mill house, while a loss of cultivation of the same kind, which is estimated at a like area, has occurred at Geneva. Considerable losses were also sustained by small proprietors at Dubecque and Petite Savanne.

Mr. Jones hoped to pay an early visit to the districts, in order to afford such assistance as is possible, and to make a further report.

St. Vincent Starches and Canadian Trade Reciprocity.

In the report of the committee appointed recently (see *Agricultural News*, Vol. X, p. 12), by His Honour the Administrator of St Vincent, to consider and make recommendations regarding the proposals for reciprocity with Canada put forward by the recent Royal Commission, special attention is given to arrowroot and cassava and their products. The committee recommends that, in addition to a preference of not less than 20 per cent. being made in favour of St. Vincent, in respect of the articles mentioned in Schedule B of Appendix I of the first part of the report of the Royal Commission, that, as arrowroot and its by-products form one of the only exports in respect of which the colony is likely to benefit from a preferential agreement with Canada, these should be placed on the Canadian free list, in accordance with the suggestion of the Royal Commission, contained in paragraph 90 of the first part of its report.

The suggestion is also made that cassava and its products from St. Vincent and other West Indian colonies possessing reciprocal trade relations with Canada should either be admitted duty free, or that there should be a refund of duty to such Canadian manufacturers as should use these articles as raw material, on evidence of their use being furnished.

The question as to the importation of West Indian cassava into Canada under favourable terms is important, as there may be brought about a great demand for the product, for the manufacture of starches and syrups.

The Tenure of Private Estates in Java.

Private estates in Java are held under grant from the Government, and a Law has been passed recently to provide for the restoration of these, under certain circumstances, to the State Domain.

The mode of application of the Law is through a declaration by Ordinance to the effect that it will be to the benefit of the general interest if one or more certain private estates in the country are restored wholly or partly to the State Domain. If, after such declaration, the ownership of the land required cannot be taken over as a matter of friendly agreement, the title may be transferred by judicial sentence, and the compensation that is to be granted to the owner will be paid at the time when this is done; the title, however, only passes after the compensation has been paid.

Further arrangements that are necessary for the execution of the Law will be made under a General Ordinance.

Sesbania Aculeata as a Green Manure.

Notes on *Sesbania aculeata*, which is known largely in India as Dhaincha, have appeared from time to time in the *Agricultural News*: references to these will be found on page 325 of the last volume. The particular usefulness of this plant is as a green manure, and its employment in this way appears to be under considerable extension in India.

The *Quarterly Journal of the Department of Agriculture*, Bengal, for October 1910, p. 94, gives a note on the employment of the plant in this way, in connexion with tobacco cultivation, in certain districts in India. The result was to increase the crop by about 50 per cent., and although, for some reason, the leaves were thinner than those produced in the ordinary way, and therefore of less value locally, a larger monetary return was obtained than when the green dressing was not used. The matter of this production of thinner leaves in land where *Sesbania aculeata* has been turned under will be investigated.

A like success has been obtained in the same district with rice, and the experiments are being continued along similar lines with both tobacco and rice.

As has been stated before, in the *Agricultural News*, *Sesbania aculeata* occurs in many islands in the West Indies, being often found along roadsides. It is a small, woody plant, having a prickly, cylindrical stem, and leaves with many leaflets. The flowers are yellow, with the largest petal dotted with purple, and the pods are long and flattened, with a sharp beak.

INSECT NOTES.

THE MOTH BORER OF THE SUGAR-CANE AS A PEST OF INDIAN CORN.

The moth borer of the sugar-cane (*Diatraea saccharalis*) has long been known as a serious pest in all parts of tropical America where sugar-cane is grown. Among the early entomological work carried on by the Imperial Department of Agriculture was an extensive study of this insect, as a result of which its life-history and habits became known. A paper entitled 'The Moth Borer in Sugar-cane' appeared in the *West Indian Bulletin*, Vol. I, p. 327, and subsequently the moth borer has been included in all accounts of the insect pests attacking this crop. In the *Agricultural News*, also, mention has from time to time been made of the work of this insect, and of the methods used for its control.

The moth borer is not recognized in the West Indies as a serious pest of Indian corn, although it has been observed to attack this crop in several instances. In the southern part of the United States, however, it is commonly known as the larger corn-stalk borer, which would indicate that it is best known as a pest of Indian corn, in spite of the fact that it is a serious pest of sugar-cane in those portions of the Southern States where this crop is cultivated.

A circular (No. 116) recently issued by the United States Department of Agriculture, Bureau of Entomology, entitled The Larger Corn-Stalk Borer (*Diatraea saccharalis*, Fab.) presents a considerable amount of information which may be of interest to readers of the *Agricultural News*.

It is believed that *Diatraea saccharalis* was introduced into the United States from the West Indies or Central or South America with importations of sugar-cane cuttings, many years ago. It occurs at the present time in localities considerably further north than those where sugar-cane is cultivated.

Corn is damaged in two ways by the larvae of the stalk-borer, which, in the latitude of South Carolina, has two broods, or generations, a year. The eggs are laid in spring (April and May) on the leaves of the young corn plants. The young caterpillar crawls down the leaf into the centre or throat of the plant, where it feeds for a time, tunnelling through and through the rolled-up, tender leaves. Later in the season, it descends on the outside of the plant, and attacks the stalk near the surface of the ground. A hole is cut through the outer wall of the stalk, by means of which the caterpillar is able to enter the central pith. The soft, central portion of the stalk furnishes food for the remainder of the larval life of the insect: this, when fully grown, tunnels upward a short distance, turns to one side, and cuts a circular hole through the outer wall. A few loose threads are spun across this opening, and the larva retreats into its burrow and transforms to the pupal stage.

The length of time required for the development of the larvae in the spring is about twenty or thirty days. The eggs hatch in from seven to ten days; the pupal stage occupies from seven to ten days, after which time the adult moths emerge, and egg-laying for the next generation commences almost at once. The time occupied for the first generation, including egg, larva, pupa, and adult, is from thirty-four to fifty-two days.

The eggs for the second generation are laid on the leaves, and the larvae proceed, after feeding there a short time, to attack the stalk of the corn near the ground. These caterpillars do not injure the plant by entering the centre, in the manner of the larvae of the first brood. The larvae of the second live in the pith of the corn-stalk, like those of the first but when fully grown they turn downward, and penetrate to the extreme base of the stem, where they pass the winter in the larval condition.

The over-wintered larvae change to pupae in the spring, and the adult moths emerge and fly about in search of young corn on which to deposit eggs.

This borer has been reported as attacking Sorghum (*Sorghum vulgare*), Johnson grass (*Sorghum halepense*), Guinea corn (*Andropogon Sorghum*, var. *vulgaris*), and Grama grass (*Tripsacum dactyloides*), in addition to Indian corn and sugar-cane.

In South Carolina, *Diatraea saccharalis* is stated to have but few natural enemies. The minute Hymenopterous egg parasite (*Trichogramma pretiosa*) has been found in a few instances, living in and destroying the eggs. The larva of a brown, velvety beetle *Chauliognathus pennsylvanicus* is a valuable natural enemy, from its habit of entering the holes in the stubble after the corn is cut and devouring the borer larvae. The termites or white ants (*Termes flavipes*) sometimes destroy the borers in the stubble in the winter. Fungi have been observed to attack and kill the larvae, but none of these agencies is thought to exert any great influence in checking the pest.

Rotation of crops is considered a very efficient means of combating the larger corn-stalk borer, for it has been proved that where corn follows corn in the same field, in successive years, the attacks are worse than when other crops intervene. The complete destruction of all stubble in the field during the winter is perhaps the best method to employ against this insect.

It may be well briefly to review the situation in the West Indies with regard to *Diatraea saccharalis*. This insect is commonly known as the moth borer—the principal insect pest of the sugar-cane. It occasionally attacks Indian corn as a stalk-borer, but no observations seem to have been recorded as to the habit of this insect of feeding on the corn leaves and tunnelling in the rolled-up leaves in the throat of the plant. The leaves of Indian corn are attacked in this manner by another insect, the corn ear-worm (*Laphygma frugiperda*).

The moth borer's eggs are laid on the leaves of the sugar-cane: the larvae enter the cane at the axis of the leaves, and most of the larval life is spent in the stem of the plant. The time required for the life-cycle is about fifty days. Breeding is probably continuous, one brood or generation following another. The greatest abundance of adult moths, and consequently the most rapid rate of egg-laying, occurs in February and March.

In addition to its direct effect, the moth borer has a very great influence on the welfare of the sugar-cane as a result of the easy access to the interior of the plant which is afforded to disease-producing fungi by means of the tunnels of the insect.

The remedies recommended and in use for the control of the moth borer, are: (a) collecting the eggs, (b) cutting out dead hearts. Parasites exercise a considerable influence in destroying numbers of eggs. Eggs of the moth borer should be kept a few days away from the fields, to allow the egg parasite to emerge. These, being able to fly, will find their way back to the cane fields, while it will not be possible for the young larvae that hatch to return in this way.

The collecting of eggs is not a difficult matter. The flat scale-like eggs are laid on the leaves of the cane, and children can easily be taught to find them. Dead hearts, the young cane shoots which are dead or dying as a result of the feeding of the borer at the growing point, should be cut out, care being taken that the cut is low enough, so that the larva is not left behind in the base of the plant.

The question has recently been raised in Barbados as to whether the cutting out of dead hearts is a beneficial practice. It is argued that the cut surface affords an additional area for infection by fungi, and that the injury from this source is greater than from the action of the borers, and their increase in numbers for the next generation. This is a point that should be carefully experimented upon by planters themselves.

The egg-laying season is now at hand. Either the eggs deposited on the mature canes, or the larvae hatching from them, will be disposed of in the process of reaping; those on the young canes are in a position to be collected, and if this is not done the larvae will cause the death of many plants during the next few months.

HALF-YEARLY EXAMINATION OF AGRICULTURAL SCHOOLS.

The following are the general reports of the examiner (Mr. F. W. South, B.A.) on the recent half-yearly examination of the pupils at the Agricultural Schools in Dominica, St. Vincent and St. Lucia:—

DOMINICA AGRICULTURAL SCHOOL.

Ten boys sat for this examination, all of whom were in the junior class. The average percentage of marks obtained was 52·3. This shows considerable falling off, as compared with that obtained by the juniors in the last examination. Poponne was the best, but G. T. Cuffy and Antoine also did satisfactorily.

The handwriting throughout was poor, and the diagrams very weak. English Grammar and Spelling still show great weakness, and have always been some of the chief difficulties with which the pupils have had to contend. The Chemistry was fairly satisfactory, but the other subjects were only moderate, and the Arithmetic and Geography were especially poor.

ST. VINCENT AGRICULTURAL SCHOOL.

Eighteen boys sat for this examination. Three were seniors, twelve juniors, and three new boys. The average percentages of marks obtained were as follows: seniors 74·8, juniors 57·5, new boys 73·6. In the case of the seniors, this average is almost identical with that obtained at the last examination. There is a slight decrease in the average obtained by the juniors, and a marked increase in that obtained by the new boys, as compared with the corresponding results given by last year's examination. The work of the seniors was again good, Floris Simmons being the best. Of the juniors, Otto and James Haynes were best, but were closely followed by Doddridge Davis and Joseph Bradshaw; the marks obtained by these boys were much the same as those recorded for the previous examination. On the other hand, Bertram Derrick and Claude Hazell, two of the three boys promoted at the commencement of the half-year, together with Joseph Robinson, obtained marks which were distinctly below the average. These boys require careful attention. Of the new boys, Julian McConnie was the best, but the work of all three was distinctly promising.

The Botany, Arithmetic and Composition of the seniors were good. Spelling and English Grammar were not so good as has usually been the case in recent examinations. The answers in Chemistry and Agriculture in this class were somewhat disappointing. The Arithmetic of the juniors requires some attention; the answers in this subject were not as good as on former occasions. Botany and Agriculture were also somewhat disappointing in this class. The three new boys sent in papers in Dictation and Geography which showed a very marked improvement on those submitted when they were probationers. The other subjects in this class were also satisfactory. The handwriting, general neatness, and tidy appearance of the papers were highly commendable throughout.

On the whole, the results of this examination are satisfactory, and it is clear that the pupils continue to receive very careful attention.

ST. LUCIA AGRICULTURAL SCHOOL.

Eight boys sat for this examination. Of these seven were seniors, and there was one junior. The average percentages of marks obtained were as follows: seniors 65·8, junior 53·8. These results are fairly satisfactory on the whole, though the junior boy was rather weak. Auguste did very well throughout, and Moise also sent in some good papers.

Dictation requires careful attention, as it appears to be much weaker than it has been previously. Attention should still be paid to Arithmetic, as there is no marked improvement in the papers on this subject, as compared with those of the previous examination. English Grammar is also open to improvement. The general appearance of the papers was neat and tidy, and the handwriting good throughout.

On the whole, the results obtained were fairly satisfactory, though somewhat variable. The pupils appear to have received careful instruction

TEPHROSIA PURPUREA AS A GREEN MANURE.

Seeds of *Tephrosia purpurea* have been obtained by the Department, through the courtesy of the Director of the Botanic Gardens, Buitenzorg, Java, and have been distributed for trial at the different Botanic and Experiment Stations.

Articles on this plant, describing its use for keeping down weeds, appeared in the *Agricultural News*, Vols. VIII, p, 405; IX, p. 281. Recently, information concerning its use as a green manure has been given in *Progress Report* No. L, of the Ceylon Agricultural Society, together with details of the analysis of the plant, by the Government Agricultural Chemist, some of which are reproduced here for the purpose of comparison with the similar facts for other green manures.

The percentage loss on drying in the sun was found to be 64·61 for the twigs, leaves and pods, and 44·89 for the roots. Further details for the sun-dried samples were found to be as follows, in percentages :—

	Twigs, leaves and pods.	Roots.
Moisture	17·50	12·50
Organic matter	78·85	84·75
Nitrogen in organic matter	2·24	0·84
Ash	3·65	2·75

The analysis of the ash of the whole plant gave the following figures, expressed as percentages: lime, 28·00; magnesia 14·40; potash, 11·96; phosphoric acid, 16·00.

Finally, details in regard to the analysis of the leaves and twigs are as follows, in percentages as before:—

	Leaves.	Twigs.	Leaves and twigs.
Moisture	7·00	6·00	6·57
Nitrogen	3·47	1·76	2·75
Nitrogen on dried sample	3·73	1·87	2·94

GLEANINGS.

A report by the International Sugar Committee, published in the *Frankfurter Zeitung* of December 20, 1910, gives the yield of sugar in Europe in 1909-10 as 6,092,070 metric tons. The estimated production for 1910-11 is 7,947,560 metric tons.

During January last, more than 22,000 cane cuttings, 1,000 lime plants and 104 miscellaneous plants were sent out from the Antigua Botanic Station. In regard to sugar-cane, several boxes of seed were sown, and nearly 100 varieties were planted out at the Skerretts Experiment Station.

A report by the Inspector of Agriculture, Uruguay, shows that the area of land under grain cultivation in the Republic during 1909 was about 1,258,000 acres; the similar figures for 1905 and 1900 were 1,150,000 and 1,193,000, respectively. As regards maize, the area increased from 364,000 acres in 1900, to 508,000 acres, in 1909.

The Department of Agriculture of Eastern Bengal and Assam has issued a forecast of the winter rice crop for 1910-11 on a basis of 9½ cwt. as the normal yield per acre. This should make the total outturn of 109,046,600 cwt. (or 67,851,223 bags of 180 lb.), which is about 5 per cent. less than the final estimate for the crop of last year.

The following figures are given in the *India-Rubber Journal* for January 21, 1911, for the imports of Maniçoba rubber into the United Kingdom during the years stated, the amounts being in tons: 1901, 176; 1902, 590; 1903, 865; 1904, 860; 1905, 675; 1906, 878; 1907, 1,024; 1908, 405; 1909, 770; 1910, 651.

An article in the *Western Daily Press* (Bristol) for January 7, 1911, shows that the exports of bananas from Jamaica to Avonmouth during 1901-2 was 600,000 bunches; this has increased to 780,000 bunches in 1909-10. In the same period the number of cases had increased from 36,000 to 65,000. These figures refer, of course, to exports in the Elder Dempster line of steamers.

Attention is drawn to the fact that a useful paper entitled The Culture of Hevea in the Malay Peninsula, by Dr. P. J. S. Cramer, Director of Agriculture, Surinam, is given in *The Proceedings of the Agricultural Society of Trinidad and Tobago* for January 1911. The paper is translated from Bulletin No. 25 of the Departement van den Landbouw, Suriname, August 25, 1910.

In relation to the employment of arsenate of lead as an insecticide, it is of interest to note that the United States Association of Economologists and Official Analysts regards samples of this substance to be adulterated which contain: moisture exceeding 50 per cent.; total arsenic oxide less than 12·5 per cent.; or a proportion of soluble arsenic equivalent to more than 0·75 per cent. of arsenic oxide.

The distribution of plants from the Dominica Botanic Station during January included: cacao plants 680, grafted cacao 135, rubber 357, spineless limes 400, limes 200, grafted mangoes 8, the total for the month being 1,886. A matter of interest is that over 25,000 Para rubber seeds arrived during the month, and were dealt with at once, in order that the percentage of germination may not be lowered through any delay.

The *Annual Report on the Forest and Gardens Department*, Mauritius, 1909, which has just been received, states that from cuttings of D.625 and D.147, acquired from this Department, twenty-three pits of each were planted. It is also of interest to note that among the canes offered for auction at the Royal Botanic Gardens, Pamplemousses, there have been included B.208, B.306, D.74, D.95, D.109, D.130 and D.145.

During the month of January, the distribution of plants from the Nevis Experiment Station comprised: sweet potatoes 1,000 lb., young cocoa-nut plants 20, and a quantity of sweet potato cuttings. In regard to the distribution of varieties of sugar-cane that have been made from this station in the past, it is satisfactory to be able to state that success has been obtained with most of these, during the past season, in spite of the unfavourable weather.

His Excellency the Governor of British Guiana has appointed a committee for the further consideration of the question of the establishment of agricultural loan banks in the Colony. The place of Chairman of the Committee will be occupied by His Excellency, and the other members are the Immigration Agent General, the Auditor General, the Surgeon General, the Solicitor General, the Hon. R. G. Duncan, Dr J. S. Nedd and Mr. J. Mc.F. Corry.

A Chefoo (China) correspondent writes to the *Textile Mercury* for January 21, stating that much is being done by the Industrial Taotai (Presiding District Officer) there, toward the extension of the cotton industry. Experiments have been made with American varieties of cotton, but these have not been successful, and such cotton is not so far supplanting the native kinds. Further trials are to be made, however, as there is a keen desire to develop a large cotton industry.

A report by Mr. H. A. Tempany, B.Sc., Superintendent of Agriculture for the Leeward Islands, on a visit made recently by him to St. Kitts, in company with the Imperial Commissioner of Agriculture, states that the average return of cotton in that island will probably be 200 lb. of lint per acre. Mr. Tempany states further, that excellent results have been obtained from the trials conducted by cotton planters in the island with the strains of selected cotton seed originated by the Department of Agriculture, and that there is a strong demand for similar seed to be used during the coming season.

STUDENTS' CORNER.

MARCH.

First Period.

Seasonal Notes.

It is often observed that lime trees growing wild among other trees, as well as those in abandoned lime plantations, show comparative freedom from severe insect attack, although the general appearance of the plants may or may not be indicative of vigour. Discuss the difference in the conditions surrounding such trees and those of the cultivated plants, with special reference to the chances of infection from pests and diseases, and of recovery after attacks by such enemies. Other observations of much interest that might be made are connected with the root disease of limes, to solve the question for instance, as to whether the absence of the fibrous roots that should be produced in the upper layers of the soil in lime cultivations is indicative of the presence of this disease. What are the signs shown by plants attacked by the root disease of limes, and what can be done to assist such plants in their struggle against them? In what ways do the diseases of roots interfere with the proper nutrition of the plants attacked?

Where pen manure has been applied in lime cultivation, it is interesting to watch the effects that more obviously result from its use. Observe if these include the production of a large amount of soft, sappy tissue, and if the presence of this tissue encourages attacks by scale insects. What damage, in lime cultivations, may be expected to follow the injudicious use of nitrogenous manures? Help in dealing with this question may be obtained by reference to the editorial in the last number but one of the *Agricultural News*.

Bengal beans that have been allowed to grow over lime trees should be removed at this time of the year, and observations should be made of the amount of injury to the trees (if any) that has resulted from their use. It would be well, in another season, to allow the beans to cover selected trees, that are in much the same state of health and growth, to different degrees, in order to determine the extent to which the covering plants may be most usefully allowed to climb over them. A circumstance that has been observed in connexion with this matter is that large amounts of dead wood are often seen, after the removal of the beans, in the case of trees that have been weakened through the attacks of scale insects.

At the present time, the grafting of cacao is being conducted. There is no need to say much about this subject at present, as it has been referred to recently in other issues, on this page. Attention may be drawn, however, to Pamphlet No. 61 of the Department Series, entitled *The Grafting of Cacao*, in which a complete account of the process will be found, and it may be well to point out that the attainment of success in grafting cacao, as is the case with regard to similar operations with other plants, depends upon thorough attention to details, as each part of the process has its definite and indispensable value. In practice, notes should be taken of the time required for union to take place, a record should be made of the proportion of grafts successfully obtained, in regard to the total number of attempts, and when it is possible, the causes of failure should be ascertained, for guidance in future work.

Time may be spent in an interesting and useful manner by making a close study of the flowers of cacao, and by observing the ways in which they are pollinated in nature. The results of such observations should be discussed in relation to the employment of spraying as a measure against cacao pests. There are indications that cross pollination will be employed to an increasing extent in the near future, for the production of improved strains of cacao. What do you consider to be the chief characteristics that should receive attention in attempting to obtain such strains?

Give an account of the processes to which cacao is subjected in order to prepare the bean for market. Why are these processes carried out? What kinds of organisms are chiefly instrumental in producing the changes that occur during the processes? Describe the kind of examination that you would make, in order to find out whether a sample of cacao has been subjected to fermentation in a proper manner, or merely dried without fermentation.

Consideration should be given to plants, such as arrowroot and cassava, which are raised more especially on account of the fact that they produce starch in quantity. The life-history of such plants should be studied, particularly in relation to the circumstance that they do store starch in this way, and enquiry should be made into the particular part of the plant in which this storage is effected. This will lead to a consideration of the question as to why plants form starch at all, and the matter will have to be viewed in its special relation to carbon assimilation.

Questions for Candidates

PRELIMINARY QUESTIONS.

(1) Give an account of the way in which ordinary green plants absorb water.

(2) What is humus, and what is the use of it to living plants?

(3) Explain: heavy soil, tilth, loam.

INTERMEDIATE QUESTIONS.

(1) How would you compare several samples of soils with respect to their power to retain water?

(2) What is guano, and how should it be stored?

(3) How would you prepare, and employ green dressings for, a field to be planted with cotton? What plants are used for providing green dressings in your neighbourhood?

FINAL QUESTIONS.

(1) Describe the principle on which evaporation is conducted in the triple effect and the vacuum pan.

(2) Give an account of the process of improvement by selection, in the case of any plant with which you are familiar. What other important means exists for the improvement of plants, and how does it differ essentially from selection?

(3) Discuss the advantages which accrue from the taking of regular inventories, on estates.

It is stated in the *India-Rubber Journal* for January 28, 1911, that a British group of capitalists has obtained concession of extensive territory at Lunda, Portuguese West Africa, for the exploitation of rubber and its direct export to Great Britain on a large scale, the capital of the group being £1,000,000. The concession has been granted on condition that the holders pay the State 10 per cent. of the profits, make roads, build a railway from the coast to the interior, make every possible improvement in the region, and buy at a fixed price all rubber presented for sale by the natives. Much mineral wealth is stated to be present in the territory granted.

FUNGUS NOTES.

SOME DISEASES COMMON TO RUBBER AND CACAO TREES.

It has been suspected for some time that several of the diseases affecting Hevea and cacao trees are due to fungi capable of attacking both host plants, and producing similar symptoms on both, while some of these fungi have also been shown to be capable of infecting Castilloa trees. This point was indicated in the *Agricultural News*, Vol. IX, p. 302, and was also mentioned in the cases of pink disease and die-back on pp. 270 and 318, while the identity of the brown root disease of cacao, Hevea and Castilloa in Ceylon is mentioned on p. 302 of the same volume. Recent work of very considerable importance has added to this list; the suspicion in the case of die-back is confirmed as regards the Federated Malay States, and two new diseases, namely, canker and fruit disease, have been added from Ceylon. These will now be considered at somewhat greater length.

PHYTOPHTHORA FABERI, Maubl. It has recently been shown by Petch, in Ceylon, that this fungus is the true cause of canker and fruit diseases of Hevea, and of canker and the pod disease, known in the West Indies as black pod of cacao. A short reproduction of Petch's work appears in the *India-Rubber Journal*, Vol. XLI, No 2. This discovery constitutes an interesting confirmation of Rorer's work in Trinidad, and also emphasizes the importance of taking all possible precautions to keep the diseases of cacao as completely as possible under control in any district where Para rubber has been planted.

It has been found in Ceylon that the disease is only active during the wet season, while in dry weather the spread of the mycelium in the tissues of the host is entirely arrested, and there is no additional infection. As has been indicated previously (see *Agricultural News*, Vol. IX, p. 318), the symptoms of canker in Hevea are not easily detected, the surest indication being the cessation of the flow of latex from all infected bark. When cuts are made into spots where this phenomenon has been observed, it is found that the bark is reddish purple in colour, while the cankered area frequently has a well-defined black border.

When cacao pods are infected by Phytophthora, the fungus is able to spread up the stalk into the cushion, and cause canker of the cushion and of the surrounding bark. In the case of Hevea, infection of the woody branches cannot occur in this way, since the fruits are borne on the young, green twigs only. The parasite may, however, spread backwards along these from the fruits and cause die-back, though the extent of the tissue destroyed in this way is limited to the end of the twig.

The diseased Hevea fruits, like diseased cacao pods, will naturally serve as a source of spores which, when carried to the trunk of the tree during damp weather, are capable of germinating and forming new areas of canker. Consequently, such fruits should be collected and burned, just as diseased cacao pods should be buried with lime.

One or two points liable to be overlooked are worthy of careful attention. In the first place, it was formerly believed that canker could only arise where the bark had been wounded. This was due to the fact that the disease was universally attributed to various saprophytic or semi-saprophytic species of the genus Nectria, which were known to be unable to produce direct infection, though allied to certain well-known wound parasites occurring in temperate countries. This belief must now be entirely discarded. The fungus in reality responsible for the disease is a direct parasite, and does not require the existence of wounds for its entrance, either on the fruits or on the stem. The only requirement is the presence on the trees of sufficient moisture to ensure germination of the spores. In the second place, it is possible that a partly diseased cacao cushion might produce pods. These, as the attack on the cushion developed, would become infected by the mycelium of the fungus, as it grew down into them from the cushion. In this way, more diseased pods and more fungus spores would be produced. Consequently, when a pod diseased at the stalk end has been removed from the tree, a cut should be made into the cushion, also, in order to determine how far back the fungus has spread. All discoloured tissue from such diseased cushions should be removed as carefully as the tissue from the more usual cankered patches. This is important, not only for the reasons stated above, but also because such cushions give rise to as large areas of diseased bark, as do diseased portions of the ordinary stems. Another point is that pods which are discoloured from the pointed end upwards for about half their length are often seen hanging on the trees. Such pods should be removed from the trees whenever they are noticed, since in this stage of the disease the mycelium of the fungus is unlikely to have penetrated as far as the stalk and, consequently, if the pods are taken away the cushion may be saved from infection. Lastly, it may be recorded that the Immortel trees, *Erythrina* spp., largely used as shade for cacao, are also subject to canker, and should be carefully examined for this disease when growing in the neighbourhood of badly infected cacao.

The only remedial measure so far known for this disease is excision. Petch suggests a new form of subsequent treatment for small wounds made in this operation. This consists of covering them with a dressing of cow dung and clay, which promotes the growth of the covering bark. Where the wounds are large, they should be tarred or painted, with the exception of a strip about 1 inch wide all round the edge. This should be dressed with cow dung and clay as is mentioned above, for the bark cannot cover the whole wound, but will grow over the strip around the edge. In the case of Hevea, tarring or painting the major portion of large wounds is especially important, in order to prevent the entry of boring beetles, which destroy the trees.

LASIODIPLODIA THEOBROMAE. This is the fungus responsible for die-back and brown pod disease of cacao all through the tropics, and for die-back of Hevea in the Malay States, West Africa and probably Ceylon. Bancroft, in the *Agricultural Bulletin of the Straits and Federated Malay States*, Vol. IX, p. 475, has shown that the die-back fungus in that country, originally described by Massee as *Diplodia rapax*, is identical with *Lasiodiplodia theobromae*, and probably with *Botryodiplodia elasticae*, of Ceylon. Furthermore, he found that cultures of the cacao fungus kept at Kew, developed asci in the perithecia and that these asci contained eight, 3-septate, dark, oblong spores belonging to the genus Thyridaria, of the family Sphaeriaceae. He has called this fungus *Thyridaria tarda*, and this is the name by which it will probably be known in future. The discovery of the ascomycetous stage is important, as it should help in preventing further mistakes in the identity of the different forms of Lasiodiplodia found on various host plants.

Rorer has shown that, like Phytophthora, the mycelium of the brown rot fungus is able to grow from the pod into the wood of the cushion and thus cause stem disease, so that in advanced stages of this disease on the pods, the cushion should also be examined. Unlike Phytophthora, however, this fungus is only a wound parasite, though once it has obtained a footing it can cause serious damage very rapidly, particularly on Hevea.

In connexion with canker, Petch supports the employment of Bordeaux mixture as a preventive measure on badly diseased estates, and there can be no doubt whatever, now that the real nature of this disease and of die-back is known, that experiments with this treatment are well worth trying. In considering this point it should be remembered that, at present, young Hevea plantations in the West Indies are, as far as is known, entirely free from these diseases; and though it cannot be expected that they will always remain so, yet every effort may well be made to delay infection as long as possible, and to keep it at a minimum when it does occur. Furthermore, spraying would also be of considerable direct advantage to cacao.

ROOT DISEASE. In the *Agricultural News*, Vol. IX, p. 366, a description is given of the root disease of cacao, together with a list of the other plants which the causative fungus is able to attack. Interesting information has recently been received from the Hon. G. S. Hudson in St. Lucia, which shows that there is very little doubt that this fungus can attack Castilloa trees in addition to its numerous other host plants. Shortly, the evidence showed that a Castilloa tree, growing near a patch of cacao infected with root disease, died suddenly, while on examination the characteristic white, fan-shaped patches of mycelium were found between the bark and wood of its roots. This information is interesting but need cause no particular alarm, as it is only to be expected that a semi-saprophytic soil fungus such as is responsible for this root disease, should attack almost any host growing in its path. As has been mentioned already, this is not the only root fungus common to several hosts, among which cacao, Hevea and Castilloa are included.

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 :—

The usual activity of Mincing Lane always suffers more or less of a check at the Christmas holidays, and stock-taking times, which extends for a week or a fortnight into the New Year, consequently our report for January will cover a period of but little more than half the month. It is satisfactory however, to know that even before the time of the renewal of the regular auctions, a firm undertone prevailed, and the prospects of future business was considered good—a prophesy which has been confirmed at the time of writing. There was nothing during the month, affecting the West Indies calling for special comment. Buchu leaves still attract a considerable amount of attention, 3*s*. per lb. being paid for short broad leaves, which are still scarce. Rubber has ceased to attract, fine hard Para being down to 5*s*. 2*d*. per lb. In the matter of

GINGER

the markets started with a firm tone, becoming easier towards the end of the month. In the middle of the month, some 117 packages Jamaica were offered and sold without reserve at 52*s*. to 53*s*. 6*d*. Cochin was represented by 466 bags, part of which sold at 45*s*. per cwt. for common wormy rough; sound Cochin was bought in at from 54*s*. to 55*s*. On the 25th, the offerings amounted to 229 barrels of Jamaica, which were sold without reserve at 54*s*. to 56*s*. 6*d*. for medium scraped. Cochin was represented by 178 bags, sold also without reserve at 49*s*. 6*d*. to 50*s*. for washed rough.

NUTMEGS, MACE AND PIMENTO.

Nutmegs were in slow demand at the beginning of the month, but later the sales improved, 130 packages West Indian being offered at one auction, and mostly disposed of at the following rates: 57's at 11*d*., 67's to 69's at 7*d*. to 8*d*. 72's to 75's at $5\frac{3}{4}d$. to $6\frac{1}{2}d$., and other sizes in proportion. At the first spice auction, there was a steady demand for West Indian mace, 57 packages being disposed of, ordinary to fair fetching 2*s*. to 2*s*. 2*d*. and good to fine 2*s*. 3*d* to 2*s*. 5*d*. Little or no alteration has taken place during the remainder of the month. For pimento there has been a very slow demand, nearly all the offerings being bought in at prices averaging $2\frac{1}{4}d$. per lb.

ARROWROOT.

At auction, the transactions in this article have been unimportant. On the 18th of the month, 20 half-barrels of Bermuda were offered and bought in at 1*s*. 8*d*. per lb. It was stated that, privately, some 400 barrels of fair fine manufacturing St. Vincent had been disposed of at from 2*d*. to $3\frac{3}{4}d$. per lb.

SARSAPARILLA.

At the first drug auction on the 12th, sarsaparilla was represented by 14 barrels of grey Jamaica, all of which were disposed of at an advance of 1*d*. to 2*d*. per lb. on previous prices, 1*s*. 6*d*. to 1*s*. 7*d* being paid for ordinary, part mouldy to fair. Out of 21 bales of Lima-Jamaica offered, 18 were sold, 12 fetching from $10\frac{1}{2}d$. to 11*d*. per lb., and the remaining six $9\frac{1}{2}d$. to 10*d*. per lb. Of native Jamaica the offerings amounted to 34 bales, but only 8 were sold, the best red fetching $10\frac{1}{2}d$. to 11*d*., dull mixed 9*d*., and mouldy 7*d*. per lb. Seventeen packages of Guatemala and Mexican and 4 packages of Honduras were also offered, but all were bought in, the first at 9*d*. and the last at 1*s*. 3*d*. per lb. Later, it was stated that the whole of the 17 packages of Guatemala and Mexican had been disposed of at $7\frac{1}{2}d$. per lb.

LIME JUICE, LIME OIL, KOLA, ETC.

At the first spice sale, concentrated lime juice was firm at £18 2*s*. 6*d*., and raw West Indian was quoted at 1*s*. to 1*s*. 1*d*. per gallon. West Indian oil of lime, distilled, was steady at from 1*s*. 2*d*. to 1*s*. 3*d*. and hand pressed 5*s*. 6*d*. per lb. Kola was well represented at the auction on the 12th of the month when some 38 packages were brought forward, but only 12 were disposed of; 8 of these consisted of dried Jamaica. Fair realized $3\frac{3}{4}d$., dark $3\frac{3}{4}d$., and mouldy $2\frac{3}{4}d$. The other 4 bags of West Indian fair but rather dark, fetched $3\frac{1}{4}d$. per lb. The remainder were all bought in at 4*d*. per lb.

It is reported by the Imperial Trade Correspondent, Brisbane, Australia, that the production of sugar in Queensland last year will probably constitute a record, the output being estimated at 190,000 tons, with that in New South Wales at 14,000 tons; in addition, a considerable quantity of coloured and dark sugars was imported to be refined, from Mauritius and Java. The opinion is given that, with the prospect of the control of the sugar industry being brought under the Federal Government, there will be a considerable expansion of the industry, so that Australia is likely to become a sugar-exporting country.

MARKET REPORTS.

London.—The West India Committee Circular, February 11, 1911; Messrs. E. A. De Pass & Co., February 4, 1911.

Arrowroot—2*d.* to 3*d.*
Balata—Sheet, 4/-; block, 2/11 per lb.
Beeswax—No quotations.
Cacao—Trinidad, 58/- to 68/- per cwt.; Grenada, 53/- to 57/6; Jamaica, 52 - to 56/-.
Coffee—Jamaica, 64/- to 73/-.
Copra—West Indian, £24 10*s.* per ton.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 20*d.* to 21*d.*
Fruit—No quotations.
Fustic—No quotations.
Ginger—52/- to 65/-.
Honey—No quotations.
Isinglass—No quotations.
Lime Juice—Raw, 10½*d.* to 1/-; concentrated, £18 2*s.* 6*d.* to £18 7*s.* 6*d.*; Otto of limes (hand pressed), 5/- to 5/3, nominal.
Logwood—No quotations.
Mace—Firm.
Nutmegs—Quiet.
Pimento—Common, 2½*d.*; fair, 2¼*d.*; good, 2 5/16*d.* per lb.
Rubber—Para, fine hard, 5/9½ to 5/10½; fine soft, 5/3½; fine Peru, 5/8 per lb.
Rum—Jamaica, 1/6 to 6/- per gallon.
Sugar—Crystals, 14/3 to 17/6; Muscovado, 11/3 to 14/3; Syrup, 9/- to 14/6; Molasses, no quotations.

New York.—Messrs. Gillespie Bros. & Co., February 10, 1911.

Cacao—Caracas, 12c. to 12½c.; Grenada, 12c. to 12¼c.; Trinidad, 12¾c. to 13c. per lb.; Jamaica, 10½c. to 11½c.
Cocoa-nuts—Jamaica, select, $26·00 to $27·00; culls, $15·00 to $16·00; Trinidad, select, $26·00 to $27·00; culls, $15·00 to $16·00 per M.
Coffee—Jamaica, no quotations.
Ginger—9c. to 12c. per lb.
Goat Skins—Jamaica, 51c.; Barbados and Antigua, 45c. to 48c.; St. Croix, St. Thomas and St. Kitts, 43c. to 45c. per lb.
Grape-Fruit—$2·75 to $4·00 per box.
Limes—$6·00 to $6·50.
Mace—39c. to 48c. per lb.
Nutmegs—110's, 10c. to 10¼c. per lb.
Oranges—Jamaica, no quotations.
Pimento—3⅞c. per lb.
Sugar—Centrifugals, 96°, 3·48c. per lb.; Muscovados, 89°, 2·98c.; Molasses, 89°, 2·73c. per lb., all duty paid.

Trinidad,—Messrs. Gordon, Grant & Co., February 20, 1911.

Cacao—Venezuelan, $12·25 per fanega; Trinidad, $11·75 to $12·25.
Cocoa-nut Oil—$1·00 per Imperial gallon.
Coffee—Venezuelan, 15½c. to 16c. per lb.
Copra—$4·75 per 100 lb.
Dhal—$3·30.
Onions—$2·75 to $4·00 per 100 lb.
Peas, Split—$6·00 to $6·10 per bag.
Potatoes—English, $1·80 to $1·90 per 100 lb.
Rice—Yellow, $4·30 to $4·35; White, $5·20 to $5·25 per bag.
Sugar—American crushed, $5·50 to $5·60 per 100 lb.

Barbados,—Messrs. T. S. Garraway & Co., February 27, 1911; Messrs. James A. Lynch & Co., February 20, 1911.

Arrowroot—St. Vincent, $4·50 to $4·70 per 100 lb.
Cacao—$12·00 to $12·50 per 100 lb.
Cocoa-nuts—$20·00.
Coffee—Jamaica and ordinary Rio, $13·50 to $15·00 per 100 lb. scarce.
Hay—$1·50 to $1·60 per 100 lb.
Manures—Nitrate of soda, $65·00; Cacao manure, $42·00 to $48·00; Sulphate of ammonia, $75·00 per ton.
Molasses—No quotations.
Onions—$3·00 to $3·50 per 100 lb.
Peas, Split—$5·85 to $6·10 per bag of 210 lb.; Canada, $4·00 per bag of 120 lb.
Potatoes—Nova Scotia, $2·00 to $2·25 per 160 lb.
Rice—Ballam, $4·80; Patna, $3·50 to $3·80, Rangoon, $2·90 to $3·00 per 100 lb.
Sugar—No quotations.

British Guiana.—Messrs. Wieting & Richter, February 18, 1911; Messrs. Sandbach, Parker & Co., February 17, 1911.

Articles.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	$9·25 to $9·50 per 200 lb.	$9·25 to $9·50
Balata—Venezuela block	No quotation	Prohibited
Demerara sheet	81c. per lb.	72c. to 80c.
Cacao—Native	11c per lb.	10c. to 11c. per lb.
Cassava—	$1·00	No quotation
Cassava Starch—	$6·50	No quotation
Cocoa-nuts—	$10 to $16 per M	$10 to $16 per M., peeled and selected
Coffee—Creole	16c. per lb.	16c. per lb.
Jamaica and Rio	19c. per lb.	19c. per lb.
Liberian	10½c. to 11c. per lb.	11c. per lb.
Dhal—	$3·50 per bag of 168 lb.	$3·50 per bag of 168 lb.
Green Dhal	$4·00	—
Eddoes—	$1·92	—
Molasses—Yellow	None	—
Onions—Teneriffe	—	—
Madeira	6c.	6c.
Peas—Split	$5·75 to $5·90 per bag (210 lb.)	$6·00 per bag (210 lb.)
Marseilles	$4·50	No quotation
Plantains—	20c. to 72c.	—
Potatoes—Nova Scotia	$2·75	$2·75 to $3·00
Lisbon	—	No quotation
Potatoes—Sweet, B'bados	$1·44 per bag	—
Rice—Ballam	No quotation	—
Creole	$5·00 to $5·50	$5·00 to $5·25
Tannias—	$2·16 per bag	—
Yams—White	$2·40	—
Buck	$2·64	—
Sugar—Dark crystals	$2·10 to $2·20	None
Yellow	$2·70 to $3·00	$2·65 to $2·75
White	$4·00	$4·00 to $4·25
Molasses	$2·10 to $2·30	None
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 Value of Humus.

IN those islands of the West Indies where sugar-cane cultivation is carried on more particularly, the agricultural procedure, which is often the outcome of the experience of several generations of planters, shows that the importance of an adequate supply of humus in the soil is generally recognized. Every effort is made to keep the soil in good condition by the use of farmyard manure, and as little waste as possible is permitted of such plant remains as are available for application to the field: while there is a constantly greater understanding of the need and importance of green dressings.

It is generally understood, by now, that the term humus means to the agriculturist the dark-coloured material, formed of plant remains, that gives the soil its characteristic different colour from that of the subsoil. The researches of recent years have shown that this material is formed, from vegetable waste, by the action of bacteria in a partial or total absence of air. The circumstances under which it is produced cause more of it to be found in land that has not been tilled for some time than in that which has been turned over regularly; this condition is met with more frequently in temperate climates than in the tropics. It is a matter of common observation, however, in this part of the world, that the humus content of clay soils is higher than that of sandy soils, because the access of air to the interior of the soil is not as great in the case of the former as in the latter: so that almost ideal conditions for the production of humus are afforded by clay soils.

In dealing with humus more gerneally, it will be well to treat, in turn, of its importance, firstly in relation to the soil, and secondly with reference to the plant. It must not be forgotten, however, that all final effects of humus have a direct or indirect influence on the plant; for whatever affects the soil must ultimately have its influence on the vegetation which it supports.

One of the most useful effects, to the agriculturist, of the possession by a soil of a good humus content is the circumstance that this improves its texture, so that there is ease as well as economy in tillage operations. The artificial employment of this fact has its largest application on heavy clay soils, in the improvement of their condition by the use of vegetable matter either in the form of decayed remains such as trash, or as withered green dressings. Another matter, to which a passing reference only need be made here, on account of its comparative unimportance in the tropics, is the effect of humus in darkening the colour of soils and thus increasing their ability to absorb heat.

It is recognized by the agriculturist that all soils contain mineral plant food in an unavailable condition. He knows, too, that some of this may be freed in a state in which it can be used by plants, by the employment of artificial dressings such as lime. Humus probably plays the greatest part, however, in this matter, both artificially and in nature. This is because of its power to form bodies, commonly called humic acids, which have a dissolving action on some of the mineral constituents of the soil. The process is naturally slow but is continuous and, where the soil is well supplied with humus, its eventual importance in relation to the provision of mineral plant food is obvious, especially when consideration is given to the comparatively small bulk of this food that is necessary to plants.

A final general matter in connexion with humus in a soil is probably of the greatest concern as regards its ultimate effect in enabling that soil to produce quantities of vegetation. This is the circumstance that it provides ideal surroundings to, and a certain amount of food for, the bacteria which effect improvements in the soil, from the agriculturist's point of view. This appears particularly to be the case in relation to the nitrogen-fixing organisms. Greater recognition of the importance of the extent to which these affect the nitrogen content of the soil is being attained rapidly, and the matter is brought particularly to the notice of agriculturists on account of the comparative difficulty and expense of sustaining an adequate nitrogen content in the land from which they raise their crops.

The next matter to consider is the value of humus in relation to the plant, more directly. In the first place, humus itself contains nitrogen, potash and phosphates, and this is a fact that becomes of importance when the suggestion is made to remove plant waste from the land, or on the other hand, to bring in supplies of vegetable material from other areas on which it has been raised. The matter will be considered further, in the former aspect, when the question is raised of the destruction of vegetable matter for the control of pests.

The most important and most fully recognized direct function of humus in relation to the plant is the effect that it possesses in increasing the capacity of soils to absorb water, as well as their ability to hold it when it is supplied to them. It has been considered already that the power of a plant to grow depends upon the existence of several limiting factors, the absence of, or deficiency in, any one of which will interfere with its proper development.* Of these factors, as is well known, the one whose absence or insufficiency most quickly shows itself is the water-supply, and the importance of humus in keeping this at an adequate level cannot be underestimated.

The consideration may now be undertaken of some of the more particularized facts in relation to humus. One that has been indicated already is the quick rate at which vegetable matter is lost from sandy soils. This is on account of the easy access of air to such soils, whereby the bacterial action which would lead to the formation of humus is prevented, and oxidation takes place: so that the material is quickly lost in the atmosphere. It is in such soils that the agriculturist requires to exercise the greatest care in regard to the supply of humus, especially as if this is deficient, any water that they receive passes away almost immediately, through drainage.

The burning of waste vegetable matter, particularly of trash in cane fields, for the eradication of pests, is often recommended. It appears, however, that this can only be done continuously, with impunity, where there is irrigation and the plentiful supply of artificial manures, as in Hawaii: and it remains to be seen, even there, what will be the ultimate effects of the procedure.

Other matters that remain for short consideration in the present relation, are those dealing with what is called 'soluble humus', and the connexion between carbohydrates in the soil and the increase of efficiency of the nitrogen-fixing organisms. Soluble humus, it may be explained, is the product obtained by the action of alkalis such as ammonia and soda on the humic acids: there is a large amount of this matter dissolved in the dark liquid that drains away from manure heaps, because of the alkalinity of the contents of such heaps, through the production of ammonia. Much remains to be discovered concerning soluble humus, and it is not yet known with certainty if similar bodies are of direct use to green plants.

The effect of the presence of carbohydrates in the soil, in increasing the power of the nitrogen-fixing bacteria

*_Agricultural News_, Vol. IX, p. 257.

to do the work that is required of them, is probably due to the greater provision of food, whereby there is an augmentation of the number of bacteria present above that which is normal, with a consequent enlargement of the amount of nitrogen fixed. Information concerning the question has been given already; * it is receiving some attention, in a practical way, more particularly in Antigua and Mauritius, where experiments on a field scale are being undertaken. Little consideration will show that work of this and a similar nature should throw much further light on the matter of the value and importance of humus to the agriculturist.

SUGAR INDUSTRY.

THE COST OF SUGAR PRODUCTION IN JAVA.

The following interesting figures, relating to the cost of making sugar in Java factories, are contained in an article, by H. C. Prinsen Geerligs, in the *International Sugar Journal* for January 1911, p. 7:—

As a complement to Mr. George Martineau's interesting paper on the cost of production of sugar, published in the December issue of this journal, I give here some figures on the cost of production of Java sugar during the last years.

In the issue of July 1904, of this journal (p. 341), I set down the cost of production in the year 1902, of an average of forty-two well equipped factories, at £7 5*s*. 11½*d*. per metric ton, subdivided as follows:—

	£	s.	d.		£	s.	d.
Salaries		13	4	Commission		7	2½
Cultivation	2	13	4	Sundry expenses		4	6½
Transport of cane		16	0	Wear and tear		8	6½
Fuel		1	1½	New machinery		15	9
Wages		3	9	Interest on floating capital		8	0
Sundries		1	10½				
Packing		4	3				
Transport of sugar		8	3		7	5	11½

After calculating the cost of production of a great number of Java factories during the years 1908 and 1909, I found this figure to still hold good. The production of sugar to the acre has increased, but the price of many articles and the rate of wages have followed the same upward movement, so that, on the whole, the cost price of raw Java refined crystals, basis 96°, packed in bags or baskets, delivered at the buyers' doors at the ports, and including all charges of management, agriculture, transport of cane, machinery, manufacture, carriage to the coast, upkeep and depreciation of plant and buildings, but not including interest on the capital invested in the sugar house and machinery, may be put down at 5·50 guilders per picul of 61·76 kilos., or 7*s*. 6½*d*. per cwt.

At a rate for freight from Java to the United Kingdom or to the United States of 20*s*. per ton, this figure comes to 8*s*. 6½*d*. in Great Britain, or 1$\frac{13}{16}$c. per lb. in New York; and at a rate for freight of 25*s*., to the equivalent of 8*s*. 9½*d*. in England, or 1⅞c. in America.

We therefore fully agree with Messrs. Willet & Gray when they state that the cost price of Java sugar is higher than 6*s*. per cwt. Some factories, situated in very favourable spots, may make the sugar at that price, but this is an exception, and not the rule, and the average cost price is much higher, so that it may be taken at 7*s*. 6½*d*. per cwt., delivered at the buyer's warehouse on the coast.

In the February number of the *International Sugar Journal*, this figure (7*s*. 6½*d*. per cwt.) is subjected to a correction, as it does not refer to f.o.b. Java, as was understood at first, but to the cost at the buyer's doors at the coast. The expenses for warehousing, lighterage and loading, and for insurance, which are not included in the charge for freight, have therefore to be added, bringing the figure up to about 7*s*. 10*d*. per cwt.

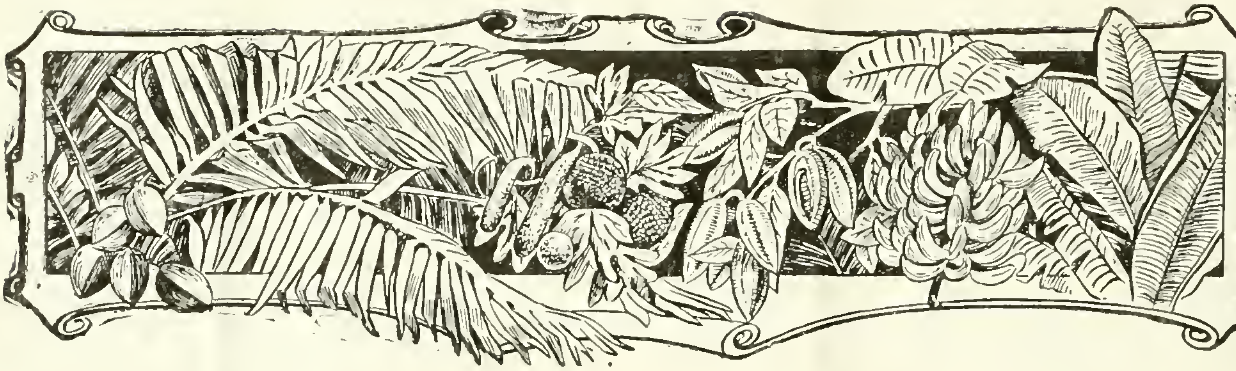
SUGAR FROM SHREDDED CANE.

There was given, in the last issue of the *Agricultural News*, a description of the McMullen process by which sugar is manufactured from shredded and dried cane; this was in the form of an abstract of an article that appeared recently in the *Louisiana Planter*. In continuation of the subject, the latter journal includes, in its issue for February 4, 1911, an account of the events which led up to the devising of the system. The information on which this is based has been supplied by the Simmons Sugar Company, of Kenosha, Wisconsin, the firm which holds the patent for the process.

The actual work of investigation has been carried out by Mr. G. W. McMullen, of the Armour Institute of Chicago, during the past six years, who evolved the process after observations had been made by him in connexion with devising methods for drying sugar beets and storing them, in order that the factories may benefit by the economy of being able to work all the year round, as well as by the additional chance that was gained of securing the by-products of the beet. This led to the invention of the shredding apparatus; its application to the sugar-cane; the discovery of the added usefulness of the sugar-cane megass obtained in this way; the use of the improved watery solution from which the sugar has to be obtained, in the place of the ordinary juice; and the knowledge of the greater recovery of sugar from cane so treated, as compared with that from cane crushed in the usual manner. The inventor considers that the greater recovery of sugar increases the return on each ton of cane by \$2, and there is an additional \$3 or \$4 on every ton, as the value of the cellulose. This is not taking into account the wax, which can be obtained more easily from the cane under this treatment than after it has been crushed for the juice in the ordinary way; the amount of this by-product should be 10 lb. or 11 lb. per ton of cane, and if it is properly extracted, it should further increase the return for each ton of cane by \$2 or \$3, not allowing for the cost of extraction, which should not be great in proportion to the obtainable profit.

A more recent issue of the *Louisiana Planter* (February 11, 1911) states, with regard to the article mentioned first, above, that later experience has shown that if the juices could have been dealt with more quickly than was the case in the original trials, a white sugar could have been easily obtained in the first process, and thus a large economy should be effected in the manufacture.

*Agricultural News, Vols. VII, p. 227; IX, pp. 159, 339.



FRUITS AND FRUIT TREES.

THE LOOFAH OR VEGETABLE SPONGE.

The loofah of Egypt, which is often used in the place of the sponge, is the fruit of *Luffa aegyptiaca*, a plant closely related to the vegetable sponge of the West Indies (*Luffa acutangula*); the latter is generally seen growing over fences, or over other plants. Both of them belong to the same order of plants as the melon, pumpkin, squash, calabash pipe fruit, etc. The following account of the way in which loofahs are prepared for market is taken from the *Agricultural Journal of the Cape of Good Hope*, for December 1910, p. 651:—

The following report from the Imperial Institute, South Kensington, has been received by Mr J. Burtt-Davy, Government Agrostologist. The loofah of commerce is prepared from the fruit of *Luffa aegyptiaca*, and consists of the network of fibres existing in the interior of the fruit. The fruits should be allowed to remain on the vines until they have acquired a yellowish tint, but not until they have begun to assume a brown colour, as this indicates that the outer skin of the gourds is undergoing decay, which will cause the fibrous structure within to become discoloured. The fruits should be cut from the vine with about 2 inches of stem attached, for convenience of hanging. They should be hung in an airy, draughty shed for two or three days, and the outer skin will then be found to be fairly soft and pliant; this stage of the preparation is assisted by cutting off the tip of the gourd at the lower end, leaving a small hole through which the contained moisture may drip. The loofahs may next be removed by running the finger down the skin of the fruit on one side, splitting it open, and turning out the loofah, which is at once thrown into a washing vat containing lime-water (5 lb. of slaked lime to 60 gallons of water). The loofahs are stirred about in the lime-water for a few minutes, and then removed to a draughty shed to dry. Care should be taken to shake the lime-water out of each loofah before drying. If the loofahs are dried too quickly they are apt to become brittle and crack; they must not, however, remain damp too long, or they may become mouldy, though the lime prevents this to a large extent, and is, indeed, used in order to protect them from fungoid growths. When the loofahs are dry, the seeds may be easily shaken out of them by hand, and when this is done they are ready for the market.

THE VARIETIES OF KOLA NUTS.

In *L'Agriculture Pratique des Pays Chauds* for April 1910, there appeared an article dealing with the kola plant in French Guinea. In this, a description of the tree is followed by an account of the fruits and seeds. It appears that the fruits are mostly collected in December, and that they are in the form of green 'pods', closely bunched, and about as large as the fist; three or four of these are ordinarily borne together. They contain from five to ten flattened nuts, which possess a white skin, about $\frac{1}{12}$-inch thick, which is easily removed. As is well known, however, this skin is not always white, but is often of a deep red colour, while there are nuts exhibiting the intermediate tints. Both kinds of nuts may be found in the same fruit, although some of the natives affirm that trees exist which give solely one kind or the other—a matter which it is at present difficult to confirm or deny. Other natives hold that any one tree never produces nuts of one tint alone, but that the proportion of nuts of each colour varies from year to year, without there being any actual change of tint in the general product, and the opinion is given in the article quoted, that this way of regarding the matter is probably correct. In any case, no special importance seems to be attached to the character of colour; and for raising new trees, seeds of either kind are sown indifferently. A further consideration is that the age of the plant producing the nuts may have some influence, and the natives in certain parts actually believe that it is only the older trees that give nuts of different tints.

The article presents attempts to account for the differences, and suggests that the kola plant of French Guinea may be an indifferently fixed hybrid between a type producing white seeds and one giving those which are red. A second hypothesis is presented, namely that they are due to accidents of nutrition—a suggestion which is supported by the fact that the plants flower at a time when the season is changing, so that the trees bearing the different kinds of fruits vary their produce in accordance with the circumstances that happen to surround them. The idea receives further support, since the greatest changes seem to be produced where the plant is near the limits of its normal habitat, and is consequently more sensitive to climatic conditions.

Analyses by Professor Heckel have shown that the white nuts are richer in caffeine than the others, so that there would appear to be some relation between the content of alkaloids and the colour. Little is known, even yet, as to the part which alkaloids play in the physiology of plants; their proportions seem to vary with changes in nutrition, but there is no certainty as to the way in which these variations take place.

The usefulness is suggested of performing experiments entailing rigorous selection, for the purpose of finding out if the possession of one character or the other has anything to do with heredity. This plan is difficult of accomplishment, however, because of the time that the plant takes to grow and the short period spent by Europeans on the West Coast of Africa; while the natives and mulattos are incapable of carrying out such work, except in regard to annual plants such as rice and millet.

The information contained in this article is of interest in connexion with the results of an examination of kola nuts from the Gold Coast, which was conducted at the Imperial Institute; these are given in Colonial Reports—Miscellaneous, No. 71, dealing with food stuffs. Here it is stated that the Hausas, who are the largest purchasers of the nut, have a preference for the white variety, and believe that the seeds lose a large proportion of their tonic properties when dried. Trials were therefore made for the purpose of determining if this opinion is correct, when it was found that, with the white seeds, the total alkaloids, principally caffeine, were as follows: fresh 2·36, dry 2·48 per cent., calculated on water-free substance; while the similar figures for the red seeds were 2·00 and 2·33 per cent. This shows, further, that the alkaloid content is slightly in favour of the white nuts—a fact which supports the conclusion reached in Professor Heckel's researches, mentioned above.

SAGO AND THE SAGO PALM.

The following extracts are taken from an article on this subject in the *Journal of the Royal Society of Arts* for January 20, 1911:—

Ceram—one of the Moluccas—is probably the metropolis of native sago manufacture in that part of the world. The whole of this large island is practically covered with forest, and the greater area is very mountainous; but there is much low-lying coastal land, and there the sago palm (*Metroxylon Sagu* of botanists, a species which only occurs in the East Indian Archipelago) grows luxuriantly. It is turned to almost as many uses as the bamboo, for besides furnishing sago, its leaf-fronds provide 'attap' or thatch; the whole mid-ribs of the leaves, termed 'gaba-gaba', make rafters and posts for houses, and when split are used for floors and walls; split into smaller strips they make excellent cord.

Many people seem to think that cocoa-nuts and other fruits growing in these wild countries may be plucked by anybody who wants them; but all such trees, even in the depths of the forest, are private property, and the sago palm is no exception. Every palm is owned, either privately or by villages, or the Dutch Government; but the trees and prepared sago are sold so cheaply that probably no death from starvation is ever heard of in the Dutch East Indies, for the sago from Ceram is sent all over the islands.

Natives come to Ceram, which is very thinly populated, from Ambon and many other islands far and near; procure a Government licence to cut so many trees, and live and work in a sago-swamp till they have converted the trees into sago, sailing for home with the finished product. The trunk of the palm often attains forty-five feet in length to where the leaf-fronds spring, and a diameter of two feet; but thirty feet to the crown is a fair average, and even then the trunk will usually measure two feet in diameter. Such trees at Piroe cost, standing, two to three guilders each (about four shillings), and one man can fell, extract the pith, build the washing apparatus, and prepare the sago in about fifteen days, if he works hard; but the Malay is not fond of hard work, or indeed any work, and in these islands he can live almost without labour. From one sago palm he can obtain a supply of food which, varied a little with fish and vegetables, will last him many months. The natives distinguish four varieties of palm viz: Sagu duri and Sagu makanaru, which are both thorny, the young trees being armed on the trunk and leaf-sheaths with immense, strong, slender spines, sharp as needles; and Sagu tuni and Sagu mollea, which are thornless. The amount of sago produced from these palms varies from about ten packages of finished sago from Sagu makanaru to eighteen or twenty from the other trees, each package weighing about twenty-five catties (say 80 lb.). The life of a palm is said to be about ten years, before it is ready for felling; this is done as soon as the flower spike appears, and the tree is always cut down before it is in full flower, otherwise much of the pith is spoilt.

After giving a description of the way in which the sago is obtained from the palm, the article goes on to say:—

The prepared sago is usually baked into small cakes about four by three inches and an inch thick, in a little clay oven with about half-a-dozen slits; the powdered sago is dried and deodorized in the sun for a day or two, then sieved, and again spread out to dry. The powder is then filled into the slits of the oven, which has been previously heated almost to a dull red, face down, over a wood fire. The upper side is then covered with plantain leaves, and in a few minutes the cakes are ready. They cost a cent each (about a farthing) in the Malay markets, and keep indefinitely, and are therefore much used on the Malay praus for their long sea voyages.

ARGENTINE CORN.

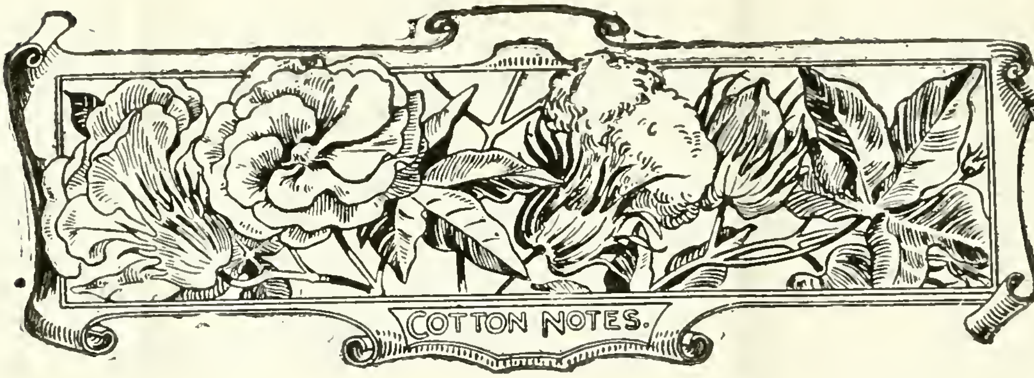
The *Journal of the Jamaica Agricultural Society* for December 1910 publishes the following information about Argentine corn:—

Argentina is now entering into competition with the United States all through the world, with corn; the Argentine has been even sending beef and mutton into the United States. Argentine corn is being imported into Jamaica by Messrs. Wessels Bros & Von Gontard, who advertise in this issue.

The following comparative analysis of Argentine corn and American corn have been made by the Hon. H. H. Cousins, M.A., Island Chemist; these we have pleasure in publishing:—

Constituents.	Argentine corn, per cent.	American corn, per cent.
Moisture	14·11	14·11
Proteids	10·41	9·18
Fats	5·09	3·43
Crude fibre	1·59	1·87
Ash	1·33	1·23
Carbohydrates as starch	67·00	70·18

The Argentine corn contains about 1·3 per cent. more proteids, and is markedly higher in fats, than the average American corn, with which it is compared, and Mr. Cousins is therefore of opinion that it is to this extent superior for feeding horses and mules in Jamaica.



WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date February 27, with reference to the sales of West Indian Sea Island cotton :—

Since our last report, between two and three hundred bales of West Indian Sea Islands have been sold at easier prices.

The sales are chiefly St. Kitts, Nevis and Barbados at 18*d.* to 20*d.*

There is still great pressure to sell all Sea Island growths, with few buyers.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending February 25, is as follows:—

With sales of only 50 bales the market has remained quiet and unchanged throughout the week, and as in the absence of demand, Factors are continuing to hold for their previous prices, we have only to repeat our last quotations, viz:—

Extra Fine Islands at	33c. = $18\frac{1}{4}d.$	c.i.f.	&	5	per	cent.
Fully Fine ,,	32c. = $17\frac{3}{4}d.$	,,	,,		,,	,,
Fine ,,	30c. = $16\frac{3}{4}d.$	,,	,,		,,	,,

BRAZIL AS A COTTON-GROWING COUNTRY.

In considering the sources of cotton supply outside the Southern States of America, the potentialities of Brazil are often overlooked and underestimated. Mr. H. Priestley, who has just returned from the cotton-growing districts of Brazil, directs attention to them. It will surprise many to be told, on his authority, that there is a larger cotton-growing area in Brazil than in the United States, although the amount of cotton actually grown in Brazil is barely one-third the quantity grown in the United States. Millions of bales more could be grown in Brazil if the cotton users of Lancashire would only interest themselves in the matter. The Germans are quite alive to the possibilities of the country in the way of cotton-growing, and within the last four months a wealthy German syndicate has secured three large tracts of land in three of the cotton-growing provinces of Brazil. Mr. Priestley says (and he has had practical experience in cotton-growing in one of our colonies from which much is expected, namely Northern Nigeria) cotton grows beautifully in Brazil. There are practically no pests, and, if native labour is not very abundant, plenty of Italians are available. Brazil would seem to offer the most promising field for cotton-growing outside the United States. (*Journal of the Royal Society of Arts*, December 30, 1910.)

THE BRITISH COTTON GROWING ASSOCIATION.

The following is taken from an account of a recent meeting of the Council of the British Cotton Growing Association:—

The eighty-fourth meeting of the Council of the British Cotton Growing Association was held at the offices of the Association, 15 Cross Street, Manchester. The Right Hon. the Earl of Derby, G.C.V.O. (President), occupied the chair.

Before proceeding with the formal business, the President alluded to the serious illness of Mr. Crinion, and expressed the hope that he might soon recover his usual health.

LAGOS. It was reported that the cotton-buying agreement was now being signed by all the merchants, and a cable had been sent to the Acting Manager in Lagos, instructing him to pay an all-round price of 1*d.* per lb. for seed-cotton.

NORTHERN NIGERIA. The Association Manager's report on his tour through the Kano and Zaria provinces was considered very satisfactory. The Kano province is the richest in the country, and contains 30,000 square miles, with a population of two million people, who are most industrious and educated, and at the present time it is estimated that at least 5,000 tons of seed-cotton is grown annually in the province. The cotton produced in the Zaria province is estimated at about 3,000 tons. The opinion was expressed that the future of the industry in Northern Nigeria would depend to a great extent upon whether the natives would be willing to sell their cotton at 1*d.* per lb.; and it is hoped that, with the importation of manufactured cotton goods, the local demand for the raw cotton will diminish.

It was reported that the site for the Zaria ginnery had been settled, but the erection of the plant was being delayed until the Executive Committee had had an opportunity of consulting with the Governor, Sir Henry Hesketh Bell, at the Colonial Office in the ensuing week.

It was mentioned that a book had recently been published by Major Ross on the Prevention of Malaria, containing some very valuable directions for preventing the disease. It was decided to take such steps as may be necessary to render the conditions under which the Association's employees are living in West Africa as healthy as possible. It is hoped that Major Ross will arrange for the publication of an abridged edition of the book.

NYASALAND. Some discussion took place with regard to the inadequate transport facilities, and it was suggested that possibly the best solution of the difficulty might be the extension of the railway from Port Herald to Beira—a distance of about 200 miles. It was pointed out that this question of transport would be brought forward for discussion at the next conference at the Colonial Office.

A letter from Mr. J. Stewart McCall, the Director of Agriculture, was read, giving a very satisfactory report on the Karonga district, and stating that this district is one of the most promising cotton centres in the Protectorate. The M'langi native cotton crop during the past season has also done well and is expected to show a considerable increase next year, and large increases are taking place in the other districts. Mr. McCall concluded that the past season had been a great success, and the native cotton now in sight amounts to fully 600 tons of seed-cotton, as compared with 250 tons last year, and 130 tons the previous year.

The report was considered most satisfactory, and it was decided that a small ginnery should be sent out immediately for erection in the Karonga district. Owing to the difficulty of transport the bales at this ginnery will have to be about 60 to 70 lb. in weight, and will afterwards be pressed at Port Herald.

RHODESIA. Satisfaction was expressed that the difficulties with regard to the site at Kafue Bridge had apparently been overcome, and that the Association's Manager was proceeding with the erection of the ginnery.

UGANDA. It was reported that a cable had been received from the General Manager of the British East Africa Corporation stating that he had purchased a satisfactory quantity of cotton during December.

It was also reported that there was a large number of bales of Uganda cotton in stock in Liverpool, and it is hoped that spinners will take the opportunity of buying this cotton.

JAMAICA AND THE CANADIAN EXHIBITIONS.

The report by the representative of the Government of Jamaica at the Exhibition of last year at Toronto, Mr. E. J. Wortley, has been published recently; it may be found as a supplement to the *Jamaica Gazette* dated December 22, 1910.

After giving a short description of the West Indian court, 800 square feet of which (or twice as much as the area required by any other West Indian island) was taken up by Jamaica, the report goes on to record the fact that much interest was shown in the growing specimens of economic plants that were sent for exhibition. Among these were full-sized specimens of sugar-cane, of vanilla with pods, and of coffee with ripe berries, as well as young trees of orange, mango and banana

Dealing with the export trade of Jamaica to Canada, it is stated that this has undergone a considerable increase during the last ten or fifteen years, and that there are indications that this may be enlarged with profit, in the near future. There appears to be the fear, in some quarters, that Jamaica products are likely not to prove true to sample. This is generally unwarranted, and there is often heard, on the other hand, the expression of the greatest satisfaction with the quality of the exports sent from the island. It is pointed out, in this connexion, that the existence of the former opinion indicates that the greatest care should be taken in the preparation and the packing and marking of produce for Canada.

Cacao from Jamaica is meeting with a fair demand, and now competes, with some success, with other kinds that were once thought to be superior. Enquiries elicited the information that care in regard to the preparation of a uniform product, and the standardization of this under definite names, would do much to increase the trade. The amount of Jamaica coffee consumed in Canada is comparatively small, and there appears to be little knowledge of the existence of the Blue Mountain coffee. Some prejudice exists against this, on account of the mixed nature of some of the shipments that are received There seems to be a likelihood of an increase in the trade, on account of the high present prices of Rio and Santos coffee.

Jamaica rum is largely imported into Canada from the United Kingdom, instead of directly, and there is evidence that much of the product sold is adulterated. A revision is being made of the laws affecting the sale of food in Canada, and it would appear to be a useful procedure at a time like the present to draw attention to the conditions under which Jamaica rum is sold in that country. A good and sustained demand for Jamaica sugars exists, the popularity of some marks being particularly great. It is thought that a steady enquiry might be created for the cheaper brands of Jamaica cigars. As regards those of high quality, only small quantities have been put on the market; these have to compete with Havana cigars, which are already popular. A sample of Jamaica leaf tobacco received a very favourable report from an expert to whom it was submitted.

It was not possible to make a good show of fruit, on account of the season of the year. From a general point of view, the Jamaica orange is not as popular as the fruit from California, mainly because the latter possesses an attractive skin, and is packed carefully with a regard for uniformity; the flavour of the Jamaica product is, however, considered to be superior. In connexion with this matter, the suggestions are made that all oranges exported before the end of September should be marked 'Jamaica Earlies', and that the fruit should never be shipped in barrels. The mangoes sent to the Exhibition arrived in good condition. Bananas, as is well known, are steadily growing in popularity in Canada.

Particulars are given further, of Jippi-jappa hats, honey and beeswax, and preserves. With due care as to the particular requirements, there should be a fair demand for these.

The awards gained by Jamaica included: gold medals by the Government of Jamaica, the Hanover Agricultural Society, and by fifteen firms of exporters; silver medals by six firms and by the Women's Self-help Society; bronze medals by fourteen firms and private exhibitors; and a diploma by the Government Reformatory.

The report concludes by drawing attention to the work done in other West Indian islands by permanent exhibition committees, and with suggestions for the formation of a local committee with functions similar to those of the former, so that a permanent exhibit might be brought together in Kingston, for general instruction, and to serve as a basis for exhibitions abroad.

It may be mentioned that references to the West Indies and British Guiana, in relation to the Canadian Exhibitions held last year, may be found in the *Agricultural News*, Vols. IX, pp. 209, 251, 291, 319, 343 and 412; X, p. 69.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture left Barbados for St. Lucia on March 14, 1911, by the S.S. 'Guiana', for the purpose of conferring with His Honour the Administrator on official business, relating more particularly to the reorganization of the Agricultural Department, consequent on the recent changes. Dr. Watts is expected to return to Barbados by the S.S. 'Korona', on the 18th instant.

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. X. SATURDAY, MARCH 18, 1911. No. 232.

NOTES AND COMMENTS.

Contents of Present Issue.

The editorial deals in a general manner with The Value of Humus, and presents some facts and points of view that are of the most recent discovery.

A short article, on page 83, gives the details of an estimate of the cost of sugar production in Java.

Some facts about the varieties of kola nuts that are produced in West Africa are given on page 84.

Page 86 contains details concerning a recent meeting of the Council of the British Cotton Growing Association, as well as other matters of interest.

The Insect Notes, on page 90, present an account of the Entomological Research Committee, which was appointed by the Colonial Office in 1909. Special attention is given to the work that has been described in the Journal of the Committee, which is published under the title of *The Bulletin of Entomological Research.*

An abstract of a recent report on the Mexican rubber industry, with references to that of Panama, is given on page 91.

On page 94, the Fungus Notes deal with recent work with the fungi that are parasitic on scale insects. The article should be of much interest to fruit growers in the West Indies, especially where the trees are attacked to a large extent by black blight.

Reduction in Number of Agricultural Journals.

The *Agricultural Journal of the Cape of Good Hope* for December 1910 contains an announcement to the effect that the Government of South Africa has decided to discontinue the publication of this, as well as of the Natal and Transvaal Agricultural Journals, and to issue one Agricultural Journal for the whole Union of South Africa, in which these will be merged. In making this announcement, the opinion is given that great advantages will accrue to the farming community, 'as such a course opens a wider field and, as a consequence, gives an opportunity for greater efficiency.'

In view of the tendency toward the multiplication of agricultural journals that is being shown at present, this decision is interesting, especially as it arises from an experience extending over many years.

Abnormal Rainfall in St. Lucia.

A note on the heavy rainfall that has been experienced recently in St. Lucia appeared in the last number of the *Agricultural News*; this was based on information received from Mr. J. C. Moore, Agricultural Superintendent, St. Lucia. Since this, a letter dated March 2, 1911, has been received from Mr. Moore, stating further, that on the 7th, 8th and 9th of last month, still heavier rains were experienced in the northern half of the island, causing destructive floods in the valleys, and landslips in the hills. Some idea of the excessive rainfall that has been received may be gained from the fact that the average precipitation for the month, at six stations in the affected district, was 20·41 inches; nearly the whole of this fell between the 1st and 9th ultimo. The month's records at the Botanic Station and the Experiment Station were 16·64 inches and 21·91 inches, respectively. On the 7th of the month, 4·04 inches was recorded at the Botanic Station, and 8·60 inches at the Experiment Station: most of this rain fell during the night. Records are not available from some of the other stations, because the rain gauges were too small, and thus overflowed.

Details of the damage and loss of life have been given in a special report submitted by the Agricultural Superintendent to the Administrator, who has forwarded a copy to the Imperial Commissioner of Agriculture. This shows that there was no loss of life, except at the factory in the Mabouya valley, where unfortunately, ten out of seventeen persons occupying a barrack building near the factory were drowned, as they were unable to escape from the building, which was carried away by the flood.

In regard to the damage done, the report shows that, while considerable losses have been sustained in some individual cases, this should be of a temporary character, and reparable by the energy of those who have suffered it. The satisfactory opinion is given that there is no evidence of general distress and hardship in any of the districts visited by the Agricultural Superintendent.

Interaction of Stock and Scion.

A note on this subject appeared in the *Agricultural News*, Vol. VIII, p. 313. Further information is contained in an abstract of a paper in the *Botanical Gazette*, 1910, p. 73 This describes experiments in which tobacco (*Nicotiana Tabacum*) was grafted on *N. affinis*, and the Irish potato (*Solanum tuberosum*); and *Datura Stramonium* (known as David's bush or wildfire bush in the West Indies), on the tomato (*Solanum lycopersicum*) and the potato. The results showed that there was a slow movement of the particular alkaloid in the case of each of the scions to the stocks. It was also shown, in the case of tobacco on *N. affinis*, that the amount of alkaloid in the former decreased, with an increase of this in the latter. A similar result occurred in the case of tobacco on the potato. the nicotine being mostly stored in the latter, with the circumstance, however, that little or none was found in the tubers.

Oil from Para Rubber Seed.

The *Planters' Chronicle* for December 31, 1910, draws attention to a statement in the *Chemist and Druggist* to the effect that several journals are again referring particularly to oil from Para rubber seed, on account of its ability to make up for part of the present shortage of linseed oil. Large quantities of the seed are now practically wasted, when it might form a useful addition to the profits of the rubber industry, particularly on clean weeded estates where the seed could be gathered or swept up comparatively cheaply, and sent to oil mills for the production of oil and seed cake.

This is of much interest, as the scarcity of linseed oil is such that it is quoted higher than has been the case for the past twenty years, and prices have doubled during last year. The rise in price seems to have been brought about through failure of the linseed crop and the employment of many of the mills for crushing soy beans.

A Machine for Picking Cotton.

There is being shown in Liverpool a new machine for picking cotton, which has been invented in the United States, and demonstrations with it have actually been made. According to the *Textile Mercury* for January 21, 1911, it is driven by petrol at walking speed, and it is said to remove the cotton from the bolls with fair ease and regularity. For the purpose, an arrangement exists by means of which teeth, acting as fingers, come into contact with the cotton hanging out of the boll, so that the lint is caught by them, and then detached automatically into a bag at the rear of the machine. The claim is made that the plant is not damaged by its use, and that no destruction of flowers takes place.

It is evident that the employment of such a machine is much more feasible for upland than for Sea Island cotton, in view of the larger power to bear of the former kind, and the consequent extent to which the lint hangs out of the boll.

Science Teaching at the St. Vincent Grammar School.

In a memorandum drawn up in relation to the suggestion that science teaching shall be given in connexion with the classes at the Grammar School, St. Vincent, for the information of His Honour the Administrator, several proposals are made for adding to the feasibility of such a scheme.

It is suggested that the classes should be held in the Agricultural School, which possesses facilities for the purpose, while these do not yet exist at the Grammar School. It is further advised that the lessons should be held in general elementary science, botany, chemistry, agriculture and physics, and that the classes should work from 7.30 to 9 a.m. It is the intention to follow the plan adopted at the Antigua Grammar School, where general elementary science is taken by all pupils up to Form IV—a plan which insures that some knowledge of chemistry is gained by every boy before Form IV is reached, so that the work with this form is much simplified. It is at this stage that specialization commences, all the science subjects being taken by the agricultural students, only.

It is not intended, at present, to substitute any of these subjects for those ordinarily taught in the schools; although as time goes on, those who intend to specialize in agricultural subjects may possibly be allowed to let these replace partly some of the others.

Hints for Transporting Paddy Seedlings.

The *Quarterly Journal of the Department of Agriculture*, Bengal, for October 1910, contains details of an experiment which was devised for the purpose of finding out how long paddy seedlings will last, and what condition they would show at the end of the time, if they were kept under certain circumstances made to imitate those which exist during transportation. In the trials, the seedlings were placed in a cart, in the open, for one day, in a closed railway truck for three days, and again in a cart for one day.

The results of the experiments showed that, before the seedlings are first put into the carts, they should be freely sprinkled with water without, however, washing the soil from the roots: only freshly plucked seedlings should be chosen. Before removal to the railway trucks, they should be watered once more, but not to excess; the employment of watering cans has been found useful for the purpose.

Another result obtained was that the best way to pack the seedlings in the trucks is in an upright position, with the roots downward, and it is suggested that a useful method to adopt would be to pack the small bundles loosely to form large ones, which should be tied with stems and not with ropes.

Before the seedlings are placed on the carts for the third stage of the journey, they should be watered again. The adoption of all these precautions made it possible to obtain seedlings for transplanting, in good condition, five, or even six, days after they had been picked.

INSECT NOTES.

THE ENTOMOLOGICAL RESEARCH COMMITTEE.

During 1909, the Colonial Office appointed a Committee to carry out investigations in Economic Entomology in Tropical Africa, with special reference to the relation between diseases, in man and animals, and ticks and insects.

The Committee includes several eminent Entomologists who receive and study the material sent in by the Committee's collecting entomologists, and that sent in by the Government Entomologists of the several African colonies, and also by medical officers and others who collect. The results of these studies are published as papers in the *Bulletin of Entomological Research*, published by the Committee, which has appeared in four parts (Vol. I, parts 1-4), with a total of 319 pages. The separate parts have appeared as follows: Part I, April 1910; Part II, July 1910; Part III, October 1910; and Part IV, January 1911.

There have been presented five papers dealing with mosquitoes, their habits, life-history and distribution, giving accounts of the different stages of development; and in many cases accompanied by figures from drawings and photographs. Papers dealing with the blood-sucking Diptera number sixteen. These include studies of tse-tse flies, which carry sleeping sickness and diseases of cattle; of the gad flies or horse flies of the family Tabanidae, which annoy animals by their vicious biting, and notes on habits and distribution.

Three papers have appeared on sleeping sickness; one on a sub-family of the Tachinidae, the larvae of which occur as subcutaneous parasites of man; one on the fleas attacking mice and rats; and one on the families of Acarina.

The more strictly agricultural papers have been on fruit flies (two), Coccidae (five), and Hemiptera injurious to cacao (two).

The notes on Coccidae are based on collections from Uganda, forwarded by Mr. C. C. Gowdey, B.Sc., which have been studied by Mr. R. Newstead. These are of scientific interest, since they contain several new species; and small Hymenopterous insects, which are stated to be fairly abundant, occur as parasites of the Uganda scale insects.

The notes on Hemiptera injurious to cacao include an account of a species of Helopeltis from the Gold Coast, which occurs as a pest in certain localities. The mosquito blight of tea in India is due to a species of this genus (*Helopeltis theivora*), which rendered large areas of tea plantations in Northern India unproductive. The injury is caused by the punctures of the insect, made in feeding. These cause many young pods to die, and often injure the older pods to such an extent that, although they survive on the tree until they reach maturity, the seeds are worthless.

Another Hemipterous insect injurious to cacao on the Gold Coast is the cacao bark sapper (*Sahlbergella theobroma*), with which is often associated a nearly allied species (*Sahlbergella singularis*). These insects are reported as destroying cacao trees in certain localities. The injury to the trees results from the punctures in the bark made by the insects with their sucking mouth parts while feeding. Experiments indicate that spraying with kerosene emulsion, at a time when the immature insects are abundant, is an efficient and practical measure.

A paper by Dr. W. M. Graham on West African fruit flies (Trypetidae) states that these pests belong to two genera: Ceratitis, of which nine species have been recorded, and Dacus, of which eleven species are known. Very little seems to be described of the habits and food plants of most of these species, but they are all liable to prove serious pests to fruit cultivations.

The remedies suggested are the destruction of all fallen fruit and the use of the poisoned sweet mixture which has given such good results in Cape Colony. This is prepared by mixing: sugar $2\frac{1}{4}$ lb., arsenate of lead (paste) 3 oz., and water 4 gallons, and is applied by being sprayed on the foliage of infested fruit trees. The adult flies feed upon this mixture and are killed.

In the second paper on fruit flies, Mr. E. E. Austen describes a new genus and two new species from Uganda. It is expected that these insects will prove to be pests of fruit, but nothing is known of the life-history and habits.

Certain of the statements with regard to the yellow fever mosquito, *Stegomyia fasciata*, which are found in the paper on the Prevalence, Distribution and Significance of *Stegomyia fasciata*, F. (S. calopus, Mg.) in West Africa, by Sir Rubert Boyce, may be of interest. Sir Rubert Boyce visited the West Coast in 1910, to investigate the conditions existing in connexion with an outbreak of yellow fever. He found Stegomyia abundant in many towns, more abundant in fact than in any of the localities visited by him in the West Indies and Central America. The yellow fever mosquito was found breeding in both pure and foul water, but always in the vicinity of human habitations. Mosquito larvae do not have a purifying effect on water in which they occur, as is sometimes supposed, but on the contrary they contaminate pure water, and probably increase the contamination in foul.

The statements in regard to the length of time spent in the several stages are of interest. It has been found that the Stegomyia eggs collected in Manaos were kept practically dry for from forty-five to forty-seven days, and that when these were placed under suitable conditions in England, they hatched in from six to twelve hours: the larval stage occupied nine days, the pupal stage three days, the complete cycle thus occurring in from twelve to thirteen days, after the eggs were placed in conditions suitable for their development.

It has been stated, also, that the eggs of Stegomyia are laid at the edge of the water and not actually in or on it. Accordingly, if a period of dry weather ensues directly after the deposition of Stegomyia eggs, these may remain dormant until submerged by the rise of water due to rains, and then hatch.

The length of time that an infected female yellow fever mosquito may live before depositing eggs is sometimes considerable, and this may often account for the sporadic appearance of yellow fever long after the latest known cases have occurred.

The influence of infected immunes in a district where Stegomyia is present and yellow fever is at the time absent, is also indicated, by acting as reservoirs of yellow fever from which new cases originate. Mosquitoes may become infected by biting such persons, and then give rise to new cases of yellow fever.

This review of the contents of the numbers of the journal published so far by the Committee of Entomological Research should serve to show the wide scope of its work, and the way in which its labours are assisting in the opening up of new countries for the practice of scientific agriculture.

THE MEXICAN RUBBER INDUSTRY.

An important report on a visit by Mr. H. S. Smith, of Tobago, to Mexico and Central America, for the purpose of investigating the rubber industry, was presented to the Trinidad Board of Agriculture on January 20, 1911.

In Mexico, Mr. Smith found that the care employed in tapping the Castilloa plants varied much on different estates; in some cases, this is done in the roughest manner with a machete, and notwithstanding the treatment, most of the trees seem to be healthy, although there were evidences that many of them had been killed through the drastic cutting that they had received. On one estate, where careful tapping was done, this was in the form of long V cuts, connected by a shallow vertical channel, which carries the latex to a single cup at the base of the tree. The method employed was to mark the cut with the V tool, and to open it down to the wood with the point of a sharp knife. Interesting particulars of results obtained by different methods of tapping are given in the report.

In parts of Mexico, much damage is done from time to time by fires, some 83,000 trees having being burned recently on one estate alone: and although these are making a good second growth, the delay in tapping is a serious affair for the company owning the estate.

It is a matter of some interest that there are unmistakable indications that Castilloa thrives well when planted at stake, closely, without shade. This has been the experience from the early times, when plants were grown in the partial shade of forest clearings, and their growth was compared with that of plants raised in nurseries, in the open. As regards weeding, the old method was to keep the land absolutely clean; at present, the plan is to remove the weeds from the vicinity of the plants alone, allowing them to come up between the rows.

Interesting experience is quoted from the Isthmus of Tehuantepec, where it was found that Castilloa will not thrive on a stiff clay soil, or on low-lying, swampy land. It also does not grow well on hilly land with a shallow soil, where the dry season is long, and strong and hot winds are prevalent. A useful result of this experience has been to discourage the flotation of bogus companies pretending to exploit Castilloa in impossible situations.

A large proportion of the rubber produced in the La Zacualpa group of estates is separated by means of a centrifugal machine, the best method having been found to be to dilute the latex until it contains 1 per cent. of rubber solids, and to allow it to stand thirty-six to thirty-eight hours before it is placed in the machine. Rubber prepared in this way realizes about 4½*d.* per ℔. more than crêpe.

In Panama, a different variety of Castilloa was found, the chief particular characterics of which are the absence of horizontal spreading of the branches—a quality which is usually very evident in the case of the Mexican tree—and the fact that the latex does not flow freely at any time.

The conclusions made by Mr. Smith at the end of his report include the following points: (1) that the varieties of Castilloa in Mexico and Tobago are identical: (2) that Castilloa rubber can be produced as well in Tobago as in Mexico; (3) information given by planters in Mexico shows that the average yield of Castilloa trees ten to twelve years old, is nearer ½ ℔. per tree than 2 ℔., as has often been supposed; (4) that tapping higher up the tree will increase the yield considerably, and the cost of production can be reduced materially by the adoption of Mexican methods of tapping; (5) that the rubber from trees of similar ages is probably the same in Mexico and Tobago, but that the former is likely to contain more resins than the latter, on account of the fact that some of it is obtained from wild Castilloa growing in the plantations.

A NEW GREEN MANURE.

Seeds of a plant called *Boja Medelloa* or *Candida Tephrosia* were distributed for trial last year among the various experiment stations in the West Indies. A short note on the plant appears in the *Agricultural News*, Vol. IX, p. 341.

The seeds of the plant were received from Ceylon, and subsequently, particulars of the analysis of the plant, in relation to its use as a green manure, have been obtained from the Superintendent of Telbedde estate, Badulla, who forwarded the seeds in the first instance. The figures given for the green plant were determined from partly withered leaves and stems, so that allowance must be made for this; the percentage of moisture is probably too low by about 20. In the following table the figures are expressed as percentages:—

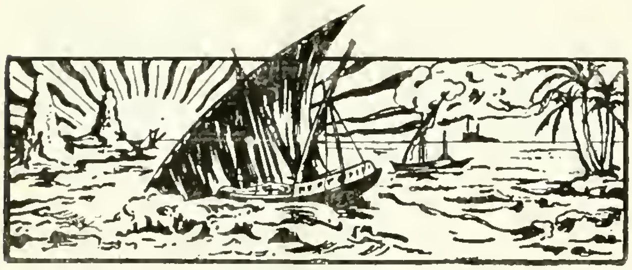
	Leaves.		Stems.	
	Green plant.	Plant dried at 100° C.	Green plant.	Plant dried at 100° C.
Moisture	54·53	—	14 06	—
Organic matter*	42·86	94·27	82·37	95·85
Ash	2·61	5·73	3·57	4·15
*Containing nitrogen	2.03	4·47	1·71	1·99

The analysis of the ash shows that this contains the following amounts for the leaves and the stems, taken in this order: lime 17·69, 14·48 per cent.; potash 21·47, 32·89 per cent.; phosphoric acid 8·10, 11·00 per cent.

A consideration of the analysis is given which shows that every 1,000 ℔. of fresh green manure from the plant supplies an equivalent, in nitrogen, phosphoric acid and potash, to about 400 ℔. of castor cake, 10 ℔. of bone meal, and a similar amount of sulphate of potash, respectively.

The investigation was made by the Analyst to the Colombo Commercial Company, Ltd., and the opinion is given that the figures compare very favourably with the similar quantities for other green manures, with particular reference to those published in the *Circulars and Agricultural Journal of the Royal Botanic Gardens*, Ceylon, and it is considered that, with a reasonable yield of material per acre, the plant should prove to be a very valuable green manure.

It is with much regret that the death of Mr. J. H. Hart, F.L.S., late Superintendent of the Royal Botanic Gardens, Trinidad, is placed on record. Mr. Hart had been engaged directly in matters connected with agriculture in the West Indies since 1875, first in Jamaica and then, from 1887 in Trinidad, where he occupied the post of Superintendent of the Royal Botanic Gardens until 1908, when he retired on the maximum pension, and took up the work of an expert adviser in tropical agriculture. Mr. Hart's keen interest in almost all questions of tropical agiculture makes his death a loss both locally, and in regard to those parts of the world where the matters on which he was an authority are of first importance.



GLEANINGS.

A report received from the Curator of the Botanic Station, Montserrat, shows that the distribution of plants during January last included: cane cuttings 9,600, cacao plants 233.

A new regulation has been made by the Government of Jamaica concerning the importation of flour, so that this is not now permitted to be landed in that island in bags, but must be packed in barrels.

The last annual report of the Secretary of the United States Department of Agriculture shows that the value of sugar and molasses imported into that country, during 1910, was about one and a quarter million pounds sterling.

It is shown in a report from the British Acting Consul at Dairen, Manchuria, that the export of sesamum seed from Manchuria has begun lately to increase largely, because of the higher prices in South China, resulting from a greater demand. From two of the Manchurian ports, over 1,500 tons was shipped to Japan during last November.

Copies of three leaflets, issued by the Permanent Exhibitions Committee of British Guiana have been received. These deal with the sugar industry, the balata and rubber industries and the rice industry, and are produced in an attractive and useful form which should help to arouse and sustain interest, where it is required, in the subjects with which they deal.

It is announced from the St. Lucia Botanic Station that several thousand lime plants are now ready for distribution in the island, from the nursery of the Agricultural Department at Union. The price of the plants is 6*d.* per 100, at the Botanic Station, and orders, together with the necessary remittance, should be forwarded to Mr. J. C. Moore, the Agricultural Superintendent.

The number of bales of cotton imported into the United Kingdom during the fifty-two weeks ended December 29 was 3,773,012. This amount included 6,500 bales of British West Indian cotton, 6,812 bales British West African, 16,209 bales British East African, and 24 bales of foreign East African cotton. (From *The Board of Trade Journal*, January 5, 1911.)

A forecast of the cotton crop of Eastern Bengal and Assam, dated December 10, 1910, states that the estimated area is 99,100 acres. When it is considered that the crop in this part of the country represents, on the average of the five years ending 1908-9, about 0·3 per cent. of the total area, some idea of the extent to which cotton-growing is carried on in India may be obtained.

Information has been received from the Curator of the Botanic Station, Dominica, to the effect that the prospects for a satisfactory carême crop of cacao are fair. With regard to cacao, it is announced that the judging in connexion with the prize-holdings competitions in Dominica has been carried out recently, with the assistance of that officer, when the work entailed the inspection of no less than thirty-seven small holdings.

The Agricultural Instructor for the Virgin Islands reports that the total amount of seed-cotton purchased during January 1911, was 55,877 lb., for which payments were made amounting to £735 9*s.* 9*d.* These figures constitute a record; they are approached most nearly by those for December 1908, when 43,000 lb. of cotton was bought, the amount paid being £439 8*s.* 3*d.* It is further stated that 17,780 lb. (80 bales) of cotton have been shipped so far, for the season, the value of this being £1,333 10*s.*, and the whole of it is reported to be of first quality.

Through the courtesy of the Trustees of the British Museum, Vol. I of *The Flora of Jamaica*, which deals with the Orchidaceae, has been received. This has been compiled by Mr. William Fawcett, B.Sc., F.L.S., late Director of Public Gardens and Plantations, Jamaica; and Dr. Alfred Barton Rendle, M.A., F.R.S., F.L.S., Keeper of the Department of Botany, British Museum (Natural History). The work consists of 150 pages of text and 32 plates; it should be of the greatest use to those who are interested in the orchids of Jamaica.

It is stated in an article entitled Some Useful Plants of Mexico, in the Journal of the New York Botanical Garden for January 1911, that there is the expectation that the seeds of Argemone, a member of the poppy family, which is largely represented in Mexico, will be used to produce an oil that will eventually become an important article of commerce, both in relation to medicine and its employment in the place of some of the fixed oils. This is somewhat interesting, in view of the fact that one species of this genus, namely *Argemone mexicana*, is very common in several of the West Indian islands.

A new Ordinance, called the Importation of Plants Ordinance, 1911, has been enacted in Uganda, to be read as one with the Importation of Plants Ordinance, 1908. It provides for the prohibition of particular importations and removals, by special proclamation; the destruction of plants which in the opinion of the Botanical Authority cannot be disinfected by ordinary means; and the designation by the Governor of any officer whom he may choose to act under the Ordinance. A subsequent declaration under these Ordinances appoints the Economic Entomologist to be the Botanical Authority for the purposes of them.

The Field for February 4, 1911, states that the most recent report of the National Sugar Beet Council is of an encouraging nature and shows that plants giving 17·0 to 20·5 per cent. of sugar have yielded as much as 26 tons per acre, in Cornwall, from 13 to 16 tons being common. The result would indicate that roots with a high sugar content and yielding a juice of satisfactory purity can be grown under the conditions of the British climate. A further note, in the next number of the same paper, shows that 19 tons per acre of cleaned roots without tops has been obtained at Farnham, Surrey, and that the juice of these gave, on analysis in Holland, 16½ per cent. of sugar.

STUDENTS' CORNER.

MARCH.

Second Period.

Seasonal Notes.

In peasant cultivation, particularly, several different kinds of crops are often planted in the same plot of ground. Discuss the advisability of adopting such a method of cultivation, especially in reference to the likelihood of obtaining the best yields from the plants, and to the chances of attack by insect and fungus pests. In the same relation, consider the question of the desirability of growing green dressings between the rows, in the case of certain crops. In peasant cultivation, again, the trash is often removed from plots where sugar-cane is being grown. What is likely to be the result of such removal, in regard to the plant and with respect to the soil? What is your opinion concerning the trashing of land, in relation to the supply of plant food that will be available from it?

Where the flower-bud maggot of cotton has proved itself to be a notable pest, records should be available concerning the date of its appearance in the season just ending, as well as in previous years. These will help in arriving at a decision as to whether early or late planting is advisable in connexion with the power to minimize the destructive effect of this pest. Where cotton is still standing, and attacks of leaf-blister mite are taking place, a comparison might be made of the effectiveness of picking off infected growths, with that of dusting with lime and sulphur, in relation to the problem of preventing its spread. What is the place of the leaf-blister mite in the Animal Kingdom, and what are the chief matters of importance in its life-history? Give an account of the flower-bud maggot, particularly in relation to the stages which are passed through by it, and include any reasons that are suggested for the great difficulties that exist in connexion with the eradication of this pest. A detailed account of it is to be found in the *West Indian Bulletin*, Vol. X, p. 1.

Make a list of the different varieties of sweet potatoes with which you are familiar, and to which you have access. From time to time, careful note should be taken of the chief characteristics of these varieties, with special reference to the shape of the leaves and roots, their colour and its distribution in the case of the leaves, as well as in connexion with the quality of the product, its yield, and the resistance of the different kinds to diseases and pests. If these matters are noted on a list which has been made, as is described above, they will give useful information with regard to the plant itself, and will form a guide in selecting varieties for future planting.

Further work in connexion with varietal differences of plants may well be done at the present time with the sugar-cane. Observations should be made continually for the purpose of attaining the ability to name the different kinds after a short examination. This leads to the practical use of the knowledge that has been gained, for it will be possible now to make notes on definite characters of the varieties, special attention being given to the yields that are obtained from them, the time that each takes to come to maturity, and the power to resist disease which it exhibits. It is a well-known fact that certain varieties of sugar-cane, especially, develop noticeable differences in their appearance, as well as to some extent in their sugar content, in relation to the surroundings in which they are grown. Of what use to plants is the power to vary under different conditions, and how, in a general way, may advantage be taken of this power by the agriculturist? For guidance in making observations on the time of maturity of different kinds of sugar-cane, it may be stated that this is comparatively short in the case of B.208; while B.147 is a late maturing cane. What hint does this give us in regard to the use of one or the other of these canes for supplying dead holes?

Why is it important that, in reaping, the cane should be cut as low down as possible, giving attention to other considerations than that of obtaining the largest yield of cane per acre? Where the stumps of plant canes are being left in the ground for a ratoon crop, a careful examination should be conducted for the purpose of determining if root disease is present, and to what extent this is the case, in order that it may be decided if it will be well to raise a ratoon crop at all in that part of the ground. What are the signs that you would look for in conducting observations of this nature? In cases where the disease is seen to be particularly prevalent, what are the proper precautions to be taken in order to lessen its chances of spread, and its opportunity to do damage to succeeding crops, as far as possible?

It should not be necessary at the present time to remind those whose work is conducted on sugar estates that every thing that is possible should be done now, in order to gain a good knowledge of the processes that are employed for the manufacture of sugar. The student will have regard, firstly, to the method used on the estate on which his work is done. He should then take all possible opportunities of gaining information concerning other methods, with the object of comparing the different kinds that come under his notice, in respect to their efficiency and adaptability under particular conditions. In any case, he should not be satisfied as long as there remains any part of the process for the adoption of which he has not been placed in possession of an adequate reason, and of the working of which he is not supplied with a well understood explanation.

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) How would you show the existence of capillary attraction? Of what use is this in relation to growing plants?

(2) How is quicklime made? What changes take place in its properties after it has been wetted?

(3) Give a general account of the effects of tillage on the soil.

INTERMEDIATE QUESTIONS.

(1) What is meant by saying that manuring with lime may be equivalent to manuring with potash?

(2) How does the soil retain water, even though it is well drained?

(3) Describe the way in which it may be shown that starch is formed in green leaves, in sunlight.

FINAL QUESTIONS.

(1) What are the chief differences in character between molasses and syrup, or fancy molasses, and how do these differences depend upon the manner in which they are respectively obtained?

(2) Give a discussion of the ways in which the presence of an excess of water in the soil may be harmful to plants.

(3) Taking into consideration the conditions that obtain on an estate with which you are familiar, discuss the advantages of the use of green dressings on that estate.

FUNGUS NOTES.

RECENT WORK WITH FUNGUS PARASITES OF SCALE INSECTS.

In the *Agricultural News* of September 18, 1909 (Vol. VIII, p. 299), a short account was given of the fungi known to be parasitic upon scale insects in the West Indies, and this preliminary paper was followed by another in the *West Indian Bulletin*, Vol. XI, p. 1, where a detailed account of their known distribution and hosts was given. It was also pointed out that for various reasons these fungi were likely to prove a useful means of controlling scale insects, provided that they were employed in the right way. Experiments have been conducted recently with one of these, the shield scale fungus (*Cephalosporium lecanii*), in Barbados and Grenada, which furnish some interesting additional information; while general observations in Grenada have indicated the advisability of paying careful attention to one or two matters which will be mentioned below.

GRENADA. As is well known, many of the trees in this island have been subject in recent years to bad attacks of scale insects, attended by black blight fungus. These are found on very many different trees, but are commonest on the mango. The scale insects chiefly associated with the black blight fungus, on whatever species of plants it occurs, are the soft shield scales, members of the genus Coccus, which are persistently attacked by the shield scale fungus. In consequence of this, experiments were undertaken with a view to extending as widely as possible the distribution of this useful fungus throughout the island, as it was known to occur there, but appeared to be limited to the Botanic Gardens and their neighbourhood, at the extreme leeward end of the island. The Superintendent of Agriculture sent out packages of leaves bearing specimens of soft shield scales attacked by the fungus, with the request that they might be tied carefully into any big mango tree on the estate to which they were sent, provided that the tree was badly infected with black blight. A request was also made that any results obtained as regards freeing the tree from black blight and scale insects might be carefully noted. In addition, experiments were conducted under the direction of the Superintendent of Agriculture for the purpose of extending the distribution of the fungus in the Botanic Gardens themselves. As a result of these experiments, the fungus has become definitely established at two localities in the interior of the island, and its distribution in the Botanic Gardens has been extended. The trees on which it has spread successfully have been almost entirely freed from scale insects and, in consequence, are not nearly so severely affected with black blight. It was noted, moreover, that the fungus had spread to a species of scale insect that it had never been known to attack before, namely the mealy shield scale (*Pulvinaria pyriformis*), which occurred on a cinnamon tree in the gardens.

Although the fungus mentioned cannot yet be said to have attained anything approaching universal distribution in the island, yet the experiments show that this much desired result might be attained, by means of diligent and persistent effort, in a reasonably short space of time.

BARBADOS. In November 1910, the Superintendent of Agriculture observed the shield scale fungus attacking the black scale (*Saissetia nigra*) on some branches of Hibiscus, and made use of this material to infect the green and mango shield scales (*Coccus viridis* and *Coccus mangiferae*) on guava and mango plants at the Botanic Station at Dodd's Reformatory. The results were so satisfactory that similar experiments were conducted at Queen's Park, and these were also attended with success. In fact, in February, the Superintendent of Agriculture reported that it was difficult to find in the infected trees scales which were not attacked by the fungus.

Information as to the discovery made in Grenada that the shield scale fungus could attack the mealy shield scale was communicated by the Imperial Commissioner of Agriculture to the local Department of Agriculture, Barbados. As a result, examination was made in February of certain trees at Dodd's Reformatory, of Java plum (*Eugenia Jambolana*) and rose apple (*Eugenia Jambos*), on which this scale was known to be living, and it was found that individual insects were attacked by the fungus in that locality, also. In order to hasten the spread of the parasite, the Superintendent of Agriculture caused certain branches of the Barbados cherry (*Malpighia glabra*), on which the scale insects had been destroyed by it, to be tied into the Java plum and rose apple trees, with the result that the spread of the fungus has gradually increased.

These experiments afford most striking confirmation of the results that might be expected in consequence of careful and well directed applications, not only of the shield scale fungus, but also of all the species known to destroy scale insects in these islands.

GENERAL CONSIDERATIONS. One of the most important points requiring consideration when employing these fungi, is that they have not yet become distributed throughout the whole of several of the islands. Consequently, where this is the case, if their spread is left entirely to natural means, it may be many years before their benefit becomes at all evident, and in certain cases, their effect might never be so large as to be of much practical service. Thus, in order to obtain the best results as quickly as possible, every effort should be made to increase their distribution artificially by means similar to those indicated above. This effort, moreover, must be sustained, the infection experiments being repeated until they are definitely successful.

In conducting these experiments, certain points should be remembered. The trees chosen for infection should be situated at the windward end of the district to be treated; this applies especially to narrow valleys. The material should be tied in at the top, and on the windward side of the trees; while it is advisable also to cause the infected leaves to come into fairly close contact with the under sides of the leaves to be infected, as it is on the under side of the leaf that the majority of the scale insects occur

Again, even when infection has been established, it is possible that after an interval reinfection may become necessary; for if all the scale insects are killed the fungus dies, so that a new attack of insects will make it necessary to introduce more fungus.

Even when a given fungus has become well established in an island, efforts to increase its prevalence by artificial means will almost certainly be necessary, in order to ensure that its spread keeps pace with that of its hosts. This is particularly the case in seasons unfavourable to the fungus, which are bound to be of periodic occurrence.

Although there is need of continuous effort and of sustained artificial encouragement in order to induce these fungi to do the work required of them, yet there can be little doubt of their economic usefulness. It may be added that no such sustained effort has as yet been made, so that the present condition of affairs cannot be taken as any criterion of the possible effect of these parasites in controlling the scale insects of the West Indies.

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:—

The month of February opened well in Mincing Lane in the matter of drugs and chemicals, but with spices much less interest has been shown. The greatest activity prevailed in the middle of the month, and affected products of Eastern origin rather than those of the West, but the general tone of the markets was considered, by buyers and sellers alike, as highly satisfactory, both in the quantities brought forward, as well as in the prices realized. The drug that is still attracting perhaps the most interest is Buchu, the leaves of species of Barosma from Cape Colony, which at the time of writing are fetching as much as 4*s.* 3*d.* per lb. The interest shown in, and the demand for, this drug are proved from the facts that in the month of December 1909, the exports from Cape Colony amounted to 13,885 lb., valued at £585, while in December last (1910) the exports were only 6,727 lb, and the value £563.

GINGER.

The demand for this article has been very slow. In the early part of the month it was represented by only 215 bags of Cochin, which were sold without reserve at 47*s.* 6*d.* to 48*s.* Again later, some 300 packages of Japan were brought forward, and sold without reserve at 38*s.* to 40*s.* per cwt.

NUTMEGS, MACE AND PIMENTO.

On the 8th of the month, 190 packages of West Indian nutmegs were brought forward, and partly sold at the following rates: 56's 10*d.*, 58's 9*d.*, 84's 8*d.*, 68's to 70's 7*d.* and in proportion down to 120's at 4*d.* to 4½*d.* Later in the month, 16 packages of West Indian were offered and sold, 67's fetching 5½*d.*, 90's 5*d.*, 104's to 109's 4¾*d.* to 5*d.* Some 51 packages from the east were also offered and partly sold; 60's realizing 8*d.*, 85's 6*d.* and 100's 4¾*d.* Mace was represented on the 8th by 58 packages West Indian, which sold at 2*s.* 3*d.* to 2*s.* 7*d.* per lb. Pimento has been very little in demand, and the offerings mostly bought in, and the same may be said with regard to arrowroot.

SARSAPARILLA.

Grey Jamaica and Lima-Jamaica have been scarce during the month, and enquiries have been made for both. Their absence has been the cause, at the latter part of the month ,of a greater demand for native Jamaica. At auction on the 9th this quality was however slow of sale. Some 11 bales were bought in at 10*d.* per lb., while 4 bales out of another offering of 21 bales sold at 11½*d.* to 11¾*d.* per lb. for dull mixed to fair red,; yellow fetched 7*d.* per lb. At the same sale, 4 packages of Honduras were bought in at 1*s.* 2*d.* per lb. At the last auction on the 23rd, grey and Lima-Jamaica were still absent, with the result that a few bales of native Jamaica fetched slightly increased prices, 10*d.* to 1*s.* being paid for dullish red mixed.

KOLA, LIME JUICE AND LIME OIL.

At auction in the middle of the month, 5 bags of West Indian kola were offered and sold at 3½*d.* per lb. for dull and dark, and at the last sale 3¾*d.* per lb. was paid for 7 barrels of fair dried West Indian. In connexion with the continental trade in kola, it may be interesting to say that the West African crops are reported to be very small, with the result that prices have risen considerably, and further advances are expected, especially as the stock at Hamburg is said to be small. The business in concentrated West Indian lime juice has been small at prices from £18 2*s.* 6*d.* to £18 7*s.* 6*d.* Raw West Indian, for which there has been a fair demand, has fetched from 1*s.* per gallon upward. For hand pressed West Indian lime oil 5*s.* to 5*s.* 3*d.* per lb. has been paid, and for West Indian distilled oil 1*s.* 1*d* to 1*s.* 2*d.*

A NEW METHOD OF COAGULATING RUBBER LATEX.

The process, devised by Mr. W. F. Dern, chemist to the Mexico Latex Company, consists of two stages, the first being the preservation of the latex. For this purpose the latex is filtered the first day it is collected; thereby particles of bark and other impurities are removed. A preserving powder, discovered by Dern, is then well mixed in, and this sets up a kind of fermentation. When this fermentation has subsided, the latex is prepared for transport by being enclosed in hermetically sealed drums. The latex prepared in this way will remain in its natural state for months. At the works it first undergoes another treatment with a second compound discovered by Dern, 2 litres of this liquid being sufficient for 5 gallons of latex. The mixture is then treated in a centrifugal machine, this process taking from twenty to thirty minutes. By these means the objectionable resins and protein substances are separated, and there remains, according to statements of the company, a pure, well-preserved, nervy, non-sticky raw product. The yield naturally varies according to the nature of the latex. With Castilloa latex about 35 per cent. of pure rubber is obtained, and 10 per cent. of rubber resins; with *Hevea brasiliensis*, up to 40 per cent. of pure rubber and 6 per cent. of rubber resins. The value of the rubber resins amounts to about 50 per cent. of that of the pure rubber, and when working with large quantities of latex it covers the total cost of treatment.

The rubber thus obtained is immediately passed through the washing rollers and dried, and is ready for despatch within twenty-four hours; the rubber resins are obtained two days later. With the plant, as at present used in San Juan Bautista, namely, one motor, two presses, and twenty mixing machines, about 200 gallons of latex can be treated daily. The compound used to bring about coagulation can be used repeatedly, and when it is finally too weak, its original strength can be restored by distillation and the addition of about 20 per cent. of spirit. At present the rubber produced by this process is shipped to Hamburg, where it is said to find a ready sale at a good price; rubber resin is sold in the United States. Up to now the process has only been tested with Hevea, Castilloa and balata. It should, however, be applicable to other sorts with equal results. As for the product of the new method, reports must be awaited. (The *India-Rubber Journal*, January 28, 1911.)

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR, February 28, 1911: Messrs. E. A. DE PASS & Co., February 4, 1911.

ARROWROOT—2*d.* to 3¾*d.*
BALATA—Sheet, 4/- ; block, 3/1 per lb.
BEESWAX—No quotations.
CACAO—Trinidad, 57/- to 66/- per cwt. ; Grenada, 52/- to 57/-; Jamaica, no quotations.
COFFEE—Jamaica, 57/- to 65/6.
COPRA—West Indian, £22 5*s.* per ton.
COTTON—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 18*d.* to 20*d.*
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—Quiet.
HONEY—No quotations.
ISINGLASS—No quotations.
LIME JUICE—Raw, 11*d.* to 1/-; concentrated, £18 2*s.* 6*d.* to £18 7*s.* 6*d.*; Otto of limes (hand pressed), 5/- to 5/3, nominal.
LOGWOOD—No quotations.
MACE—Firm.
NUTMEGS—Quiet.
PIMENTO—Quiet.
RUBBER—Para, fine hard, 6/10½: fine soft, 6/1; fine Peru, 6/7 per lb.
RUM—Jamaica, 1/6 to 6/- per gallon.
SUGAR—Crystals, 14/9 to 18/3; Muscovado, 13/-: Syrup, 9/6 to 12/6; Molasses, no quotations.

New York.—Messrs. GILLESPIE BROS. & Co., February 24, 1911.

CACAO—Caracas, 12c. to 12½c. ; Grenada, 11⅝c. to 11⅞c. ; Trinidad, 12c. to 12½c. per lb.; Jamaica, 10½c. to 11½c.
COCOA-NUTS—Jamaica, select, $30·00 to $31·00; culls, $18·00; Trinidad, select, $30·00 to $31·00; culls, $18·00 per M.
COFFEE—Jamaica, 12½c. to 13c. per lb.
GINGER—9c. to 12c. per lb
GOAT SKINS—No quotations.
GRAPE-FRUIT—Jamaica, $1·50 to $2·00 per box.
LIMES—$4·75 to $5·00.
MACE—41c. to 48c. per lb.
NUTMEGS—110's, 10c. to 10¼c. per lb.
ORANGES—Jamaica, $1 25 to $1·50.
PIMENTO—4c. per lb.
SUGAR—Centrifugals, 96°, 3·67c. per lb.; Muscovados, 89°, 3·17c.; Molasses, 89°, 2·92c. per lb., all duty paid.

Trinidad,—Messrs. GORDON, GRANT & Co., March 6, 1911.

CACAO—Venezuelan, $12·10 per fanega; Trinidad, $11·25 to $12·00.
COCOA-NUT OIL—96c. per Imperial gallon.
COFFEE—Venezuelan, 16c. per lb.
COPRA—$4·30 per 100 lb.
DHAL—$3·30.
ONIONS $2·75 to $4·00 per 100 lb.
PEAS, SPLIT—$5·90 to $6·00 per bag.
POTATOES—English, $1·80 to $1·90 per 100 lb.
RICE—Yellow, $4·30 to $4·35; White, $5·40 to $5·50 per bag.
SUGAR—American crushed, $5·50 to $5·60 per 100 lb.

Barbados,—Messrs. T. S. GARRAWAY & Co., March 13, 1911; Messrs. JAMES A. LYNCH & Co., March 6, 1911.

ARROWROOT—St. Vincent, $4·50 to $4·70 per 100 lb.
CACAO—$12·00 to $12·50 per 100 lb.
COCOA-NUTS—$20·00.
COFFEE—Jamaica and ordinary Rio, $13·50 to $14·50 per 100 lb. scarce.
HAY—$1·40 to $1·50 per 100 lb.
MANURES—Nitrate of soda, $65·00; Cacao manure, $42·00 to $48·00; Sulphate of ammonia, $75·00 per ton.
MOLASSES—No quotations.
ONIONS—$2·50 to $3·50 per 100 lb.
PEAS, SPLIT—$5·80 to $6·10 per bag of 210 lb.; Canada, $4·25 per bag of 120 lb.
POTATOES—Nova Scotia, $2·00 to $2·25 per 160 lb.
RICE—Ballam, $4·85; Patna, $3·50 to $3·80; Rangoon, $2·90 to $3·00 per 100 lb.
SUGAR—No quotations.

British Guiana.—Messrs. WIETING & RICHTER, March 4, 1911; Messrs. SANDBACH, PARKER & Co., March 3, 1911.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	$9·25 to $9·50 per 200 lb.	$9·25 to $9·50
BALATA—Venezuela block	No quotation	Prohibited
Demerara sheet	81c. per lb.	72c. to 80c.
CACAO—Native	11c. per lb.	10c. to 11c. per lb.
CASSAVA—	96c.	No quotation
CASSAVA STARCH—	$6·50	No quotation
COCOA-NUTS—	$12 to $16 per M	$10 to $16 per M., peeled and selected
COFFEE—Creole	16c. per lb.	16c. per lb.
Jamaica and Rio	19c. per lb.	19c. per lb.
Liberian	10½c. to 11c. per lb.	11c. per lb.
DHAL—	$3·50 per bag of 168 lb.	$3·75 per bag of 168 lb.
Green Dhal	$4·00	——
EDDOES—	$1·92	——
MOLASSES—Yellow	None	——
ONIONS—Teneriffe	——	——
Madeira	6c.	6c.
PEAS—Split	$5·75 to $5·90 per bag (210 lb.)	$6·00 per bag (210 lb.)
Marseilles	$4·50	No quotation
PLANTAINS—	20c. to 72c.	——
POTATOES—Nova Scotia	$2·75	$2·75
Lisbon	——	No quotation
POTATOES-Sweet, B'bados	$1·44 per bag	——
RICE—Ballam	No quotation	
Creole	$5·00 to $5·50	$5·00 to $5·25
TANNIAS—	$2·40 per bag	——
YAMS—White	$2·16	——
Buck	$2·40	——
SUGAR—Dark crystals	$2·30 to $2·40	None
Yellow	$2·70 to $3·00	$2·65 to $2·75
White	$4·00	$4·00 to $4·25
Molasses	$2·10 to $2·30	None
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 Stimulation of Agricultural Effort.

AGRICULTURAL work, in its broadest sense, means that which is undertaken for the purpose of assisting and directing the development of industries which are concerned with the production from the soil of things useful to man. It includes efforts to introduce and grow new products, and to bring about the best conditions under which they will thrive, as well as to maintain a progressive standard of agricultural practice in relation to everything that is grown for use. Such work cannot attain to its best fruition unless means exist for its stimulation and encouragement, and it will be well to consider generally how it originates, and the manner in which the impulses arise that cause its inception, and make for its progress.

The chief ways in which agricultural effort in any given direction is stimulated are through the operation of commercial interests; through the desire by private individuals for investigation and advice; and through suggestions on the part of agricultural departments and similar bodies, arising from their experience and work. There is also the incentive to such effort that comes from the direct action of Governments; but this action is most generally taken as a result of the independent indication of a need, so that Governments may be regarded as being the media through which the stimulus acts. In other words, they often form useful means of directing and encouraging effort that has already been suggested through any of the channels that have just been mentioned.

Commercial methods for the inception and encouragement of agricultural work are becoming employed more frequently than has been the case in the past. The efforts of the late Sir Alfred Jones, in relation to the West Indies and West Africa, form an example of work of the kind that has been undertaken on a large scale. Many other illustrations of the same phase are available in the West Indies, notably those having relation to the introduction of improved methods of sugar-making, in Antigua and St. Kitts, as well as to the development of the citrus industry and timber resources—the former in Dominica and Montserrat, more especially, and the latter particularly in the first-mentioned island. These do not by any means exhaust the illustrations of such effort, nor do they include the great extent to which the resources of Jamaica, Trinidad and British Guiana are being developed by commercial bodies. They are merely cited as being instances of the large degree to which the exigencies of trade and the supply of raw material are increasing continually the amount of agricultural effort throughout the world. They have a larger interest in the present connexion—an interest which is bound up with the fact that they nearly all illustrate the greater measure in which the necessity is being recognized for obtaining the co-operation of the scientific adviser, in order that the best results may be achieved. The interests of agricultural commerce demand the existence of the agricultural department, and often require, further, the services of the trained expert immediately employed by those under whose direction the commercial activities are sustained.

The second stimulus to agricultural effort, as has been stated, is concerned with the expressed desire on the part of individuals for the adoption of some definite policy, for the purpose of the improvement of agricultural conditions in a given instance. This desire may arise through the existence of a declining state of a particular industry, through untoward natural or economic circumstances; these may be the prevalence of pests in the first case, or that of unfavourable trading conditions in the second. It may also be caused through the recognition of the need for the development of new industries, either to replace the old, or to provide additional means of agricultural activity, especially for the sake of the diversification of crops. There are instances, too, where this desire for increased agricultural effort has not led only to the attempt to gain the interest of those who are responsible for the administration of the Government or for the provision of agricultural advice; the individuals themselves have decided to attempt a large part of the work, and this is why the present generation is in possession of the results, among others, of the labours of Lawes and Gilbert at Rothamsted, of Coke of Holkham, and of the Dukes of Bedford.

The stimulation of agricultural effort through the aid of agricultural and botanical departments has its first and greatest illustration in the work of the Royal Botanic Gardens, Kew. Reference is made to this in a recent article* by Sir W. T. Thistleton-Dyer, from which some of the facts mentioned here are taken.

*What Science Has Done for the West Indies. *Nature*, February 9, 1911, p. 477.

For many years, Kew was almost solely responsible for the work that was done for tropical countries in plant economy, entomology and mycology. It would not be possible to indicate here, even approximately, the extent to which this has been the case. The value of its work in the past, in the identification and distribution of economic plants, cannot be judged adequately; the fact of its being through Kew that the introduction of useful rubber plants into India, Ceylon and the Federated Malay States originally took place, and the circumstance that it was largely on account of its useful advice that the Government of India was able successfully to introduce Cinchona into that country, are sufficient to give some idea of the scope of its work, and of the accurate foresight with which its schemes have been carried out. In the plan of its activities which was sanctioned by Parliament, recognition was made of its duties in relation to commerce and agriculture: in fine, in the words of the article to which reference has been made above, 'The history of Kew...affords one of the earliest instances...of the recognition of the duty of the State to promote scientific knowledge in the public interest.' Among matters that affect more nearly the concerns of the West Indies is the circumstance that it was from Kew that the first suggestion came for the application of the principle of chemical selection for the improvement of the sugar-cane; and, as is stated in the article quoted above, it was this institution that directed the attention of the Colonial Office to the importance of the selection of varieties raised from seed, for the same purpose.

Turning from the consideration of detail, the history of the past and present activities of Kew is illustrative of the work that is now being done by a number of agricultural and botanical departments, each placed where it will most usefully serve its purpose.

It has been stated already, that the work of Governments is most usually concerned with the administration of schemes that have been indicated as necessary through other channels. Some of the most extensive work of the kind has been done by the Indian Government, particularly in relation to tea and rubber. In the West Indies, part of the agricultural activity in some of the islands, especially St. Vincent and the Virgin Islands, is directly regulated and fostered by the local Government; and there is, in relation to the former island and Barbados, the circumstance that the Governments were responsible for the appointment of a Commission to investigate the sugar-cane diseases which caused great losses during certain years in the decade 1890-1900. In St. Vincent, too, Government is responsible for the administration of the Land Settlement Scheme, and, as regards the sugar industry more directly, the central factory scheme in Antigua, to take an example, was originally fostered by it. These examples simply serve the purpose of illustration. Others have existed, but are no longer found: for it must be understood that the object of Governmental work in such connexions is most generally the provision of necessary pioneering activity and initial encouragement, further developments being left to individuals and corporations acting under the advice of agricultural departments.

It remains to be pointed out that the consideration of the matters with which this article deals draws attention to the necessity for endeavouring to gain a reasonable mental estimate of the extent and importance of the work of the past. The attempt to compare present conditions with those which might have obtained under better and more ideal systems of working has a useful purpose; but it is of much importance to compare the progress that has been made in matters of agriculture and commerce during the phases that are past, in order to appreciate the improved circumstances of the present. This will provide encouragement for the future, and will make for the attainment of knowledge by which the progress to come will be still more stimulated and hastened.

SUGAR INDUSTRY.

THE PRODUCTION OF SUGAR-CANE SEEDLING VARIETIES IN LOUISIANA.

Many attempts have been made, since the year 1890, to produce sugar-cane seedling varieties in Louisiana. These are reviewed shortly in Vol. I, No. 4, of the *American Breeders' Magazine*, where it is pointed out that these efforts attained no success until the work was taken up a few years ago by Mr. A. E. Weller, whose labours are first described in a report of the Louisiana Sugar Experiment Station, issued in 1908.

The article in the periodical mentioned gives information concerning the continuation of this work, and it is from this that the following facts are taken. The preparation for the investigation consisted in addressing requests to various Governments, agricultural departments, experiment stations, botanic gardens, sugar companies and individuals, throughout the world, for cane seeds with which it might be conducted. A list of the contributors who replied to this request includes, in the British West Indies, Dr. Francis Watts, C.M.G., then in Antigua, Mr. J. C. Waldron, Antigua, Mr. J. R. Bovell, Barbados, Mr. F. Evans, Port-of-Spain, Trinidad, the Department of Agriculture, Trinidad, and the Department of Agriculture, Jamaica. Of the material sent, only nine varieties gave seedlings; of these six were from Antigua, two from Barbados and one from Jamaica, the canes with which success was obtained being B.147, B.208, B.306, B.1355, B.3412, D.95, D.109, D.115, and one with no number, sent from Antigua. Of these D. 109 was the most prolific, giving as many as 194 seedlings, whereas the next in order—B.147—gave 77, while any of the others did not produce more than five. The largest number of germinations was obtained from the seed sent by Mr. Waldron, and as is stated, this is all the more remarkable because of the opinion that the sugar-cane in Antigua rarely bears fertile seed. The greater success of this material is suggested to be due to the fact that the arrows were shipped in large bundles, so that they arrived in a better state than if they had been sent by mail, and to the circumstance that the material was in its best condition when it was gathered.

The conclusions to be drawn from the work are rather suggestive than final; they indicate however, that the production of new seedling varieties of sugar-cane in Louisiana will become of much commercial value to that State.

Investigations with the canes that were raised have shown that while L.92 gave a richer juice than D.74, at first, it has deteriorated since. Other Louisiana canes, namely L.201, L.248, L.450 and L 511, which were propagated in 1908, have shown a similar superiority to D.74, but in the light of the experience with L.92, it remains for further work to demonstrate if this superiority will be maintained.

The value of the work is to be increased by the co-operation of the Bureau of Entomology, which proposes to investigate the power of the different varieties to resist insect attacks so that choice from them will be enabled to be made from a consideration of this factor, as well as from those that have usually been given attention, in the past. It is expected that similar co-operation will be made with the Bureau of Plant Industry, in regard to investigations of the resistance to plant diseases.

IMPROVED SUGAR MACHINERY IN ST. LUCIA.

Information has been received from Mr. J. C. Moore, Agricultural Superintendent, St. Lucia, that a new 6-roller crushing plant has been erected at the Cul-de-Sac factory in that island, as an addition to that which is in existence already. The new plant consists of two horizontal 3-roller mills, 30 × 60 inches, fitted with Siemens-Martin mild steel gudgeons, journals 16 × 16 inches, cast steel pinions, Rousselot head-stocks, water-jacketed brasses, a cast steel Rocker type trash turner, patent toggle pressure-regulating apparatus, and a compound spur gearing to enable the two mills to be driven from one engine. The engine itself is of the Corliss type, with a 26-inch cylinder having a 48-inch stroke, fitted with piston valve and link motion reversing gear.

The machinery has been supplied by Messrs. Mirrlees Watson & Co., Ltd., and was erected under the supervision of one of the engineers employed by this firm. The Cul-de-Sac factory is therefore now equipped with an efficient 9-roller crushing plant of a modern type.

A trial of the plant was made on March 1, when its working appeared to be satisfactory in every way. It is estimated that the possession of the additional crushing plant should increase the efficiency of the factory by at least 18 per cent. It seems that the Cul de-Sac Company is to be congratulated on the valuable addition to the equipment, which may now be considered to be well up-to-date.

It is of interest that this company does not confine its attention to the cultivation of sugar-cane, as it possesses about 100 acres in cacao cultivation and 40 in limes, the trees in both cases being nearly all in bearing.

FRUITS AND FRUIT TREES.

COCOA-NUT CULTIVATION IN ANTIGUA.

A paper on cocoa-nut cultivation in Antigua was read by Mr T. Jackson, Curator of the Botanic Station, at a general meeting of the Antigua Agricultural and Commercial Society, held on March 10, 1911, an abstract of which has been forwarded by Mr. H. A. Tempany, B.Sc., Superintendent of Agriculture for the Leeward Islands:—

In the course of his remarks Mr. Jackson pointed out that, at the present moment, there are 150 acres under cocoa-nuts in Antigua. The majority of the plants for this area were raised at the Botanic Station, from which institution some 7,500 plants have been sent out during the last few years. Unfortunately, here, as in other places, a large percentage of the nuts fail to germinate, and it is advisable to have about 40 per cent. more nuts in the nursery than the number of plants that it is desired to plant out in the field. The best germination has been obtained when the nuts are planted horizontally, or with the pointed ends turned upward. This agrees with experiments conducted in various parts of the world, which indicate that the least successful results are given when the nuts are planted vertically, with the points either upwards or downwards.

When one considers that there are about sixty varieties of this palm, the difference between each mainly consisting in variations in size, shape and character of the fruit, it will be seen how necessary it is for seed nuts to be rigidly selected. They should be obtained from middle-aged trees of robust growth, and should be allowed to mature on the trees, and when picked should be lowered, and not thrown down. The size of the nuts must also be considered, depth of flesh and thickness of husk being factors to take into consideration when selecting seed for planting purposes.*

The question as to the type of soil best suited to the cocoa-nut palm is not easily answered, but it is generally acknowledged that a deep alluvial soil, or that of a sandy nature, possessing moving underground water, situated at no great distance from the sea is a type in which it flourishes. Speaking generally, as far as Antigua is concerned, it would appear that the land situated between Old Road and Claremont, chiefly that included in Claremont estate, is probably the part best suited to the requirements of this crop. In addition to this, there are numerous pieces of land suitable to its cultivation, some forming gentle slopes to the sea, and others valleys, possessing underground supplies of water, which this deep-rooting palm would tap. Types of soils to be avoided are thin gravels, and those of a particularly clayey nature.

In the existing plantations, the soil is of a very sandy nature, apparently not containing an adequate supply of food for the immediate use of the young plants. Consequently, for some time after planting, the foliage of the trees is yellow and, on the whole, unhealthy-looking. As the plants become established and root systems of comparatively large dimensions are formed, the general appearance of the trees improves considerably. A probable explanation of this is that the roots reach underground water, which undoubtedly exists in the land in question. By the aid of the additional nourishment thus placed at their disposal, they increase in vigour and the plants are better able to withstand the attacks of scale insects. The improvement is decidedly noticeable after the latter have attained a height of about 3 feet. Such soil conditions are generally acknowledged to be suitable to the requirements of this crop.

It is much too early to estimate when these plantations will be in bearing. On good land, the time from the planting of the crop to the first return is usually given as six years, and under such conditions, the plants are in full bearing in eight or nine years. If artificial watering were resorted to until the plants were firmly established, the time of fruiting would be hastened considerably.

With the exception of scale insects, cocoa-nuts do not at the present time, in Antigua, suffer from the attacks of any serious pests, as far as can be gathered; only one attacks these palms to any great extent, that is *Aspidiotus destructor*. For some time after planting, this pest seriously retards the general development of the trees. The larger trees, however, some of which are between 14 and 16 feet high, appear to have sufficient vigour to withstand successfully the attacks.

The planting of this crop in Antigua is only in its experimental stage, but the general appearance of the plantations, started some three or four years ago, is on the whole encouraging.

One very obvious conclusion that can be drawn from these plantings is that when cocoa-nut plants are raised in soil of a nature similar to that under consideration, they should be provided with sufficient plant food to tide them over the first two years of their existence. This might be

*See also *Agricultural News*, Vol. IX, p. 244. Ed. *A.N.*

done by growing and turning under crops of green dressings, as it is generally admitted that the increased returns from such treatment more than compensate for the extra outlay.

In the discussion which followed the reading of the paper, several members of the society took part. During the course of it, Mr. Tempany called attention to the fact that beside the south-western district, in which practically all the planted areas existed, Antigua possessed numerous places which in his opinion were favourable to the growth of cocoa-nuts, and mentioned in particular the coast lands of the northern and windward districts, in which part he thought that, notwithstanding the low rainfall, numerous suitable areas could be found, by reason of the plentiful supply of underground water existing there. He pointed out that, with present prices, the industry was highly profitable.

Mr. G. N. Sahasrabuddhe made some remarks on the subject of the cocoa-nut industry in the Bombay province of India Here cocoa-nut plantations thrived best near the sea shore; though the cocoa-nut did grow as far inland as 150 to 200 miles from the sea, it thrived best up to 5 or 6 miles from the coast, as it requires a constant sea-breeze. It grew well on sandy soils, free from stones or clay and reasonably removed from the approach of sea-water. The life of a cocoa-nut tree was eighty to one hundred years, but it gave its best return when it was twenty to forty years of age, though it afforded an average yield ten years after being planted. Each tree yielded 125 to as much as 800 nuts per year, though the mean may be taken as 150 to 200 nuts. The cocoa-nut tree was of all-round importance in Bombay, as nothing of the plant was wasted. The stem served as the building material of the cultivators, the leaves formed the thatching material, the ribs of the leaves were made into good brooms, the core afforded excellent ropes which were much valued in navigation, also it served as an excellent material for making mats and brushes; good buttons were made from the inner hard shell; the copra yielded a good edible oil, and the oil cake formed a valuable cattle food. The cocoa-nut oil was used in cooking or as a substitute for butter; also for the toilet, for burning, and for making soaps and candles. The tree was tapped for extracting a beverage called 'madi', which was either drunk or evaporated down to concrete sugar (gul) and was used as such or sold for refining.

A vote of thanks to Mr. Jackson for his paper terminated the discussion.

AGRICULTURE IN ANGUILLA.

The Agricultural Superintendent of St. Kitts, Mr. F. R. Shepherd, recently accompanied His Honour the Administrator of St. Kitts-Nevis on a visit to Anguilla, for the purpose of viewing the present agricultural conditions in that island. On his arrival, on February 26, Mr. Shepherd was received by Mr. C. Rey, who made arrangements by which he was enabled to inspect the cotton and other cultivations carried on in the Dependency.

At the time of the visit, cotton picking was taking place, being late on account of the dry conditions which obtained when the seed was sown; this has caused the crop to reach maturity much later than is usually the case. The yield of cotton promises to be larger than that of either of the past two years. The whole of the crop is ginned at the Central Cotton Ginnery, which is owned by Mr. Rey, either after being purchased by him, or for shipment for other buyers. This factory is equipped with a Hornsby oil engine, three gins and a hand baling press; by February 28, it had turned out 40,000 lb. of ginned and baled cotton, and it seemed likely that the crop would reach at least 60,000 lb.

It is chiefly owing to the efforts of Mr. Rey in connexion with cotton-growing, that the producers in Anguilla and the neighbouring island, called Dog Island, are able to grow cotton successfully. With the aid of the local Government and the British Cotton Growing Association, Mr. Rey is enabled to make advances to the small growers during the season; at the end of it, the cotton is taken over by him at a fixed rate, according to market prices, and after the accounts have been carefully balanced at the end of the season, a *pro rata* bonus is declared, in the event of the price having reached a value above the average market price paid during the season. The amount of this bonus, last year, was £250.

As regards cotton cultivation, much improvement has taken place in this during recent years, and ploughs are now being successfully used on the larger growers' estates. The matter of the provision of power for drawing ploughs in Anguilla is of serious moment, as the frequent droughts cause a high mortality among the oxen usually employed for draft. As a consequence, Mr. Rey is importing a small 'Universal' motor for the purpose of hauling ploughs, as well as for other similar work. This motor is being selected by an official of the British Cotton Growing Association, and as it is highly recommended, it is hoped that it will prove successful for the purpose.

Cotton is not the only crop that is raised to a fair extent in Anguilla; sweet potatoes, pigeon peas and Guinea corn all find a reasonable place among the products of the island. One of the chief difficulties that are met with, is the provision of pasture; at present, the stock lives chiefly on 'bush' and weeds. It is intended to try to introduce a hardy grass, such as Barbados sour grass (*Andropogon pertusus*), which would very likely form a valuable addition to the agricultural assets of the island, if it was protected for a time, after its introduction.

The report shows that encouraging progress is being made in connexion with agricultural matters in Anguilla, and that there no longer exists any reason for the despairing view of the prospects of the island which might have been taken a few years ago.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture returned to Barbados from St. Lucia on March 19, 1911, by the S.S. 'Korona', from a visit to that Colony for the purpose of conferring with His Honour the Administrator on official business, relating more especially to the recent reorganization of the local Agricultural Department.

Rice in British Guiana.

The last fortnightly report of Messrs. Sandbach, Parker & Co., of Georgetown, on the rice industry of British Guiana, dated March 17, 1911, gives information as follows:—

The weather during the past few weeks has been very dry, and mills have been busy, and deliveries of rice to town brisk.

Preparations are being made for the growing crop, and sowing should be general next month.

A little paddy still remains in millers' hands, but with continuance of fine weather it should soon be milled off.

We quote to-day, f.o.b. Demerara, for good export quality :—

Nominally, 21*s*. to 22*s*. per bag of 180 lb. gross.
" 19*s*. to 20*s*. " " " 164 " "

COTTON NOTES.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date March 13, with reference to the sales of West Indian Sea Island cotton :—

Since our last report, West Indian Sea Island cotton has been neglected.

The Fine Spinning Trade is still unsatisfactory, and buyers are holding off until they can gauge the basis at which American Sea Island cotton will eventually be sold in bulk

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending March 11, is as follows:—

The market has been at a stand throughout the week, and in the absence of any demand we have only to confirm our previous advices and to nominally renew our last quotations, viz :—

Extra Fine Islands	at	33c. = $18\frac{1}{4}d.$	c.i.f.	&	5	per cent.
Fully Fine	,,	32c. = $17\frac{1}{4}d.$	,,	,,	,,	,,
Fine	,,	30c. = $16\frac{3}{4}d.$	,,	,,	,,	,,

THE SUPPLY OF RAW COTTON.

The expectation that the present high price of cotton will lead to a great extension of the cotton acreage in the southern states of America does not seem to rest on any solid foundation. In fact, the production of cotton there is not keeping pace with the increased demand for cotton goods. On the contrary, the growth of maize is rather encroaching on the growth of cotton in America. At current prices it pays the farmer in the southern states better to grow maize than to grow cotton. It becomes, therefore, increasingly important to encourage the cultivation of cotton elsewhere. Last week Sir Percy Girouard, the Governor of the British East Africa Protectorate, addressed a special meeting of the Council of the British Cotton Growing Association at Manchester on the subject of cotton-growing in East Africa and Uganda, but more especially in the Protectorate. We are promised from Uganda in a short number of years something like 15,000 bales of upland American variety, whilst in the Protectorate there are large areas of land apparently eminently suitable for cotton-growing, but there are practically no natives on the land. Sir Percy Girouard says that the valleys of the Juba and Tana rivers are specially suitable for cotton-growing, and that on the British side of the Juba, which is the frontier line between British and Italian territory, there are about half a million acres suitable for irrigation. The Governor does not think that the labour question will be a very difficult one. At present, the plantations on the coast have no difficulty in obtaining labour at very reasonable rates from the highlands of East Africa, where there are several million natives. But cotton-growing in the Protectorate cannot be developed properly by small men, and the Governor suggests that it should be made the subject of a scheme by means of irrigation on a large scale, such as has been suggested for the Sudan. The British Cotton Growing Association is ready to render all possible assistance, and they have promised to join in experimental work. Assuming such work supports the conclusion that cotton-growing in the Protectorate can be made commercially successful, it will be for the general investor to find the large capital that will be required to utilize the whole of the cotton area. Obviously, it would be unreasonable to expect Lancashire, with her immense and expanding industries, to finance, unaided, great schemes of cotton development in distant dependencies. (*Journal of the Royal Society of Arts*, January 20, 1911.)

NATURAL CROSSING IN COTTON.

Investigations are being made by H. A. Allard, of the United States Department of Agriculture, for the purpose of ascertaining the extent to which natural crossing takes place among plants in cotton fields, whether these are being raised in the ordinary way, or for the purposes of selection and breeding. An account of the work that has been done up to the present is contained in an article, having for its title Preliminary Observations Concerning Natural Crossing in Cotton, which is published in Vol. 1, No 4, of the *American Breeders' Magazine*.

This investigator points out that apparently no serious attempt has been made, so far, to ascertain the exact extent to which cotton flowers may be cross-pollinated by natural agencies, under field conditions. The possession of accurate information on the subject is important, because in breeding and selection experiments, particularly, the isolation of the progeny rows, as regards cross-pollination, must depend upon the readiness with which this may take place, through insects, the wind, or birds. Attention is drawn to the fact that most breeders and growers of cotton have considered that such crossing does not affect more than 5 to 10 per cent. of the seeds; whereas O. F. Cook, in describing work conducted in Arizona, considers that natural crossing takes place very frequently, while W. L. Balls, in Egypt, is of the opinion, in consideration of his later work, that this amounts to 5 to 25 per cent. These conclusions are supported by the preliminary work described by the writer, and he has arrived at the conviction: 'that natural crossing must be considered a most important factor, not only in all technical cotton-breeding problems, but also in the extensive field operations of the practical grower who wishes to secure increased yields and higher quality.'

The problem to be solved by such work must have reference not only to the number of flowers that have been crossed, but what is more important, to the actual number of crossed ovules. It has not been possible to deal with the question from these points of view, because an interruption to the work enabled definite figures to be secured only for the number of bolls crossed.

The investigations were made while co-operative breeding work, begun in north Georgia in 1908, was being carried out. The varieties of cotton with which the observations were conducted were the Okra type with narrow leaves, the Willet Red, and a pure-bred strain of the Keenan variety. The seeds were sown, in a plot of land having an area of about ½-acre, so that the plants came up in the order: Willet Red, Keenan, Okra, Keenan, Willet Red, Keenan, Okra, Keenan; thus every Keenan plant stood between one of the variety Okra, and one of Willet Red. In order that the amount of hybridization may be determined as accurately as possible, only the narrowest-leaved plants of Okra and plants of the Willet Red with the darkest red-purple leaves were used; so that the distinct characteristics of these two parent plants were obtained in the most definite manner possible.

In the result, 1,290 bolls were obtained, of which 260 showed evidence of having been more or less completely crossed in a natural way, giving a proportion of 20 per cent. It is probable, however, that the actual amount of crossing was greater than this, for many hybrid seedlings were doubtless lost because they had to be removed before they had grown large enough to display the distinctive characters which would give evidence of their true parentage. It is estimated that if these could have been retained, evidence would have been forthcoming that there was as much as 40 per cent. of crossing.

After a description has been given of the diagnostic characters of the hybrids, a short review is presented of the agencies which effect the natural cross-pollination of cotton in the field. Most of the work, by far, is done by insects, especially bees and certain species of wasps, particulars of which are given. It is stated that the bee *Melissodes bimaculata*, Le P., and the honey bee are probably the most abundant and constant visitors of cotton in Georgia, the more active being the former. Other Hymenoptera visit cotton flowers, but they do not take a large place in effecting pollination, because of their smaller size, their rarity, or their irregular visits. A list is given of all the Hymenoptera and beetles that had been taken by the writer during the two years of observation; this includes twenty-six species of Hymenoptera, and seven of beetles. As regards other insects, it is stated that, in Northern Georgia, cotton flowers are rarely visited by any of the Lepidoptera. Only one, individual, butterfly (*Basilarchia astyanax*, F.) has been seen on them by the writer, and very little consideration need be given to the members of this Order in the matter of cross-pollination of cotton in Georgia. As regards other countries, it is stated by Balls, in Egypt, that the glands outside of the calyx are visited by Lepidoptera; no pollination could, however, be effected by them. Among casual visitors of cotton flowers are some of the Hemiptera (bugs), and a few small flies, leaf-hoppers, beetles and ants. Again in Egypt, Balls has found that the chief insects which visit the true nectar glands in the flower are ants, but their influence in the matter of cross-pollination, like that of the other small insects, may be neglected.

Birds have been alluded to in connexion with cotton pollination. Special mention is only made, however, of humming birds, which on their part are not likely to take any place in effecting cross-pollination, as they rarely enter the flowers, but force their bills between the outer floral organs, at the base, for the purpose of reaching the inner nectar glands.

It is believed by the writer that a considerable amount of pollen may be carried in cotton fields by the wind, particularly after the middle of the day, when the grains have become dry; and additional importance is given to this factor because the pollen is often brought out of the flowers by bees and scattered into the air during their flight. An actual test of the extent to which pollen is present in the air in cotton fields was made by placing several exposed and developed photographic plates between the cotton rows, the plates having being coated with a very thin film of vaseline, in order that they may hold any pollen that might fall on them. The trials were made during several days, when there was very little wind, and the appearance of the plate, on whose dark surface the pollen was easily seen, showed that considerable amounts of this had been caught: thus the fact was demonstrated that the pollen of cotton is carried to an important extent in the air.

Observations made particularly in regard to the behaviour of bees in cotton fields showed that these insects seem to prefer to pass from plant to plant in the rows, rather than to travel from one row to the next. Records of casual observations are given which indicate that a single bee is capable of visiting a very large number of flowers in a few hours; so that evidence is adduced as to the large extent to which bees may effect cross-pollination. The time at which these insects accomplish this most readily is in the early morning, when the pollen is very soft and sticky. A final matter of interest is the probability that the extent of cross-pollination by bees in different localities varies largely with the conditions, particularly because of the differences in number and kind of these insects.

Special consideration is given to the fact that many kinds of cotton-breeding require the absolute elimination of all chances of cross-pollination; and this is especially true where Mendelian problems are being studied. The prevention of free crossing is of the greatest importance in this and all similar work, and the conclusion is reached that the only safe way to preclude cross-pollination is the tedious process of bagging the individual blossoms. While the matter is being considered, it may be stated that the writer has not obtained any definite results, so far, in connexion with the possible prepotency of certain pollens.

After reviewing the effects of the unchecked natural crossing in the field, the writer gives a summary of the conclusions to which he has been led, so far, by his work. These have relation to the facts that natural crossing in cotton has been much neglected, as regards its possible effects on breeding, in the past; that it is certain that at least 20 per cent. of the flowers in the fields of North Georgia are crossed naturally, with a strong probability that 40 per cent. is nearer the actual proportion; that although where cotton is not selected such crossing may do much harm, it is not as detrimental where selection is practised: and lastly, that the circumstance of the existence of cross-pollination to such an extent, in cotton, makes it all the more important that careful seed selection should be constantly carried out.

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.

As an editorial article in the present issue, the subject of the Stimulation of Agricultural Effort is given consideration. The chief purposes of the article are to point out how such effort generally arises, and the way in which it is sustained.

Page 100 contains an account of cocoa-nut cultivation in Antigua.

On pages 102 and 103, an abstract is given of an interesting article that has appeared recently, which deals with work undertaken for the purpose of obtaining information in connexion with the crossing of cotton under natural conditions.

The Insect Notes, on page 106, have reference to the mole cricket in Trinidad, and the increased occurrence of the green scale on tea in India.

On page 107, there will be found general accounts of agricultural shows that have been held lately in Antigua and St. Kitts.

Under the heading of Fungus Notes, on page 110, there is given some of the latest information concerning banana diseases, particularly in connexion with legislation against their introduction.

Interesting work that has been undertaken in Grenada, in connexion with the germination of Hevea seeds, is described in an abstract of a report on the investigations, on page 111.

The Centralization of Agricultural Research.

An editorial article on this subject appeared in the *Agricultural News* during last November (Vol. IX, p. 353). It is interesting to note, in connexion with this, that Circular No. 43 of the Scientific Department of the Indian Tea Association, Calcutta, refers to this matter, and suggests that the work which is being carried out under that Association should be supplemented by a series of experiments on a large scale, under the control of garden managers, with the advice and co-operation of the Officers of the Department. Attention is drawn to the advantages which are given by such a scheme, among these being the provision of more time for laboratory work than has been available up to the present.

The Circular, which is reproduced in the *Planters' Chronicle* for December 10, 1910, goes on to point out that it would be also desirable, at the present time, to consider whether the Officers of the Department should be located at one central station, stating that the advantages of such a plan are obvious. The opinion of other departments engaged in agricultural work, with regard to the matter, is supported by the following statement in the circular, which is given as the outcome of experience under the conditions with which it deals: 'The existing arrangement, whereby the officers are situated in widely separated districts, was admirably adapted to the conditions of the pioneer work which was necessary when the Department was first founded, but at the present time it has several drawbacks. Mutual help and exchange of opinion between the Officers of the Department is reduced to a minimum, and the time occupied in travelling to the various centres of work is considerable. At a central station each officer would be in touch with the work of the others, and the absence of one of them would not necessitate the temporary cessation of his work, or its relegation to his subordinate staff.'

Agriculture and Trade of Martinique, 1909.

No. 4612 Annual Series, of the *Diplomatic and Consular Reports*, dealing with the trade of Martinique in 1909, has just been received. It shows that the export of sugar during the year was 33,904 tons, as compared with 32,081 tons in 1908. The output would have been larger, except for the irregular rainfall that was received; the area under cultivation is being increased in some parts of the island. As regards the exports of the other important sugar-cane product of the island, namely rum, these increased from 2,742,632 gallons in 1908, to 3,329,813 gallons in 1909. It is estimated by the Martinique Chamber of Commerce that the quantity of rum distilled during 1909 was 4,130,720 gallons: of this, 346,139 gallons, reckoned as pure alcohol, was consumed locally.

The exports of cacao increased from 1,162,779 lb. in 1908, to 1,304,153 lb. in 1909. The amount of coffee produced is quite insufficient for the local demand, and there was an importation of 297,167 lb., the local production being at the same time 15,330 lb., against 14,326 lb. in the previous year. The cultivation of coffee is being gradually extended, and the same is true to some degree of bananas, 223,551 lb. of which was sent to France, as compared with 128,330 lb. in 1908. The increase took place in consequence of the abatement of the yellow fever epidemic of 1907-8, which had interfered with the export facilities. There is still, however, a surplus production, and as the opportunities for sending the fruit to France are limited, it is suggested that British shipowners should interest themselves in the trade, particularly as the excess output is likely, sooner or later, to find its way into the United States.

The trade of Martinique with the neighbouring British colonies is insignificant; this is indicated by the fact that the value of the imports from all British colonies was only £1,835.

Mosquito Larvae in Drinking Water.

An article in the *Annals of Tropical Medicine and Parasitology* for 1910, page 591, describes experiments which were conducted for the purpose of determining the effect of the introduction of mosquito larvae, or wrigglers, into water, particularly in regard to the number of bacteria contained therein. The larvae employed were those of several species of Culex, and of *Theobaldia annulata*. These were placed in drinking water which had not been sterilized in any way, and the number of bacteria in the water was determined from day to day: while the same determination which was made for similar drinking water, without larvae, was used as a control.

The result of the investigation was to show that the effect of larvae in water is to increase the number of bacteria present, to a very considerable extent.

Schools Show in Tobago.

A successful schools show was held in Tobago on February 16, an account of which was given in the Trinidad *Mirror* for February 21, 1911.

A matter of some general interest in connexion with the show is that specimens of vegetables preserved in alcohol, and showing plant diseases, were exhibited for the purpose of adding to the practical knowledge of teachers, and to stimulate interest in nature study. Another matter for remark is that natural history specimens were exhibited by several schools, and although the attempt to make good collections was creditable, there appeared to be room for improvement. The display of flowering plants was not very satisfactory, while the exhibits of bananas were good, except for the fact that more care was required in packing and transportation. Most of the food plants appeared to have been of fair quality, and some were good, although the exhibition of corn was poor.

In regard to cotton, an exhibit of some interest was made by Mr. Thomas Thornton (late Travelling Inspector for this Department, in connexion with cotton investigations), who showed two full-sized plants of a hybrid that has been raised by him, in full bearing.

A Machine for Felling Trees.

A means for felling trees, which has been put to a certain amount of use, was described in the *Agricultural News*, Vol. IX, p. 297. A method that is of more general application is described in the Supplement to *The Field* for February 11, 1911. This was invented by Mr. A. Ransome some years ago, and consists of a cross-cut saw worked by steam from a cylinder with a long stroke, which is mounted, and arranged to turn on its centre in the direction required, by means of a hand wheel. Great simplification of the apparatus arises from the fact that the saw is fixed to the end of the piston rod, so that there is no need for a crank shaft, connecting rod, or fly wheel. The steam reaches the cylinder through a flexible hose, which is sufficiently long to allow the machine to be worked over an area of an acre without moving the boiler, although the last matter is comparatively simple, as the boiler itself is mounted on broad wheels, for ease in transit. The machine is also easily moved from place to place, four men only being required for the purpose; while the saw with which it is fitted can fell trees up to 7 feet in diameter.

For the purpose of working, the whole apparatus requires three men only—to attend to the boiler, the cylinder and the saw, respectively. Lastly, the working parts of the machine can be fitted into a special frame, by which it is enabled to be employed for making vertical cuts, or for cross-cutting trees after they have been felled.

The Broom Corn Industry in the United States

The *Board of Trade Journal* for January 5, 1911, reproduces a report by H. M. Consul General at Chicago, which gives particulars concerning the broom corn industry of the United States. According to the report, broom corn is chiefly grown in Illinois, Kansas, Oklahoma, and Tennessee, the best corn being considered to come from the first-mentioned State. In regard to the production of broom corn in the United States during 1910, it is calculated that enough of the material was made for the manufacture of forty-two million brooms, having a value of about three million pounds sterling.

Broom corn growing in the United States is said to be very remunerative, although the work on the farms is very hard. The restriction of the growing of the plant to a comparatively small area causes the prices of broom corn to be generally high; they amount to about £21 to £73 per ton.

An idea is prevalent that broom corn only grows well on certain soils, and that it does not usually flourish where Indian corn is raised. For the production of the best kinds, it is necessary to construct sheds for the seasoning and storage of the crop. It leaves the farm in bales having a weight of about 300 lb. As broom-making is a simple process, and few tools are required for the purpose, it has been largely in the hands of small manufacturers. The brooms are now, however, being made in large factories to a continually increasing extent, and machines are in use which are capable of turning out hundreds of brooms per day.

INSECT NOTES.

THE MOLE CRICKET IN TRINIDAD.

Dr. Fredholm read a paper before the Agricultural Society of Trinidad and Tobago on December 20, 1910, on the mole cricket (*Scapteriscus didactylus*). This paper was published in the Proceedings of the Society for February 1911, page 153.

Mention has been made of the mole cricket in the *Agricultural News* at various times, and in the Insect Notes entitled Crickets, in Vol. VI, p. 106, the previous references to this insect are given. It is also stated that there are two other species of mole cricket known in the West Indies; these are *Scapteriscus variegatus* and *Gryllotalpa hexadactyla*.

The mole cricket appears to be a more serious pest in Trinidad than in the smaller islands, and a brief abstract of Dr. Fredholm's paper may be of interest to readers of the *Agricultural News*, since this is based on extended experience and observation.

It is estimated that the damage by the mole cricket in Trinidad amounts to about $15,000 per annum, and this amount of loss, together with the difficulty with which it is controlled, makes this insect a pest of importance. The mole cricket lives underground, in galleries which it tunnels for itself, during the whole of its life-time. The adults sometimes come to the surface at night, but during the day they remain hidden. It is not difficult to determine the location of their galleries, since these are generally so near the surface that they are indicated by the loosened and slightly raised earth which forms the top of them. These galleries ramify, running in all directions on the level, and descending into the lower soil. It is noted, however, that mole crickets rarely inhabit any but very level spots and that their superficial galleries seldom extend upwards when any slight elevation is encountered.

The mole cricket is very powerful in the matter of burrowing through the soil; but on the surface is very awkward in walking and jumping, and feeble in flight. Its food is largely the underground portions of plants, and when small plants are cut off near the surface and fall within the reach of the insect, the leaves and tender stems are also eaten. Earthworms and insects smaller and weaker than itself are often killed and eaten by it, when these are encountered in the galleries.

Mole crickets have several natural enemies in Trinidad, the most important of these being insectivorous birds, the savannah blackbird (*Quiscalus crassirostris*), the tick bird (*Crotophaga ani*), and the qu' est ce qu'il dit (*Lanius pitanga*), which feed freely on these insects wherever they are found, and are very persistent in hunting them out. They snap them up quickly whenever the insects appear above ground, and they also carefully scrutinize the raised top of every burrow, and when any movement of the soil indicates the presence of an insect beneath, the birds break through into the gallery and capture the insect. Fowls also search diligently for mole crickets, scratch them out of their galleries, and eat them. Ground lizards and toads, too, are natural enemies of this insect.

Many remedial measures have been tried from time to time, but only a few of them have proved entirely satisfactory. In the protection of small areas, as in the case of provision grounds and gardens, no great difficulty should be experienced if war is persistently waged on this pest. Before planting, the soil should be thoroughly turned up by forking or ploughing, thereby exposing the mole crickets to their natural enemies. A trench about 1 foot wide should be dug round plots of this kind. If the ground is left clean for some time before planting, the absence of food will have a tendency to force the insects to seek other feeding grounds. Hand picking after heavy showers will result in the capture of large numbers, when they are driven to the surface to escape from drowning in their burrows.

Poisoned baits have been found useful, the most efficacious poison being arsenic or some arsenical compound. The baits are prepared with some favourite food plant of the pest, which is cut or chopped into fine pieces, slightly moistened, and thoroughly mixed with a small amount of white arsenic or Paris green. This may be distributed along the rows of plants where the insects feed, either on the top of the soil, or slightly covered with it. Poisoned bait used in this manner has the objection that it may be eaten by fowls and useful birds. A valuable substitute is a bait made by using fresh horse dung to which poison has been added: mole crickets are very fond of this, and there is less danger of its being eaten by their natural enemies than when ordinary food baits are used Mole crickets which have been poisoned immediately retreat to their burrows and die in the ground, out of the reach of birds. Young plants in nurseries can be protected by placing around each a screen made from banana leaves, leaves of mammee apple, or a wire screen, or even short sections of bamboo. For the treatment of lawns, strong soap solutions have been found successful; these are merely poured on the ground, and serve to drive the mole crickets to the surface, when they should be collected by hand, as the soap and water does not kill them. For protecting large areas, it is suggested that light traps should be used. These are made by suspending a bright light over a tray containing water, on the surface of which is a film of oil at least $\frac{1}{10}$-inch in thickness. They have been found fairly satisfactory, but it is worthy of note that the number of males caught by these traps is greatly in excess of the number of females. In conclusion, it is stated that the most effective and economical method to pursue is the protection of the natural enemies, especially birds, which exercise such a large influence over the extent of the occurrence of this pest.

THE GREEN SCALE.

In the report of the Government Entomologist of Ceylon for 1909, mention is made of the green scale (*Coccus viridis* [Lecanium viride]) which was a serious pest of coffee a few years ago. Since the abandonment of coffee cultivation, this insect has shown a tendency to establish itself on tea in certain districts, and in one area it has assumed the proportions of a serious pest. At the time of the writing of the report, it was largely abundant in one district only, but there are indications that it may become a pest of tea.

The Entomologist could not account for its prevalence in only one district in destructive numbers, since it had been equally abundant in all the coffee-growing districts, and is still generally distributed throughout the island; besides, there seems to be no reason why it should not adapt itself to act in one section as well as another.

The suggested control measures are the burning of prunings, and the spraying of the trees with kerosene emulsion, except when 'flushing', when a simple mixture of soap and water should be used.

The removal of the wild food plants from the vicinity of tea cultivation is recommended, in order that re-infestation may not so readily take place from outside.

RECENT AGRICULTURAL SHOWS.

Agricultural Shows have been held recently in Antigua and St. Kitts, reports of which have been furnished by Mr. H. A. Tempany, B.Sc., Superintendent of Agriculture for theLeeward Islands, and by Mr. F. R. Shepherd, Agricultural Superintendent, St. Kitts. From these reports the following particulars are taken.

ANTIGUA AGRICULTURAL AND INDUSTRIAL EXHIBITION, 1911.

This exhibition, which forms the tenth in the series of similar events that have taken place in Antigua, was held on February 23, under the distinguished patronage of His Excellency Sir Bickham Sweet-Escott, K.C.M.G., and under the auspices of the Imperial Department of Agriculture and the Antigua Agricultural and Commercial Society. For the purposes of the show, the grounds of the training school, St. John's, were kindly placed at the disposal of the Show Committee by His Excellency.

In opening the Exhibition, Sir Bickham Sweet-Escott expressed his desire to thank the officials, judges and exhibitors, who had made it a success; he also tendered his thanks to the Moravian authorities for having kindly lent the Buxton Grove premises for past exhibitions. After comparing the present show with former ones, and making reference to the signs that the cotton industry of Antigua was recovering from the set-back of recent years, His Excellency declared the Exhibition open, having first distributed certificates to the successful candidates in the recent examinations held in connexion with the Courses of Reading of the Imperial Department of Agriculture.

The display of large stock showed considerable improvement over those of previous years, although it was a matter for disappointment that only two milch cattle were shown. In regard to horses in harness, the special prize offered by the Governor for the best equipage gave rise to keen competition, and brought very good exhibits. The show of small stock was creditable, though not up to the standard of the large; there were, however, excellent exhibits of poultry. In the stock classes, His Excellency's silver challenge cup, for the best set of exhibits, was again won in competition. As regards agricultural produce generally, a high level of quality was maintained by the exhibits, notwithstanding the fact that unfavourable weather conditions have been experienced during the past season.

The standard of the cotton exhibits encouraged the opinion that the industry in Antigua is recovering, as has been mentioned already, from the untoward conditions of the past. A feature among the prizes was a handsome silver challenge cup, offered by the British Cotton Growing Association for award among cultivators of not less than 10 acres of cotton. The competition for this was fair, and the offer of such a generous gift should serve to stimulate future interest in the industry.

A special prize of £1 had been offered by Lady Sweet-Escott for the best set of exhibits among ornamental plants and flowers, and many beautiful specimens of these were shown. Numerous entries were obtained in the class for miscellaneous articles, and there was much appreciation of the enlargement of the scope of the exhibition to include handicraft work, needlework, cookery and photography. Good collections of preserves were shown, and the school gardens sent fine exhibits of vegetables. In the last connexion, the Schools Challenge Cup, presented by the late Sir. C. C. Knollys, was won by Spring Gardens School.

The chief special prizes offered locally were an award of £2 by His Excellency the Governor for the best display of goods from the store of a merchant in St. John's, and a handsome cup by the Hon. H. E. W. Grant, C.M.G., Colonial Secretary, for the best collection of exhibits from an estate, designed to illustrate its resources. The number of competitors in each case was seven, and the Governor's prize was gained by Messrs. D. Hope Ross, Ltd.; Mr. Grant's prize fell to the share of Fitches Creek estate, the next in order of merit being Jolly Hill estate. The offer of both of these prizes was effective in bringing forward excellent displays, which aroused much interest.

A demonstration section was included, as usual, by the Imperial Department of Agriculture. This comprised samples of cotton, essential oils, woods, grasses and pressed plants of economic value, samples of manures, insecticides and other specimens of agricultural interest.

The number of exhibits received for competition was far greater than that in any other year, being 1,640, as against 718 in 1906—the most successful previous year; this increase was, of course, partly due to the enlarged scope of the exhibition. Altogether, the function was very successful and this circumstance was assisted by the facts that the day on which it was held was proclaimed a public holiday by the Governor-in-Council, and that the show was enabled to be held under the most favourable conditions of weather.

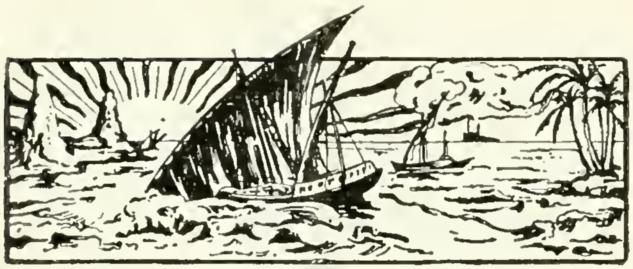
ST. KITTS AGRICULTURAL AND INDUSTRIAL SHOW, 1911.

This event, which is the fifth of its kind, was held at the Grammar School on February 14, 1911, under the auspices of the Imperial Department of Agriculture and the St. Kitts Agricultural and Commercial Society. In opening the show, His Honour the Administrator made reference to the good quality of the exhibits and to the fact that the way in which they were displayed showed a great advance on that of previous years.

The total number of exhibits was 736, made up as follows: large stock 77, small stock 13, poultry 20, sugar-cane and its products 57, fruits 63, vegetables 145, industrial exhibits 58, fancy work 25, plants and flowers 35, school exhibit 1, miscellaneous 59; there were also 28 articles not classed in the prize list, and 4 trade exhibits from merchants.

Among the horses, the young animals shown were not up to the standard of previous years. The riding and driving competitions were not as keenly contested as they should have been; the Governor's prize of £1 for the best equipage was gained by Mr. E. de Santos. In the cattle classes, the bulls were of a distinctly high quality, and the champion prize given by Colonel Cotton was awarded to an animal from Estridge's estate; this estate also won Colonel Cotton's prize for a steer over three years of age. Another of Colonel Cotton's prizes, for the best young mule, was won by Mr. W. Berridge. Very good exhibits of sugar-cane, fruits, vegetables, preserves, meals and starches, and general industrial products were sent in. The collections of six kinds of ground provisions were disappointing; the Governor's prize for the best basket of such products was won by a peasant. In the class for ornamental plants, fair exhibits were received. There was only one school exhibit, but this was judged to be of a sufficient standard to earn a prize. Four trade exhibits were sent in, and a diploma of merit was awarded to Messrs. R. R. Kirkwood & Co. for a display of hardware and groceries. From a general point of view, the show was a success, although the attendance was perhaps not as large as that in some former years.

The prizes, together with twelve diplomas of merit awarded by this Department, were distributed by His Honour the Administrator on March 14, at a meeting of the Agricultural and Commercial Society held specially for the purpose.



GLEANINGS.

Sir Daniel Morris, K.C.M.G., late Imperial Commissioner of Agriculture for the West Indies, delivered an address, having for its subject The West Indies, before the Birmingham University, on February 8, last.

The sugar and molasses exported from Barbados, up to March 4, 1911, amounted to 772 tons and 8,630 puncheons, respectively. The quantities for a similar period during last year were 1,237 tons and 5,660 puncheons.

Information received from the Curator of the Botanic Station, Montserrat, shows that the total export of cotton from that island, up to February 20, was 241,000 lb., and it is expected that the total crop will reach 360,000 lb.

It is announced that, at the Annual International Industrial Exhibition to be held at Winnipeg in July next, there will be a competition open to firms producing agricultural motors, and that applications to enter this will be received until June 1, 1911.

Particulars of the exports of maize over-seas from South Africa, for the last two years, are given in the *Union Gazette* for January 20, 1911. They show that the amount exported in 1910 was 1,760,208 bags of 200 lb. net; the quantity in 1909 was 1,551,187 bags.

The *Textile Mercury* for February 11, 1911, states that the cotton crop of Chosen (Korea) has been a comparative failure, on account of excessive rains in last June, July and part of August. Attempts are being made to obtain improved yields by the introduction of American seed.

The young sugar-cane crop in Barbados is making satisfactory progress, and, according to the Superintendent of Agriculture, may be said to be one of the most forward that has been obtained for many years. The same Officer states that the attack of the root borer on the sugar-cane seems at present to be stayed.

It is stated by the Superintendent of Agriculture, Grenada, that the cacao crop is generally healthy, although it appears to be short, on account of the abnormal rainy season that has been experienced. The cultivation of rubber in the island is being extended, and an order for about 20,000 seeds of Hevea will be shortly sent to Ceylon.

Arrangements are being made for holding an exhibition at Columbia, South Carolina, toward the end of the present year, for the purpose of encouraging the growing of good cotton. The work is being undertaken as an extension of the efforts toward cotton improvement in the State that are being made by the South Carolina Cotton Manufacturers' Association.

A report from the Agricultural Superintendent, St. Vincent, states that cotton-picking has been practically concluded in the island, and that growers are now pulling up and burning the old plants. The crop of Marie Galante has turned out to be shorter than usual. During February, the greater part of the cotton crop of Union Island was purchased by the Government.

Diplomatic and Consular Reports, No. 4615 Annual Series, dealing with the trade of Siam, shows that the export of rice from Bangkok for 1909-10 was the highest on record, being 952,889 tons, value £6,433,162, as compared with 918,367 tons, value £5,975,162, in 1908-9. The amount of the export next in value, namely teak, was 76,081 tons; in 1908-9 it was 76,930 tons.

A useful departure is being made at the Education Office, Port-of-Spain, Trinidad, in the form of the establishment of a Nature Study Museum at that office. The museum is intended chiefly for the needs of elementary school teachers, in order that they may themselves attain a better knowledge of natural history, and be in a position to give improved instruction to their pupils.

It is stated in a recent number of the *Bulletin of the South Australian Intelligence Department* that rapid progress is being made in South Australia, in regard to bee-keeping. The amount of honey produced in 1909 was more than one million pounds, and the yield has probably increased since that time. Most of the honey is consumed locally, but it is now being produced in quantity for export, and orders have been received already from England and the Continent.

The Agricultural Bulletin of the Straits and Federated Malay States, for January 1911, p. 18, makes mention of a small hand-power crêping and sheeting machine for use on rubber estates which do not possess power factories. The machine has been designed by a firm described as Messrs. Howarth Erskine, and its purpose is to lessen the waste entailed in using a mangle for rubber preparation, as well as to give a method for the making up of ordinary scrap in a convenient form, and for utilizing bark scrap.

The *Trade Review* of St. John's, Newfoundland, refers to the dependence of the colony on Barbados for molasses, and the higher prices that this product has commanded of late years, on account of the smaller output from Demerara and Porto Rico. It proceeds to point out that samples of molasses have been sent from Brazil, as producers in that State wish to enter the trade. So far, however, this has not met with entire appreciation, as although the sweetening properties are good, it darkens the colour, when used in tea—a matter that naturally interferes seriously with its popularity.

In regard to the last examinations held in connexion with the Courses of Reading of the Department, it is of interest that the certificates gained by successful candidates in Grenada were distributed by His Excellency the Governor of the Windward Islands, in Legislative Council, on March 3. In St. Kitts and Barbados, a similar distribution was made at meetings of the Agricultural Societies, in the former case by His Honour the Administrator. The Administrator of St. Kitts-Nevis also presented a certificate to the successful candidate in Anguilla, on the occasion of a recent visit made by him to the island.

STUDENTS' CORNER.

APRIL.

FIRST PERIOD.

Seasonal Notes.

During the first months of the year, the picking of the lime crop comes to an end, so that at this time attention is given to the work of bringing the trees into a good state of health, in order that they may bear freely during the coming season. Prepare an account of the measures that you would take in this connexion, having special reference to tillage, the application of manures, pruning and the removal of suckers and epiphytes. What should be done with the material that is taken from the tree, and why is the procedure necessary if the plants are to remain healthy?

It has been mentioned recently in these notes that useful observations can be made on the insect visitors to the cacao flower, in connexion with the determination of the particular means of cross-pollination in this plant. The same is true of the lime, and after the ovaries have become fertilized it is useful to continue the observations, in special relation to the development of the fruit, until this is ripe, in order that the time may be ascertained which elapses from fertilization to the ripening of the fruit. The extension of these observations will enable the time to be found during which the crop will last, and the period when it is likely to be heaviest.

Reference was made above to tillage in lime cultivations. When this is done with the fork, care must be exercised to prevent damage to the roots near the surface, as these are of the greatest importance in relation to the nutrition of the plants from the soil. Where a root has been damaged, ascertain the manner in which it heals, and compare this with the similar process in the case of stems. Further useful work in connexion with the roots of lime trees may be performed by making an examination of the surface roots in different parts of the orchard, and finding out in what way, if any, the number and prevalence of these is related to the character of the soil.

Why is drainage necessary in relation to: (1) the soluble salts in the soil; (2) the supply of fresh water to it; (3) the renewal of air in it; and (4) the operations of tillage on estates? What are the conditions under which drainage is most likely be needed? Why is drainage often necessary where fairly flat areas of soil are almost surrounded by higher land, and where such land rises quickly from small neighbouring flatter areas? Describe the kinds of drainage that would be suitable under the different conditions. What relation do the character and composition of the underlying rocks and soils bear to drainage? It is found, sometimes, that the roots of plants do not utilize the soil below a certain comparatively small depth, although its physical condition is apparently favourable to their growth. What is the reason for this, and when this reason obtains, what is the remedy? What appearance in the roots just below the surface of the soil would lead to an indication of the existence of the condition that has just been described? A greater understanding of the way in which drainage takes place, and of its importance to plants, will be obtained by considering the question as to why proper drainage actually increases the amount of water in the soil that is available to plants.

It is important to remember that when areas of land are well drained, deeper access is given to the organisms, such as earthworms, which open out the soil and enable the air to enter it easily. What circumstance has the same effect in relation to the changes that take place in deep clay soils after they have been drained? A matter of interest is that if air is enabled to circulate in the depths of the soil, nitrates are formed in greater amounts, and the presence of these salts leads to a flocculation of the clay, so that this admits of more easy tillage, and again the access of air is facilitated. While these matters are being considered, discuss the relation of heavy falls of rain to aeration of the soil.

Give a general account of the kinds of drainage with which you are acquainted. What is the nature of this in cacao and lime plantations, and in sugar-cane and cotton fields, under ordinary conditions? Describe situations in which the ordinary methods of drainage have to be modified to suit special circumstances. What is meant by contour drains? How are they made, and what care is required in order to keep them in a state of efficiency?

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) Give an account of the chief differences between roots and stems.

(2) Describe shortly the value of humus in the soil.

(3) What is the difference between pollination and fertilization?

INTERMEDIATE QUESTIONS.

(1) Mention the chief uses of leaves to plants, and state when and why it is expedient that all or any of the leaves should be removed from a plant.

(2) Mention some different forms of seeds, and account for the special peculiarity of each.

(3) Write a description of the weevil borer of the sugar-cane and give a short account of its life-history.

FINAL QUESTIONS.

(1) Can you indicate if there are any broad general differences between the modes of cultivation for dicotyledons and those for monocotyledons?

(2) Give a general account of the effects of the chief artificial manures on the soil.

(3) Describe the uses to which the available locally-grown woods in your district are put, and indicate any special purpose for which one or more of them may be employed.

A communication from H. C. Prinsen Geerligs, in the *Louisiana Planter* for February 4, 1911, shows that the total importation of sugar in the United Kingdom during 1910 was 1,728,730 tons, of which somewhat less than half (846,862 tons) was refined sugar. The latter came chiefly from: Germany—335,791 tons, Austria Hungary—199,465 tons, Holland—118,160 tons. Of the raw sugars, 562,161 tons was cane-sugar, against 302,455 tons in the previous year. This sugar was supplied as follows: Java 118,304, Cuba 96,330, British West Indies 78,737, Brazil 51,469, Peru 46,206 tons. The contribution from the British Colonies was 130,138 tons, against 85,264 tons in 1909; but the great increase in the importation of raw sugar was provided chiefly by foreign countries.

FUNGUS NOTES.

SOME DISEASES OF THE BANANA.

During the last few months considerable interest has been shown in the diseases of the banana, particularly on account of the destruction wrought in Panama, Costa Rica and Surinam. Consequently, it is thought that a short account of some of these diseases, and of the protective legislation which they have called forth in the West Indies, may not be without interest.

COSTA RICA AND PANAMA. A disease of bananas which has now assumed very serious dimensions has been known for several years in these countries, having been observed as early as 1890, in isolated spots. In 1904, a scientific investigation of the trouble was commenced by Dr. McKenny, who published a preliminary paper on the subject in *Science*, Vol. XXXI, p. 750. This author refers to the disease as the Central American banana blight, and states that, according to report, it is not limited to the countries mentioned, but occurs also on the Atlantic side of Nicaragua, Honduras and Guatemala.

The external symptoms of the disease are briefly as follows. One or more of the leaves turn yellow rapidly, then become brown, and wilt. Sometimes the terminal part of the leaf turns yellow and is noticeably curved, while the remainder is green. Subsequently, all the leaves die and fall back against the trunk, and a crop of suckers is left. These in turn die, leaving still weaker shoots which are also killed.

The internal symptoms of the disease are particularly noticeable in the vascular bundles. When the bases of the leaves which compose the pseudo-stem are cut longitudinally, it is seen that the bundles have a yellow discoloration which becomes red lower down, and is almost black near the root-stock. Even in an early stage of the disease, when the vascular bundles in the upper part of the stalk appear healthy, those near the root-stock are always coloured. When leaf-stalks which have been affected for some time are cut open, a nauseating smell is often given off, although there may be no sign of rotting in the trunk. Fruits produced on diseased plants seldom mature, and even when they do so are worthless, having a blotched and somewhat shrivelled surface and a dry, pithy interior

The disease is not due to excessive moisture or drought, nor to general conditions of agriculture; though the plants succumb most easily during the period of active growth from April to July. The common yellow, or Martinique, variety is the most susceptible; the red variety is also attacked. A new Chinese variety introduced by Dr. McKenny was found to be immune—at any rate temporarily.

A fungus and a bacteria occurred in the diseased tissues, but McKenny was unable to say definitely which was the cause of the disease, confining himself to the statement that it is evidently produced by a vegetable parasite which makes its entrance into the plant through the rhizome or roots.

No remedial measures beyond the planting of an immune variety have as yet been devised, although several have been tried. Some of these are given in a paper by Mr. H. Q. Levy, Agricultural Instructor in Jamaica, in the *Journal of the Jamaica Agricultural Society*, Vol. XIV, p. 241.

CUBA. A similar disease has been reported from Cuba by Dr. Erwin F. Smith, whose paper on the subject appeared in the number of *Science* cited above. This author remarks that he and McKenny are of the opinion that this is probably the same as the Panama disease, though in Cuba a species of Fusarium was found in the discoloured vascular bundles. Inoculation experiments with this fungus showed that it was capable of living as a parasite on the banana, but did not prove conclusively that it was the cause of the disease. Additional experiments are in progress to determine this point

TRINIDAD. Bananas and plantains in this island are attacked by two stem diseases and a root disease. The stem diseases are the 'moko disease', shown by Rorer to be of bacterial origin, and the Panama disease. This last was found on the Gros Michel variety of banana, and Rorer succeeded in isolating a species of Fusarium from the diseased tissues, though the results of inoculations with this fungus were inconclusive. (See *Annual Report of the Mycologist*, Trinidad, 1909-10.) The moko disease is characterized by symptoms very similar to those described for the Panama disease, but has been proved by Rorer to be definitely of bacterial origin. The plants attacked were the 'Moko Fig' variety of banana and the French plantain. In considering other accounts of diseases of bananas attributed to bacteria, Rorer mentions one described by Earle from Jamaica in 1903, and another from Porto Rico in 1904. (Earle, *Journal of the New York Botanic Garden*, Vol. 4, p. 37, reprinted in the *West Indian Bulletin*, Vol IV, p. 6, and *Annual Report of the Porto Rico Agricultural Experiment Station*, 1904.) These are the only two that Rorer was able to find. The first is not considered by him to be identical with the moko disease, but is mentioned by Smith as being possibly the same as the Panama disease. It would seem, however, that possibly the moko and the Panama disease are the same, unless, as Rorer remarks, it is definitely proved that one is due to a bacterium and the other to a species of Fusarium. According to Earle's account, the Jamaica disease differs somewhat in symptoms from either of the two referred to above. It may be worthy of note that a rot of plantains is also recorded from British Guiana, though the cause is not given (*Journal of the Board of Agriculture*, British Guiana, Vol. III, p. 90). The third disease in Trinidad is the root disease due to a species of Marasmius, probably *Marasmius semiustus*, which was reported as being severe on the red banana.

SURINAM. The Panama disease has been very destructive to the banana industry in this country, being especially prevalent on the Gros Michel variety, which is that chiefly cultivated.

The problem here has been investigated by Essed, who published a preliminary note on the subject in the *Annals of Botany*, Vol. XXIV, p. 488. In this note the author attributes the disease to a member of the Ustilagineae, probably in connexion with one of the primitive group Chytridineae. Subsequently, however, in a letter to this Department, he stated that it is due to a fungus named by him *Ustilaginoidella musaeperda*, related to the genus Ustilaginoidea, one of the Hypocreales, the family to which the genus Nectria with its conidial stage Fusarium belongs. An attempt was made to overcome the damage due to this disease by planting bananas of the Congo variety. This at first appeared to be successful, but later reports state that the new variety is also becoming affected.

Another disease known as Elephantiasis or 'Bigge Foote' also occurs in Surinam. In this case, the sheathing petioles of the leaves that form the pseudo-stem begin to rot at the base. The outer leaves die and fall away, leaving a slender pseudo-stem springing from a large bulb at the base. (Stockdale, *Journal of the Board of Agriculture*, British Guiana, Vol. IV, p. 18.) This disease is also under investigation by Essed. It may be controlled by digging out and destroying infested plants, as soon as they are observed.

The prevalence of the Panama disease has called forth various proclamations against the importation of banana plants into the different islands. Jamaica led the way with a proclamation prohibiting the importation of banana plants, or implements used in banana cultivation, from all countries of Central or South America and the Island of Trinidad. In Barbados and the Windward Islands similar proclamations have been issued, on the advice of the Imperial Commissioner of Agriculture, with the difference that there is no prohibition against the importation of tools, and that Tobago has been added to the list of prohibited countries. The name of this island does not appear on the proclamations in force in Antigua and Dominica; though otherwise they are similar to those in Barbados and the Windward Islands. It may be noted further, that Mr. Ehrhorn, Entomologist to the Board of Agriculture and Forestry, Hawaii, has advised the Board not to permit the importation of the Bluefields banana into that island at present, as is shown by a letter from him published in the *Hawaiian Forester and Agriculturist*, Vol. VIII, p. 31.

Many of the above facts afford clear proof of the seriousness with which the Panama disease is regarded, and of the necessity of restricting it, as far as possible, to the countries in which it is already present.

THE GERMINATION OF HEVEA SEEDS

It has been found that the seed of *Hevea brasiliensis*, which has been imported from time to time for use in Grenada, has shown very unsatisfactory germinating power, and in view of the cost of the seed, it was considered expedient by Mr. G. G. Auchinleck, B.Sc., Superintendent of Agriculture, to make observations on seeds grown locally, for the purpose of deciding as to what the low percentage of germination might be due. The results of Mr. Auchinleck's investigations have been presented by him in the form of a report, from which the following information is taken. They show that experience in Grenada is confirmatory of that which has been described already from other parts of the world.

Mr. Auchinleck points out that the low germinating power of imported seed is obviously due to actual sterility of the seeds, to their rapid deterioration after maturity, or to both causes acting at once. For the purpose of obtaining information in regard to the suggested deterioration, seeds from capsules which had been opened just before dehiscence took place were planted twenty-four hours after the fruits had been plucked, a few being kept, however, for three days. The number of seeds collected altogether was 975, and 160 of these were set aside as being too light. That there is a great difference in weight between the heavy and light seeds is shown by the fact that 100 of the former were found to weigh 16 oz., while the weight of the same number of light seeds was only 6 oz.; there was, however, no observable difference in size between the two kinds.

In the continuation of the experiment, all the light seeds were planted in a bed, while of the heavy, eighty were sown at stake and seventy-five in pots. None of the light seeds germinated; of the heavy, nineteen of those at stake, and thirteen in pots, gave sprouts. These results appear to justify the rejection of light seeds when those of Hevea are being selected for planting.

Observations on the rapidity with which the seeds lose weight, together with the consideration that from two weeks to several months are required for germination, led to the supposition that the rate at which heavy seeds become lighter in the soil might result in a serious diminution of their power to germinate, before the young plant has had time to pierce the hard seed coat. This led to the following experiment, undertaken to find how quickly heavy Hevea seeds may lose weight.

For the purpose, ten heavy seeds were packed in thoroughly dried charcoal, in a flask; while ten others were placed in a flask open to the air. Each lot was taken periodically from its flask, at the same time, and weighed, with the following results:—

Day of weighing.	Seeds in air, grams.	Seeds in charcoal, grams.
1st	48·8	49·0
5th	48·5	43·5
9th	47·0	40·5
15th	45·5	38·7
20th	44·4	38·0
25th	43·0	37·5
30th	41·8	37·2
42nd	39·0	37·0
49th	38·0	37·0
54th	37·5	37·0

Calculation of the results shows that in two weeks the seeds kept in air had lost 6 per cent. of their weight, and those in dried charcoal 20 per cent., the latter being about the extreme limit of desiccation; the light seeds took fifty days to reach this.

Further observations, made for the purpose of ascertaining the cause of the decrease in weight, gave negative indications that this is due to the loss of water; and it is thought that it takes place on account of the presence of a definite ferment in the seed.

The fact that the trials were commenced late in the bearing season make it impossible to ascertain if the poor germinating power is the indirect result of some imperfection in the flower, or irregularity in fertilization. It was noted, however, that the embryos of all the seeds examined appeared to be normal, and there was the interesting observation that, out of about 320 capsules, all were trilocular and three-seeded, except two, which possessed four loculi and four seeds. The seeds in the abnormal capsules were subjected to a germination test, and three out of the eight gave sprouts. Attention is drawn to the faint possibility that a tendency toward irregularity in the floral organs of *Hevea brasiliensis* is indicated, with the consequent production of a low germinating power in the seed that is eventually borne. The improbability of the correctness of such a suggestion is, however, pointed out.

The final conclusions from the investigation are given as follows:—

(1) Seeds of *Hevea brasiliensis* lose weight rapidly after maturity, the loss being apparently due to desiccation.

(2) The loss of weight appears to coincide with loss of germinating power.

(3) Desiccation apparently takes place, in some instances, even before dehiscence of the capsule.

(4) Probably, without special precautions, Hevea seeds will lose their germinating power within two or three weeks after the ripening of the capsules.

The matter of practical importance that can be deduced from these results is that no Hevea seed should be sold until it has been selected rigorously by weight, and there is the additional indication that no unnecessary exposure, or loss of time in planting, should be allowed after the seeds have been received.

MARKET REPORTS.

London.—The West India Committee Circular, March 14, 1911; Messrs. E. A. De Pass & Co., March 4, 1911.

Arrowroot—2*d.* to 3*d.*
Balata—Sheet, 3/9; block, 3/- per lb.
Beeswax—£7 10*s.* to £7 12*s.* 6*d.*
Cacao—Trinidad, 56/6 to 65/- per cwt.; Grenada, 51/- to 56/-; Jamaica, 49/- to 54/6.
Coffee—Jamaica, 58/- to 64/6.
Copra—West Indian, £22 per ton.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, no quototions.
Fruit—No quotations.
Fustic—No quotations.
Ginger—Common to good common, 52/- to 53/6 per cwt.; low middling to middling, no quotations; good bright to fine, no quotations.
Honey—No quotations.
Isinglass—No quotations.
Lime Juice—Raw, 8*d.* to 1/1; concentrated, £18 2*s.* 6*d.* to £18 7*s.* 6*d.*; Otto of limes (hand pressed), 5/- to 5/3, nominal.
Logwood—No quotations.
Mace—Firm.
Nutmegs—Quiet.
Pimento—Common, 2½*d.*; fair, 2¼*d.*; good, $2\frac{5}{16}$*d.* per lb.
Rubber—Para, fine hard, 6/8; fine soft, 6/2; fine Peru, 6/6 per lb.
Rum—Jamaica, 1/6 to 5/- per gallon.
Sugar—Crystals, 14/9 to 17/6; Muscovado, 11/6 to 14/6; Syrup, 11/3 to 13/-; Molasses, no quotations.

New York.—Messrs. Gillespie Bros. & Co., March 10, 1911.

Cacao—Caracas, 11¾c. to 12¼c.; Grenada, 11⅝c. to 11¾c.; Trinidad, 11¾c. to 12c. per lb.; Jamaica, 10½c. to 11½c.
Cocoa-nuts—Jamaica, select, $29·00 to $31·00; culls, $18·00; Trinidad, select, $29·00 to $31·00; culls, $18·00 per M.
Coffee—Jamaica, 12½c. to 13¼c. per lb.
Ginger—9c. to 12c. per lb.
Goat Skins—No quotations.
Grape-Fruit—Jamaica, $1·75 to $2·25 per box.
Limes—$6·50 to $8·00.
Mace—41c. to 48c. per lb.
Nutmegs—110's, 10c. to 10½c. per lb.
Oranges—Jamaica, $1·50 to $2·00.
Pimento—4c. per lb.
Sugar—Centrifugals, 96°, 3·76c. per lb.; Muscovados, 89°, 3·26c.; Molasses, 89°, 3·01c. per lb., all duty paid.

Trinidad,—Messrs. Gordon, Grant & Co., March 20, 1911.

Cacao—Venezuelan, $12·10 per fanega; Trinidad, $11·25 to $12·00.
Cocoa-nut Oil—91c. per Imperial gallon.
Coffee—Venezuelan, 16c. per lb.
Copra—No quotations.
Dhal—$3·30.
Onions $2·75 to $4·00 per 100 lb.
Peas, Split—$5·90 to $6·00 per bag.
Potatoes—English, $2·00 to $2·25 per 100 lb.
Rice—Yellow, $4·30 to $4·35; White, $5·40 to $5·50 per bag.
Sugar—American crushed, $5·50 to $5·60 per 100 lb.

Barbados,—Messrs. T. S. Garraway & Co., March 27, 1911; Messrs. James A. Lynch & Co., March 20, 1911.

Arrowroot—St. Vincent, $4·50 to $4·70 per 100 lb.
Cacao—$12·00 to $12·50 per 100 lb.
Cocoa-nuts—$20·00.
Coffee—Jamaica and ordinary Rio, $13·50 to $14·50 per 100 lb. scarce.
Hay—$1·40 to $1·50 per 100 lb.
Manures—Nitrate of soda, $65·00; Cacao manure, $42·00 to $48·00; Sulphate of ammonia, $75·00 per ton.
Molasses—No quotations.
Onions—$2·50 to $4·00 per 100 lb.
Peas, Split—$5·80 to $6·00 per bag of 210 lb.; Canada, $4·25 per bag of 120 lb.
Potatoes—Nova Scotia, $2·25 to $2·80 per 160 lb.
Rice—Ballam, $5·30; Patna, $3·50; Rangoon, $2·90 per 100 lb.
Sugar—No quotations.

British Guiana.—Messrs. Wieting & Richter, March 18, 1911; Messrs. Sandbach, Parker & Co., March 17, 1911.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	$9·25 to $9·50 per 200 lb.	$9·25 to $9·50 per 200 lb.
Balata—Venezuela block	No quotation	Prohibited
Demerara sheet	81c. per lb.	72c. to 80c.
Cacao—Native	11c. per lb.	10c. to 11c. per lb.
Cassava—	96c.	No quotation
Cassava Starch—	$6·50 to $7·00	No quotation
Cocoa-nuts—	$12 to $16 per M	$10 to $16 per M., peeled and selected
Coffee—Creole	16c. per lb.	16c. per lb.
Jamaica and Rio	18c. per lb.	19c. per lb.
Liberian	10½c. to 11c. per lb.	11c. per lb.
Dhal—	$3·50 per bag of 168 lb.	$3·50 to $3·75 per bag of 168 lb.
Green Dhal	$4·00	——
Eddoes—	$1·68	——
Molasses—Yellow	None	——
Onions—Teneriffe	——	——
Madeira	6c.	7c.
Peas—Split	$5·75 to $5·90 per bag (210 lb.)	$5·90 per bag (210 lb.)
Marseilles	$4·50	No quotation
Plantains—	20c. to 48c.	——
Potatoes—Nova Scotia	$3·00 to $3·25	$3·50
Lisbon	——	No quotation
Potatoes-Sweet, B'bados	$1·92 per bag	——
Rice—Ballam	No quotation	——
Creole	$5·00 to $5·50	$5·00 to $5·25
Tannias—	$2·88 per bag	——
Yams—White	$2·88	——
Buck	$1·32	——
Sugar—Dark crystals	$2·30 to $2·40	None
Yellow	$2·70 to $3·00	$2·65 to $2·75
White	$4·00	$4·00 to $4·25
Molasses	$2·10 to $2·30	None
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 Degrees of Virulence of Fungus Attacks.

IN these days, when almost everyone connected with agriculture has had a considerable and often unpleasant, experience of the general effects of fungus diseases on crops, it is hardly necessary to point out that some fungi are much more thorough than others in carrying out their work of destruction. It is only requisite to consider for a moment the damage inflicted upon the sugar-cane in the West Indies by the rind fungus during the last decade of the past century, and to contrast it with the comparatively small annual toll exacted by the root fungus of that crop, or by the pod diseases of cacao, in order to realize fully how different may be the effects produced. In the first instance, the colonies were threatened with the complete annihilation of their staple industry; while, with the other two, though the yield is reduced to a greater or less extent by the parasites, some return may always be expected from the crops.

Since the attacks of endemic fungi, such as those causing pod diseases of cacao, are much less immediate in their economic effect, and consequently of a considerably less alarming nature to the community in general, ample time is afforded to the mycologist in which to perfect his means of combating them, and to the practical agriculturist in which to realize the importance of such means and to apply them to his crops. Moreover, endemic fungi are frequently in their nature more easy of control than the epidemic. The majority of plant diseases are of an endemic nature, and this fact, taken in conjunction with their extended scientific study, has resulted for the greater part in the formation of fairly efficient means for reducing the damage they inflict, and the recognition of the nature and importance of these diseases has called into being a body of men specially trained in the knowledge of this subject.

Now, since common experience has shown in many cases that such trained men are able to give advice which, if followed, will result in the extensive reduction of the losses formerly incurred owing to the attacks of parasites, a natural belief is tending to arise that mycologists can always afford advice of a simple kind for controlling or eradicating all fungus diseases. In reality, this is far from being the case. Much depends on the nature of the host plant, on general external conditions, and on the co-operation of large numbers of persons whose crops are attacked by any given disease

Even then the position may appear almost hopeless, and may only be saved by the intervention of some unforeseen external circumstance. A good illustration of what is meant is afforded by the outbreak of canker on the chestnut trees of the United States,* which only attracted attention in the year 1904, and has now become a serious epidemic, so far impossible to control.

The disease is due to a wound fungus identified as *Diaporthe parasitica*, Murrill, which lives in the inner bark and cambium of the stem and all woody branches of the chestnut. On limbs with smooth bark, the parasite produces pale brown, sunken patches on the outer bark. These become more or less thickly covered with the yellow orange or reddish brown pustules of the fungus, which break through the lenticels. In a damp atmosphere, the summer form of spore is extruded in a yellow or greenish tendril, which becomes brown as it grows older. The fungus grows so fast that it can completely girdle a branch or small trunk, and thus kill it, in from one to two years. Even large trunks are girdled as a rule in four years.

The native American chestnut (*Castanea dentata*) is the plant most subject to attack, but the chinquapin (*Castanea pumila*), found native from New Jersey to Florida, is also affected, while the disease has been found, as well, on the Japanese chestnut (*Castanea crenata*.) Indeed, it is suggested that imported plants of this foreign variety growing at Long Island may well have served as the original source of the disease. This point has not, however, been definitely established.

Instances of a disease which may have been this were noted as early as 1902, but it was not until 1904 that it attracted attention: while it did not receive full investigation by a mycologist until 1905. At that time it had assumed serious proportions, and by 1909 over fifty per cent. of the trees within a radius of twenty-five miles of New York had been completely killed out. In addition to this, the disease had appeared at various points in a number of states, and its rapid spread throughout the whole of the chestnut and chinquapin-growing area of the United States appeared imminent. Another very serious consideration was that all the preventive measures tried within the area of serious infection had failed absolutely to produce any effect, though these had been carried out on a fairly extensive scale by trained men, and though support was given to the work by the United States Department of Agriculture. There was, moreover, no lack of co-operation on the part of individuals, and no want of money. Everything possible was done in many instances, but absolutely no result was achieved. At the present time, practically every tree within the infected area is doomed, while the possibility of the complete destruction of the native American chestnut and of the chinquapin must be faced. It is needless to state that this destruction represents a loss of economic products aggregating in value several hundred million dollars.

Metcalf and Collins†, writing in 1909, took a less gloomy view of the situation. They believed that the spread of the disease could be restricted to the badly infected area, if stringent measures were adopted with this object. These measures included the most careful inspection of all nursery stock, and the passing of very thorough quarantine laws in all districts at that time free from the disease. Furthermore, they stated that the Department of Agriculture was prepared to give all possible assistance, particularly in educating the public to recognize the disease, so that trees recently infected in a previously healthy area could be removed, and diseased parts burned. In such an area, where the sources of reinfection were small, very careful excision of diseased parts might also prove effective. Even then, they advised that constant vigilance would be necessary. Spraying experiments with infected trees were inconclusive. In the badly infected area, the complete destruction of diseased trees was recommended as the only course to be adopted, since the sources of reinfection were so numerous as to preclude the possibility of successful treatment. It was also suggested that, subsequently, replanting with a partially immune variety, such as the Japanese chestnut, or with a cross between this and the native species, might be found possible, though the Japanese tree does not yield such good nuts, and does not appear to be nearly as useful as lumber.

No disease as destructive as this has ever yet been experienced in the West Indies. The sugar industry was fortunately saved by the discovery of comparatively immune varieties of cane, giving returns as good as, or even better than, the variety destroyed. Nevertheless, the experience of the United States in the instance quoted indicates that an outbreak of disease might occur on any crop, which could not be checked by the most skilful treatment or the most thorough co-operation, and that nothing would remain but to face the consequences and to adopt the cultivation of some different plant.

*A popular account of this disease is given in an article in *Munsey's Magazine*, for September 1910, by B. Millard.

†Bulletin No. 141, Part V, Bureau of Plant Industry, United States Department of Agriculture.

SUGAR INDUSTRY.

THE MANFACTURE OF SUGAR FROM MAIZE.

An article originally published in the *Chemiker Zeitung*, Vol. XXXIV, p. 1330, which is stated to have been widely noted by the technical press of Europe, has been translated by Dr. O. W. Willcox, for the *American Sugar Industry and Beet Sugar Gazette*, and appears in the issue of that journal for February 1911, from which the following particulars are taken.

The original article is by Dr. G. Doby, who has conducted an investigation in Hungary to determine if Professor F. L. Stewart's method for obtaining sugar from the maize stem is suitable for introduction into that country. It is stated that this method depends upon the fact that if the unripe ear is removed from maize, the sugar content of the stem rises to a proportion which renders economically possible the manufacture of cane sugar from its juice. The increase in sugar content is given as amounting to 12 to 14 per cent. of the weight of the green stem. Sugar is not the only product, however, as the molasses obtained, together with the fermentable matters in the green ear and the husks may be used for making alcohol. This is not the limit of the usefulness of the plant, in this special connexion, as the fibrous residue can be employed for manufacturing paper or cellulose, and the slop from the distillation of alcohol may be converted into food for stock.

For the experiments, the corn was planted closely, as is done when it is raised for producing green stock food; and while the grains were still in the milk, the heads were removed. The fact that there was no mill available for extracting the juice made it necessary for the investigator to analyze the plant itself, instead of juice expressed from it. A table is given which shows that, in the case of the different kinds of maize employed, the total sugar varied from 12·0 to 3·5 per cent., the amount of glucose in the respective cases being 4·4 and 2·0 per cent. The tests were made at different stages of development of the corn, and it is stated that the results show that the total sugar in the corn stem, even under different methods of cultivation, is nearly uniform for each stage. The factor which influences the cane-sugar content to the greatest degree is the ratio of this sugar to the reducing sugars—a relation which depends on the kind of corn grown, and on the method of cultivation employed.

The results are illustrated by means of curves which shew plainly that, ignoring individual variations, there is a gradual decrease in the cane sugar content after the maximum proportion has been attained, probably because, while the dead leaves have ceased to assimilate, there is a certain amount of destruction of sugar through respiration in the still living stem. When again, no notice is taken of individual variations, it is seen that the amount of reducing sugars present remains the same after the removal of the ear. Returning to the cane sugar, it is evident from the figures given above that the proportion of this is not as great as has been stated to have been obtained in the United States. The reasons for this circumstance are given as the retardation of the development of the plants, on account of unfavourable weather, and the fact that the approach of winter stopped their growth.

Dr. Doby was able to prepare sugar crystals from the maize easily and quickly by the employment of Schulze's method (described in the *Zeitschrift für Physiologische Chemie*, Vol. XX, p. 530), and the product appeared to possess all the typical properties of cane sugar. The opinion is given that the preparation of sugar from corn on a large scale, by a similar method, will meet with little difficulty. The conclusion is further reached that additional experimentation is necessary before the practicability of the method can be decided upon, and that this will have to take account of the influence of variety, climate, cultivation, manuring and improved seed. Attention is also drawn to the desirability of ascertaining what variety will give the stand from which the largest yield of sugar per acre can be obtained.

The foregoing serves to give some idea of the extent and results of the investigation undertaken by Dr. Doby. On another page of the issue of the *American Sugar Industry and Beet Sugar Gazette*, to which reference has been made, a quotation from the *Sugar Beet* with relation to the above work is given, in which regret is expressed that time and money are still spent in attempting to prepare sugar from corn stalks. The opinion is brought forward that the matter has no value in practice, and support of this idea is adduced by comparing the yield from sugar beets with that from corn, in the following way. The claim is made that where conditions are favourable to corn-growing, the yield is 22 tons to the acre, which gives 13 tons of stalks, from which over 1,000 lb. of sugar can be obtained; whereas with sugar beets yielding 10 tons per acre, with an extractiou of 13 per cent. of sugar, the return would be over 2,800 lb., or nearly three times as much sugar as that from the corn stalk. Further evidence is given, concerning other matters in relation to the by-products in the two cases, which appears to support the argument that corn will never be able to compete with beet as a sugar producer.

MOLASSES PRODUCTS IN THE NETHERLANDS.

The *Louisiana Planter* for January 7, 1911, contains information that has been obtained from a report by the United States Consul-General at Rotterdam, which deals with the demand for molasses in the Netherlands. Although the product is not employed to any extent as human food, the importations at Rotterdam, Amsterdam and Flushing are of no little concern; they are made in connexion with the manufacture of alcohol, both beet molasses and cane molasses being employed, the former selling at $16 to $18, and the latter at $20 to $24 per metric ton.

In the Dutch Customs, the classification of molasses products is as 'syrup, melado and molasses'; the imports of this from various countries during 1909 were as follows: Great Britain, 1,220 tons; Belgium, 2,625; Cuba, 19,981; Germany, 23,282; Roumania, 1,711; United States, 2,507; Sweden, 1,192 tons: forming a total of nearly 53,000 tons. The suggestion is made that, as this molasses is mainly used for manufacturing alcohol, and is therefore required in large quantities, profitable importations from the United States can only be made in tank steamers, which would discharge directly into the tank lighters owned by the purchasing companies.

Attention is drawn to the circumstance that stock foods containing molasses have been little used so far in the Netherlands, and it is suggested that trade could only be developed in this direction, as a subsidiary industry to the provision of molasses for alcohol-making—a provision which would probably be required to the extent of 10,000 to 15,000 tons of molasses, annually.

FRUITS AND FRUIT TREES.

THE PAIRI MANGO.

In the Bombay markets the mango most in demand is the Alphonse. This is a fairly well known variety, and has been distributed to most quarters of India, to the West Indies, to America, and to Australia. Next to this famous variety, a much less known variety called the Pairi has a large production and sale. In a typical Alphonse fruit, the left shoulder is high, the right low, and the beak is almost absent. In contrast to this, in a typical Pairi fruit, both shoulders fall about equally, and the beak is very marked. The shapes of both varieties are fairly constant, and it is impossible to confound the two, once one has seen them side by side. The Pairi fruit when fully ripe has an external colour varying from red on the shoulder to yellow at the beak The flesh of this mango is of a brownish orange colour, with very little fibre. The stone occupies perhaps one-third of the volume of the fruit. The taste is delicious, and slightly more piquant than that of the Alphonse.

Some judge the taste inferior to that of Alphonse, but personally I prefer the slightly acid Pairi to the heavier and more luscious Alphonse. Woodrow gives the following weight and size of a typical fruit: weight 8 oz., size 4 × 3 × 3 inches. One which I measured and weighed myself was as follows: weight 360 grammes, size 10·5 × 8·5 × 7 cm. [4·2 × 3 4 × 28 inches]. It is therefore a moderate-sized mango. There are several varieties with bigger, and many with smaller, fruits. The Pairi mango has one defect: it does not keep well. Whereas Alphonse may be kept up to two months even, if properly stored; Pairi, with the utmost precautions, will hardly last eight days. This character and its different flavour make it a cheaper mango than the Alphonse. The Pairi mango tree has a most vigorous spreading habit of growth. This character of the Pairi makes it an excellent trunk piece for a composite grafted mango, giving a vigorous stem.

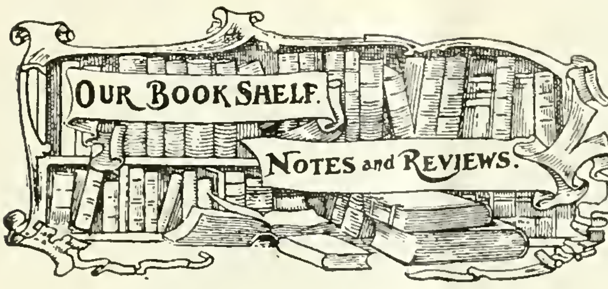
One or two sub-varieties of the Pairi mango are known, for example, Moti-Pairi, which is a larger kind. One specimen of the fruit which I examined weighed 527 grammes and measured 12 × 9·5 × 8 cm. [1 8 × 3·8 × 3·2 inches]. Another sub-variety is the Kagdi-Pairi (Kagdi-papery) so called on account of its thin and shining skin. The fruit is said to have firmer flesh, and to be superior in flavour to the ordinary Pairi.

As regards the source and history of the Pairi mango, little is known, but it is clear that it is of Bombay origin, and has been little cultivated in other parts of India. Maries, in Watt's *Dictionary of Economic Products*, Vol. V, pp. 146-57, has one doubtful reference to Pairi, which is worded as follows: 'I should advise planting seedling mangoes where grafts are difficult to obtain, taking for the seed only such sorts as Afooz, Puary, Kishenbogh, Durbhangah, Bombay, Fuzlee, and good forms.' In the portfolio of paintings of mangoes in the herbarium of the Calcutta Botanic Gardens, I found no painting labelled Pairi. Firminger, in the year 1874, or the more recent edition of his *Manual of Gardening for Bengal and Upper India*, does not mention the Pairi. Two old Indian gardening books, Speede's *The Indian Handbook of Gardening* (Calcutta, 1842) and Pogson's *Indian Gardening in Bengal, Upper Provinces, and the Hill Stations of India* (Calcutta, 1875) make no mention of Pairi. These facts would seem to show that it was for long unknown in Upper India.

On the other hand, in a Resolution of the Bombay Government, Revenue Department, made in 1885, the following entry is made against Thana: 'Afus and Pyre mangoes are largely grown in this district, especially in Salsette ' Cooke, in his *Flora of the Bombay Presidency*, 1903, Vol. 1, p. 214, has a long note on the Pairi mango, mentioning its botanical and commercial characters. Gupte and Raje, in their Marathi book, *Krishi Karma*, 1901. p. 680, mention the Pairi mango, and state that its name is a corruption of the Portuguese name Pereira. This is not impossible, seeing that the Portuguese Alphonse has become corrupted into Apoos, Afoos and Hapoos. In Woodrow's *Gardening in India*, 1894, pp. 253-60, Pairi is mentioned as one of the celebrated mango trees occurring in the following districts: Poona, Kolaba and Surat.

All this would seem to show that it is a mango evolved probably by some Goanese horticulturist, but that it has somehow not spread over India, or come to the knowledge of gardeners outside the Bombay Presidency to the same extent that Alphonse has. (From *The Agricultural Journal of India*, Vol. VI, p. 27.)

A report by the Officer Administering the Government of the Gold Coast shows that the cacao crop of last year was 50,609,950 lb., as against 15,277,606 lb. in 1909, and 28,545,910 lb. in 1908. The value of the crop of 1910 is placed at £865,419.



CANE SUGAR. By Noel Deerr. *Norman Rodger, Altrincham.*

This work, which virtually forms a new and extended edition of the author's well-known text-book Sugar and the Sugar Cane, consists largely of a judicious compilation of the views and facts put forward by various writers on the many branches necessarily included in so wide a subject. In carrying out the scheme, the author had regard to the older writers, and has referred to their work in a manner that is sufficient to give a clear account in the various sections; but the greater, and perhaps more useful, part consists mainly of a critical survey of the large amount of literature on sugar matters recently issued, and scattered for the greater part through reports and pamphlets, emanating from workers throughout the world.

The work is divided into twenty-six chapters, the first of which deals with the sugar-cane, its importance and varieties; the soil suited to it; the manner of raising and harvesting sugar-cane; and the pests and diseases to which it is subject. Following these, is that part of the work treating of the extraction of the juice by mills and by diffusion, and the manufacture of sugar; while the final chapters have for their subjects the methods of analysis of sugar products and allied methods, the control of the factory, and fermentation and the production of alcohol.

It will be well to deal with some of the matters in the book, in detail. Chapter V contains an interesting compilation of facts from available sources concerning sugar-cane soils; though there is little information regarding the physical composition of these, in spite of the fact that this matter has received considerable attention. Chapter VI commences with a summary of the published results concerning the manuring of cane in different countries; in regard to Barbados, however, reference is only made to those for 1885-9, and the Leeward Islands are not mentioned in the connexion. In relation to the effect of manuring on the sugar-cane, the author appears to agree with Watts and Cousins that the weight of the cane is the only characteristic influenced to any extent; there is, however, no reference to the work of these authorities. The results of the experience of Watts in the Leeward Islands, and of Bouf in Martinique in 1877, in relation to the time for applying manures to sugar-cane, are supported by the author's experience. A useful but brief general summary of the nature and use of artificial manures contains a discussion as to whether the ash of the cane forms an index of its manurial requirements; the idea that any such index exists is dismissed, and quotation is made of A. D. Hall's summary of the results of his experience in England. Pages 77 to 80 contain a useful section on the utilization of waste products from sugar factories as manure. Other matters in this chapter, to which particular attention may be drawn, have reference to bacteria in relation to soil conditions, green dressings, rotation, pen manure and irrigation, the last of which naturally occupies a fairly prominent position in view of the author's experience in Hawaii. It must be said that the treatment of rotation and the use of pen manure is incomplete. In regard to the former, there is very scant reference to its bearing on the control of insect and fungus pests, and in the latter, little regard is had to anything beyond conditions in Mauritius, the author being doubtless influenced to deal shortly with the matter by his experience in British Guiana.

The first part of Chapter VII gives a summary of facts regarding the implements of husbandry—matters that are naturally followed by an account of the preparation of land and material for planting; in regard to the last, there is no reference to the treatment of planting material with germicides, although the subject is noted very shortly on page 155. Trashing cane is discussed in this chapter and the results are recorded of the work of Boname and Eckart, who entertain opposite views in regard to the matter. In Chapter X, attention is given to cane-harvesting; and toward the end in regard to the deterioration of cut cane, an interesting point is raised with respect to the loss in crushing on account of the increase in fibre in drying, but nothing is said as to the increase of sucrose in the juice. Useful data are given with reference to the loss of water and sugar in cut cane. Chapter XI opens with a concise summary of the evolution of the modern mill. Further on, on page 199, it may be noted, a useful simple empirical formula in connexion with the capacity of mills is given, and this is followed on the next two pages by a good description of mill rollers and of problems connected with the milling of canes. Finally, in this chapter, questions affecting extraction and maceration are dealt with in a most useful manner, a good deal of attention being given to the algebraic treatment of the subject. In relation to sugar manufacture more particularly, attention may be drawn lastly to the accounts of the diffusion process, on page 225, and of clarification on page 241, the latter of which forms the subject of Chapter XIII.

The pests and diseases of the cane are dealt with in Chapter IX, and as regards insect pests this appears to present a good summary of the facts, with adequate reference to conditions in the West Indies. Among minor matters it may be noted that the numbers of Figs. 54 and 55 in the plate at the commencement of the book should be transposed, and that Fig 49 should be lettered to correspond with the matter on page 129; the sugar-cane frog-hopper of Trinidad is now identified as *Tomaspis varia*, Fabr.; the cane fly of the West Indies (*Delphax saccharivora*) is referred to as a spittle insect, although the genus *Delphax* does not contain such forms. Lastly, the shot borer of the sugar-cane (*Xyleborus perforans*) is not regarded as a serious pest, in spite of the opinion that its tunnels form a means of entrance for fungi. In regard to plant diseases, it should be stated that Griffon and Maublanc do not consider that *Darluca melasporum* is identical with *Coniothyrium melasporum*, nor that *Diplodia cacaoicola* has any connexion with either of them; the account of the fungi associated with rind disease is somewhat confused, though the summary of the literature relating to them is good; reference to Griffon and Maublanc's work, and to Maublanc's summary of Delacroix's notes, would have been useful. Neglecting these matters, a good, clear and fairly complete account of the fungus pests of the sugar-cane has been presented.

The way in which the work is produced merits nothing but praise. The type is good; the illustrations contain adequate detail without being confused; there is included a most useful appendix of tables; and the index—a part of more than the usual importance in a book of this nature—forms a most trustworthy guide to its excellent contents.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date March 27, with reference to the sales of West Indian Sea Island cotton:—

Since our last report, about 50 bags of West Indian Sea Islands are reported as sold at 18*d.* to 18½*d.*; these representing very small lots of selected bales from various islands.

There is great pressure to sell all Sea Island growths, and buyers having such a large selection, have only purchased such bags as are suitable for their immediate requirements.

There is an unsold stock of between seven and eight thousand bales in Charleston, which has been pressed for sale throughout the season at gradually lower prices, without finding buyers. We notice, however, that a meeting has been held with a view to reducing the production of long stapled cotton in the States, substituting Uplands, and to hold the balance of the stocks for better prices.

Meanwhile, the demand for lace is still poor, with the result that many mills are using other descriptions of cotton and the normal consumption is very much curtailed.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending March 25, is as follows:—

There was some demand for planters' crop lots during the week. The owners being discouraged, lowered their prices to meet the views of buyers and accepted the offers made them, resulting in sales of 299 bales, prices ranging from 32c. to 40c. The buying was for England, France, and the North.

In the absence of any demand for the odd bags the market remains nominally unchanged, but as Factors to effect sales would accept some decline from their asking prices, we quote, viz:—

Extra Fine Islands at	32c. = 18*d.*	c.i.f. & 5 per cent.
Fully Fine ,,	30c. = 17*d.*	,, ,, ,, ,,
Fine ,,	29c. = 16½*d.*	,, ,, ,, ,,
Off Grades ,,	23c. to 25c.	
= 13*d.* to 14*d.*		,, ,, ,, ,,

According to the *Bulletin of Agricultural Statistics* of the International Institute of Agriculture, Rome, the area of cotton planted in Egypt, in 1909-10, is estimated at 1,725,083 acres. The area in 1908-9 was 1,677,240 acres; so that there has been an increase of nearly 3 per cent. Similarly, as far as reports have been received, the figures for British India are 21,516,888 acres and 20,546,645 acres, giving an increase of 4·7 per cent. The estimated output of British India is placed at 4,668,000 bales of 400 lb.—a decrease of 5·7 per cent. on the amount for the previous year.

COTTON-GROWING IN ASIA, AFRICA AND SOUTH AMERICA.

Under the above title, the *Textile Mercury* for January 7, 1911, gives excerpts taken from the reports of Consuls and commercial agents that have been supplied to the United States Bureau of Manufactures, dealing with cotton-growing in certain parts of the world. The following is an abstract of the matter presented in the journal to which reference has been made:—

INDIA: CAMBODIA COTTON. The area of this cotton in the Tinnevelley district of the Madras Presidency has quickly increased to about 17,000 acres. The cotton itself is a variety of acclimatized American cotton, which was introduced into the country about four years ago, and has a greater yield than any of the old kinds. It thrives on irrigated lands, and there seems to be little doubt that in very few years its cultivation will extend to the whole of South India, if not to other parts of the country in addition. As its fibre compares favourably with that of American upland, the opinion is given that in a few years India may become a serious competitor of the United States in regard to the provision of short staple cotton.

NORTH BORNEO. Attempts to grow Sea Island cotton have not been successful. It appears however, that British Borneo possesses strains of cotton that grow well in the country, and yield a useful fibre. Large plantings have been made of the silk cotton (kapok) tree (*Eriodendron anfractuosum*), but it is too early at present to determine the commercial value of the fibre of this plant in British Borneo.

ALGERIA. Enquiries seem to indicate that this colony can only produce cotton under the best market conditions, and even then the quantity would be limited. This is because of the scarcity of water for irrigation, which is made necessary by the low rainfall, and the employment of such water for the growing of other products that are of greater value. Well cultivated land under irrigation gives 880 to 1,750 lb. of unginned cotton: this must obtain a price of at least 7·8*d.* per lb. of lint, or it cannot be grown profitably. The amount of cotton exported during 1909 was 40 tons, valued at £1,700.

THE TRANSVAAL. Satisfactory progress is being made with most of the cotton experiments in the Transvaal, and increasing areas of the plant are being sown. The trials that have been made show that almost the whole of the low veldt, and many parts of the middle veldt, are suitable for cotton-growing; but that this is not at all the case in regard to the high veldt. A matter of further encouragement is that the normal Transvaal climate appears to be well suited to cotton, as the rainy season from December to April is available for its growth, while the dry season, during which the crop can mature and be picked, commences in May. It has been found that the most suitable districts for cotton-growing are situated in the eastern foothills of the Drakensberg, the Zoutpansberg, Lydenburg, Barberton, and Piet Retief districts, as well as in Swaziland. The improved types of American upland cotton have so far given the best results.

ARGENTINA. A circular issued by the Argentine Department of Agriculture shows that investigations have demonstrated that the extension of cotton cultivation in the State has been retarded by special circumstances, as the plant itself appears to be well suited to the conditions that obtain where it is grown, and gives reasonable yields. In order to encourage cotton-growing in the State, the Office of Agricultural Competitions and Exhibitions is devising competitions to be held among the cultivators of cotton plantations and cotton producers. For this purpose, seed of different varieties from the United States is being distributed; among these are Russell, Culpepper, Texas Wood, Dickson, Strickland, King and Simkin.

SOME FACTS CONCERNING FOREST RESOURCES.

Bulletin 83 of the United States Forest Service, entitled *The Forest Resources of the World*, has been issued recently. This gives the following information concerning the West Indies, in the special connexion:—

Semler takes a very gloomy view of forest conditions in the West Indies. He thinks that, on the whole, the West Indies present a sad picture of forest destruction. The small islands are robbed of their former forest wealth; and the large ones, like Jamaica, San Domingo, and Cuba have only remnants. What little is left is almost entirely in the hands of private individuals, and nothing is done for the preservation of the forests.

John T. Rea, who lived for four years in the West Indies, takes a more optimistic view of the situation, and since his observations are more recent and many of them are original, they are apparently more trustworthy than Semler's. According to Rea's statement, two-thirds of most of the West Indian Islands are still in virgin bush and forest, which are capable of yielding a plentiful supply of good material. Thus the Layou and Sara flats, or Crown lands of Dominica, have an area of 40 square miles, and contain a mine of wealth in timber. In Trinidad, he estimates that there are at least 300,000 acres of forest land.

The total area of the West Indies is about 100,000 square miles. The trees, on the whole, are not very large, and yield as a rule only small scantlings. Some of the woods are useful for building and engineering work, but they are valuable principally for furniture, panelling, cabinet, and other fancy work. The immense variety of small articles, such as knife handles, knobs, buttons, etc., which are now manufactured from choice grained woods, opens a ready market for many West Indian timbers, the beauty of which cannot be surpassed. Gum and resin-yielding trees abound, and commercially valuable fibres may be stripped from quite a number of them. The bark, leaves and berries of others furnish well-known drugs, dyes and spices. Owing to the fact that all the best timber is in the inland forests, with few convenient rivers for floating it down, and owing also to the defective character of the means of communication and the absence of sawmills and machinery for their treatment, the native woods have until lately been available only in small quantities. Circular and other rapid saws have been added to the plant of most of the public work-yards, so that some of the disadvantages have been overcome.

Little definite information is to be had concerning the forest area of Cuba. It probably does not exceed 5,000,000 or 6,000,000 acres, which, with a population of 2,050,000, makes the area *per capita* about 3 acres, and constitutes about 20 per cent. of the total land area. Such an area, with the small local demand for wood, if the forests are properly managed and cared for, certainly ought to furnish a sufficient supply for home consumption. Unfortunately, however, the forests do not contain the kinds of timber needed for most purposes, and hence large quantities are imported annually.

The following are the general conclusions reached in the Bulletin, in relation to the forest resources of the world:—

The review of the timber trade of the various countries of the world shows a steady increase in wood consumption, and imports of nearly all the leading import countries, and but three important countries, Russia, Finland and Sweden, which can increase their export without lessening their forest capital. This increase will be needed in Western Europe to make up the growing deficit there, and will not be a source of supply for the United States. Thus the tendency is toward a greater over-cutting of timber on the part of the export countries, to make up the increasing deficit of the import countries, which policy, if continued, would lead to a universal shortage, with no surplus to draw upon. This picture, gloomy as it may seem, is offset by the birth of a new economic force—the general appreciation of the value of forests, and the movement toward the introduction of rational forest management by all civilized peoples. There is no doubt whatever that there is enough accessible actual and potential forest land in civilized countries to produce, under proper management, an abundance of timber to supply indefinitely the world's growing demand.

Doctor Schlich states, in his *Forest Policy*, that by planting up waste lands in Great Britain much of the annual import could be replaced by home-grown timber. If any material results can be expected in Great Britain, this country, with its great existing forests and large amount of permanent forest land, can certainly supply its timber needs. Not only of necessity, in view of the lack of any adequate foreign source of supply, but also from national pride and the desire to preserve a tremendous native industry, the United States should introduce rational forest management. At present, forest management would consist in large part of conservative treatment of existing forests with a relatively small amount of planting. If postponed until a timber shortage forces the United States to action, it would face the problem of the slow conversion of scrubby woodland into productive forest, and the costly planting of denuded wastes on a very large scale. While the present area of wooded land in the United States is usually estimated at 545,000,000 acres some of this is of no commercial value, and much is inevitably destined, with the increase in the population of the country, to be cleared for agriculture. The area of land so situated as to be permanent forest land is about 450,000,000 acres, of which 100,000,000 will consist of farm wood-lots. The inevitable increase in wood consumption, following increase in population and growth of industries, will thus have to be supplied from a diminished forest area Therefore the only solution of the problem of a wood-supply is to begin now to prepare for making a diminished forest area supply an increased population. This means that the land should be surveyed and classified by the Government, and forest management applied to the permanent forest land, now—before it is too late.

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 of the editorial is The Degree of Virulence of Fungus Attacks. It shows that the damage likely to be caused by such attacks varies greatly in different instances, and that the treatment will differ with the circumstances of this; while in some cases, the harm done may be so great as to lead to the abandonment of the cultivation of the plants of the species attacked.

On page 119, some facts are presented in connexion with the forest resources of the world.

Attention is drawn to a note on this page, setting forth the contents of the *West Indian Bulletin*, Vol. XI., No. 3, which is now being issued. It will be followed by Pamphlet No. 67, entitled Seedling and Other Canes in the Leeward Islands, 1909-10.

The Insect Notes, on page 122, contain two articles dealing respectively with pests of palms that have been found to attack sugar-cane, and with some general facts concerning the control of insect pests.

Articles on the forthcoming International Rubber and Allied Trades Exhibition appear on page 123. The second of these shows that the list of prizes for competition has been increased by the offer of two silver cups by the West India Committee.

An article on the same page presents the results of work that has been done in connexion with the poisoning properties of unripe sorghum.

The subject of the Fungus Notes (page 126) is The Fungus Causing Pine-apple Disease. The article shows that this fungus is capable of attacking a larger variety of host plants than was suspected at first.

Publications of the Imperial Department of Agriculture.

The *West Indian Bulletin*, Vol. XI, No. 3, is now being issued. The first article in it is entitled Fungus Diseases of Ground Nuts in the West Indies, by F. W. South, B.A., Mycologist on the Staff of the Department. Ground nuts also receive attention in the next article, Notes on Ground Nuts in the West Indies, which presents the results that have been obtained with this crop in recent years at the various experiment stations. The third article consists of a report by H. A. Ballou, M.Sc., Entomologist on the Staff of the Department, giving particulars of a recent visit made by this Officer to Florida, with special reference to the methods that are employed in that State for the control of citrus pests.

Matters not directly connected with agriculture, but which are of much interest to those whose work is concerned with the growing of crops are dealt with in the information which succeeds A List of the Birds of the Island of St. Lucia, by Austin H. Clark, B.A., F.R.G.S. Among other matters, this includes particulars concerning the introduction of birds—a subject which is followed up in the next article, which consists of a short note treating further of the matter.

The remaining articles are comprised of An Account of the Working of the Land Settlement Scheme in St. Vincent, by W. N. Sands, Agricultural Superintendent of St. Vincent; The Sugar Industry of the Island of Negros, by Austin H. Kirby, B.A., Scientific Assistant on the Staff of the Department: and Observations on Mill Control Experiments in Negros, by Dr. Francis Watts, C.M.G., Imperial Commissioner of Agriculture. The second of these forms a summary of a report recently issued on the sugar industry of Negros, and the last deals with certain work on the efficiency of sugar mills, the results of which are presented in that report.

The *West Indian Bulletin* may be obtained from the agents for the publications of the Department, price 6*d.*, post free 8*d.*

Pamphlet No. 67 of the Department Series, dealing with Seedling and Other Canes in the Leeward Islands, is about to be issued. It will be obtainable from the same agents, at the price of 6*d.*, post free 7½*d.*

Hygiene in English Elementary Schools.

Information has been received from the Board of Education, Whitehall, that it has been determined to include Hygiene and Physical Training as an additional optional subject at the Certificate Examination for Teachers in Elementary Schools, to be held in December 1912.

In order that candidates may become eligible for examination in the subject, they will have to satisfy the Board that they have attended an approved course of physical training, which commenced not earlier than August 1, 1911; such an approved course should have extended over a period of not less than six months, and have included not less than forty hours of instruction. The tests to be passed by candidates will include both a written examination and a practical trial in physical exercises.

It may be stated that the Syllabus of the course in Hygiene and Physical Training is issued as a Supplement to Syllabus 2, 1912, which deals with the Certificate Examination of the Board of Education for Teachers in Elementary Schools, 1912.

Machinery for Cleaning Broom Corn.

During last year, enquiries were addressed by this Department to the Department of Agriculture, New South Wales, for the purpose of obtaining information concerning a machine of simple construction for removing the seed from broom corn. This has been obtained, through the courtesy of the latter-mentioned Department, and it appears that such a machine is manufactured by Messrs. D. Sim & Sons, Morpeth, New South Wales.

The Department of Agriculture of New South Wales has communicated with this firm, which has consequently forwarded particulars of its machines; these are of two kinds—one for use with horse power and one worked by hand. The former is arranged to be driven directly from the shaft of an ordinary one-horse or pony gear, or by steam power; the drum is 21 inches long and 14 inches in diameter, and the machine may be driven from either side. The hand power machine is geared at 10 to 1, and contains a drum 12 inches in length and 14 inches in diameter. The latter should be particularly useful where broom corn is grown on a small scale and cheap hand labour is available for cleaning the product.

Hydrocyanic Acid in Linseed Cake.

The *Journal of the Board of Agriculture* for February 1911 contains an article dealing with the occurrence of hydrocyanic acid (prussic acid) in linseed cake. The subject is important, because samples of the cake are often met with, which on being macerated with cold water, produce free hydrocyanic acid: none of those examined, however, were found to contain more than 0·025 per cent. of the free acid; although cases are on record where the proportion was as high as 0·051 per cent. or 3·57 grains per ℔. It has, however, been found impossible to make sheep eat linseed cake of the latter kind unless they are kept without other food.

Particulars are given of various experiments with sheep and a heifer six months old, which were fed with linseed cake containing 0·025 per cent. of the acid, but no definite results were forthcoming, so that further experiments were made in which potassium cyanide was mixed with the food of the heifer, when no result of note was obtained until a gentian ball containing potassium cyanide equivalent to 30 grains of hydrocyanic acid was forcibly administered, on the day after a similar ball containing cyanide equivalent to 22·5 grains of the acid had been given in the same way; when the result was fatal in two hours.

The observations lead to the conclusion that linseed cake of the kind employed is harmless. Variations in the effects will of course occur with different animals. There were no indications that hydrocyanic acid is a cumulative poison; nor would this be expected, on account of the fact that it is very volatile. In a similar way, if the acid is gradually freed from the food, it may be taken in quantities which would kill if they were administered in one dose. Finally the investigations do not indicate that animals fed on food containing the free acid attain a state of tolerance, although it cannot be said definitely that this is not the case.

Trials Conducted with 'Water Finders'.

Much interest is often aroused in the claims of persons called 'dowsers' or water finders, to be able to discover underground sources of water by the use of divining rods of different kinds. The *Journal of the Royal Society of Arts*, for February 24, 1911, contains an account of investigations that have been undertaken for the purpose of gauging the value of such claims, by Professor J. Wertheimer, B.Sc., B.A., F.I.C., F.C.S., Principal of the Merchants Venturers' Technical College and Dean of the Faculty of Engineering in the University of Bristol.

Considerations of space prevent the details of the experiments from being given here; reference to the journal mentioned already will however show them to have been thorough in nature and conceived with regard to fairness.

The author gives as his conclusion that the motion of the rod carried by the water finder, and the sensations felt by him, are not due to the action of anything outside himself. He believes, on the other hand, that when such persons state that they do not cause the movement of the rod, they say what they believe to be the truth, but are nevertheless misleading themselves unconsciously.

Absorbent 'Cotton' from Marine Plants.

According to the *Journal d'Agriculture Tropicale*, for February 1911, a patent has been taken out by which a product is obtained from marine plants, particularly seaweed, which is capable of replacing wadding, absorbent cotton, lint and other articles used for bandages. It is also claimed that it will take the place of wool and hair, for different purposes.

In preparing the fibre, the first process is the bleaching of the seaweed, by a method that has been patented. It is then boiled under pressure, in an autoclave, in a liquid containing caustic soda or potash, which has been mixed with resin in such proportions as to produce a soap, and to which one-tenth of its weight of a saturated solution of zinc chloride has been added.

The boiling is maintained until the fibres of the seaweed alone remain, and the mass is then dried. The claim is made that the product of the operations is light in weight, and that it absorbs water without shrinking. It also lasts well, and is easily made up into a form in which it can be most conveniently used for bandaging purposes.

INSECT NOTES.

PALM PESTS ATTACKING SUGAR-CANE.

THE PALM WEEVIL. In Circular No. 9 of the Department of Agriculture, Trinidad, Dr. Lewis H. Gough gives an account of the palm weevil, *Rhynchophorus palmarum*, attacking sugar-cane in that island.

From Dr. Gough's account it appears that the larva of the palm weevil, which has long been known as the gru-gru worm, has for many years been known to attack sugar-cane. In 1828, the Rev. Lansdown Guilding recorded such an attack for the first time; in 1847, Sir Robert Schomburgk made a similar record in Barbados, and more recently this insect has been reported as attacking sugar-cane in British Guiana and Trinidad.

The cut ends of cane plants seem to be chosen by the adult female weevil for egg-laying, the rind of the cane being apparently too hard to be penetrated by the ovipositor. Older canes are probably attacked at some point where the cane has been injured.

The egg stage occupies only a short time. Dr. Gough states that he has observed eggs to hatch in less than forty-eight hours. The larval period lasts about three months, during which time the larva grows to a length of 2½ to 3 inches. The cocoon is found in the ground, and is constructed out of fibres of the cane. The pupal stage is stated to last from two to four weeks.

The remedies suggested for the control of the palm weevil on sugar estates are (1) the cleaning up of all pieces of cane at the places where the cane plant is chopped, and at the loading places, and (2) the covering of the ends of the cane plants in such a way that the weevil cannot deposit eggs in them. In relation to the second remedy, a useful substance for the purpose is mould or some compound which would repel the insect. Flat planting of the canes would accomplish the same object. The palm weevil does not seem to be a serious pest of sugar-cane in Trinidad, although it is widely distributed.

CASTNIA DAEDALUS. *Castnia daedalus* is a large day-flying moth, known as a pest of palms in South America which has been reported to attack sugar-cane in British Guiana.

A letter dated March 18, 1911, from Mr. J. Rodway, Curator of the Museum, Georgetown, appeared in the *Demerara Daily Chronicle*, in which attention was called to the fact that *Castnia daedalus* has, in one instance at least, been known to attack sugar-cane: while the previously recorded food plants of this insect are palms.

The letter states that the adult is about twice the size of *Castnia licus*, which has become such a pest of sugar-cane in British Guiana in recent years, and it suggests that effort should be made to prevent its becoming established as a pest of canes.

In the *Agricultural News* for January 22, 1910 (Vol. IX, p. 26), *Castnia daedalus* is mentioned as occurring in Surinam as a pest of cocoa-nuts, and *Castnia licus*, the aforementioned serious pest of sugar-cane in British Guiana, is noted as attacking cocoa-nut and other palms in Trinidad. It would appear that the transition from palms to sugar-cane and from sugar-cane to palms is not difficult for these insects.

The nature of the attack on sugar-canes by *Castnia daedalus* is not stated in Mr. Rodway's letter; but it seems likely that the larva of this insect would occur as a borer, since that is the habit of the insects of the genus Castnia.

An interesting point in connexion with the occurrence of species of *Castnia* as a pest is found in Sharpe's *Insects*, Part 2 (see *Cambridge Natural History*, Vol. VI), where it is stated: 'these insects are rare in collections; they do not ever appear in numbers, and are generally very difficult to capture.' This volume appeared in 1899, a few years after the occurrence of *Castnia licus* as a pest of sugar-cane, but before this was known generally.

THE CONTROL OF INSECT PESTS.

The first of a series of addresses on economic entomology was given on March 2, 1911, at the Imperial College of Science, by Mr. H. Maxwell-Lefroy, Entomologist to the Government of India and sometime Entomologist on the Staff of this Department. According to an account of the meeting contained in the *West India Committee Circular* for March 14, 1911, Lord Cromer, who acted as Chairman, drew attention to the lack of men who had received field training in the methods of combating insect pests. This matter was continually made evident to members of the Entomological Research Committee, when applications were received from various parts of the world for experienced economic entomologists. Lord Cromer made reference to the offer by Mr. Andrew Carnegie, to defray the expense for three years, of sending three or four men selected by the Committee to the United States, for the purpose of observing the methods that are employed in that country for dealing with harmful insects. In the development of the plans pursuant to the scheme that it was intended to follow, experiment stations would have to be established for the purpose of giving experience to the workers employed in them, for the demonstration of the practical value of economic entomology, and lastly, for the provision of experts to be sent out to the districts where they were required, so that they would be able to make good use of their knowledge in the actual places where the damage was being done.

In his lecture, Mr. Maxwell-Lefroy drew attention to the very great loss that was suffered in various countries, particularly by agriculturists, through the harm done by insect pests. Although the devising of means for combating such pests was an important part of the work of the economic entomologist, such work did not end here; it extended to the interests of industries where insects were kept for the provision of useful products, among these industries being silk manufacture, bee-keeping and the lac industry. In relation to these, much of the effort of the future would have to be directed toward devising improvements, as there was plenty of scope for the employment of better methods of production.

The greatest amount of attention had, however, been drawn to the work of the economic entomologist through the recent discoveries of the part played by insects in the transmission of disease. The lecturer pointed out the way in which it was now fully recognized that the control of many diseases, especially in the tropics, was itself a matter of the control of the insects which had shown themselves capable of carrying them. The subject was of the greatest importance, for if the colonies were to be peopled by healthy races capable of developing their immense resources, the first consideration was to ensure the absence of disease as far as possible, and therefore to conduct energetic campaigns against all the lower forms of life that were proved to be capable of carrying diseases.

RUBBER NOTES.

INTERNATIONAL RUBBER EXHIBITION, 1911.

A meeting of the General Purposes Committee of the International Rubber and Allied Trades Exhibition was held on February 13, at the London Chamber of Commerce.

The President, Sir Henry A. Blake, G.C.M.G., presided, and a large number of persons interested in the industry were present. The following Committees, with power to add to same, were appointed: Awards Committee, International Congress Committee, Reception Committee, International Banquet Committee; and as soon as they are completed the names will be published.

A recommendation was made to the Awards Committee that a prize to the value of 50 guineas be offered for the best suggestion for a foundation or bed best suited for the laying of rubber blocks or sheets for road-paving.

That manufacturers be approached with a view to arranging for a few square feet of rubber road paving, to be laid in one of the London streets, to test if in a few years, when the production of rubber will be much greater than it is to-day, it will be possible to pave the London streets with a rubber composition.

Sir Henry Blake stated that Mr. Manders had supplied him with the information that the following countries were exhibiting officially: Straits Settlements, British Guiana, Ceylon, Dominica, Uganda, German New Guinea, Dutch East and West Indies, India, Madagascar, Indo-China, the Hawaiian Islands, French Congo, State of Para (Brazil), Federated Malay States, Queensland, Trinidad, the Gold Coast, British East Africa, Kameruns and other German Colonies, Federal Government of Brazil, Occidental Africa, Equatorial Africa, Belgium, State of Manaos (Brazil). Other countries were negotiating; also many private planters in different parts of the world, and several of the largest manufacturers of England, Germany, France, America, Holland, etc., were exhibiting. The Exhibition would be a very complete one, and it was the duty of everyone interested in the industry to give the undertaking all the support they could.

A vote of thanks to the Chairman concluded the business. (From the *India-Rubber Journal*, February 18, 1911.)

THE WEST INDIA COMMITTEE AND THE INTERNATIONAL RUBBER EXHIBITION.

The following particulars of a competition for West Indian rubber, initiated by the West India Committee, are given in the issue of the Circular published by the Committee, dated March 14, 1911.

In connexion with the forthcoming Rubber Exhibition, to be held at the Royal Agricultural Hall from June 24 to July 11, the West India Committee have decided to offer, for competition by British West Indian exhibitors, two silver cups, for:—

(1) The finest prepared sample of plantation rubber of any species, and

(2) For the best specimens of balata.

The specimens must in each case be sent over with the exhibits of one of the Permanent Exhibition Committees. The judging will be entrusted to rubber experts to be appointed by the Committee.

The West Indian colonies participating in the Exhibition will be Trinidad and Tobago, for which a space of 33 feet by 16 feet has been taken; and British Guiana and Dominica, whose exhibits will each occupy a space of 10 feet by 10 feet. The Trinidad exhibits will include herbarium specimens, living rubber-producing plants, tapping instruments and sections of trunks of rubber trees for demonstrating purposes, together with diagrams, photographs, and literature for distribution. Mr. Edgar Tripp, Secretary of the Permanent Exhibition Committee, is leaving no stone unturned to make the exhibit a success. British Guiana will show about 2 cwt. of balata, 40 or 50 lb. of plantation Para rubber and biscuit, and 20 lb. of scrap Sapium, which will be taken charge of by Mr. F. A. Stockdale, with a Wardian case of growing rubber plants. A special rubber pamphlet has been prepared, giving a concise account of the position of the local rubber industry. Particulars regarding the Dominica exhibit have not yet been received; but it is of interest to note that rubber-planting is being rapidly extended in that island.

THE POISONOUS PROPERTIES OF UNRIPE SORGHUM.

The *Bulletin of the Imperial Institute*, Vol VIII, p. 384, contains a continuation of an investigation, which was partly described in Vol. IV, p. 333 of the same journal, in relation to the poisonous action of immature green sorghum. The article commences with the presentation of observations that have been made in West Africa, where the natives give a similar reason for the occasional acquisition of poisonous properties by the plant to those put forward in India, namely abnormal growth on account of drought or the attacks of insects—a matter to which reference is made in the *Dictionary of the Economic Products of India*, Vol. VI, Part III.

The work carried out at the Imperial Institute has shown conclusively that the poisonous action of Egyptian and Indian young green sorghum is due to the formation of prussic acid, and this conclusion is supported by the results obtained by other investigators. The reason for the occasional occurrence of the acid in young plants, in poisonous quantities, appears to arise from the fact that prussic acid is one of the compounds formed in the process of building up more complex substances. Therefore, if the growth of the plant is interfered with in any way, it is likely that an excess of the acid will be present in it, because it is unable to make use of this in the normal manner. Such interference with growth is most likely to occur through drought or insect attack; thus support is given to the native opinion stated above.

Samples of Guinea corn and of millet (*Pennisetum typhoideum*) from Northern Nigeria have been examined recently at the Imperial Institute; but as the plants were nearly mature, it was not expected that prussic acid in any quantity would be found, especially as the glucoside dhurrin, which produces the prussic acid, disappears as the plant ripens, in the case of sorghum at least. The millet was found to contain a trace of prussic acid, but none was available from the sorghum. Further experiments are to be carried out with younger material from Northern Nigeria.

GLEANINGS.

According to a report by Messrs. Czarnikow, the forthcoming sugar crop of Java is promising well. It is stated by the same authority that during the middle of the present year there will probably be a surplus of sugar, in the East, amounting to about 300,000 tons.

An article in the *Cuba Review*, for January 1911, draws attention to the need for agricultural and engineering colleges in that island, for the special purpose of providing those who will be employed later in assisting in the development of the Republic and carrying on its agriculture.

As a coagulant for the latex of *Ficus elastica*, Dr. O. von Faber, Director of the Sugar Laboratory at Soerabaya, Java, recommends the following mixture: cream of tartar, 3 per per cent.; formaldehyde, as formalin, 0·5 per cent.; carbolic acid, 0·5 per cent.; water, 96 per cent. (The *India Rubber World*, March 1, 1911.)

Attention is drawn to the issue of *Analytical Notes*, 1910, by Messrs Evans, Sons, Lescher & Webb, Ltd., Druggists and Manufacturing Chemists, 60, Bartholomew Close, London, E.C. The usefulness of this number is increased by the inclusion of an index which has reference to all the numbers that have been published so far.

The publication of *Timehri*, the Journal of the Royal Agricultural and Commercial Society of British Guiana, has been resumed by the issue of a number for January 1911, which contains several interesting articles. It is edited by Mr. J. J. Nunan, B.A., LL.B., President, and Mr. J. Rodway, F.L.S., Assistant Secretary, of the Society, and published by the Argosy Company, Ltd.

A copy of the latest prospectus relating to Avenarius Carbolineum, made by R. Avenarius & Co., Stuttgart, has been received. This gives particulars of some of the most recent trials of the preserving material. These appear to show that success has been obtained in such trials, and indicate that the preparation is undoubtedly useful in connexion with the purpose for which it is intended

At a meeting of the Legislative Council, Dominica, held on January 4, 1911, the report of the Select Committee appointed to consider the question of reciprocal trade relations with the Dominion of Canada was presented, and the following resolution of the Committee was adopted by the Council: 'That this Committee is of opinion that it would be to the interest of Dominica to enter into reciprocal trade relations with the Dominion of Canada as recommended by the Royal Commission.'

The coffee crop in Mexico for 1910-11 is stated by H.M. Consul-General at Mexico City to be estimated at 18,496 tons. The amount in the preceding season was 20,187 tons.

An indication of the progress that is being made in relation to the sugar industry in the Philippine Islands is contained in a note in the *Louisiana Planter* for February 25, 1911, which states that the British steamer 'Beachy' has been chartered by the Mindoro Development Company to bring a large sugar-cane mill, as well as lumber, to Manila from Seattle, for use in the construction of a sugar factory. The weight of the mill is stated to be 1,680 tons, the rollers alone weighing 18 tons each.

A publication entitled *Soil and Plant Sanitation on Cacao and Rubber Estates*, by Harold Hamel Smith, editor of *Tropical Life*, is about to be issued. This contains an introduction by Professor Wyndham Dunstan, Director of the Imperial Institute, as well as special articles and supplementary notes by several authorities. The volume is comprised of 730 pages and 108 illustrations, and is obtainable at the price of 10*s*., from Messrs. John Bale, Sons & Danielsson, Ltd., 83-91, Great Titchfield St., London, W.

Reports on the cotton crop by the Economic Board of the Government of the Sudan indicate that a good yield may be expected, and that there will be an improvement in quality, as all the seed sown has been that of one kind of Egyptian, only. The particulars received from various districts show that fair progress is being made, and a matter of importance in connexion with the cotton industry in the Sudan is that there are indications that Egyptian cotton can be grown successfully as a flood crop.

An account of a machine for stripping Manila hemp is contained in the *Textile Mercury* for February 1911. It is stated to work on the principle of the hand method of hemp stripping employed in the Philippine Islands, and that with twelve men it will do the work of forty hand strippers. The only question as to the success of the machine appears to arise in connexion with the quality of the product obtained from it, and experiments are being made for the purpose of gaining definite information in regard to this matter.

The *Journal of the Board of Agriculture* for February 1911, p. 911, gives an account of experiments which were undertaken at the Midland Agricultural and Dairy College, for the purpose of ascertaining the effect of the administration of large quantities of water to cows on the quality of the milk given by them. The trials showed that common salt, even in large doses, does not necessarily cause cows to consume an excessive amount of water: and that the amount of water drunk by cows has no direct bearing on the composition of the milk yielded by them.

A note in the *Board of Trade Journal* for February 23, 1911, states that H.M. Trade Commissioner for Canada reports that a company called The Internations Contracting Company, Ltd., has been formed at Winnipeg with an authorized capital of about £10,270,000 for the purchase and exploitation of a patent process for extracting oils, to be used in preserving timber, from coal-tar without distillation. The oil obtained in this way is said to have exceptional preservative qualities, particularly in relation to the protection of wood from insects in tropical countries.

STUDENTS' CORNER.

APRIL.

Second Period.

Seasonal Notes.

Where cotton is grown as an intervening crop with sugar-cane—a scheme that has been adopted to a large extent in St. Kitts—the planting of the coming cane crop is delayed to a certain degree, and it is well to consider the advisability, under these circumstances, of planting early maturing varieties of cane, such as B.208. Discuss the effects of cutting at the same time varieties of cane that have been planted simultaneously, but reach maturity at the end of different periods of growth. What effects has such a circumstance on the work of making muscovado sugar? Compare the results of these effects in a muscovado works with those in a modern central factory. If the weather is dry during the time that cane is being planted, an excellent opportunity is afforded of making observations for the purpose of finding the connexion between the methods of treatment of the cuttings, before planting, and the percentage of sprouts that is obtained; these observations should have special reference to the treatment of sugar-cane planting material with Bordeaux mixture.

The chief insect pest of the cane that will show itself at the present time is the moth borer, which at this season lays its eggs on the leaves of the young plants. Where the eggs are found, a few should be collected, and after they have hatched, the caterpillars should be fed on fresh cane leaves, being at the same time kept in a jar at the bottom of which there are 2 or 3 inches of soil. Another reason for keeping the eggs of the moth borer under careful observation will be to study, if possible, the way in which the parasites of the egg work in attacking and destroying it. In relation to the moth borer as a pest of sugar-cane, discuss the advisability or otherwise of cutting out dead hearts in order to control it as far as possible. In relation to this matter, make a consideration as to the way in which the extent of the adoption of such a means of control has relation to the possible loss of crop that it entails, and what is more, to the degree to which the plants are being attacked. It must be remembered that in any discussion as to whether the cutting out of dead hearts for the control of this pest is profitable, consideration must be given to the question of the severity of the attack, and to the cost of the labour entailed in the operation.

In the cultivation of ratoon canes, regard must be had to the circumstance that the sugar-cane possesses an underground stem, or rhizome, and that any injury to this is likely to have the effect of reducing the number of stalks in the ratoon stool. In order to observe this underground stem, the best method is to remove a stool of well-grown canes completely from the soil and to wash away any of the latter that is clinging to them, by means of a stream of water. The possession of such a stem by the cane explains the fact that ratoons grown season after season tend to spread and make the lines of cultivation irregular. Why is it advised, in the light of the first-mentioned facts, to till ratoons as soon as possible after the reaping of the crop; and what result is damage to the underground stem likely to produce in relation to the next year's crop? Information in connexion with these matters may be found in the *Agricultural News*, Vol. VIII, p. 329, and in the *West Indian Bulletin*, Vol. X, No. 2.

The question of tillage naturally suggests that of the different uses of the soil to the plant, and therefore to the agriculturist. The soil is of the greatest importance in relation to the power which it possesses of absorbing and storing water, and of giving it up to plants when it is wanted; this is why so much attention is paid, particularly where the rainfall is small, to the carrying out of such methods of tillage as will best enable the soil to hold the water which may be otherwise lost through evaporation. Much attention has been given in the past to the view that soil is a storehouse of food for plants, and many of the theories of manuring have been based alone upon this idea of its utility. These theories are receiving considerable modification at the present time, because it is now recognized that the soil constitutes a place where many of the food bodies useful to plants are manufactured from substances that are not available to them. In relation to this manufacture, more knowledge is being gained continually as to the part taken in it by several of the minute organisms that live in the soil, and it is expedient for the student, as well as all others interested in agriculture, to follow as far as may be the developments that are taking place in this view of soil activity and usefulness to plants. Other lines of thought will have reference to the physical support afforded to plants by soil, and the influence of light both on the plants and on the organisms in the soil, in relation to the changes that take place in its constitution, and affect its utility as a medium for the growing of plants.

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) Examine and describe carefully the seeds of any three commonly cultivated plants.

(2) Give an account of the value of green dressings to the soil.

(3) Write down the details of any simple method for classifying manures.

INTERMEDIATE QUESTIONS.

(1) Give an account of the operations in connexion with checking the growth and spread of weeds, on an estate with which you are acquainted.

(2) State what you know about the fact of the possession of a rhizome by the sugar-cane.

(3) What are the main features of the means that are commonly adopted for keeping in check the fungus diseases of plants?

FINAL QUESTIONS.

(1) Give an account of the way in which leguminous plants assist in the addition of nitrogen to the soil.

(2) State what you know of the commercial importance of the possession of rhizomes by certain plants.

(3) Draw up a scheme of the general methods for the control of insect pests, and illustrate the methods mentioned by means of matters from your own experience.

FUNGUS NOTES.

THE FUNGUS CAUSING PINE-APPLE DISEASE.

The history of the fungus causing the well-known pine-apple disease of cane cuttings is somewhat interesting, and contains at least one curious coincidence. Moreover, recent work has shown that it is an organism of very considerable economic importance, as its range of host plants includes at least two other valuable crops besides sugar-cane, namely pine-apples and cocoa-nuts. Another point that enhances its economic importance is its extensive distribution throughout almost all tropical and some subtropical countries. It occurs chiefly on sugar-cane in India, Java, Hawaii, Mauritius and the West Indies, on pine-apples in Hawaii and the West Indies, and on cocoa-nuts in Ceylon and Trinidad.

The peculiar coincidence connected with its popular name began with its discovery on pine-apples in France by de Seynes in 1886; the scientific name then given to it was *Sporochisma paradoxum*. In 1893, Went made an independent discovery of it on sugar-cane in Java and on account of the smell of the infected tissues, called the disease which it occasions the pine-apple disease of sugar-cane. At the same time he gave the fungus the name *Thielaviopsis ethaceticus*. In 1901 Howard found this same fungus* causing a rot of shipped pine-apples in Antigua, but the result of his investigations was not published until 1907, when it appeared embodied in a paper by Stockdale (*West Indian Bulletin*, Vol. VIII, p. 162). In 1904 von Höhnel found de Seynes's fungus on a cocoa-nut in Austria, and on comparison with Went's description, came to the conclusion that *Sporochisma paradoxum* and *Thielaviopsis ethaceticus* were the same. This opinion was confirmed by Went himself, and since his generic name appeared the more suitable, the fungus became *Thielaviopsis paradoxa*. In 1907 Cobb found it on pine-apples in Hawaii, and recent work by L. D. Larsen, published in Bulletin 10 of the Experiment Station of the Hawaiian Sugar Planters' Association, has resulted in a clear understanding of its effects on that host. Thus the fungus best known as that causing pine-apple disease of the sugar-cane has been found to cause serious diseases of the true pine-apple. Another recent publication dealing with the effect of this fungus on pine-apples is Bulletin No. 171 of the Bureau of Plant Industry of the United States Department of Agriculture, by Flora W. Patterson, Vera K. Charles and Frank J. Veihmeyer. This treats of the effect of fumigation with formaldehyde gas in killing the spores of the fungus.

Two important papers on this fungus were published by Petch in 1909 and 1910, which dealt with its effect on cocoa-nuts, and with various other points, such as its life-history, and the action of various poisonous substances in preventing the germination of its spores, or in causing their death. The first of these appears in the *Circulars and Agricultural Journal of the Royal Botanic Gardens*, Ceylon, Vol. IV, No. 22. The second was published in the *Annals of the Royal Botanic Gardens*, Peradeniya, Vol. IV, p. 511.

Before proceeding to an account of the fungus, it may be worth noting that a general recognition by agriculturists of the fact that this fungus could occur on pine-apples in the West Indies has probably been to some extent obscured by the use of the name *Trichosphaeria sacchari* for the parasite. The reason is that Massee, in investigating the life-history of the so-called rind fungus of the sugar-cane, found forms of spores which appeared identical with the spores produced by the pine-apple disease fungus, and in consequence put forward the theory that these two fungi were in reality identical. This view was long held in the West Indies, but the balance of recent evidence is certainly opposed to it; and it seems now to be much more probable that the cane stem fungus, *Trichosphaeria sacchari*, and the pine-apple disease fungus, *Thielaviopsis paradoxa*, are quite independent of one another.

The pine-apple disease of sugar-cane is too well known to require description here, and the symptoms of the stem bleeding disease of cocoa-nut trees have been described in the *Agricultural News*, Vol. IX, p. 255, and elsewhere. Three diseases of pine-apples are known to be due to this fungus in Hawaii, namely, fruit rot, or soft rot of the fruit, which is the same as that reported from Antigua, base rot of cuttings and leaf spot. The Antigua disease referred to, is not that known as black heart.

The fungus produces two forms of spores, microconidia and macroconidia. Different authors give somewhat varying accounts of their appearance and method of formation; the following is taken from that given by Petch. The microconidia are smaller than the macroconidia, they are colourless at first and almost exactly rectangular in shape; subsequently, they become oval and darker in colour until they are greenish black. In some instances, especially when removed to some distance from the mycelium, the colour change occurs very slowly. The microcondia are produced inside a long, narrow hypha which is somewhat swollen at the base. They are formed one after another, and are extruded from the hyphae, as they are formed, in long chains containing from twenty to eighty of the spores. The macroconidia are larger; they are usually oval or pear-shaped, and when mature are greenish or brownish black in colour. Like the microconidia they are formed inside a hypha and are extruded; but in this case the hypha is shorter than that giving rise to microconidia; the process of formation occupies more time; and only about twelve macroconidia are produced. Unlike the microconidia, the macroconidia will not germinate in water. When either of these spores is sown in a nutrient medium, it will germinate readily, and give rise to a mycelium which produces microconidia first and then macroconidia. In the decaying tissues of sugar-cane or cocoa-nuts, only macroconidia appear to be produced.

In addition to the plants already mentioned, the fungus can live upon ripe mangoes and bananas, while Petch has shown that it does not survive on parts of the cocoa-nut plant which do not contain sugar. This led him to suggest that the growth of the fungus is dependent upon the presence of sugar in the substance upon which it is living. Another interesting point has been shown by Larsen, who carried out an experiment to prove that the fungus can live on decaying vegetable matter in the soil at a depth of at least 2 inches below the surface. This throws some light on its power of attacking sugar cane and pine apple cuttings. Petch showed that the fungus will grow much more vigorously in the dark than in the light. Drought and sunlight will in some instances kill the spores in seven days; while in others as much as seventy days is required. Larsen, in Hawaii, found that during the summer the spores growing in liquid media were killed by a few hours' exposure to direct sunlight, and that even when growing inside a covering of pine-apple tissue a quarter of an inch thick, both spores and mycelium were killed by twenty-four hours' exposure to sunlight.

Some other interesting points connected with the fungus will be dealt with further, in a subsequent article in the *Agricultural News*, and in this the diseases of pine-apples will also be described.

* Described by him as the endoconidial stage of *Trichosphaeria sacchari*.

THE SPONGE FISHERIES OF THE BAHAMAS.

An article on Sponge Culture appeared recently in the *Agricultural News* (Vol. X, p. 69). In relation to this, the following report, for 1909-10, on the sponge fisheries of the Bahamas, by Sir James Young, Chairman of the Marine Products Board, is of interest:—

During the past nine months the Board closed the sponging grounds, known as the Northern Bight, at Andros Island. This locality for many years has yielded a good supply of sponges.

The Commissioner, Mr. Forsythe, called the attention of the Board to the condition of these beds, stating that there was great need for protecting the young sponges that remained, the marketable sponges having been overfished.

This area was closed on the first day of August, and two watchmen appointed to guard against poaching.

Reports from the Acklin sponge beds, which were closed to fishing on March 1, are encouraging; these beds, as well as the beds in the Northern Bight, have been marked in several places with buoys; specimens of the sizes of the sponges taken from where the buoys were laid have been forwarded to the Board. The specimens from Acklin's Island indicate that the reef and yellow sponges have grown faster than the grass since the destruction by the hurricane of the previous year.

Instructions have been given to the watchmen in these districts to forward specimens from the marked places quarterly, so as to enable the Board to form an opinion as to the time it requires for the various sponges to grow to marketable sizes.

The rigid inspection of the wool and velvet sponges from the Bight of Abaco, where the restriction as to size is still in force, has shown good results, and fewer cases of violation of this rule have been detected by the Inspector.

The Board is able to report that the sponging grounds along the Eleuthera shore are gradually recovering from the effects of the hurricane which uprooted and destroyed these grounds entirely in 1883.

The sales of sponge on the Exchange from January 1, 1909, to December 31, 1909, were £71,367, against £50,603 the previous year. While this is much better than the last year, it does not reach the average for the past five years.

Satisfactory results have followed the rules protecting conchs from being over-fished near inhabited islands, as well as the rules prohibiting the capture of small turtle.

Most of the tortoiseshell now exported is brought to market from the high seas, where the captured turtle are usually of a large size. The exports for this year amount to £6,107.

The Board again expresses the hope that the Legislature will soon be able to place it in a position to obtain the services of a biologist, to assist and advise it in developing the resources of the sea.

The Board would further suggest that an aquarium, in connexion with a biological station, would be most interesting, as an exhibition of such a beautiful variety of submarine specimens as are found in our waters would not fail to create greater interest in the sea products of the Colony.

The Board of Public Works has consented to the use of Fort Montague for this purpose, the estimated cost for tanks, pumps, repairs, etc., to the interior of the fort, being only about £200.

INDIAN RUNNER DUCKS.

Although there has been a great boom in buff Orpington ducks—a new breed with splendid credentials—I firmly believe that the Indian Runner will still remain not only popular, but absolutely the best layer amongst the increasing family in the waterfowl world. As its name implies, the Indian Runner is built on very slim lines, and can cover many acres during the day in search of food, without any sign of fatigue. In appearance it is quite different from the heavy Aylesbury and Pekin, and somewhat resembles a soda-water bottle, especially when standing erect. The colour should be fawn and white. The chief characteristics are the head and bill, which should be long and slender, with the bill carried in a perfectly straight line with the eye. The weight is only about 4 lb.; often much less. As a table bird, it does not rank high; but if killed when quite young, the flesh is juicy and very palatable. I have often been surprised at the small number of farmers who keep ducks. Whether there exists a belief that they are unprofitable, or that they damage the land, I cannot say, but one thing is certain, that hardly one farmer in a hundred keeps a flock of Indian Runners. A peculiar feature in connexion with duck-breeding, and one that has struck me most forcibly, is the fact that right on the edge of the moors, in desolate regions, is usually found a good number of ducks. On several occasions I have had conversation with these isolated duck breeders, and find they attach great importance to their ducks as a source of profit.

It appears perfectly clear that if duck-keeping can be profitable in these districts, there is no reason why even larger profits cannot be made when the conditions are more favourable. It is quite common for a good laying strain of ducks to lay as many eggs daily as there are ducks, and in one instance I know of, this record was beaten, but two eggs a day is rather more than most people would wish from one duck.

The small poultry keeper with limited space should not attempt to keep Indian Runners; they are essentially a farmer's duck, and give best results when allowed to roam over green fields. As a rule they care little for a large swimming place, but prefer to work away at the end of a drain or in a shallow stream. Like all members of the duck family, Indian Runners lay away unless kept in the house overnight. Some persons who keep a small number allow them to sleep in the open; this may be quite right when the weather is warm, but dry sleeping quarters prevent disease and also make it a certainty that no eggs are missing.

The main secret of successful hatching is plenty of ventilation, a good supply of moisture, and not too high a temperature. The great difficulty with all incubators is the large number of dead in shell; these appear fully formed, but with insufficient energy to break the shell, which in duck eggs is very thick and the inner membrane tough. Having had a good deal of experience in this line, I firmly believe that a large number of both chickens and ducklings that die in this manner are simply suffocated through want of fresh air. Fifteen to twenty minutes cooling should be allowed twice daily during the last week for all duck eggs. When the ducklings are hatched they are certainly easy to rear; there should be little loss in this direction if ordinary care is taken. I feel sure that with the present great distribution of poultry literature, and the constant recommendations of the press, duck-breeding will increase largely. Those who take up the Indian Runner will have no cause for regret. (From the *Farmer and Stock Breeder*, January 2, 1911.)

MARKET REPORTS.

London.—The West India Committee Circular, March 28, 1911; Messrs. E. A De Pass & Co., March 18, 1911.

Arrowroot—2*d*. to 3¼*d*.
Balata—Sheet, 3/10; block, 2/10 per lb.
Beeswax—£7 12*s*. 6*d*
Cacao—Trinidad, 56/6 to 69/- per cwt.; Grenada, 51/- to 56/-; Jamaica, 48/6 to 54/-.
Coffee—Jamaica, 59/- to 69/-.
Copra—West Indian, £22 10*s*. per ton.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 18*d*. to 18½*d*.
Fruit—No quotations.
Fustic—No quotations.
Ginger—Common to good common, 48/- to 52/- per cwt.; low middling to middling, 53/- to 56/-; good bright to fine, 58/- to 62/-.
Honey—No quotations.
Isinglass—No quotations.
Lime Juice—Raw, 11*d*. to 1/3; concentrated, £18 2*s*. 6*d*. to £18 7*s*. 6*d*.; Otto of limes (hand pressed), 5/- to 5/3, nominal.
Logwood—No quotations.
Mace—Firm.
Nutmegs—Quiet.
Pimento—Common, 2⅛*d*.; fair, 2¼*d*.; good, 2$\frac{5}{16}$*d*. per lb.
Rubber—Para, fine hard, 6/3½: fine soft, 5/9; fine Peru, 6/1 per lb.
Rum—Jamaica, 1/7 to 5/- per gallon.
Sugar—Crystals, 14/7½ to 17/6; Muscovado, 11/6 to 14/6; Syrup, 10/- to 13/9; Molasses, no quotations.

New York.—Messrs. Gillespie Bros. & Co., March 24, 1911

Cacao—Caracas, 11¾c. to 12¼c.; Grenada, 11⅜c. to 11⅝c.; Trinidad, 11¼c. to 11¾c. per lb.; Jamaica, 10¼c. to 11¼c.
Cocoa-nuts—Jamaica, select, $28·00 to $29·00; culls, $17·00 to $18·00; Trinidad, select, $28·00 to $29·00; culls, $17·00 to $18·00 per M.
Coffee—Jamaica, 12½c. to 13¾c. per lb.
Ginger—9c. to 12c. per lb.
Goat Skins—Jamaica, 50½c.; Barbados and Antigua, 47½c. to 50c.; St. Croix, St. Thomas and St. Kitts, 44c. to 46c. per lb
Grape-Fruit—Jamaica, $2·50 per box.
Limes—$6·00 to $6·50.
Mace—40c. to 48c. per lb.
Nutmegs—110's, 9¾c. to 10c. per lb.
Oranges—Jamaica, $2·00 to $2·75.
Pimento—3⅞c. 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., April 3, 1911.

Cacao—Venezuelan, $12·00 per fanega; Trinidad, $11·10 to $11·75.
Cocoa-nut Oil—91c. per Imperial gallon.
Coffee—Venezuelan, 16c. per lb.
Copra—No quotations.
Dhal—$3·30.
Onions $2·75 to $4·00 per 100 lb.
Peas, Split—$5·90 to $6·00 per bag.
Potatoes—English, $2·25 to $2·50 per 100 lb.
Rice—Yellow, $4·30 to $4·35; White, $5·20 to $5·25 per bag.
Sugar—American crushed, $5·50 to $5·60 per 100 lb.

Barbados,—Messrs. T. S. Garraway & Co., April 10, 1911; Messrs. James A. Lynch & Co., April 3, 1911.

Arrowroot—St. Vincent, $4·50 to $4·70 per 100 lb.
Cacao—$11·00 to $12·00 per 100 lb.
Cocoa-nuts—$16·80.
Coffee—Jamaica and ordinary Rio, $13·50 to $14·50 per 100 lb. scarce.
Hay—$1·40 to $1·50 per 100 lb.
Manures—Nitrate of soda, $65·00; Cacao manure, $42·00 to $48·00; Sulphate of ammonia, $75·00 per ton.
Molasses—No quotations.
Onions—$2·50 to $4·50 per 100 lb.
Peas, Split—$5·80 to $6·10 per bag of 210 lb.; Canada, $4·00 to $4·25 per bag of 120 lb.
Potatoes—Nova Scotia, $2·80 to $3·50 per 160 lb.
Rice—Ballam, $4·80; Patna, $3·50; Rangoon, $2·90 per 100 lb.
Sugar—No quotations.

British Guiana.—Messrs. Wieting & Richter, April 1, 1911; Messrs. Sandbach, Parker & Co., March 31, 1911.

Articles.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	$9·25 to $9·50 per 200 lb.	$9·50 to $10·00 per 200 lb.
Balata—Venezuelablock	No quotation	Prohibited
Demerara sheet	81c. per lb.	72c. to 80c.
Cacao—Native	11c. per lb.	10c. to 11c. per lb.
Cassava—	$1·20	No quotation
Cassava Starch—	$6·50 to $7·00	No quotation
Cocoa-nuts—	$12 to $16 per M	$10 to $16 per M., peeled and selected
Coffee—Creole	16c. per lb.	16c. per lb.
Jamaica and Rio	18c. per lb.	19c. per lb.
Liberian	10½c. to 11c. per lb.	11c. per lb.
Dhal—	$3·50 per bag of 168 lb.	$3·50 to $3·75 per bag of 168 lb.
Green Dhal	$4·00	——
Eddoes—	$1·56	——
Molasses—Yellow	None	——
Onions—Teneriffe	——	——
Madeira	8c.	8c. to 9c.
Peas—Split	$5·75 to $5·90 per bag (210 lb.)	$5·90 per bag (210 lb.)
Marseilles	No quotation	No quotation
Plantains—	20c. to 60c.	——
Potatoes—Nova Scotia	$3·00 to $3·25	$3·00 to $3·50
Lisbon	——	No quotation
Potatoes-Sweet, B'bados	$1·32 per bag	——
Rice—Ballam	No quotation	——
Creole	$5·00 to $5·50	$5·00 to $5·25
Tannias—	$3·00 per bag	——
Yams—White	$2·28	——
Buck	$2·64	——
Sugar—Dark crystals	$2·30 to $2·40	None
Yellow	$2·70 to $3·00	$2·65 to $2·75
White	$4·00	$4·00 to $4·25
Molasses	$2·10 to $2·30	None
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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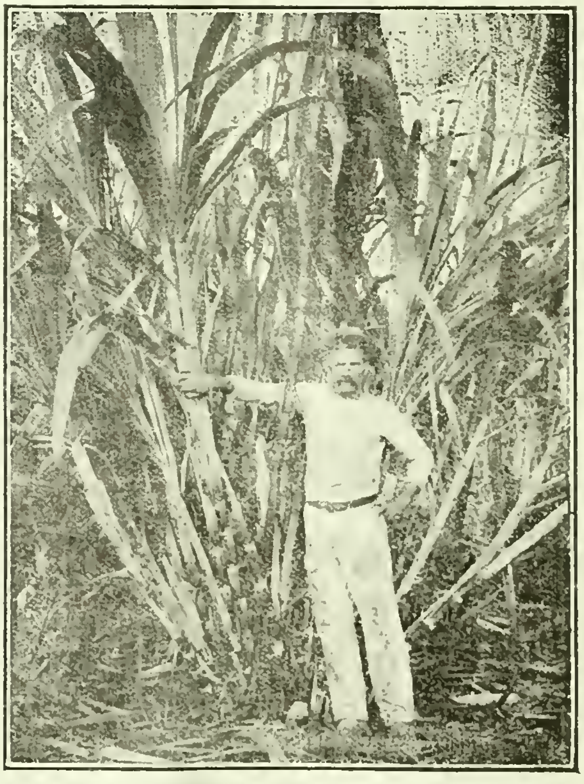

AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

OF THE

IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

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CONTENTS.

The Canadian National Exhibition, 1911.

THE announcement has been made that the Canadian National Exhibition, 1911, will be held in Toronto from August 26 to September 11. Information has also been received from the Exhibition Authorities that the space reserved last year for exhibits from the British West Indies and British Guiana will be again at their disposal. In making a statement to this effect, the Exhibition Authorities, commenting on the West Indian and British Guiana exhibit of last year, speak very highly of this; although they give the opinion that more space would have been useful for it, in showing it to better advantage.

This definite announcement as to the holding of the exhibition will enable the Exhibition Committees in the various colonies to decide whether they will make arrangements for representation. As little time as possible should be lost in arriving at a decision, in order that, if it is intended to forward exhibits to Toronto, there may be a reasonably adequate period for making the necessary arrangements. The experience of the past, and the lessons learned in connexion with former exhibitions, should enable this work to be done expeditiously and efficiently.

The dates of the exhibition are such that non-perishable articles for Toronto should be forwarded by a steamer leaving Demerara about the middle of July, in order that they may arrive in St. John in the first week of August. Perishable articles should be sent by a steamer leaving Demerara about the end of July, and reaching St. John near the middle of August. It is not possible, at present, to give more definite dates than these; exact information will be published as soon as it is available.

As on former occasions, the steamers of the firm of Messrs. Pickfork & Black will carry goods that are intended for the exhibition, free, as far as St. John. Mr. C. S. Pickford, of this firm, will be present again at the exhibition, to superintend the arrangement of the West Indian exhibits, as well as to give attention to West Indian interests, generally.

Information in connexion with the packing and forwarding of exhibits has been given from time to time in the *Agricultural News*, more particularly in Vols. VII, p. 145 and IX, p. 210. It will be well to recapitulate this here, as well as to draw attention to the additional information that is available since the visit of Mr. W. N. Sands, Agricultural Superintendent of St. Vincent, to Canada last year, in connexion with the exhibitions at Toronto and St John. The information is embodied in Mr. Sands's report on his mission, which is reproduced in the *West Indian Bulletin*, Vol. XI, p. 133. Attention is drawn to this article, in view of its particular usefulness in connexion with the assembling and despatch of material for exhibitions in Canada.

In regard to the packages in which the collected goods are sent, these should consist of cases and crates that are strong and likely to remain rigid even when roughly handled: for this reason, kerosene tins and similar packages should not be used for outside packing. Great care should be exercised in the matter of placing the different kinds of goods in the cases. Heavy articles should not be packed with exhibits in glass bottles, nor should bottles containing liquids be put into cases containing bottles carrying dried products. This is especially important in regard to syrups and molasses, which are likely to burst the bottles and escape, doing irretrievable damage to any such articles as sugars and starches that may have been packed with them. As far as dried products, more particularly, are concerned, these are best enclosed in neatly made boxes provided with glazed sliding lids.

Sufficient room should be provided for an adequate space between the different articles in the packages, in order that a proper amount of carefully selected packing material may be employed. In this connexion, cotton wool is often used to some extent; it is not well suited for the purpose, however, because of the fact that it is adherent, and its employment sometimes necessitates the expenditure of time and labour in removing it from the exhibits and packages that it has been designed to protect.

Every effort should be made to facilitate the disposition and arrangement of the exhibits when they reach their destination, and to cause them to be as useful as possible to any who may be interested in them. To this end, the descriptive labels on the jars and bottles should be placed near the bottom of them, and should contain as much primarily useful information as possible; this should be concerned with the name of the colony and of the exhibitor, as well as that of the exhibit, and where there are no general market quotations for a product its price should be placed on the label (see *West Indian Bulletin*, Vol. XI, p. 142). In a like connexion, the labelling of the packages should be done in a plain and uniform manner, following the example given on page 134 of the volume of the *West Indian Bulletin* to which reference has been made. Finally, much useful assistance will be given to those responsible for the placing out of the exhibits by the provision of a list of these, giving the numbers and corresponding contents.

Fruits other than limes, oranges and grape-fruit should not be sent in any quantity, as they are very unlikely to arrive in proper condition, under present transport arrangements. Any fruits that are forwarded should be selected with care and should possess an attractive appearance, with no signs of blight or disease. Fresh fruits in glass bottles should be placed in a four per cent. solution of formalin, and these packages as well as all others containing liquids should be examined carefully, immediately before packing, to ensure that there is no leakage. Crates containing vegetables such as yams should be well ventilated in order to ensure that the specimens will arrive in good condition. Decorative material will be found useful at the exhibition, but no heavy packages such as plants in pots or tubs should be sent, on account of the expense of their transport from St. John to Toronto. In regard to the provision of descriptive handbooks and photographs, the advice to send them may be repeated, as these serve to fix the interest of visitors to the exhibition, and to place them in possession of information of the kind that will be most useful to them.

A further edition of the illustrated booklet entitled 'The West Indies in Canada', which has been issued annually by the Imperial Department of Agriculture, since 1907, for use at the Canadian Exhibitions, is about to be prepared, in accordance with the revision that is entailed in the issue of such a publication from year to year. This comprises chiefly a description of the conditions in the West Indies, with their circumstances of production, and gives as well such statistics as are of more particular concern in this special connexion. The purpose of its compilation is to increase the interest in the West Indies, in Canada, and to provide easily accessible information of a useful nature for those in whom this interest has been aroused.

SUGAR INDUSTRY.

THE REDUCED SUGAR OUTPUT FROM HAWAII.

The output of sugar for the past year in the Hawaiian Islands shows a decided falling off from that of recent years. The yield was 428,000 tons against 535,000 tons for the preceding year, and 521,123 tons for the year previous. Several causes are ascribed as accounting for this result, two of which are the scarcity of labour and the decrease in the artesian water-supply. Japanese labourers have almost entirely replaced the Chinese help on the sugar plantations, and have become more or less independent, as a result of the abundant prosperity in these islands. This has resulted in higher prices for labour, and there has been one rather serious labour strike.

The Hawaiian sugar planters are now turning to the Philippines for relief, and are taking thousands of Filipinos to Honolulu each year, for working on the plantations of the Hawaiian Sugar Planters' Association. This movement has met with some opposition in the Philippines, yet it is conceded that the number of labourers taken will not seriously affect the labour supply here, and those who actually work on the sugar plantations will be better fitted for the same work when they return to the Philippines. The entire population of the Hawaiian Islands is but little more than half of the population of the city of Manila. The area planted in sugar-cane is about 100,000 acres, or less than that now planted in the Island of Negros in the Philippines. However, the Hawaiiau Islands derive a large income from their sugar crop, on account of the high rate of production and of modern milling methods, while the Philippines, with a much larger area planted, export sugar worth only about one-sixth of that exported from Hawaii. (From *The Philippine Agricultural Review*, Vol. III, p. 783.)

EXPERIMENTS IN DRYING MEGASS.

The *Agricultural News*, Vol. IX, p. 355, contained a short article, abstracted from information given in the *Modern Sugar Planter*, on the work of Professor E. W. Kerr, of the engineering Department of the Louisiana State University, relating to the burning of megass in sugar factories, and the drying of this before use. In the issue of the *Modern Sugar Planter* for January 14, 1911, a letter appears from Professor Kerr, giving further results of his work. In this he describes the drier as consisting mainly of a sheet-iron rectangular box about 4 feet × 6 feet × 20 feet high, containing six inclined shelves at equal distances apart, from top to bottom on the inside, each having an area of about 4 feet. The megass travels downward from shelf to shelf on account of the inclination which they possess, and because of a slight shaking motion that is imparted to them. The drying is effected by means of the heat from the furnace gases, which are passed through the box from bottom to top, so that when they are hottest they come into contact with the driest megass. The apparatus for driving the gases through the drier takes the form of a 50-inch induced draught fan, placed near the top of the drier.

In the experiments, the product from the drier was used for a 100-h.p. boiler, and though it was found to be rather small for this, a large number of tests was made for the purpose of comparing the fuel values of dried and undried megass. When relatively small amounts of megass were passing through the drier, the moisture was reduced from 52 to 37 per cent., the tests, when sufficient megass was passing to supply the boiler, showed an average decrease of moisture from 54 to 44 per cent., which amounts to an evaporation of about 18 per cent. of the original moisture in the megass. The average temperature of the gases entering the drier was about 490° F., and of those leaving it about 230° F. Figures are given to show that the megass thus dried had a fuel value larger by 46 per cent., when equal weights of the two kinds of megass are considered. On equal amounts of megass, the increased efficiency, obtained as the average of a large number of tests, was shown to be 19·1 per cent.

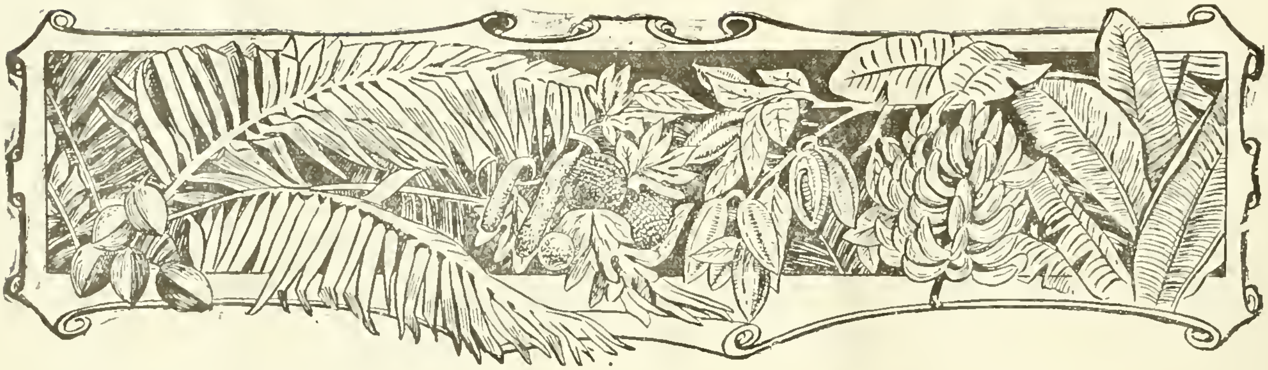
From a mechanical point of view, the drier was found to be satisfactory, although, as has been stated, it was not quite large enough for the boiler used; and the outcome of the experiments has been the gaining of suggestions for other matters of improvement. As far as the burning of the fuel is concerned, it was found that much higher furnace temperatures were obtained with the dried product than with that which had not been so treated, and there was the additional advantage that a smaller draught was required for burning the dried megass.

PRIZE-HOLDINGS COMPETITION IN DOMINICA.

A report has been furnished by the Assistant Curator, Botanic Garden, Dominica, on the Prize-holdings Competition held in the La Plaine district during 1910-11. This is the third competition of the kind held in the district; like the others, it had for its object the encouragement of the adoption of improvements among peasant cacao growers in the La Plaine district. The competition comprises two classes, including holdings of bearing cacao between 1 and 4 acres in extent, and those having an area under 1 acre, and containing not less than 100 trees of bearing cacao at proper distances; the entries in these classes were twenty-four and thirteen, respectively, making a larger total than in any other year. As formerly, much useful assistance was given by Mr. Alexander Robinson, ex-Government Officer, and now a planter, who acted as local instructor.

Owing chiefly to Mr. Robinson's efforts, the competition was a success. The holders now show a readiness to receive and carry out instructions; most of them possess a proper regard for planting at correct distances, pruning, the removal of pods with a knife or with cacao pickers, and the use of manures. In regard to the last, a tendency was shown to bury animal manure in holes too near the trees. Suggestions are given for the greater employment of lime, in the event of this becoming available, and of green dressing plants. It was found that many of the suggestions made during the judging of the last competition, such as thinning of trees, opening drains, reducing shade, and planting wind-breaks, have been carried out. It is a fact of some interest that, although the prize winners of the previous years were not allowed to compete, the work on their holdings was being done with care.

The prize winners in this competition were as follows: Class I, first prize, C. Barry and A. Lawrence; second prize, C. Didier and E. Eloir; third prize, N. Laurent and L. Cuffy; fourth prize, B. Sorhando, D. Barry and M. Sorhando. Class II, first prize, R. Didier and M. Laronde; second prize, O. Oscar and D. Alfred; third prize, M. Chassot, W. Laronde, E. Laudat and R. Attidore. The cost of the competition was £21 5s.



FRUITS AND FRUIT TREES.

COFFEA ROBUSTA IN PARA RUBBER CULTIVATION.

The following information is taken from Dr. P. J. S. Cramer's paper on *Coffea robusta* as an intercalary crop with Para rubber, which appears in the *Bulletin de la Société Belge d'Etudes Coloniales*, for February 1911. This commences by referring to the origin of *Coffea robusta*, which Dr. Cramer considers to be identical with *Coffea Laurentii*: this species is as distinct from *Coffea arabica* and *Coffea liberica* as these are different from one another, and requires conditions quite other than those needed by these, for its proper growth. In the history of the distribution of the species, it was first obtained from Brussels in 1900 for planting in the east and centre of Java, where it was considered as a curiosity until two years later, when its large power of production came under observation. Since 1907, there has been a great extension of the area of *Coffea robusta* in Java; the estimated area in 1907-8 was 5,000 acres, and 1908-9 from 20,000 to 30,000 acres, and it is probable that this estimate is below the actual extension No other kind of coffee is being planted at present, to any extent, in Java.

CLIMATE. Experiments in Java show that this coffee will flourish from sea-level to an altitude of 3,000 feet. The best plantations are found in the humid districts of East Java, where there is a large rainfall distributed equally during the year. These estates are situated from 1,000 to 1,500 feet above sea-level, and the soil is deep and rich in vegetable matter. The plant is capable of resisting drought to a certain degree, but prefers an abundant and regular rainfall. In the south of Java, it has survived a dry period lasting nearly four months; the trees suffered to some extent, but recovered very quickly after the first rain. In Java, Robusta coffee is always planted under shade; in connexion with this, the shade given by Para rubber trees would be insufficient on account of its inequality, and its absence for part of the year owing to the loss of the leaves. The plant suffers severely if exposed to the wind, and where such exposure is likely to occur, it is useless to attempt to grow it unless measures are taken for its protection

SOIL. The roots of *Coffea robusta* are strongly developed, and it is noticed in the nurseries that they largely occupy the top soil. It is on this account that the soil conditions should be as favourable as possible for the development of the roots. It has been found that the plant grows very quickly on volcanic soils, and on those which are rich in vegetable matter. The growth is much slower in compact and clayey soils.

COFFEA ROBUSTA AS AN INTERCALARY CROP. The article summarizes the advantages that should be shown by an intercalary crop, in the special connexion, as follows It should not injure the Para plants in any way: it should yield a harvest as soon as possible; its cultivation should not entail any specially skilled labour; the preparation of the products from it should not require the employment of any costly machinery. In regard to these matters, the cultivation of coffee is very simple, and *Coffea robusta* possesses a special advantage on account of its quick arrival at maturity, by which it is enabled to give a small yield two years after planting, and, usually, a complete crop in the third year; under normal conditions, Robusta coffee planted between rubber will give, at the end of the last-mentioned period, a crop of 15 cwt. per acre. The most important matter, however, is that the presence of the coffee does not interfere with the development of the rubber. Observations are given in support of this, as well as of the fact that coffee planted with rubber grows as well as that which is being raised alone.

NURSERIES FOR COFFEA ROBUSTA Nurseries for *Coffea robusta* require much care. They should be capable of providing a deep shade, which can be diminished gradually as the plants become older, in order to accustom them to the sun before they are planted out. The seeds should not be planted more closely than 6 inches apart, as such a distance will enable the plants to be kept longer in the nurseries, so that they will not be planted out before they are ready: that is, when they possess four or five pairs of leaves. The best method is to keep the plants in the nursery for nine months, and then to place them out as stumps. When this is done, the most useful plan is to sow the seed very thickly in a germinating bed, and then to put the best plants out in the nursery at a distance of 1 foot apart The chief objection to the use of stumps is that they yield their first crop later than trees that have been put out as seedlings. If it is necessary to have the plants in the ground very quickly, these methods are too slow, and it is of interest that *Coffea robusta* can be transplanted at almost any age, for plantations exist that have been made from seeds that had just germinated, as well as from plants that have been raised from seed at stake. In the examples of this seen by the author, although the plants were only six months old, flower buds had formed in the axils of the leaves on the lower branches. It is pointed out that a similar method of planting could not be employed successfully with any other species of coffee.

PLANTING OUT. If seedlings are to be employed, these should be planted out, in the ordinary way, with a ball of soil adhering to the roots; with stumps, this is not the case, all that is required being to cut the tap root back a little, while the lateral roots are untouched. The distance for planting depends upon that between the Para rubber plants. As a basis, 6 feet may be taken as the least distance between the coffee plants, and 7 feet between the rubber and the coffee. If the rubber trees are planted in lines well apart, it is best not to plant coffee in the rows, because this would prevent the rubber from being seen as a whole, and to plant the rows of rubber from east to west, in order to ensure the largest supply of light to the coffee between the rows.

TOPPING, PRUNING AND CARE OF A YOUNG PLANTATION. Robusta coffee possesses a strong tendency to form solely primary branches, during early growth, so that it is necessary to top the trees in order to prevent their growing too tall; if the top is removed, the principal branches form secondary branches which are not inferior to the former from the point of view of production. Another method for encouraging the growth of secondary branches is to expose the young plant to direct light. Very little difference in yield has been found from topped and untopped plants. The sole disadvantage of topping is the formation of suckers at the top of the trunk; these should be removed regularly, and this includes all the pruning that is required, except in the case of old trees that have produced suckers near the base on account of injury. The care of a plantation of *Coffea robusta* is certainly less expensive than that of one containing Liberian coffee; epiphytes do not grow upon it, and it shades the ground completely; in fact, the expenses of its cultivation are less than those entailed in the clean weeding of a rubber plantation. If weeds happen to become abundant, the coffee does not die, but ceases to produce fruit, and is capable of recovering in a few months. When they are one and a half years old, the trees may be topped at a height of 8 feet, and after they have been topped they reach their full development in three years.

TIME OF FLOWERING AND YIELD. The first flowering takes place a year after planting, though cases are known in Sumatra when the period has been eight months; in the latter case, sterile flowers were formed after seven months, and the normal flowers appeared a month later. After flowering, the time for the formation of ripe fruits may be taken as nine months; thus trees of the latter kind would yield a harvest in two years. The plant flowers during the whole of the year, resembling *Coffea liberica*; nevertheless, the climate has some effect on production, and the crop is increased in amount during the dry season; the berries remain on the branches for about a month, so that a monthly picking is necessary.

Examples are given of the yields on plantations. In one case where the plants were placed at the corners of a 12-foot square with another plant in the centre, the yields per acre at the different ages of the plants were as follows: two years, 1·5 cwt.; three years, 5·5 cwt.; four years, 17 cwt.; five years, 15 cwt.; six years, 21 to 24 cwt. In another case, the plants were at 10×10 feet, with a nutmeg tree in the place of every ninth coffee plant, when the yields were, similarly, as follows: two years, 1·5 cwt.; three years, 1 cwt.; four years, 17 cwt.; five years, 17 cwt. Other examples of yields are presented, and the following course of a plantation of Robusta coffee with rubber is given as satisfactory under the conditions mentioned. The flowers should appear in the first year after planting. In the next, a small crop of about 1 to 2 cwt. should be obtained, and this should increase to 14 cwt. per acre in the third year, with the same production in the fourth year. In the fifth year, the shade of the rubber trees would become too thick, and only the trees in the middle of the rows would give a crop; this would be about 7 cwt. per acre. In five years the coffee plants should be removed, as the shade of the rubber trees would by now make their yield unsatisfactory. These figures apply only to conditions where the rubber trees are planted at a suitable distance from the coffee, namely, at least 7 feet, and where the conditions of soil and climate are favourable to intercalary cultivation.

PREPARATION FOR MARKET AND QUALITY OF THE PRODUCT. The berries are smaller than those of Liberian coffee, and are borne in thick bunches, so that picking is facilitated and hastened. The fruit covering is thin, and there is another advantage in that the skin is easily removed. The seeds are fermented for thirty-six hours, and then washed and dried; for the last-named purpose they should be exposed immediately to a temperature of about 60° C. The quality of well prepared Robusta coffee is about equal to that of Arabian coffee of middling quality; the seeds are slightly different in shape, being larger and more convex than those of Arabian coffee. The bulk is about the same, and Robusta coffee possesses a bluish green colour similar to that of good Arabian. The market price is about 10 per cent. below that of Java and Liberian coffee, but there is ample compensation for this disadvantage in the difference of expense in production.

In relation to the cost of establishment of a plantation, it must be remembered that the driers and buildings required for the coffee will be of use later in connexion with rubber production. Final matters of interest in the present relation are that Robusta coffee is ranked by brokers with good Java coffee, and above Santos; for its proper preparation the seeds should be well roasted—a process to which they lend themselves well, and under which they lose less weight than those of other kinds of coffee.

INSECTS AND DISEASES. The only insect dangerous to *Coffea robusta* that has been noticed so far is *Xyleborus coffeae*, Wurth, which bores holes in the branches; the damage from this is lessened by topping the tree and encouraging the formation of secondary branches. The most serious disease is caused by *Corticium javanicum* (see *Agricultural News*, Vol. IX, pp. 286, 318, 334, 383 and 414). In the treatment for this, it is advised that the trees be cut down, and the sucker which arises be topped and allowed to take the place of the old plant. Frequent and thorough examinations should be conducted for the detection of Corticium. Lastly, *Coffea robusta* is only slightly attacked by *Hemeleia vastatrix*, and the root disease which is so serious in regard to Para rubber is never found on the living roots of the coffee, so that there appears to be no fear of an increase in the amount of this disease in Para rubber through the intercalary cultivation of *Coffea robusta*.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture left Barbados on Tuesday, April 18, by the S.S. 'Oruro', for St. Vincent, for the purpose of conferring with His Honour the Administrator on general agricultural matters. Dr. Watts was accompanied by Mr. F. W. South, B.A., Mycologist on the Staff of the Department, who will conduct investigations in connexion with diseases of cacao and other crops, in St. Vincent.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date April 10, with reference to the sales of West Indian Sea Island cotton:—

Since our last report, there has been a complete absence of demand for Sea Island growths, and all values are purely nominal. The fine spinning trade is in a worse condition than it has been for some years past. Spinners would be quite willing to purchase, if there were any demand for the finer classes of yarn. Meanwhile, they are using up their old stocks bought last season.

Holders in America are continually reducing their prices. without effecting sales of the better sorts. Best Floridas are offering at $14\frac{1}{2}d.$, and Fully Fine Islands at $15\frac{3}{4}d.$, without business ensuing, and factors in Charleston are very dispirited.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending April 8. is as follows:—

The sales this week consisted of several planters' crop lots, at prices ranging from 36c. to 45c., for export, and there is some further inquiry. Otherwise the market is very quiet, with apparently no demand for the odd bags classing Fully Fine and below. The factors are becoming more concerned over the situation, and are disposed to make some concession to sell, especially so if they can sell quantity.

Therefore, with orders in hand, we think we can buy on the following basis, viz.:—

Extra Fine	30c. to 32c.	$= 16\frac{3}{4}d.$ to $18d.$	c.i.f. & 5 per cent.
Fully Fine	28c.	$= 15\frac{3}{4}d.$	" " " "
Fine	27c.	$= 15d.$	" " " "
Off Grades	23c. to 25c.	$= 13d.$ to $14d.$	" " " "

THE COTTON MARKET AND COTTON-PLANTING.

It is a matter of common knowledge that the reports on cotton in the Liverpool market, furnished fortnightly by Messrs. Wolstenholme and Holland, have shown that an indifferent demand for Sea Island cotton has existed since the middle of January in this year; it is also known that similar conditions have obtained for the past few months in the Sea Island markets of the United States. At the present time, in the West Indies, the cotton planter has had already to decide the maximum area that he will plant in cotton during the coming season, and he will have soon to ascertain definitely, how much of this area he will actually use for cotton-growing. In making this decision, several matters will have to receive careful consideration, but none of these will probably have more influence in assisting him to arrive at a conclusion than that relating to the prices which he is likely to receive for the cotton that will come into his possession at the end of the season.

Reports from the Sea Island cotton-producing areas of the United States show that suggestions for taking steps to regulate the position have already been made. According to the *Savannah Morning News* for March 14, 1911, a meeting of Sea Island cotton growers was held in Savannah on March 9, and a committee was appointed for the purpose of considering the present circumstances of cotton production and sale, in order that recommendations may be made which would enable growers to cope with the situation. This committee, after drawing attention to the dull state of the market for the ninety days preceding the making of its report, compares the stock of cotton on hand, at Savannah and Charleston, on March 10. 1911, with that for the same date in previous years: the figures, in bales, are as follows: 1911, 26,135; 1910, 8,082; 1909, 13,035; 1908, 11,516. It is thus seen that the amount of cotton on hand, at this period of the present season, is far greater than any of the quantities at the same time in the three preceding years. The committee states that the unfavourable condition is aggravated by the existence of an estimated stock of 20,000 bales in the interior, and there is the additional untoward circumstance of the prevalence of a rumour to the effect that there will be a material increase in the area planted in Sea Island cotton, in the coming season. The recommendation is therefore made that a resolution that the area of Sea Island cotton in Florida, Georgia and South Carolina, shall be reduced by 50 per cent., which was passed at the general meeting of March 9, shall be carried into effect: and the further suggestion is made that the area no longer employed for cotton-growing shall be used for the production of peas and ground nuts, and for the raising of pigs.

Whether this resolution will be actually carried into effect is another matter, and it behoves the West Indian cotton grower to consider the question in relation to his own circumstances. He may at once dismiss the idea of effecting a drastic reduction of area in the crop, similar to that suggested in the United States. The great disparity of area for cotton-growing, in the two cases, is sufficient to show this; for, whereas more than 100,000 bales of about 400 lb. can be obtained from that in the United States, the area in the West Indies has never produced Sea Island cotton amounting to even as much as 8,000 bales of a similar size. The matter may be illustrated in another way by saying that if the West Indies halved its production, it would only be equivalent to reducing that of the United States Sea Island area by about 4 per cent.—a reduction that would have virtually no effect on the market. The question of reduction having been thus decided, it remains to consider the position in regard to any proposed extension.

In a letter received recently, Mr. J. A. Hutton, Chairman of the British Cotton Growing Association, expresses the opinion that it will not be wise to effect any increase of note in the cotton-growing area of the West Indies, and showing agreement at the same time with what has been said above concerning reduction. Mr. Hutton comments, further, on the present difficulty of moving any quantities of Sea Island cotton at high prices, and refers particularly to the similar circumstances in the United States. He points out that West Indian producers have to decide whether they will permit the cotton to be offered at 14*d.* to 16*d.* per lb.—at which rate, as he states, every bale would be sold promptly—or if they will hold out, for six months to a year, for higher prices, in which case the British Cotton Growing Association will be quite willing to finance the cotton for them.

This is the present position, described briefly. Turning to the conditions in the various islands, the increased yields of the past season have in some cases led to the suggestion that larger areas shall be put in for the coming crop. There does not appear to be any reason why this should not be done, as long as the increases are not extensive and of such a size as to prevent the crop from obtaining that particular and sustained attention that is necessary to the realization of a reasonable yield. The ability of the planter and his staff to give adequate care to the area in the fields that he will find under his supervision is a far more important factor in the case than any considerations as to market prices—a matter that has been demonstrated to an almost tragical extent in some of the islands, such as Antigua and Nevis. The matters of importance, then, are these: caution in making individual extensions, and the provision of constant care for the purpose of increasing the yield per acre, due consideration being given to the relation between the increased expenditure for this yield and the added value of the probable total product.

FORESTRY IN SOUTHERN NIGERIA.

The *Annual Report on the Forestry and Agricultural Departments*, Southern Nigeria, 1909 (Southern Nigeria, No. 30 of 1910), has been received recently, and it is the purpose of the present article to draw attention to a few out of the many points of interest contained in that report.

Much work is being done in Southern Nigeria with reference to the artificial regeneration of forests, and in pursuance of this, large numbers of seeds, seedlings, rooted stumps and suckers of various plants have been sold by the Forestry and Agricultural Departments to individuals, distributed to Executive Officers and placed out, in plantations. The chief of the plants thus employed have been Para rubber, the soft-shelled oil palm, bamboo, mahogany, Funtumia, *Ficus elastica*, West Indian cedar, Indian teak, as well as some of the native plants.

An interesting note on *Funtumia elastica* refers to the fact that both the excision and the incision systems may be employed for collecting rubber from this plant. In the former method, the cuts are deep, and extend as far as the cambium, while in the incision system, shallow channels are opened, which are just deep enough to allow the latex to flow, and then incisions are made into these with a pricker. In regard to the excision system, the most satisfactory yields were obtained with spiral cuttings, though the results have been generally very disappointing, as the trees require a long rest after having been tapped in this way. The best method seems to be the employment of incision tapping, as comparatively little damage is done to the plant, and it is claimed that a tree can be tapped three times a year in this manner without showing a decreased yield.

It was not found possible to coagulate cold Funtumia latex either with acetic acid or Purub (see *Agricultural News*, Vol. IX, p. 143); though good results were given when formalin or absolute alcohol was used. In regard to the preparation of rubber, the statement is made that there is no reason for the natives to employ expensive chemicals for the purpose, as good thin biscuits can be made equally well by boiling small quantities of the latex, and washing and pressing it.

Information is given in regard to the palm oil tree (*Elaeis guineensis*), and attention is drawn to the importance of discovering the nature of the differences between the soft-shelled and the hard-shelled varieties. Much work has been accomplished in regard to the question, but it appears that the only matter of certainty at present is that seeds of the soft shelled kind cannot be depended upon to give plants yielding similar seeds. In any case, the importance of the matter to Southern Nigeria can be gauged from the fact that the total exports of the products of the oil palm during 1909 were over 40,000 tons of kernels, and nearly 7 million imperial gallons of palm oil.

As has been indicated, the above report contains several interesting matters which cannot be well dealt with here. Attention may be also drawn to another report issued by the same Department (Southern Nigeria, No 25 of 1910), entitled *Report by the Conservator of Forests on His Tour through Meko and Shaki Districts*, which contains, among other matters, important information in regard to the more useful plants of the savannah forests of Southern Nigeria.

AGRICULTURAL TRAINING IN ST. LUCIA.

An announcement bearing the date March 18, 1911, has been issued by the St. Lucia Department of Agriculture, dealing with the new organization in connexion with the teaching of practical agriculture. This is to the effect that the department is prepared to receive a limited number of pupils for practical training in agriculture at the Botanic Station, for two years. Candidates must be at least sixteen years old; they must be physically fit, and have shown aptitude for instruction in agriculture. They must also have received sufficient instruction in ordinary elementary school subjects to show that they are capable of taking advantage of the training offered, and must possess a good character. Arrangements will be made for granting satisfactory pupils a small increasing allowance; and in cases where it is necessary, a small additional allowance toward the carriage of pupils, living at a distance, to the Botanic Station.

The course of instruction will be essentially practical, including nursery work, the cultivation and care of staple crops, and subjects connected with these such as tillage, drainage, weeding, sowing, transplanting, manuring and mulching: the treatment of pests and diseases, pruning, methods of vegetative propagation, and the preparation for the market of crops and their transportation.

Proper attention will be given to the theoretical side of the subjects by the provision of class instruction and home study under the direction of the Agricultural Superintendent.

Application for admission of candidates must be made on forms supplied by the Agricultural Superintendent. Accepted pupils will have to show satisfactory conduct and progress, or they will not be retained under instruction.

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 of the present number gives information concerning the Canadian National Exhibition of this year, which is to be held at Toronto.

On pages 132 and 133 there appears an article which presents the latest information in connexion with the intercalary cultivation of *Coffea robusta* on rubber estates.

An article entitled The Cotton Market and Cotton-Planting appears on p. 134. Its purpose is to give information which will serve as a guide in arriving at a decision in regard to cotton-planting for the coming season.

A short note on page 135 presents facts of interest taken from recent reports on forestry in Southern Nigeria.

The Insect Notes, on page 138, give an account of experiments that have been made for the purpose of investigating the damage done by cotton stainers. They also contain a note on cocoa-nut pests.

An article on page 139 gives information concerning work that has been conducted recently in connexion with the identity of the Bengal bean and related plants.

The Fungus Notes will be found on page 142. They contain the former of two articles dealing with the diseases of pine-apples.

The Disinfection of Manure.

The Experiment Station Record of the United States Department of Agriculture, for December 1910, p. 625, contains an abstract of a paper dealing with methods for the destruction of the organisms, occurring in manure, that produce some of the diseases of animals. The means employed are thoroughly to moisten the manure, carefully to mix it with litter in the proportion of about 2 : 3, to cover it with materials that are poor conductors of heat, and to pack it fairly loosely. This procedure, under the conditions of a temperate climate, has proved successful in destroying almost all such organisms, with a reduction in the activity of even the more resistant forms.

It is evident that the adoption of such a method of keeping manure would go far toward killing the spores of fungi and the seeds of weeds that it is likely to contain, and thus to lessen the chances that exist for the continual reintroduction of these into areas where valuable and useful plants are growing. The matter seems to be of sufficient importance to the agriculturist to warrant the making of definite experiments in connexion with it. These would of course have reference also to another subject, namely the effect of various methods of mixing and packing manure on the prevention of loss of the constituents that are of value to growing plants.

The Preservation of Herbarium Specimens.

The Report of the Department of Agriculture, Victoria, for 1907-10, contains that of the Government Botanist, which deals, among other things, with the results of experience at the National Herbarium, Melbourne, in the matter of the preservation of herbarium specimens from the attacks of insects.

The most successful method of preservation has been found to be the use of camphor, in tightly fitting cupboards; this is stated to be more effective than periodical exposure to the vapour of carbon bisulphide. The objection to the latter insecticide is that it does not penetrate large parcels of plants sufficiently thoroughly to destroy all the grubs in them during the maximum time, namely three days, that they may be exposed in the poison chamber; such parcels simply reinfect others when they are returned to the herbarium. The cost of the methods is about the same as regards material, but circumstances in favour of the use of camphor are the smaller amount of time and labour that are involved by its employment.

It is pointed out that specimens will last all the longer if they are handled as little as possible. A useful precaution that has been employed, whenever reference has been made to the specimens, is to poison any that show signs of insect infestation, with an alcoholic solution of mercuric chloride similar to that which has been recommended by this Department for use in connexion with the preservation of books in the tropics. The importance of such a precaution, in a hercarium containing large numbers of type specimens, is easily understood.

The Flora of Jamaica.

A note appeared on page 92 of the current volume of the *Agricultural News*, drawing attention to Vol. I of the work entitled *Flora of Jamaica*, which has been compiled by Mr. William Fawcett, B.Sc., F.L.S., late Director of Public Gardens and Plantations, Jamaica, and Dr. Alfred Barton Rendle, M.A., F.R.S., F.L.S., Keeper of the Department of Botany, British Museum (Natural History).

In the preface to the volume, attention is drawn to the fact that Mr. Fawcett, during his residence in Jamaica, gave attention to the botanical exploration of the island, particularly in regard to the orchids, of which, with the assistance of Mr. William Harris, Superintendent of the Gardens, a very fine collection was made. It was during one of Mr. Fawcett's visits to England that an agreement was made with Dr. Rendle to prepare an account of the Jamaican orchids together, and in 1904 the genus Lepanthes was dealt with in the *Transactions of the Linnean Society*. Progress was slow, until 1908, when Mr. Fawcett went to live in England on his retirement, but as the permission of the trustees of the British Museum to publish the work as a British Museum catalogue was obtained, and as Mr. Fawcett was able to give an adequate amount of time to the task, the present work has now been issued.

It is satisfactory to be able to announce that Mr. Fawcett will continue his labours at the Museum, so that a complete Flora of Jamaica will probably be issued by him, of which the present work is to form the first volume.

Agriculture and Hygiene in Trinidad Schools.

The Annual Report of the Inspector of Schools on Elementary Education, Trinidad, for 1909-10, shows that, in District No. 1, seven more schools were examined in practical agriculture during the year than in 1908-9, and that the results were better, sixteen out of forty-four schools having obtained the highest award. The increased success in teaching of this kind is attributed largely to the hints and practical suggestions given to teachers by the agricultural instructors, when making their periodical visits to the school gardens. These remarks apply chiefly to the schools in the country.

In District No. 2, twelve out of eighty-two schools obtained the highest mark in practical agriculture. The appointment of a new agricultural instructor is expected to result in useful progress during the present year. The number of schools examined in District No. 3 was eighty-five, twenty-seven of which gained the highest marks; satisfaction is expressed with the progress that has been made.

About three years ago, the Trinidad Board of Education placed hygiene among the optional subjects in the Teachers' Certificate Examination. By the new Code of 1909-10, it has been included in the list of special subjects that may form a part of the primary school curriculum. A year's course includes instruction in regard to the outlines of elementary physiology, cleanliness and ventilation, proper clothing and feeding, health and exercise, and information regarding infectious diseases, malaria and vaccination. The subject is said to be popular, and has been taken up in a number of schools.

The Barbados Goat Society.

Notes on the formation of this society have appeared in the *Agricultural News*, Vols. IX, p. 364; X, p. 9. Since the latter was written, the society has been regularly instituted, on January 31, 1911, and the rules are now published. Its objects are mainly concerned with the circulation of information regarding goats, the encouragement of the keeping of better kinds, and the improvement of the various breeds of these animals, particularly in regard to milch goats.

The members' annual subscription is 5*s.*, except in the case of peasants, who pay 1*s.* A payment of a sum not less than £2 confers the privileges of life-membership, without any additional charge. The society is managed by a committee of five members, who are elected at an annual general meeting to be held in January. Other general meetings may be convened at any time by the committee, on its own initiative, or on the receipt by it of a requisition for such a meeting signed by at least six members.

The rules published by the society contain information regarding the eligibility of goats for registration in the herd book, nomenclature, and the keeping of a stud goat register. They should be of use in cases where it is desired to form similar societies in other islands.

The Rainfall of Dominica, 1910.

According to the rainfall returns of Dominica for 1910, the highest precipitation was registered at Gleau Manioc, Long Ditton, Lancashire and Saltoun, with 302·56, 259·73, 248·35, and 241·18 inches, respectively; the only other station at which more than 200 inches was registered was Corlet, with 219·69 inches. The first-mentioned station has received the highest rainfall during the last three years, the figures for 1908 and 1909 being 236·18 inches and 258·82 inches.

Batalie retains its position of 1907 and 1908, as the station receiving the smallest rainfall, with 59·32 inches. It is followed by Wall House with 71·81, Macoucherie with 73·25, and Goodwill with 84·17 inches. Reference to the results of last year will show that there was a large increase in the rainfall, even at those stations where it is usually low; this increase has been maintained to some extent during 1910.

The circumstance of the increased rainfall during the last two years is also evidenced by the fact that in 1910 the mean for thirty-four stations was 136·59, and in 1909, 137·36 inches; these figures are about 30 inches more than those for 1908 and 1907. As was pointed out in the last volume of the *Agricultural News*, p. 121, after 1906 the rainfall decreased by about 20 inches, and remained steady for the next two years; in the last two years, it has exceeded the precipitation of 1906 by about 10 inches.

INSECT NOTES.

EXPERIMENTS WITH COTTON STAINERS.

A series of experiments to determine the effect on the lint and seed of cotton, of the feeding of cotton stainers (*Dysdercus* spp.), was outlined early in 1910 by the Entomologist on the Staff of this Department, to be carried out in several of the cotton-growing islands in the West Indies.

The following notes give the results of the experiments conducted by Mr. W. Robson, Curator of the Botanic Station, Montserrat, and are taken from that officer's report, submitted to the Imperial Commissioner of Agriculture.

It will be seen that practically no effect on germination was produced by the feeding of the stainers on seed which had been protected during growth, and exposed to the feeding only after being harvested; while the seed which was produced in bolls attacked during growth showed a very small relative germinating power. It will also be seen that the lint was affected to a very serious extent where the stainers were abundant during the development of the cotton.

The experiments were carried out at Grove Station and at Reid's Hill, Montserrat.

GROVE STATION. Fifty bolls were enclosed in muslin, and developed in the middle of the season (October to November). The seed-cotton was kept until the end of February and divided into two lots, one of which was placed with cotton stainers for about a week. The delinting of the seeds was inadvertently omitted. Germination tests were made on the seed of both lots, with the following results :—

(1) Seed placed with stainers: average germination 96 per cent., on three tests.

(2) Seed kept from stainers: average germination 96 per cent., on three tests.

No examination of the lint was made in this case.

A supplementary test was made subsequently on delinted seeds known to show a high percentage of germination, (1) placed with stainers, (2) kept from stainers. The germination tests made on these seeds showed the following results:—

(1) Seed placed with stainers: average germination 91 per cent., on six tests.

(2) Seed kept from stainers: average germination 92 per cent., on six tests.

The cotton plots in Grove Station were not infected with cotton stainers until the beginning of this year (1911). On the attack becoming general, tests were made on seed developed previous to, and after, the attack, on the same strain of cotton, with the following results:

(1) Seed obtained before the development of stainers: average germination 89 per cent., on six tests.

(2) Seed obtained after the attack of stainers was severe: average germination 20 per cent., on six tests. I am not of opinion that the great difference in the results of this last test is accounted for in the lesser vitality, generally, of seeds developed in the latter part of the season.

REID'S HILL. Samples of seed-cotton were collected on this estate from sections of the same field: (1) where cotton stainers were abundant, (2) where no cotton stainers were found.

The lint from each of these samples was submitted to to the usual tests. That from the plants attacked by stainers was so decidedly weak, as well as discoloured, as to render it useless for shipping as first cotton. The length of the staple and the percentage of weak fibre were not notably different from those of the sample in comparison, though there was a difference in the weight of the seeds, as is shown by the following determinations:

(1) Seeds attacked by stainers: average weight of 100 seeds 9·52 grams, on ten tests.

(2) Seeds not attacked: average weight of 100 seeds 11·4 grams, on five tests.

One hundred of the seeds from the cotton attacked were cut open, and forty-two were found to be decayed or shrunken internally; while sixty of the seeds not attacked, which were examined, were all found to be sound and plump.

The average germination, on ten tests, of the seeds attacked by the stainers, was 21 per cent.; while of the seeds not attacked by the insects the average germination, on four tests, was 94 per cent.

While the results seem to show that the stainer is capable of doing serious damage to cotton, I am not of opinion that it can be regarded as a serious pest in Montserrat at the present time. It seems to become prevalent in certain localities in particular seasons, but does not assume the nature of a pest over large areas until after the bulk of the crop has been gathered, that is after December of each year.

A NOTE ON COCOA-NUT PESTS.

In a number of the *Agricultural News* issued early last year (see Vol. IX, p. 26), a short account of the insect pests of cocoa-nuts appeared in the Insect Notes.

The following insects were mentioned at that time as pests of cocoa-nuts in the West Indies:—

The Bourbon scale (*Aspidiotus destructor*), the cocoa-nut white fly (*Aleyrodicus cocois*), the palm weevil (*Rhyncophorus palmarum*), (see also *Agricultural News*, Vol. X, p. 122), all of which are of general distribution.

The larger moth borer (*Castnia licus*) was stated to have occurred on cocoa-nut and other palms in Trinidad, and *Castnia daedalus* in Surinam, while the cocoa-nut butterfly (*Brassolis sophorae*) was reported as a pest in British Guiana.

Since the publication of the article mentioned above, *Castnia daedalus* has appeared in British Guiana attacking sugar-cane (see *Agricultural News*, Vol X, p. 122), and as this insect is recorded as a pest of cocoa-nuts in Surinam, it may be expected to attack the same plants in British Guiana.

The *Proceedings of the Agricultural Society of Trinidad and Tobago*, for February 1911, contained Notes on Some Cocoa-nut Pests, by P. L. Guppy, in which it is mentioned that the cocoa-nut butterfly (*Brassolis sophorae*) occurs in Trinidad, and that the caterpillars attack cocoa-nuts in the same manner as in British Guiana. Another caterpillar, the larva of a moth, *Hyperchiria* sp., also attacks the leaves of the cocoa-nut in Trinidad. The caterpillars of this moth differ from those of *Brassolis sophorae* in not building 'nests', but resemble those of that species in being gregarious. The attacks of these two species produce a very similar appearance of the leaves.

Mr. Guppy gives an account of the attack of a rhinoceros beetle (*Strategus anachoreta*), on young cocoa-nut trees in Trinidad, which is also additional to the pests in the list given previously in the *Agricultural News*.

THE BENGAL BEAN.

Work has been undertaken recently by Messrs. C. V. Piper and S. M. Tracey, of the United States Department of Agriculture, having for its object the determination of the true botanical relationships of various plants which were considered to belong to the genus Mucuna. The purpose of the investigations was to find plants closely related to the Florida velvet bean which would attain maturity earlier, and be thus more suited to conditions in the Southern States. The receipt of seeds of plants resembling the Florida velvet bean, growing in Brazil and the Philippine Islands, made it seem expedient to try to collect plants of all the other species of the genus Mucuna, in order to find varieties that would reach maturity more quickly, or prove more valuable, than the Florida velvet bean. Previously, this plant had been shown to belong to the genus Stizolobium, and not to Mucuna, and had been named *Stizolobium deeringianum*. The result of the work of the investigators mentioned has been to show that at least twenty distinct plants that were once regarded as species of Mucuna are included in the genus Stizolobium. Further, a matter of practical interest has been demonstrated; namely, that these plants show greater possibilities of usefulness than have been attributed to them, so far.

The work of the investigators mentioned is published in Bulletin No. 179 of the Bureau of Plant Industry of the United States Department of Agriculture. The purpose of the present article is to show how the results of this work have reference to the Bengal or Mauritius bean, which has been generally described as *Mucuna utilis*, or *Mucuna pruriens*, var. *utilis*. Specimens of this bean were sent from Barbados some time ago, and were identified with others as belonging to a new species called *Stizolobium aterrimum*. More recently, specimens of the Bengal bean, from Montserrat, have been sent by this Department to Kew for identification, in order that there may be no doubt as to the true affinities of the plant called Bengal bean in that island. A reply has been received to the effect that this bean, like the one known by the same name in Barbados, belongs to the species *Stizolobium aterrimum*. The description of it, as given by Piper and Tracy is as follows:—

'Vine very strong and vigorous, the stem striate but scarcely furrowed, covered with a soft, sparse pubescence; leaflets very large, plane, mostly acute, strongly mucronate, sparsely appressed-pubescent on each side; racemes pendant, 18 to 30 inches long, many flowered; flowers purple; calyx not saccate, densely appressed-pubescent without and within; pods falcate, about 4 inches long, black when mature, sparsely covered with a short, white, appressed pubescence; median ridge on valve prominent but sometimes broken; secondary ridge faint or wanting; seeds four or five, oblong, black, very shiny, 10 to 12 mm. long, the prominent hilum white.'

The reason why the plant has been known as *Mucuna utilis* is that Voigt gave an identification of this, under a description of this species by Wallich. The identification is considered by Piper and Tracey to be erroneous; though there is some doubt in the matter until comparison can be made with the original type. The authors mentioned state that *S. aterrimum* appears to be more widely cultivated than any of the other Stizolobiums, as they have received specimens from Australia, Cochin-China, Mauritius, Java and Ceylon, in addition to those already mentioned from Brazil and Barbados. The plant is grown in Hawaii under the name Mauritius bean; a name for it in Brazil is the horse-eye bean. Further, evidence is given in the bulletin mentioned to show that the habit of the plant varies to some extent in different parts of the world.

As a result of the investigations, the Bengal bean is to be known as *Stizolobium aterrimum*, and the Florida velvet bean as *S. deeringianum*. In addition, the cowitch, or cowhage, will be called *S. pruriens*, and the Lyon bean, or Sabual, from the Philippines, *S. niveum*.

MASCARENHASIA RUBBER.

The *Bulletin of the Imperial Institute*, Vol. VIII, No. 4, published recently, gives information concerning the rubber of *Mascarenhasia elastica*—a plant found in East Africa and Madagascar—as follows:—

In 1898 a new rubber-yielding tree was discovered by Dr. Stuhlmann in the neighbourhood of Dar-es-Salaam, German East Africa, and from the botanical specimens which he collected, the plant was determined by Dr. K. Schumann as a new species of Mascarenhasia to which the name *Mascarenhasia elastica* was given. The plant was described as a small tree, from 30 to 40 feet in height, with slender branches; the trunk usually branches low down and is covered with a greyish bark. The leaves are opposite, oblong obtuse or obtusely and shortly acuminate, acute at the base, and coriaceous; they vary from 3 to 10 inches long and from $1\frac{1}{4}$ to $2\frac{1}{2}$ inches broad. The flowers are conspicuous and fragrant; the follicles are purplish-black and from 3 to $3\frac{1}{2}$ inches long.

Like other species of the genus, *Mascarenhasia elastica* furnishes rubber which is collected to some extent by the natives, and is known as M'goa or Goa rubber in East Africa. It is stated, however, that the latex flows so slowly that the collection of the rubber is not profitable, and that owing to the crude methods employed, the product is of inferior quality and low value.

Mascarenhasia elastica is reported to be fairly common in the neighbourhood of Dar-es-Salaam, growing principally on the banks of streams or in moist situations. The trees have smooth, straight trunks, which are used by the natives for building their houses, and it is for this purpose, rather than as a source of rubber, that they are chiefly prized.

Experiments which have been made in German East Africa on the cultivation of the tree have shown that it grows quickly even in dry soil, and flowers and fruits when five years old. The yield of latex at this stage was, however, only slight. For some years after its discovery in German East Africa, *Mascarenhasia elastica* was not recorded from any other locality, but it has since been found in the East Africa Protectorate, the island of Pemba, and Portuguese East Africa, and specimens of the rubber furnished by the tree in these countries have been examined at the Imperial Institute.

After giving the results of the examination of different samples from the East Africa Protectorate, Pemba, and Portuguese East Africa, the article presents the following conclusions:—

The results of the examination of these specimens of *Mascarenhasia elastica* rubber from the East Africa Protectorate, Pemba, and Portuguese East Africa, show that the product is of good quality if carefully collected. No definite information is, however, available regarding the average yield of rubber which the trees will furnish, so that it is not possible at present to state the probable value of the plant as a source of rubber. The experiments which are in progress in all three countries will determine this point, and also the further question of the suitability of this East African rubber tree for cultivation in suitable localities.

GLEANINGS.

The exports of cotton from Montserrat, up to the end of last month, amounted to 374,879 lb. This is the largest output of cotton from Montserrat, since the introduction of the industry.

The amount of cotton picked in Antigua up to the end of March was about 245 bales. From present indications, it is expected that there will be an increased area in this crop during the coming season, while that planted in onions will be probably smaller.

An account of a simple method of electroplating, by means of a proprietary article called Galvanit, was given in the *Agricultural News*, Vol. IX, p. 136. It may be of use to state that this substance may now be obtained from Messrs. Davidson & Todd, Port-of-Spain, Trinidad.

According to the *Government Gazette* of the Federated Malay States for December 23, 1910, the exports of cultivated rubber during the twelve months ending December 1910 were 12,212,526 lb. For 1909, they amounted to 6,087,815 lb. The export for December 1910 was 1,234,669 lb

The *Textile Mercury* for March 4, 1911, states that there has been a material falling off in the demand for Manila hemp, which is considered to be due to the inferior quality of the fibre that is being produced. Prices for the hemp are lower at present than they have been for ten years.

In connexion with the extension of the Land Settlement Scheme of St. Vincent to Union Island, it is stated in the St. Vincent *Government Gazette* for March 23, 1911, that applications for the purchase of allotments in Union Island under the scheme were to be received up to March 30, 1911.

An announcement in *Tropical Life* for February 1911, states that the Kolonial Wirtschaftliches Komitee of Berlin has decided to award, at the International Rubber and Allied Trades Exhibition, 1911, their gold medal, for the best method of extracting rubber from Manihot and Kickxia (*Funtumia elastica*) plants.

In the *Agricultural News* for October 29, of last year, an account was given of the Bambarra ground nut (*Voandzeia subterranea*), and at about the same time seeds of this plant were distributed for trial among the various experiment stations. In relation to this matter, it is of interest that the Superintendent of Agriculture, Grenada, now reports that the plants raised there from this seed fruited heavily during last month. This is of interest in relation to the extension of growing of the Bambarra ground nut, in the West Indies, from other parts of the world where it has already proved useful.

H. M. Consul at Jerusalem reports that great damage has been done to the Jaffa orange crop by a very violent storm, which arose on the afternoon of February 10. It is calculated that oranges sufficient to make 100,000 cases were torn from the trees, while those remaining have all been more or less damaged. (*The Board of Trade Journal*, March 2, 1911.)

Mention was made, in the issue of the *Agricultural News* for March 18, last, of three leaflets published by the Permanent Exhibitions Committee of British Guiana, dealing with the sugar industry, the balata and rubber industries, and the rice industry. Since then, copies of three other equally attractive and useful leaflets in the same series have been received: these have reference to the timber industry, the cacao and coffee industries, and the cocoa-nut and lime industries.

Diplomatic and Consular Reports, No. 4613 Annual Series, shows that Alexandria still remains the chief cotton port of Egypt, the exports in 1909 being valued at £20,941,671, as compared with those from Port Said, which are stated to have been worth £11,828. The importance of Port Said in this respect is likely to increase on account of the construction of a channel between Lake Menzaleh and the Suez Canal, the effect of which will be to reduce the cost of the transport of cotton from the interior.

Statistics show that the output of sugar from Formosa is rapidly increasing, while the consumption in Japan is only rising slowly. *The Board of Trade Journal* for December 29, 1910, gives figures with reference to this matter, and shows that the sugar producers in Formosa will have to turn their attention, in consequence, to the shipping abroad of sugar in order to dispose of their surplus produce; thus it is anticipated that Formosan sugar will enter the Chinese and Corean markets, with centrifugal sugar, by next year.

The *Experiment Station Record* of the United States Department of Agriculture, for October 1910, gives an abstract, on page 429, of a paper presenting the results of an investigation concerning the fixation of nitrogen in soil, when cellulose is used by the bacteria as a source of energy. It is claimed that the experiments show that the beneficial results obtained by adding a small quantity of farmyard manure to plant remains, which are then to be buried in the soil, are due to the fact that it provides the proper bacteria for making available the cellulose in the plant remains as a source of energy for the nitrogen-fixing organisms.

The *Bulletin des Séances de la Société Nationale d'Agriculture de France*, 1909, p. 890, gives a description of experiments with a fungicide containing caustic soda and copper sulphate, to which a certain proportion of a form of black soap had been added. It was found that this mixture was very effective against fungi—probably more so than ordinary Bordeaux mixture: the effect of the copper was to prevent the germination of spores, and of the soap to cause them to swell up and burst, while the presence of the latter made the liquid more fluid and more adherent. The claim is also made, in regard to fungi attacking leaves, that the possession of the power to penetrate the tissues enables it to destroy the mycelium of fungi within leaves that have been attacked.

STUDENTS' CORNER.

MAY.

First Period.

Seasonal Notes.

In lime cultivation, the work at the present time is chiefly concerned with care of the soil in the matters of weeding, draining, forking and manuring; in the last connexion, the preparation of the land is particularly important where artificial manures are to be used. Give details of the way in which this preparation is best carried out. The heavy rainfall received during the period that is just past will have been useful in giving indications as to those parts where drainage is required most urgently, and it may be necessary for this work to be undertaken at an early date, in order to prevent the loss of plants, following short periods of heavy rainfall that may occur. Trees that are dying on account of the want of drainage of the soil in which they stand often appear as if they are being killed by root disease; the similar appearance in the two sets of untoward circumstances is due to the fact that, in both cases, there is interference with the efficiency of the roots, so that like symptoms are produced. Dry weather, during the next few months, will prevent much new work from being done in the nursery. The chief matters for attention will be to assist the seedlings to resist the effects of lack of rain and to keep the nursery beds free from weeds. How are these matters accomplished, and why is the second of them very important? In very dry weather, the fungi parasitic on scale insects usually become comparatively inactive; what aid may be given in order to enable them to resist severe drought? Compare the convenience of applying green dressings and heavy mulches in lime orchards with that on cacao estates, and state why this is less easily done in the former instance. Where pen manure is being bedded, in lime cultivations, care must be taken to avoid injury to the roots, as this naturally interferes with the development of the trees, and may cause them to lean over heavily. All parasitic and epiphytic plants should be removed from the trees, at the present time. Returning to matters connected with the nursery, the receipt of heavy showers may cause the loss of many seedlings through fungus disease. What steps should be taken to prevent this as far as possible? Toward the end of the present quarter, the lime crop will begin to mature, so that preparations will have to be made for collecting the fruit. What preliminaries are often necessary in order to facilitate this collection?

During the present season, much attention will have to be given to the sanitation of cacao orchards. In pursuance of this, dead branches will have to be removed, and all dead wood cut out, the wounds that are left being dressed with Bordeaux mixture, and after a few days, with tar. The present time is most suitable for the application of special manures and mulches, and as in the case of limes, the drainage of the soil should receive attention. May is a favourable month for carrying out the grafting of cacao. Observations should be made in order to ascertain where additional windbreaks, if any, are required, and the preliminary arrangements for planting these should be carried out.

In very dry regions, in some parts of the world, salts collect in the soil to such an extent as to render impossible the growth of plants. Although these conditions do not exist in the West Indies, the matter is of importance, as it indicates the way in which the content of soluble salts in the soil is influenced. The fact that certain soluble salts are necessary to living plants does not preclude the possibility, under given conditions, of the quantity of such salts becoming so great as to interfere seriously with their growth, or even to prevent this from taking place. In the latter case, the strength of the soil solution is so great as to cause the protoplasm to shrink away from the walls of the absorbing cells in the roots, and thus to prevent those cells from performing their functions, finally causing the death of the plants through starvation. Under conditions of comparative drought, the tendency is for soluble salts to be brought constantly into the upper layers, in water which passes upward through the soil by capillarity, and is evaporated. This shows that leaching, or the travelling of water downward between the particles, is necessary in all soils, in order to prevent an unwonted accumulation of soluble salts in the upper layers. Where this has gone on to such an extent that there is an excess of sodium carbonate in the soil, a remedy is sometimes found in applications of gypsum. Explain the action of gypsum, in this connexion.

The only effective remedy for the condition that has just been described is drainage. It is necessary, in fact, that all fertile land should be properly drained, not only for the removal of the excess of water that it may contain, but for preventing the accumulation of soluble salts in the way that has been described. It is evident that, as the amount of rainfall varies throughout the year, the quantity of soluble salts at a given level in the soil must differ with the season of the year. This is a subject that has been worked out to a considerable extent in temperate climates; there is not much information, however, as to what definitely takes place in soils in the tropics. Though the matter is not likely to attain any large direct importance in the West Indies, it is of interest to remember that one of the reasons for carrying out effective drainage, as well as tillage and mulching, is to prevent the accumulation of salts in the soil to any degree in which they may be inimical to the growth of plants.

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) To what extent does the selection of cotton seed benefit the succeeding crop. What is the use of raising new varieties by crossing?

(2) What precautions are observed in growing plants from cuttings, and what are the reasons for their observance?

(3) How would you show what is meant by capillary attraction?

INTERMEDIATE QUESTIONS.

(1) Explain what is meant by the water table in soils. How is the water table affected by drainage and tillage?

(2) Describe the appearance of a section made through the woody stem of some common plant, and state the uses of the different parts seen with the naked eye.

(3) State what you know of the relationship between the direction and spread of the roots of a plant and the drainage system of its leaves, illustrating your answer by means of examples.

FINAL QUESTIONS.

(1) Discuss the relationship between the retentive power of a soil and the kinds of manures that are most suitable for it.

(2) Give an account of the manner in which the soluble salt content of a soil is increased, and state how this increase may be prevented.

(3) Present a general discussion of the ways in which mulches are of use to the agriculturist.

FUNGUS NOTES.

DISEASES OF PINE-APPLES.

PART I.

In the last number of the *Agricultural News*, some account was given of the fungus *Thielaviopsis paradoxa*, which causes diseases of the pine-apple, as well as of other host plants. It is proposed to give, in this and a subsequent article, an account of the pine-apple diseases due to this parasite, and of certain other diseases of different origin found on pine-apples in Hawaii. These are described in Bulletin 10 of the Experiment Station of the Hawaiian Sugar Planters' Association. The matter is believed to be of some interest, as most of these diseases would appear to occur in the West Indies also, more particularly in Antigua, where they have been made the subject of one or two preliminary investigations; the latest of these was conducted during the pine-apple season of last year. This investigation yielded some information as to the insects commonly found on pine-apples in Antigua, and on their distribution throughout the parts examined. Owing, however, to the fact that the black heart disease, which was that especially under investigation, cannot be detected from the outside of the fruit, and to the fact that this was much rarer in that year than it had been for some time, nearly all the specimens examined were found to be remarkably healthy. The few unhealthy specimens were attacked by soft rot, or were bruised, while not a single instance of black heart was found.

FRUIT ROT. To return to the subject of diseases found in Hawaii, the fruit rot or soft rot is undoubtedly the most important, according to the account of them given by L. D. Larsen in the Bulletin referred to above. This disease attacks ripe pine-apples in the field, and occurs at the cannery to some extent, but is most destructive on crated fruits during shipment. Such fruits, as well as those in storehouses, are often attacked when still quite green. In the field, direct infection usually commences at the base of the fruit. Here a moist chamber is formed between the bracts which occur on the stem, and the base of the pine-apple; the moisture enables the spores of the fungus *Thielaviopsis paradoxa* to germinate, and the existence of the chamber prevents them from being killed by the sun. Infection in the field may also occur on other parts of the fruit where there is a wounded surface. On crated fruit during shipment, the rot commences at the top or on the sides, almost as frequently as at the base. Here again, the presence of wounds favours the entry of the fungus, but, under the dark, moist conditions that prevail in this case, the fungus is able to penetrate the fruit directly. This it does especially at points in the cracks between the individual fruitlets of which the pine-apple is composed. The dry conditions and the destructive effect of sunlight on the spores of the fungus prevent direct penetration of the fruit in the field except, as already stated, at the base.

The symptoms of this disease are as follows. The affected tissue has a water-soaked appearance, is of a slightly darker shade of yellow than the normal, and has a characteristic odour. It is very soft, even in the early stages of decay, and, as the disease progresses, becomes so disintegrated as to yield to the slightest pressure. The rot spreads very rapidly, and is found to destroy half the fruit in four days from the date of inoculation. On cutting open a diseased fruit and exposing the infected tissues to the air, an immense number of black macroconidia of Thielaviopsis is formed, giving all the portion attacked a black appearance. These symptoms agree very closely with those of the disease described by Howard on packed pines in Antigua, which was attributed by him to the macro- and microconidial stages of *Trichosphaeria sacchari*, which was then regarded as almost certainly identical with *Thielaviopsis paradoxa*. This fungus was found in at least one instance on ripe pine-apples from the same island, in the examination carried out during last season, and referred to above; the symptoms of the rot produced were similar to those observed in Hawaii.

The wounds which enable the fungus to gain an entry, especially in the field, may be due to sun scald, or damage by animals, or by implements during field operations. One considerable source of injury is that inflicted by insects, of which the most important in Hawaii are: a mealy-bug (*Pseudococcus bromeliae*), a fruit beetle (*Carpophilus humeralis*), vinegar flies (*Drosophila ampelophila* and others), and a grasshopper (*Xyphidium varipenne*). It may be of interest to note that a similar mealy-bug (*Pseudococcus* sp.) is of common occurrence in Antigua on pine-apples; more rarely a scale insect, probably a species of Diaspis, is found, while different species of mites are numerous; vinegar flies and various grasshoppers are common in the islands generally.

The preventive measures suggested by Larsen are:—

'(1) Cutting the fruit with long stems in place of the usual short ones.

(2) Cutting the fruit bracts at some distance from the stem instead of pulling them off.

(3) The use of straw for packing material, in preference to excelsior (wood wool).

(4) Wrapping the fruit in paper.

(5) Fumigating with formaldehyde gas.'

It has not yet been determined if the use of this last reagent on a commercial scale will be practicable, as recent work by Flora W. Patterson, of the United States Department of Agriculture, referred to in the last article, has shown that a concentration of the gas sufficient to kill the spores of the fungus and to prevent rot, produced a slight change in colour, and loss of turgidity in the fruit.

BASE ROT OF CUTTINGS. This is another disease due to the fungus *Thielaviopsis paradoxa*. According to the information given in the Bulletin mentioned above, it was found in some instances that many cuttings were killed when newly planted out in the field, and that death was due to a rot which had spread through the heart and the underground portion. A gentle pull would remove the diseased plants from the soil, and would often separate the leafy top from the base. Occasionally, plants were found to have recovered from a slight attack of the rot. These showed indentations near the base, where the tissues had been destroyed. The disease also occurred on crowns or suckers left in bags, or in piles in the fields, and on cuttings during shipment.

Infection appears to occur principally in two ways, either directly from the fungus present on the surface of the cutting at the time of planting, or by means of the mycelium or spores present in the soil. It was found that the disease was much more prevalent when the weather was dry after planting than when it was wet; it may be noted that the harm done to cane cuttings by the same fungus is much more noticeable in dry weather than in wet.

The remedies suggested by Larsen consist of drying the cuttings by placing them butt end upwards in the sun for a week; this should be combined with low stripping, that is the removal of as few as possible of the leaves at the base of the cutting. The effect of sunlight in killing the spores which is made use of in this instance has been referred to above.

A similar disease was reported by W. V. Tower from Porto Rico in 1906, in the Annual Report of the Experiment Station of that island.

LEAF SPOT. Spots varying considerably in size and shape were found to occur on the leaves of the pine-apple. In typical instances, the spots consist of a straw-coloured central area surrounded by a dark margin A black central portion may occur within the straw-coloured area, or scattered black blotches may be found; both of the appearances are due to the formation of the macrospores of *Thielaviopsis paradoxa*. Sometimes, long white arms extend from the black border, at others the spots are white or straw-coloured throughout. The internal tissue is soft and decayed at first, but soon dries and leaves the injured area dry and sunken.

The fungus gains an entry through wounds in the surface. These may be due either to grasshoppers, which feed on the leaves, or to the effect of the spines and edges of other leaves. The punctures made by a scale insect (*Diaspis bromeliae*) do not appear to act as sources of infection. The disease is much more prevalent in damp, shady weather than at other times, as in bright, sunny weather the spores of the fungus are killed. The injury caused by this disease in Hawaii was not sufficient to justify the expense of remedial measures. It is clear, however, that any means tending to reduce the general prevalence of the fungus would not be without their effect on this disease also. A similar disease was reported by G L. Fawcett from Porto Rico, in 1908.

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 :—

The anticipation mingled with hope, current in business circles, that March would bring with it an increasing volume of trade in drugs and chemicals, has been dissipated from week to week, and finally proved to be not realized, and this notwithstanding that the month has practically covered five weeks' sales, the first spice auction being held on the first of the month and the last on the 29th. Though the volume of goods disposed of has not been remarkable, the general tone of the markets has been satisfactory. No West Indian product calls for any special comment, but, as will be seen from the following details, the prices realized, and the quantities disposed of, have been quite of a normal character.

GINGER.

At the auction on the first of the month there were large offerings of Cochin, Japan and Liberian, but no Jamaica. Rough washed Cochin, of which 344 bags were offered and were bought in at 50*s*.; brown rough Calicut was also held at 55*s*.; 265 bags of limed Japan realized 37*s*. 6*d*. to 38*s*. 6*d*. per cwt., and 200 bags of Liberian character were sold at from 31*s*. to 32*s*. per cwt. A fortnight later there was again a very large supply, but no Jamaica was brought forward. Prices were generally easier, Cochin and Calicut were represented by 800 bags, 160 of which sold without reserve, old crops, fair washed Cochin fetching 45*s*. 6*d*. to 46*s*. 6*d*. The reserve price on the new crop was 50*s*. to 55*s*., at which the offerings were bought in. Brown rough Calicut fetched 52*s*. 6*d*. to 55*s*.; 365 bags of limed Japan were brought forward and 227 sold without reserve, at 35*s*. 6*d*. to 36*s*. 6*d*. per cwt. On the 22nd of the month some 549 bags of washed rough Cochin were offered, and all bought in at 47*s*. 6*d*.; fine bright was quoted at 52*s* 6*d*. and Liberian at 40*s*. per cwt. At the last sale on the 29th, some 160 packages of Cochin and Calicut were offered, but no sales were effected.

NUTMEGS, MACE AND PIMENTO.

At the spice auction on the 8th, 58 packages of West Indian nutmegs were offered, all of which sold at the following rates: 76's 5¾*d*., 84's 5½*d*., 86's to 89's 5¼*d*., 93's to 99's 4½*d*. On the 15th, 171 packages of West Indian nutmegs were offered and sold at an advance of from ¼*d*. to ½*d*. per lb. on the above rates. Mace has occupied a firm position during the month. At the auction on the first, 33 bags of Eastern were brought forward, and partly sold at 2*s*. 5*d*. to 2*s*. 6*d*. Fair palish Singapore was bought in at 2*s*. 6*d*., and ordinary Red Penang at 2*s*. 3*d*. On the 15th, there was a steady market; firm rates were realized for 38 packages of West Indian, good pale fetching 2*s*. 8*d*., fair palish 2*s*. 4*d*., and fair red 2*s*. 1*d*. to 2*s*. 3*d*. per lb. For Pimento there has been but little demand; 140 bags were brought forward at auction on the 1st of the month, and all were bought in at 2¼*d*. At the last sale on the 29th, 109 bags were offered, and 57 sold at 2¼*d* per lb.

ARROWROOT.

This article is attracting but very little attention; nothing has been offered at auction until quite the end of the month, and private sales have been reported as very dull. On the 29th however, 112 barrels of St. Vincent were offered, and all bought in at from 2⅛*d*. to 2⅝*d*. per lb. Twenty-three half-barrels of Bermuda were also offered and bought in at 1*s*. 7*d*. per lb.

SARSAPARILLA.

At the drug auction on the 9th, sarsaparilla was represented by 4 bales of grey Jamaica, 9 bales of Lima-Jamaica and 31 bales of native Jamaica. The whole af the grey Jamaica and Lima-Jamaica found buyers, but only 26 out of the 31 bales of native Jamaica were disposed of, fair to good red fetching 11*d*. to 1*s*. 0½*d*., dullish mixed red and yellow 9*d*. to 10½*d*., and dull yellow 8*d*. per lb. The 9 bales of Lima-Jamaica sold at 11*d*. to 11½*d*. per lb. for bright, part roughish. The 4 bales of grey Jamaica realized from 1*s*. 8*d*. to 1*s*. 9*d*. per lb. At auction on the 23rd, 7 bales of grey Jamaica were offered and sold at 1*s*. 8*d*. to 1*s*. 9*d*. for fair, part slightly rough; 26 bales of native Jamaica were also brought forward, 5 only being sold, 10*d*. being paid for red and yellow mixed, and for fair red; and 8*d*. for common grey.

LIME JUICE, KOLA, CASSIA FISTULA.

At the beginning of the month, concentrated West Indian lime juice was firm, small sales being effected at from £18 2*s*. 6*d*. to £18 7*s*. 6*d*. A fair business was also done in raw West Indian at 1*s*. per gallon. Later in the month, raw West Indian was quoted at 1*s*. to 1*s*. 1*d*. per gallon. At auction on the 9th, 7 barrels of fair West Indian dried kola sold at 4*d*. per lb., and a fortnight later 5 bags from Jamaica were offered, and sold at 3½*d*. to 3¾*d*. per lb. for part dark mouldy. Cassia Fistula was represented at auction on the 23rd by 21 bags West Indian, for which 20*s*. 6*d*. per cwt. was paid.

MARKET REPORTS.

London—The West India Committee Circular, April 11, 1911; Messrs. E. A De Pass & Co., March 18, 1911.

Arrowroot—2d. to 3¾d.
Balata—Sheet, 3/8; block, 2/8 per lb.
Beeswax—£7 12s. 6d
Cacao—Trinidad, 56/- to 69/- per cwt.; Grenada, 50/- to 55/6; Jamaica, 48/6 to 54/-.
Coffee—Jamaica, 59/- to 69/-.
Copra—West Indian, £22 to £22 10s. per ton.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, no quotations.
Fruit—No quotations.
Fustic—No quotations.
Ginger—Common to good common, 48/- to 52/- per cwt.; low middling to middling, 53/- to 56/.; good bright to fine, 58/- to 62/..
Honey—No quotations.
Isinglass—No quotations.
Lime Juice—Raw, 11d. to 1/3; concentrated, £18 2s. 6d. to £18 7s. 6d.; Otto of limes (hand pressed), 5/-, nominal.
Logwood—No quotations.
Mace—Firm.
Nutmegs—Quiet.
Pimento—Common, 2⅛d.; fair, 2¼d.; good, 2$\frac{5}{16}$d. per lb.
Rubber—Para, fine hard, 5/11 to 6/-: fine soft, 5/5; fine Peru, 5/9 per lb.
Rum—Jamaica, 1/7 to 5/- per gallon.
Sugar—Crystals, 14/7½ to 17/6; Muscovado, 11/6 to 14/6; Syrup, 9/3 to 14/9; Molasses, no quotations.

New York.—Messrs. Gillespie Bros. & Co., April 7, 1911.

Cacao—Caracas, 11¾c. to 12¼c.; Grenada, 11¼c. to 11¾c.; Trinidad, 11¼c. to 11¾c. per lb.; Jamaica, 10½c. to 11½c.
Cocoa-nuts—Jamaica, select, $27·00 to $28·00; culls, $15·00 to $16·00; Trinidad, select, $27·00 to $28·00; culls, $15·00 to $16·00 per M.
Coffee—Jamaica, 12¼c. to 13¾c. per lb.
Ginger—9c. to 12½c. per lb.
Goat Skins—Jamaica, 51½c.; Barbados and Antigua, 47½c. to 50c.; St. Croix, St. Thomas and St. Kitts, 45c. to 47½c. per lb.
Grape-Fruit—Jamaica, $3·00 to $3·75 per box.
Limes—$5·75 to $6·50.
Mace—40c. to 50c. per lb.
Nutmegs—110's, 10c. to 10¼c. per lb.
Oranges—Jamaica, $2·25 to $3·00.
Pimento—4¼c. to $4½c. 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., April 17, 1911.

Cacao—Venezuelan, $12·00 per fanega; Trinidad, $11·00 to $11·60.
Cocoa-nut Oil—83c. per Imperial gallon
Coffee—Venezuelan, 16c. per lb.
Copra—No quotations.
Dhal—$3·30.
Onions $3·25 to $4·25 per 100 lb.
Peas, Split—$5·50 to $5·60 per bag.
Potatoes—English, $2·00 to $2·25 per 100 lb.
Rice—Yellow, $4·30 to $4·35; White, $5·20 to $5·25 per bag.
Sugar—American crushed, $5·25 to $5·50 per 100 lb.

Barbados,—Messrs. T. S. Garraway & Co., April 24, 1911; Messrs. James A. Lynch & Co., April 19, 1911: Messrs Leacock & Co., April 13, 1911.

Arrowroot—St. Vincent, $4·50 to $4·70 per 100 lb.
Cacao—$11·00 to $12·00 per 100 lb.
Cocoa-nuts—$16·80.
Coffee—Jamaica and ordinary Rio, $11·50 to $14·50 per 100 lb., scarce.
Hay—$1·40 to $1·50 per 100 lb.
Manures—Nitrate of soda, $58·00 to $65·00; Cacao manure, $42·00 to $48·00; Sulphate of ammonia, $75·00 to $76·00 per ton.
Molasses—No quotations.
Onions—$4·00 to $7·11 per 100 lb.
Peas, Split—$5·65 to $6·10 per bag of 210 lb.; Canada, $4·00 to $4·25 per bag of 120 lb.
Potatoes—Nova Scotia, $2·25 to $2·80 per 160 lb.
Rice—Ballam, $4·60 to $4·65 per 100 lb.; Patna, no quotations; Rangoon, no quotations.
Sugar—No quotations.

British Guiana.—Messrs. Wieting & Richter, April 15, 1911; Messrs. Sandbach, Parker & Co., April 15, 1911.

Articles.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	$9·25 to $9·50 per 200 lb.	$10·00 per 200 lb.
Balata—Venezuela block	No quotation	Prohibited
Demerara sheet	85c. per lb.	72c. to 80c.
Cacao—Native	11c per lb.	12c. per lb.
Cassava—	$1·20	No quotation
Cassava Starch—	$6·50 to $7·00	No quotation
Cocoa-nuts—	$12 to $16 per M	$10 to $16 per M., peeled and selected
Coffee—Creole	16c. per lb.	15c. per lb.
Jamaica and Rio	18c. per lb.	18c. per lb.
Liberian	10½c. to 11c. per lb	10c. per lb.
Dhal—	$3·50 per bag of 168 lb.	$3·50 to $3·75 per bag of 168 lb.
Green Dhal	$4·00	——
Eddoes—	$1·56	——
Molasses—Yellow	None	——
Onions—Teneriffe	——	——
Madeira	8c.	8c. to 9c.
Peas—Split	$5·75 to $5·90 per bag (210 lb.)	$5·90 per bag (210 lb.)
Marseilles	No quotation	No quotation
Plantains—	20c. to 60c.	——
Potatoes—Nova Scotia	$3·00 to $3·25	$3·00 to $3·25
Lisbon	——	No quotation
Potatoes—Sweet, B'bados	$1·32 per bag	——
Rice—Ballam	No quotation	——
Creole	$5·00 to $5·50	$5·00 to $5·25
Tannias—	$3·00 per bag	——
Yams—White	$2·28	——
Buck	$2·64	——
Sugar—Dark crystals	$2·35 to $2·40	None
Yellow	$2·70 to $3·00	$2·65 to $2·75
White	$4·00	$4·00 to $4·25
Molasses	$2·10 to $2·30	None
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.

Economic Entomology and Health Administration.

ECONOMIC ENTOMOLOGY, as a separate branch of applied zoology, may be termed a young science. For centuries, the large brightly coloured, or peculiarly shaped insects, such as certain butterflies, moths and beetles, have attracted the attention of even casual observers, and have been collected and studied by entomologists. Few persons, however, seriously applied themselves to the task of determining the effect of insects, as a class, on the affairs of men until within comparatively recent times, and in the first instance, such application was almost entirely in reference to the relations between insects and plants. The discovery of the connexion which exists between certain insects and the dissemination of diseases of animals, including man, has within even more recent years, resulted in the development of an entirely new branch of study and investigation.

It is not difficult for mankind to realize the relationship existing between a plant and an insect, when for example, the leaves of a plant are devoured by caterpillars. It is not as easy, however, to understand the connexion between the bite of a mosquito and a subsequent attack of malarial fever; but, as a result of careful and patient study, the relationship in the latter instance is as well proved as in the former.

It has long been known that the abundance of the insects that prey upon agricultural crops has a very direct bearing on the development of newly settled countries, but it has only recently been understood how great an influence insects of other kinds have on the ability of men to keep their health, while opening up such countries, and on the health of their domestic animals, on which in such circumstances so much depends.

The order Diptera, which includes those two-winged insects known as flies, is perhaps the most important group of insects, as far as the dissemination of disease is concerned. Yellow fever, malaria and filaria are communicated to man by the biting of mosquitoes, which are of this order; while sleeping sickness of man, and the related diseases of animals in which the causative agency is a trypanosome, are communicated by the bites of other blood-sucking flies. Typhoid fever is transmitted by the common house fly, which merely acts as a carrier in a mechanical way; but the insects previously mentioned are intermediate hosts, and are necessary to the development of the parasitic organism causing the disease.

Ticks, which are related to the insects, infect cattle with Texas fever, or red-water, and are known to transmit other diseases, acting as intermediate hosts of the disease-producing organism in the same manner as the insects mentioned above.

It seems likely, also, that other relationships between insects and diseases may be demonstrated in the future. A very brief consideration of the effects of the diseases mentioned will serve to illustrate the very important bearing of insects on great developmental problems.

A list of the colonies of the British Empire in which there are employed at the present time scientific officers trained in entomology, with the dates at which these officers were first appointed, would show remarkable progress within the last fifteen years, and in other countries the progress has also been great, especially in the United States.

Government entomologists are for the most part connected with agricultural departments, but the increasing knowledge of the manner of the spread of disease is resulting in more particularized entomological training on the part of medical officers, and the schools of tropical medicine are offering increased facilities for the study of entomology relating to the practice of medicine; in fact, at all institutions of learning in science, entomology is receiving an increasing amount of attention.

The African Entomological Research Committee, appointed in 1909 by the Colonial Office, of which a brief account was published in a recent number of the *Agricultural News* (see Vol. X, p. 90), affords evidence of the recognition by the Imperial Government of the value of the study of entomology in connexion with diseases and agriculture.

The principal object of this committee is the investigation of tropical diseases and of the insect agencies by means of which they are disseminated. Insects of importance on account of their relations to crops are also collected and studied. Under the direction of the committee, entomologists are sent out to tropical Africa, who make collections of, and notes on, blood-sucking and other insects, and also endeavour to enlist the co-operation of medical and other officers, whom they instruct, when necessary, in the best methods of collecting, packing and forwarding insects for study.

Agriculture, as an industry, is fundamental, and agricultural products are the world's greatest necessities. The ability to produce the greatest amounts of these products with the least loss from preventable causes should be included among the aims of governmental activities. To preserve the health of its subjects should be also a matter of concern to a government; for whatever may be the agricultural possibilities of any locality, these are not likely to be fully realized while deadly diseases play havoc with the health of the inhabitants and of domestic animals. These facts are becoming more and more realized, and the important bearing of entomological knowledge on the productivity of agricultural and other districts, especially in the tropics, is increasingly apparent. The results that have been achieved already in combating the insect pests of agricultural crops, and the control of such diseases as yellow fever, malaria and Texas fever, are sufficiently striking and important to direct attention to the enormous possibilities along these lines.

These matters are of first importance to governments, since the prosperity of a nation depends on the well-being and health of the people, and it is only when those who are responsible for governmental administration control, through their officers, the necessary investigations and experiments, and the practical application of the acquired knowledge, that the greatest good can be expected to accrue.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture, accompanied by Mr. F. W. South, B.A., Mycologist on the Staff of the Department, returned from St. Vincent by the S.S. 'Ocamo', on the 1st. instant.

Dr. Watts left Barbados on May 8, 1911, by the R.M.S. 'Orotava', for Grenada, for the purpose of conferring with His Excellency the Governor of the Windward Islands on general agricultural matters, and is expected to return by the R.M.S. 'Clyde' on May 17.

SUGAR INDUSTRY.

WEST INDIAN SUGAR-CANE SEEDLINGS IN QUEENSLAND.

The *Annual Report of the Bureau of Sugar Experiment Stations*, Queensland, for 1910, contains information concerning several varieties of West Indian cane seedlings that are under trial in that State.

Among the Barbados seedlings, at the Mackay Central Sugar Experiment Station, B. 147 is stated to be a promising cane, and to appear healthier and stronger than the other seedlings under trial. Tables containing details of analysis and field observations show that this cane takes a high place in regard to richness of juice and yield per acre. Other canes showing promise in the same trials are Mauritius Malagache, Q. 2 and Q 5. In the districts south of Mackay, B. 208 has given fair promise in a few localities, but has been generally regarded as rather delicate in constitution; in some parts, however, it has yielded remarkably good results.

A fair number of trials has been made with D 1135, and south of Mackay it has been found to give good results, both as plant cane and ratoons. It is stated, in fact, to have a good reputation in the southern districts, quite 60 to 80 per cent. of the cane grown around Bundaberg being of this variety, which is known there under the names D.11 and Frost Resister. It is also mentioned specially from other districts of the same locality. Another Demerara cane, namely D.1483, is stated to be highly spoken of in the same part of Queensland.

Results similar to the above do not appear to have been obtained with T.60 -the only Trinidad seedling mentioned as being under trial—as it does not seem to flourish in the districts south of Mackay. In the north, however, this cane is exhibiting much greater promise, and is stated to have caused great surprise when its behaviour was compared with that shown by it in other places. It appears to be particularly suited to the drier soils that are found north of Mackay: and under irrigation, it has been found to form a good, upright, thick cane, which is quickly coming into greater favour among growers. Its development is comparatively slow, but the crop produced is healthy, and canes 12 feet long and more than 6½ inches in circumference have been obtained

It is of interest that, in some parts outside Mackay, canes were observed to show symptoms of disease similar to the West Indian root disease, particularly where the same soil had supported the Rose Bamboo and Striped Singapore for many years. Dr. Cobb, lately of the Hawaiian Sugar Experiment Station, thinks however, that there is some connexion between this disease and the fungus known as the coral stinkhorn (*Phallus* sp.), and this view is given support by the observation that the characteristic spore-bearing stage of the fungus has been very plentiful in some parts where the disease has occurred.

Information as to the distribution of sugar-cane varieties in Queensland is given, toward the end of the report. Among the seedlings introduced during 1910 were included Barbados, Demerara and Trinidad varieties. The condition in which many of these were received made it uncertain whether they would be germinated successfully; the trials with those that survive will be watched, however, with interest.

THE SUGAR-CANE IN SPAIN.

An article in the *Journal d'Agriculture Tropicale* for December 1910 shows that about 25,000 tons of cane sugar, and 75,000 tons of beet sugar, were produced in Spain in 1909 From this article the following further information is taken.

Cane cultivation is carried on in the south of Andalusia, along the coast from Gibraltar to Almeria. In this belt, which is sheltered on the north by a mountain chain, the best soil is found near the mouths of the rivers.

The average temperature during summer is about 79°F., and during winter about 55°F. Although the thermometer may fall nearly as low as freezing point, the ordinary frosts are not sufficiently severe to kill the cane plants. The rainy season extends from October to April. After this period, it is necessary to provide means of irrigating the canes twice a month during the whole of the dry season.

Cuttings are planted in the period between March and April, and the cultivation consists of such ploughing and weeding as the growth of the canes will admit. Some cultivators do not reap a crop until after two years, but it has been shown that this practice is to be recommended only when, after being in the ground twelve months, the canes remain poor in growth. Under other conditions, it is preferable to cut the crop after ten or eleven months of growth.

Where the cultivation is annual, the opportunity is afforded for the convenient manuring of the plantation, and for giving the soil the necessary attention.

The yield of cane varies from 8 to 16 tons per acre. It is considered to be poor when it is below 8 tons, and very satisfactory when it reaches 14 tons. The return of sugar from the cane is 10 per cent., on an average.

Where the cultivation is good, the cane remains in the land for four years, and sometimes longer, without replanting, and under such conditions, adequate applications are made of both natural and artificial manures.

A DEVICE FOR UNLOADING CANE TRUCKS.

A note on a device for removing sugar-cane from loaded trucks and placing it on the cane carrier has been received from Mr. H. A. Tempany, B Sc, Superintendent of Agriculture, Antigua. An arrangement of the kind has been recently erected at the Sugar Factory at Gunthorpes in that island, and it is to this that the following description has particular reference.

The device consists of a series of rakes placed on an endless band, which is made to revolve slowly over the trucks containing the cane. As the level of the canes becomes lower in a truck that is being emptied, the band is depressed, so that a continuous removal of the cane is obtained, the movement of the band, up and down, being effected by means of a windlass operated by one workman. The rakes are guided in a slotted frame, and an arrangement for counterbalancing them is provided in the shape of weights hung on wire cables.

Mr. Tempany states that the appliance is giving much satisfaction. It provides a means of securing readily a continuous feed of cane of any thickness, within reasonable limits, that may be desired, and at the same time effects a considerable saving of labour.

FRUITS AND FRUIT TREES.

CACAO CULTIVATION AND SHADING IN TRINIDAD.

It is well known that, in Trinidad as well as in other parts of the West Indies, there is much interest in the question of providing shade in cacao plantations. In order to gain definite information on the subject, the Agricultural Society of Trinidad and Tobago recently appointed a committee to make observations on the Mont Valmont estate, and to present the results of these to the Society. This has been done, and the report of the committee appeared in the *Port-of-Spain Gazette* for March 12, 1911.

Observations showed that the gradual removal of shade from cacao has been completely successful, as far as this estate is concerned; the plants have fruited heavily, and present a very healthy appearance, with a marked absence of squirrels, insect pests and other parasites. There are, however, special circumstances to be considered in regard to the good effects that have accrued from the gradual removal of the shade; the chief among these is the circumstance that, although the trees are fully exposed to the sun, the estate is sheltered from the wind through its situation, and this favourable condition is assisted by the fact that the plants have been well manured with pen manure and bone meal. If the cacao had been still shaded by the immortel, it is certain that the shade plants would have absorbed a large proportion of the manure.

Although a large measure of success has followed the gradual removal of shade on this estate, the committee recommends caution in the matter of adopting this policy. Special attention must be given to the extent to which an estate is exposed to the wind; there must be reasonable provision of material for mulching, and of the labour required in connexion with this; the soil must either be light so that it already drains easily, or where it is heavy, there must be very thorough draining for the removal of the water which would be otherwise transpired by the immortel trees.

It is the opinion of the committee that the untoward effects of overhead shade have arisen in the past through the employment of excess of this; so that plant food has been removed from the soil to an unreasonable extent, by the immortel trees. Further, cacao plants have been mutilated in order to admit light and air during the wet season, and in consequence of these conditions, black pod and other diseases have been very prevalent in all low lying localities, at certain seasons.

The final recommendation of the committee is that the immortel should be planted as usual on new cacao estates, and that after a few years, before they become likely to do damage in falling, the shade trees should be thinned out or removed entirely, according to the situation of the estate, the kind of soil, and the other circumstances that are mentioned particularly, above.

METHODS OF DEPOLLINATING FLOWERS.

Bulletin No. 167 of the Bureau of Plant Industry of the United States Department of Agriculture has been issued under the title New Methods of Plant Breeding. The publication does not, however, describe strictly any new methods that might be employed for the breeding of plants, but rather suggests useful practical variations in connexion with those that are in common employment.

The chief part of the information contained in the Bulletin has more particular reference to methods for facilitating the depollinating of flowers that are to be used for crossing. The work which is dealt with was undertaken as a result of the difficulty that was found in depollinating the flowers of lettuce, when it was intended to cross different varieties. The manipulation of these flowers is particularly difficult, on account of the smallness of the flower heads, and the fragile nature of the florets. The work continued to present difficulties, until it came to be suggested that a jet of water might be used for removing the pollen. The first application of this means was by fitting a piece of soft rubber tubing of small diameter to the end of a garden hose, turning the water on to such a degree that it just trickled from the tubing, and squeezing the end of the latter so as to produce a very small jet of water. When this jet was directed on to the lettuce flowers, the pollen was removed completely after a few seconds. The depollinated florets were then dried by touching them with the edges of small pieces of blotting paper, and then pollinated with the required pollen.

It was soon found that the method of depollinating, using water from a hose, was somewhat clumsy, and uncertain in its results; there was the additional objection that a hose was not always available for the purpose. A fairly good substitute for the arrangement was found in a large rubber bulb, into the mouthpiece of which a suitable piece of bamboo, or something similar, was fitted, for the purpose of regulating the size of the jet of water produced when the bulb is squeezed. An arrangement of this kind is suitable for large flowers, such as those of the Compositae and Leguminosae. For every small and fragile flowers, however, the jet of water formed in this way is too large: it may be obtained of a suitable size from bulbs of the kind sold for the use of dentists. Where many flowers are being treated, several such bulbs are used, each being placed, compressed, in a bowl of water, after it has been employed; so that by the time it is required again, it has expanded and filled itself. Other useful bulbs are similar to those used on photographic cameras; these can be adapted for the work by fitting them with jets made from drawn out glass tubing.

Information is given regarding the kinds of forceps that are most suited to the needs of the plant breeder. The suggestion is made that those in common use would be more suited to the work required of them if they were supplied with a flattened pin attached to the handle and pointing away from the ends of the forceps. The special advantage of such an attachment is that it makes it unnecessary for the operator to lay down one tool and take up another while he is performing a piece of work that requires his undivided attention. An arrangement of the kind can be easily obtained by tying a needle to the handle of an ordinary pair of forceps.

Detailed particulars are presented of the way in which depollination by water may be employed in the case of alfalfa. These are followed by a description of a means by which these flowers, as well as others, may be depollinated by using compressed air. In this method, after the flower has been prepared for the removal of the pollen, the stamens are subjected to a current of air coming from a small cylinder at a pressure of 20 lb. It has been found convenient for the nozzle of the air tube to be held about ½-inch from the stamens, by an assistant. Satisfactory cross-pollination has been effected with the aid of this means, but the success was not as great as when a jet of water was used in depollination.

WILD INDIGO AS A GREEN MANURE.

Information concerning wild indigo (*Tephrosia purpurea*), used as a green manure, has appeared in the *Agricultural News*, Vols. VIII, p. 405; IX, p. 281; and X, p. 75. The following is taken from an article in the *Agricultural Journal of India*, Vol. VI, p. 88:—

Wild indigo is an erect shrub growing up to 3 feet in height and 3 feet in diameter at the top. The plant belongs to the family of pulses, and is recognized as one of the best green manure crops there is in the country. It has a long tap root which strikes on plant food from the deeper layers of the soil and is a means of improving the texture and the moisture-retaining quality of the land. It possesses the power or means of absorbing nitrogen from the air.

The plant is generally found on high level waste lands, plains, and fallow lands which are fairly loose in texture. It is keenly sought after for manure, during the cultivation season, when it is spread and trodden in the land which has been puddled for the sowing or transplanting of paddy.

The Agricultural Department [of India] is taking much interest in spreading the practice also in other districts by purchasing the required quantity of seed at Sivagiri. During the present season the Department purchased 200 bags, or more than 14 tons, of seed for the district of Tanjore alone.

The seed should be first sown on the land at a rate of three Madras measures, or 10 lb., per acre, and then covered with one or two ploughings, as is generally done in the case of pulse crops.

It may also be sown along with gingelly [sesame (*Sesamum indicum*)] as a mixture, when it thrives and forms a good green manure after the harvest of gingelly. When sown under favourable conditions, a good portion of the seed germinates within about a week, the remaining portion sprouting in batches at different times later on. The chief peculiarity of this seed is that it lies dormant in the soil for even a year without losing its vitality. There are several instances in which the seed did not germinate in the first season it was sown, but yielded a satisfactory green manure crop after the succeeding crop of paddy had been harvested, the seed lying dormant in the soil throughout the period the paddy crop was occupying the land.

Occasional showers help the crop to come up well, but continuous heavy rains producing water-logged conditions even for a day would kill it, especially a young crop. The crop should therefore be sown at the end of the rainy season. After five or six months' growth it can be ploughed in and applied as green manure for the succeeding grain crop.

As goats and cattle do not relish wild indigo, there is no fear of the crop being destroyed by stray animals.

This crop will not grow on stiff and saline soils, but even these are known to bear a crop of wild indigo when improved by continuous and heavy applications of tank silt, sand and leaf manure, obtained from outside.

Wild indigo can also be sown on dry land as a mixture with gingelly or with the final hoeing of other crops. In this case also, it can be applied as a manure by being ploughed in either standing, or after being cut and spread on the land.

As has been stated already in the *Agricultural News*, seeds of wild indigo have been obtained by the Department from Java and distributed, for trial, among the different Botanic and Experiment Stations in the West Indies.

Agriculture in the Straits Settlements.— According to *Colonial Reports—Annual*, No. 663, dealing with the Straits Settlements in 1909, the increase of rubber-planting in Singapore was phenomenal during that time; there was also a slight increase in cocoa-nut planting and in that of indigo, citronella grass, ginger and ground nuts, while pepper and gambier showed signs of a return; pine-apple and vegetable cultivation decreased considerably; the soy bean proved a failure. In Penang and Province Wellesley, there was a large increase in the area under rubber; the exports of tapioca, cocoa-nuts, nutmegs and rice were larger than those of the previous year, while those of copra and cloves were smaller; the cultivation of native, or basket sugar, has almost disappeared, on account of the sale of their lands by the natives, to Europeans, for rubber-growing. The impulse to rubber-planting in the above-mentioned places was shared by Malacca, where large areas of land were applied for during the latter part of the year, though many of the applications could not be finally dealt with; the plants were generally healthy. The output of tapioca and gambier has decreased, because these plants are now grown chiefly as catch crops for rubber. Attention was being given to cocoa-nut planting, but the extension of this was limited by the interest in rubber.

COTTON NOTES.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date April 10, with reference to the sales of West Indian Sea Island cotton :—

Since our last report there has been a complete absence of demand for Sea Island growths, and all values are purely nominal. The fine spinning trade is in a worse condition than it has been for some years past. Spinners would be quite willing to purchase, if there were any demand for the finer classes of yarn. Meanwhile, they are using up their old stocks bought last season.

Holders in America are continually reducing their prices, without effecting sales of the better sorts. Best Floridas are offering at $14\frac{1}{2}d.$, and Fully Fine Islands at $15\frac{3}{4}d.$, without business ensuing, and factors in Charleston are very dispirited.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending April 15, is as follows:—

The market has remained very quiet with only limited demand. There has been some inquiry for Planters' crop lots at prices below the views of Factors, resulting in the sale of only one small crop of 17 bales at 32c. Since the close of the Exchange report a sale has been made of 100 bales of Fully Fine at 28c. at which the factors continue unwilling sellers.

However, the absence of any general demand causes much concern, as the holders of cotton are becoming each day more anxious to dispose of some of the stock. Therefore, with orders in hand for quantity, we could probably buy to advantage.

We quote, viz.:—

Extra Fine	30c. to 32c.	$= 16\frac{3}{4}d.$ to $18d.$	c.i.f. & 5 per cent.
Fully Fine	28c.	$= 15\frac{3}{4}d.$	,, ,, ,, ,,
Fine	27c.	$= 15d.$	,, ,, ,, ,,
Off Grades	23c. to 25c.	$= 13d.$ to $14d.$	,, ,, ,, ,,

A New Egyptian Cotton.—A letter from Mr. G. C. Dudgeon, Director General of Agriculture in Egypt, appears in *Nature* for March 30, 1911, stating that a form of cotton has been produced, by selection in the field, from superior growths of the Egyptian variety known as Mit Afifi. This is said to be a pure strain, and similar to the Mit Afifi of twenty years ago.

The name given to the new form of cotton is Assil, a word which means 'of pure original strain'. In consequence of this, and as there is the likelihood that, in the substitution of Assil for the impure Mit Afifi, there may be considered to exist the advocacy of the introduction of a new variety, it is recommended by Mr. G. C. Dudgeon that this form of cotton be referred to, for the present, as Assil Afifi.

THE BRITISH COTTON GROWING ASSOCIATION.

The following is taken from an account of a recent meeting of the British Cotton Growing Association :—

The eighty-sixth meeting of the Council of the British Cotton Growing Association was held at the Offices of the Association, 15, Cross Street, Manchester, on Tuesday, April 4. In the absence of the President (the Right Hon. the Earl of Derby, G.C.V.O.), Mr. J. Arthur Hutton occupied the Chair.

WEST AFRICA. The Association's Manager in Northern Nigeria has recently returned from a tour along the Benue River, and reports favourably on the prospects for cotton growing in the Muri and Bassa Provinces. As a result of his report, it has been decided to erect a small ginnery and cotton-buying Station at Ibi, so that the cotton produced can be ginned and the seed selected and distributed to the planters. The local supply of superior cotton seed is proving altogether inadequate for the demand this season, and a cable has just been received asking for about 80 tons of Nyasaland seed; there is thus every reason to believe that a considerably increased acreage is being planted under cotton this year.

It was reported that 1,925 bales of cotton had been purchased in Lagos during the month of March, as compared with 1,715 bales for March last year, and 3,430 bales in 1909. The total purchases since the beginning of the year amount to 3,207 bales against 2,425 bales for the first quarter of last year, and 6,312 bales for the corresponding period of 1909.

Samples of the new crop from Lagos were produced, and satisfaction was expressed at the great improvement in the quality of the cotton as compared with previous years.

NYASALAND. A considerable quantity of seed is now being distributed to native planters, and the Director of Agriculture is quite enthusiastic in regard to the prospects for cotton in the Karonga district, where the Association has sent a small ginning installation which will be ready to deal with next season's crop. Measures are being taken to have the cotton properly graded before it is ginned, and that only seed from white cotton shall be issued to the natives for planting. A further letter has been received from the Director of Agriculture, stating that the native crop for the past season shows a large increase, and that the prospects for the new crop are most favourable.

SUDAN. Satisfaction was expressed that the Government have arranged for a series of experiments to be carried out in the Gezira Province, and it is anticipated that great developments will take place in the Sudan, should these experiments prove successful.

NEW TYPES OF EGYPTIAN COTTON.

The following summary appears at the end of Bulletin No. 200 of the Bureau of Plant Industry of the United States Department of Agriculture. It presents the results of work connected with the breeding of new types of Egyptian cotton in the United States:—

Several distinct and promising varieties and strains which have resulted from the acclimatization and breeding experiments with Egyptian cotton in the south-western United States were tested on a field scale in the Colorado River region in 1909, and gave very favourable results in regard to the quality and uniformity of the fibre produced.

The results of the season's work showed that by planting carefully selected types, and by 'roguing out' the markedly aberrant individuals early in the summer, the degree of uniformity can be attained which is demanded by the market for this class of cotton.

Diversity can be still further controlled, and the fruitfulness of the plants maintained, by avoiding extremely light and extremely heavy types of soil, and by managing irrigation so that the plants are not exposed to alternations of severe drought and excessive moisture.

Samples of the fibre produced in 1909 were submitted to a number of spinners and other experts, who were unanimous in pronouncing them equal in all respects to imported Egyptian cotton of corresponding grades.

Two of the best types (the Yuma and Somerton varieties) are so distinct from the Mit Afifi variety from which they have been derived as to warrant the belief that they are mutations and have originated in the same manner as Abbasi, Jannovitch, and other superior types which have been developed in Egypt from the Mit Afifi variety.

A third type (strains 360, 361, 362) resembles Mit Afifi in all characters of the plants, bolls, and fibre, but the plants are much more productive, and produce fibre of better quality than those grown in the same region from imported seed. This type is to be regarded as an acclimatized and improved Mit Afifi rather than a new variety.

The Yuma variety was tested in a field of 4 acres near Yuma, Arizona, in 1909, and showed a very satisfactory degree of uniformity in the productiveness and habits of the plants, and in the quality of the fibre. It is characterized by a strong tendency to develop a stout main stem, greatly surpassing the limbs, and possesses long fruiting branches, long taper-pointed bolls, and strong, silky, cream-coloured fibre, averaging about $1\frac{3}{8}$ inches in length.

The Somerton variety resembles the preceding in the length of its bolls, and in most of its fibre characters, but the bolls are more sharply pointed, the seeds generally smoother, the percentage of lint smaller, and the plants more bushy, with a greater development of large vegetative branches.

The group of strains, Nos. 360, 361 and 362, constitutes a uniform type that is very different from the Yuma and Somerton varieties. The plants are of open habit, with several large limbs, nearly equalling the main stem; short, plump, abruptly pointed bolls; and strong fibre of medium length (averaging $1\frac{1}{4}$ to $1\frac{3}{8}$ inches). In colour the fibre is almost as brown as that of imported Mit Afifi.

Other more or less distinct types have been developed, but are either less satisfactory, or have not yet been sufficiently tested.

Imported seed of the principal Egyptian varieties was planted in 1909 in Arizona, in the vicinity of Yuma and at Sacaton. The varieties differed greatly in the amount of individual diversity manifested. None of them equalled the acclimatized stocks in fruitfulness or in quality of the lint.

Progenies of a number of first-generation Egyptian-Upland hybrids were grown near Yuma. The second-generation plants showed excessive diversity of type, but none of them could compare with the first-generation parents in yield or in excellence of the fibre.

The imports of cotton from Egypt into the United States during the calendar year 1909 amounted to 72,617,893 lb., valued at $12,101,000, as compared with 61,511,723 lb., valued at $11,560,009, in 1908.

Cyprus Origanum Oil.—The Cyprus origanum oil so far imported to this country with the assistance of the Imperial Institute has been mainly used as a perfume for soap; but in the first report on this oil published in this Bulletin (1906, 4, 298) it was pointed out that the investigations carried out by Cadeac and Meunier in France had shown that Cretan origanum oil possessed strongly antiseptic properties, and that since the Cyprus oil contained far more carvacrol than the Cretan product, it seemed likely that its antiseptic power was far greater. There is a very large demand for thyme oil to be used in the preparation of thymol, employed as an antiseptic in various toilet preparations. It seemed likely that Cyprus origanum oil, the odour of which is similar to that of thyme oil, and which contains no less than 82 per cent. of carvacrol, an isomeride of thymol, could be successfully used as a substitute for thyme oil if it could be clearly established that carvacrol is as strongly antiseptic as thymol. It is therefore of very great interest to note that in a paper on Essential Oils in Relation to their Antiseptic Powers, as Determined by their Carbolic Coefficients, by Dr. W. Harrison Martindale, published in the current number of the *Perfumery and Essential Oil Record*, it seems to be clearly established that of all the essential oils and their constituents examined, origanum oil had the highest carbolic acid coefficient, viz. 25·76, being followed by thymol 25·29, and carvacrol 21·32. This means that by the test employed, origanum oil is 25·76 times as strong an antiseptic as pure carbolic acid. The origin of the origanum oil used by Dr. Martindale is not stated, but it was probably the Cyprus variety, since it contained 82 per cent. of phenols (carvacrol), and this exceedingly high percentage of phenols distinguishes the Cyprus oil from all other origanum oils at present on the market. (*The Bulletin of the Imperial Institute*, Vol. VIII, p. 407.)

Rice in British Guiana.

The last fortnightly report of Messrs. Sandbach, Parker & Co., of Georgetown, on the rice industry of British Guiana, dated April 28, 1911, gives information as follows:—

The weather during the first part of the fortnight under review has been dry, but the last few days have been very wet. Planting is general and should be finished within the next two weeks.

The local demand for rice is good, and with a continuance of wet weather we expect a smart advance. Shipments to West Indian islands during the fortnight amounted to 100 bags.

We quote to-day, f.o.b. Demerara, for good export quality:—

Nominally, 21*s.* to 22*s.* per bag of 180 lb. gross.
" 19*s.* to 20*s.* " " " 161 " "

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 in the present issue has reference to the subject of Economic Entomology and Health Administration.

An account of some interest, giving facts concerning West Indian sugar-cane seedlings in Queensland, is presented on page 147.

Useful methods of depollinating flowers, especially where these are small and fragile, are described on page 148.

Attention is drawn to a note on this page, in which it is announced that a new and re-enlarged edition of *Nature Teaching* has just been issued, and that this will be obtainable, as usual, from the agents for the publications of the Department.

Two articles appear under the heading Insect Notes. These deal with the Frog-hopper of the Sugar-cane and Sugar-cane Borers in British Guiana, and will be found on page 154.

An interesting account of the work that is being done in connexion with rubber-planting in Martinique is given on page 155. The original article, from which the abstract was made, shows that the chief attention is being given at present to *Funtumia elastica.*

The Fungus Notes, on page 158, contain an article in completion of the description of recent work that has been undertaken in connexion with the diseases of pineapples. The description was commenced in the last number of the *Agricultural News.*

Publications of the Imperial Department of Agriculture.

A new and revised edition of *Nature Teaching* has just been issued. In this, owing to the use of smaller type, several additional features have been included without increasing the size of the book.

In making this announcement, it may be well to indicate the nature of the chief among these additions. On page 9, a section is given dealing with the external characters of seeds, and the nature of the practical work in relation to this is indicated on page 21: further on, on page 26, additional matters receive attention with reference to the comparison between monocotyledons and dicotyledons. Additional hints in connexion with the functions of the air in soils are given on pages 81 and 94. On page 83, the original matter that was given in relation to tillage has been considerably amplified, and references are included relating to the subject of the rotation of crops. The section on manures (page 103) has been extended to comprise descriptions of calcium cyanamide and nitrate of lime. Other additions of similar extent are a paragraph on the uses of weeds (page 131): information concerning the parasitism of insects by other kinds (pages 140 and 142); and a section on insecticides additional to those treated in former editions of the book.

Additions of a more extensive nature are comprised in a chapter on fungi, and indexes of the common and botanical names of the species mentioned in the appendix dealing with the habitat of plants; the latter should be particularly useful for reference to the list in Appendix 1, on pages 155 to 177. It may be mentioned that this part of the book has been interleaved with ruled paper, in order to provide a ready means of making additions to the lists of plants that are given. While drawing attention to these matters, it may be pointed out that the paragraph at the top of page 178 has reference to the indexes that commence on page 180.

Nature Teaching may be obtained from the agents for the sale of the publications of the Department, at the price of 2*s.*, post free 2*s.* 3½*d.*

Suggestions for an Institute of International Commerce.

An article in the London *Times*, for March 18, 1911, draws attention to the extent to which suggestions have been made recently for the formation of an institution for the purpose of doing work in connexion with the retention of existing British markets and the securing of new outlets for the products of the Empire. There is also reference to a letter from Lord Furness, containing the suggestion that a Chartered Institute of International Commerce should be founded. The article states that a communication has been received by the *Times* from the Royal Colonial Institute, which makes it apparent that something of this kind is under contemplation by that body.

The information from the Royal Colonial Institute shows that, at a recent meeting of the Council, it was agreed to form a representative committee to carry out the work of the Institute in this connexion. The statement is made that this committee will include, among others: Sir J. Bevan Edwards, K.C.M.G., Sir Daniel Morris, K.C.M.G. (late Imperial Commissioner of Agriculture for the West Indies), the Hon. Sir Cornthwaite Rason, Mr. Henry Birchenough, C.M.G., Mr. Richard Jebb, Mr. Ben H. Morgan, Colonel John Denny, Major Archer Shee, M.P., Mr. Hugo Hirst (Chairman. Manufacturers' Association), Mr. Stanley Machin (Chairman, London Chamber of Commerce), Mr. Edward Manville (Chairman, Society of Motor Manufacturers and Traders), and Sir Godfrey Y. Lagden, K.C.M.G.

The article concludes by stating: 'The work of the committee at the outset will include the arranging of industrial conferences with a view to regulating and coordinating empire trade conditions and, by means of lectures at the Institute itself and before the chambers of commerce and other trade bodies and institutions throughout the country, to make more widely known the opportunities that exist in the overseas Dominions for British trade and capital; and, on the other hand, to place the British merchant and manufacturer in touch with the sources that are available within the Empire for the supply of raw materials and other products. It is hoped in this way to find an increased market for British goods in the Colonies, and, on the other hand, to increase the demand in Great Britain for Empire products. British manufacturers, merchants, shippers, brokers, and others interested in the work of this committee are invited to communicate with the Secretary of the Institute at Northumberland Avenue, W.C.'

The Jippi Jappa Hat Industry in Jamaica.

In order to obtain information as to the state of the Jippi jappa hat industry in Jamaica, letters have been sent out by the Jamaica Agricultural Society to the various hat-making centres. The replies to these have been received and investigated by a committee of the Society, the report of which appears in the *Journal of the Jamaica Agricultural Society*, for February 1911, p. 46.

The report shows that the demand for the hats fluctuates very much, and that the prices received for them are consequently subject to large variations. In the Above Rocks district, however, the industry has been organized by two exporters from Kingston, so that the prices paid there for hats are even and regular. In this district, the hat-making industry did much to ameliorate the conditions after the flood of November 1907; the results obtained are much more satisfactory than in other parts of the island, where the efforts have been more spasmodic in nature. In regard to the latter, £30 or £40 has been spent in the teaching of hat-making to some 460 girls, with little success, except that one or two of the learners are continuing the work, and manage to earn a fair living. Notwithstanding the untoward conditions in these instances, the committee is of opinion that the work has been worth the doing, though not to the extent that was hoped for, and that generally, the encouragement of the hat industry by the society has effected considerable good to the island.

An Interesting Plant in St. Vincent.

The Botanic Gardens of St. Vincent contain the only specimen known at present of *Spachea perforata*, Juss. This is in the nature of a large tree, estimated to be at least 100 years old. The species was first recorded by the Rev. Landsdowne Guilding, by whom specimens were probably collected in St. Vincent, in the early part of last century.

The description in Grisebach's *Flora of the British West Indian Islands* shows that the leaves of the plant are lance-shaped, while the flowers are borne in terminal racemes, each flower containing small rosy petals, and stamens which are all fertile: the fruits are small.

In forwarding information concerning the plant, Mr. W. N. Sands, Agricultural Superintendent, states that the flowers, though small, are distinct and attractive, and are produced in great profusion; the tree is largely visited by bees and other nectar-loving insects. Mr. Sands points out, further, that *Spachea perforata*, besides being of much interest to botanists in that the species is not known to occur elsewhere than in St. Vincent, is of considerable value as a tree, from a decorative point of view.

Prize-holdings Competition in St. Lucia.

A report received from the Agricultural Superintendent of St. Lucia states that a meeting, attended by a fair number of peasant proprietors, and several of the principal persons interested in agriculture, in the district, was held in the Soufrière Court House on March 25, 1911, for the purpose of the distribution of the prizes awarded in the recent prize-holdings competition. The successful competitors were: Class I—A. Clement, First Prize, £4; R. Medouze, Third Prize, £2. Class II—A. H. Victor, Second Prize, £2.

The prizes were distributed by Mr. A. F. Palmer, Magistrate of the District, who presided, and several of the principals among those interested in agriculture in that part of the island showed their interest in the scheme by addressing the meeting, and urging the importance of the adoption of better methods of cultivation, at the same time drawing attention to the usefulness of the competitions.

Another feature of the meeting was a review of the work done on the holdings during the past year, by the Agricultural Superintendent, who explained the objects of the competition, and invited entries for the year 1911-12.

The advisability of the continuation of the competition for another year was indicated in a minute by Mr. Palmer to His Honour the Administrator, in which the views were expressed that a very favourable impression had been made on the recent occasion, and that the next competition will be taken up keenly. It is owing to the satisfactory nature of this report that it has been decided that such a continuation shall be made, and a notice to this effect appears in the current number of the St. Lucia *Gazette*.

INSECT NOTES.

THE FROG-HOPPER OF THE SUGAR-CANE.

The frog-hopper of the sugar-cane has been the subject of Insect Notes in the *Agricultural News* on two previous occasions. On the first of these (see *Agricultural News*, Vol. V, p. 330) mention was made of the occurrence of this insect in Trinidad before it was generally recognized as a serious pest, and on the second (see Vol. IX, p. 346) an account of the life-history, methods of control, and natural enemies, was given after a considerable amount of work had been done in investigating these points in connexion with an insect which has rapidly assumed a position of importance in consequence of the nature and amount of the injury it is able to cause to sugar-cane. The information contained in this latter article was based on papers and reports published by Mr. F. W. Urich, Entomologist to the Board of Agriculture, Trinidad.

Since the appearance of the articles already mentioned, Mr. Urich has issued a paper on the identification of the sugar-cane frog hopper (*Proceedings of the Agricultural Society of Trinidad and Tobago*, Vol. X, p. 525) in which it is stated that this insect has been re-identified, and should be known as *Tomaspis varia*, Fabr., instead of *Tomaspis postica*, Walk., as it has been known for several years. Other species of Tomaspis are recorded on a variety of food plants.

Additional information in regard to this pest has been presented in a paper by Dr. L. H. Gough, entitled Results Obtained in the Study of the Frog-hopper During the Wet Season of 1910. In this account of the Frog-hopper, the author summarizes the previous knowledge and the previous literature of the subject. As an instance of the amount of injury and loss that may be occasioned by this insect, it is stated that on one estate 150 acres of sugar-cane attacked by frog-hoppers gave a yield averaging 10 tons of cane per acre less than probably would have been obtained if there had been no attack, and the 1,500 tons of canes thus lost represented a value of £1,800, which was lost to the estate.

In discussing the methods of control to be employed, Dr. Gough gives an account of several spray mixtures and solutions which have been tried or suggested, with directions for preparing them and details of their cost, and the expense of application. Several spraying machines are described, and particular attention is given to a nozzle designed by the author for the purpose. This nozzle has for its special features: the length (about 2 feet), which enables the operator to apply the spray fluid to the centre of the cane plant without cutting his hands on the cane leaves; the bend or curve near the top, which enables the stream to be directed downward while the nozzle is held at a convenient angle in the hand; and the automatic cut-off, which enables the operator to control the spray, thus obviating waste and saving labour. This nozzle delivers the spray fluid in a very fine, solid stream, and not in a mist-like spray.

Kerosene emulsion and kerosene-lysol mixture are highly recommended, and the directions for preparing and applying these are very complete.

The object of spraying is to kill the adult frog-hoppers, since the egg by its position, and the immature stages, also, or by their covering of spittle, are protected from the successful action of insecticides.

The cost of spraying with the kerosene emulsion is given as \$1·61¼ per acre for labour and materials, when materials are purchased at Trinidad prices, or \$1·21¾ per acre when materials are procured duty free. Other methods of control which are reported as giving good results in 1910 are the use of trap lights, the capture of mature insects and the burning of trash after the crop. The trap lights are inexpensive, both in the first cost and in that of attendance and maintenance; but it is noted that the greater part of the frog-hoppers captured are males, the females amounting only to about 1 to 2 per cent.

The object of burning the trash is the destruction of the eggs, which are deposited in the dry, dead portions of the cane.

The artificial dissemination of the frog-hopper fungus is also discussed at length, and is apparently considered as a method of control likely to yield very satisfactory results. Reference to the use of the fungus was made in a previous number of the *Agricultural News* (see Vol. IX, p. 350).

SUGAR-CANE BORERS IN BRITISH GUIANA.

An interesting account of the giant moth borer (*Castnia licus*) and other sugar-cane pests in British Guiana has just been received, in the Interim Report on Insect Pests by Mr. John J. Quelch, B Sc., April 1911.

It appears from the report that the practice of flooding the fields immediately after the crop is taken off is likely to furnish the most practical method of dealing with serious attacks.

The collecting of adults and grubs continues to be carried on, and is counted a valuable aid to flooding in severe infestation, and a fairly satisfactory means of control where this is slight.

The protection and encouragement of birds which prey upon the moths is strongly recommended; it is stated that the burning of the trash in the field destroys and drives away many beneficial insects, especially small internal parasites.

Slight outbreaks of the giant moth borer have not developed into serious proportions in several localities. This indicates that, in these instances at least, the natural enemies are working fairly satisfactorily, and that this control has been exercised even when outside sources of infestation were not far distant.

The smaller moth borer (*Diatraea saccharalis*) has been carefully studied, and it appears that three species have been commonly associated under one name. Mr. Quelch reports that he has identified *Diatraea canella*, *D. saccharalis*, and *D. lineolata*, which are similar in appearance and vary but little in size.

The cutting out of dead hearts and the removal of the caterpillars causing the injury are recommended as remedies, and it is stated that many young larvae of the giant moth borer are removed by this process before they have penetrated too deeply into the cane. It is advised that this work be entrused to reliable labourers equipped with suitable sharp knives, and that great care be exercised to cut low enough to remove the caterpillar and at the same time not to injure the remaining canes in the stool.

The eggs of the small borers are attacked by two species of parasites, which appear to be fairly abundant at certain times. These minute insects are probably greatly reduced in numbers by the practice of burning the trash.

RUBBER-PLANTING IN MARTINIQUE.

Rubber plantations, subsidized by the Government, have been established in Martinique. on the Military Territory, at Balata, in the Cadoret Ravine and in the forest of La Tracée. An account of the experiments that are being made in rubber cultivation, in these places, is given in *L'Agriculture Pratique des Pays Chauds*, for February 1911, and it is from this that the following information is taken.

At Balata, the main cultivation is in *Funtumia elastica*, as the other species introduced, namely *Hevea brasiliensis* and *Castilloa elastica*, have been gradually replaced by that species—the former on account of its susceptibility to fungus diseases, and the latter because it is not suited for growing under the wild forest conditions that obtain. *Castilloa elastica* has, however, been found to make reasonable growth, requiring practically the same cultural attention as cacao; it is noted to be subject to attacks by scale insects, but these have only affected the decayed lower branches, without reaching the upper and younger parts of the plants. Its inferiority to Funtumia, under the special conditions, has been found to arise from its more delicate nature and its suitability to certain soils alone. In consequence of these circumstances. the work with rubber plants in Martinique is concerned mainly with investigations in relation to *Funtumia elastica*. Planting in Martinique is effected in two ways: either in cleared land, or in the forest where the introduced plants are shaded by trees existing already. The plantation at Balata has been made according to the first scheme; it presents a healthy appearance, with trees free from disease placed about 12 feet apart, in clear rows, running according to the contour of the hill. The plantations contain 8,000 plants; these show a tendency to branch from the lower part—a property that is common to forest trees raised in the open; in the particular case, the fault has been remedied by the removal of the lower branches.

In the Cadoret ravine, the plants are being raised under forest conditions, and in this way the expenses in connexion with cultivation have been reduced to a minimum. Here, about 1,100 plants have been put in, and these have shown little tendency to branch low down; their whole appearance indicates that *Funtumia elastica* is, above all, a forest tree. This is an important matter, for it shows that the species is particularly adapted for increasing the forest cover, under conditions that are most suitable to its development.

A particular incident has demonstrated the power of *Funtumia elastica* to regenerate itself by putting out new branches. In the garden of La Tracée, an area has been planted for seven years in the three species mentioned; the trees are 30 to 36 feet high, and 5 to 7 inches in diameter, and are sheltered by tall borders of pois doux (*Inga laurina*) and galba (*Calophyllum Calaba*); the species are growing separately, and this permits comparisons between them to be made easily. In the block reserved for Funtumia, one of the trees was blown over; a short time after this took place, buds began to develop near the collar. This property of easily branching after injury suggests a method of exploitation that is particularly adaptable to *Funtumia elastica*; that is to say, it may be used for the production of rubber, and felled for firewood when exhausted, with the certainty that it will grow readily from the part left in the ground. The other advantages, to which reference has been made, are its adaptation to rough cultivation in forests, and the small expense of its culture under such conditions. These make it superior, in the special circumstances, to Hevea and Castilloa, even though its yield of rubber is inferior to that of these species. In regard to this matter, the plantations in Martinique are too young for definite experiments to be made at present. There exist, however, several mature trees in the garden of La Tracée, which have enabled comparisons of the latices of the three kinds to be made.

Attention will be given to the latex of Funtumia, more particularly. It was collected by means of herring-bone tapping, and coagulated with boiling water. The rubber was found to be very strong and elastic, and of good quality. Its analysis gave the following figures:—

	Per cent.
Ash	1·00
Resins	8·64
Caoutchouc	71·40
Water	15·66
Organic matter	3·30

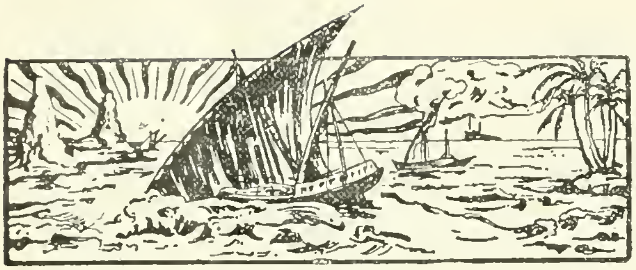
Further figures are given to show that this latex exhibits some superiority to that of *Castilloa elastica*, though it is inferior to the latex from *Hevea brasiliensis*. In the latter regard, however, there is adequate compensation in the adaptability of *Funtumia elastica* to the conditions, the remarkable ease with which the plants can repair serious damage by throwing out new branches and can recover from the operations of tapping, and the resistance which this species shows to pests and diseases.

Coagulation by boiling water has been found to be the most satisfactory method under the conditions. In the same way, herring-bone tapping appears to give the best results, although further experiments are required in order to find out the proper times for tapping.

With the object of extending the cultivation of *Funtumia elastica* in Martinique, nurseries have been made which contain at the present time more than 60,000 plants, and seeds are to be distributed as soon as they are available again. The seeds are sown in sheltered beds, and the seedlings are removed to bamboo pots when they have produced two or three leaves, being planted out about three months later. In the forest, it is advised that the seeds be sown at stake.

A summary of the conclusions reached, given at the end of the article, shows that work in the field and laboratory indicates that the conditions in Martinique are favourable to the growing of *Funtumia elastica*. From all accounts, it seems that this plant will provide a useful means of re-afforestation, at the same time giving a valuable product, while requiring little expense in connexion with cultivation.

A bonus of £20 is being offered by the Imperial Department of Agriculture for the importation of a stallion horse into Dominica before March 1, 1912, under certain conditions. These include: satisfaction as to the suitability of the animal for the purpose for which it is intended; an undertaking that the animal shall not be exported from the island for at least five years; and an agreement to make provision for not less than twenty services a year, at a fee of not more than 15*s*. for each service. Any person desiring to import an animal under the grant of the bonus should communicate with His Honour the Administrator before making arrangements for such importation. A bonus not exceeding £50 is being offered in Antigua, for the importation of a jack donkey, under somewhat similar conditions.



GLEANINGS.

The exports of rubber from Para, Manaos, Iquitos and Itacoatiara, via Para, during 1910 were 37,153 tons. In 1909 the export was 38,963 tons, and in 1908, 37,013 tons.

The *Leeward Islands Gazette*, for March 23, 1911, contains a notice which shows that a patent is being applied for, in respect of a machine for extracting cold drawn essential oil from citrus fruits. The applicants are Messrs. W. A. D. Allport and T. J. W. C. Davenport, of Dominica.

An up-to-date factory, equipped with British machinery, for dealing with ramie fibre, has been completed at Kow-kong, in Kwangtung, China. The factory will also make grass cloth. At Shahow, on the West River, a large silk filature, to be equipped with British machinery, is being erected. (*The Textile Mercury*, March 4, 1911.)

A report received from the Curator of the Botanic Station, Dominica, shows that the lime plantations in the island are flowering well, and that the prospects of the coming crop are good. A similar report from the Agricultural Instructor, Tortola, indicates that like favourable prospects for the lime crop also exist in the Virgin Islands.

A communication has been received from the Superintendent of Agriculture, Grenada, to the effect that enquiries are being made in that island as to the possibility of the disposal by sale of the seeds of the gru-gru palm (*Acrocomia lasiospatha*), and that information is required as to the prices that will be obtainable if such disposal can be made.

The *Agricultural Bulletin of the Straits and Federated Malay States*, for February 1911, gives approximate figures for the area of land under rubber cultivation in the various parts of the Colony. The total is stated to be about 100,000 acres, and it is pointed out that this is fairly large, considering the class of country in which the rubber is planted.

Information forwarded by the Agricultural Superintendent of St. Vincent shows that arrowroot and cassava starches, exported recently, have realized satisfactory prices in the different markets. During the quarter ended March 31, 1911, the exports from St. Vincent included 288,752 lb. of cotton, valued at £22,860, and 151 head of large stock, value £757.

It appears that cotton-growing in Turkey is undergoing a fairly large extension. The authorities are desirous of introducing the production of Egyptian varieties of cotton, and in pursuance of this, application has been made by the Minister of Agriculture at Constantinople for supplies of seed of the best varieties of Egyptian cotton for trial in Turkey.

It is stated, for general information, that useful wood preservatives are made by Messrs. D. Anderson & Sons, of Roach Road, Old Ford, London, E. The name of the preparation sold by this firm is Sideroleum. The firm also produces a roof felt known by the name of Stoniflex, the special purpose of which is to ensure complete protection from rain.

The Permanent Exhibition Committee of Dominica announces its intention to endeavour to send a collection of the economic products of Dominica to the Festival of Empire Exhibition to be held at the Crystal Palace under the patronage of His Majesty's Government. In consequence of this, the committee has made arrangements for obtaining such information as will enable it to decide whether an exhibit shall be forwarded.

According to the *India-Rubber Journal*, for March 18, 1911, the Belgian Committee (at Antwerp) of the International Rubber and Allied Trades Exhibition has announced that it will award a trophy to the value of 1,000 francs for some special exhibit, the arrangement of the competition being left in the hands of the manager, Mr. A. Staines Manders. In this volume of the *Agricultural News*, references to the International Rubber Exhibition are made on pages 44 and 123.

The final forecast for the sugar-cane crop of Eastern Bengal and Assam is 177,400 acres, as compared with 170,300 acres, which is the final estimate for last season. On the basis of a 90-per cent. crop, for which the normal yield is 1 2 tons per acre, the estimate reckoned on the first of these figures, for the total outturn of 'gur' from sugar-cane this year, is 191,590 tons, or about 3 per cent. less than that of last year. The quantity of gur from the juice of the date palm is estimated at 537,948 tons.

Information contained in *The Board of Trade Journal*, for December 29, 1910, shows that the Government of Colombia has granted a fifty-year concession for the establishment of banana plantations on an extension of about 12,500 acres of land on the eastern coast of the Gulf of Uraba. The receivers of the concession have to make arrangements within two years for a coastal and river steamship service, and within three years for a regular ocean service for the exportation of bananas and other products.

H.M. Consul at Santiago, Chili, reports that schemes are being made for the purchase by foreign capitalists of various lands in the south of this State, where there is a variety of large timber of good quality, and especially of land containing wood suitable for the manufacture of paper pulp. The market conditions are stated to be very advantageous for prospective buyers, owing partly to the failure of Chilian Colonization Companies established in 1905-6. (*The Board of Trade Journal*, March 2, 1911.)

A note in the *Journal of the Royal Society of Arts*, for March 17, 1911, draws attention to the great losses that are suffered through the damage done to buildings and crops by insects and fungi. After referring to the loss on the Ceylon coffee plantations, from *Hemileia vastatrix*, mention is made of the destruction, to the extent of £100,000, of the spruce forests of Bavaria, by a moth, and of the fact that the monetary loss through insects and fungi in the United States represents, every year, a sum greater than the cost of the year's upkeep of the army and navy of that country.

STUDENTS' CORNER.

MAY.

Second Period.

Seasonal Notes.

Where cotton is grown, it will have been decided already as to what parts of the estate shall be planted with this. Experiments and other manners of experience in the West Indies appear to show, that as long as the land is kept in a proper state by the employment of tillage and the use of organic manures, there is little or no need for artificial manures in cotton cultivation. In respect to the use of pen manure and green dressings on cotton land, consideration should be given to the question as to whether the seed should be planted soon after these have been turned in, or whether time should be allowed to elapse before the cotton is sown. State what you know in regard to the application of green dressings to heavy land, especially where this is likely to be wet. In the cultivation for cotton, as well as for other plants, the nature and texture of the soil must be considered in relation to the kind of tillage that is to be employed. An example of this matter is the fact that a very loose sandy soil may be best treated by giving it only a small amount of cultivation, in order that the particles may be left as closely packed together as possible; on such soil, the cotton plant is likely to become very lank, particularly where there is plenty of rainfall. What kind of growth is often shown by cotton plants raised in soils containing a plentiful supply of nitrogen? Compare the effect on the soil on a cotton estate where the seed is used for feeding the stock, and the manure is placed on the land, with the conditions where the seed is sold from the estate. How would you demonstrate that little of the mineral content of the soil is removed in the cotton lint. Discuss methods of returning to the soil the material in the stems and leaves of the plant.

Where cotton has been planted at different times on an estate or on neighbouring estates, good opportunities have been afforded for comparing the results of early and later planting. How are these results related to (1) the distribution of the rainfall throughout the year, (2) the incidence of insect pests? In the latter connexion, with what pest has the time of planting an intimate relationship? Discuss the advantages or disadvantages of early and late planting of cotton in an island, such as St. Kitts, where it is grown as an intervening crop with sugar-cane.

The great importance of careful seed selection for the next cotton crop should be well understood, by now. In making preparations for this, it is well to have reference to the publications of the Department, in order that no important part of the matter may be omitted; hints in connexion with cotton seed selection are to be found in the *West Indian Bulletin*, Vols. IV, p. 208; VII, p. 153. Where such selection is carried out in a thorough manner, it will have started from observations on, and the choice of plants in the field, according to the methods described in the references given in the *Agricultural News*, Vol. IX, p. 365. It is best to limit seed selection to the product of such plants, and not to practise it on seed from plants of unknown character. If imported seed is planted, careful note should be made of the areas where this is done, and the plants watched throughout the season, in order to ascertain whether it is advisable or not to use such seed. Such observations will have a particular importance when they are made on the lint in order to determine its yield and quality. It need hardly be mentioned that, so far, facts appear to indicate that selected local seed is superior, for cotton-growing, to that of the same kind which has been imported.

It has been indicated already, recently, that the student will do well where it is feasible, to compare the different methods for the manufacture of sugar. He will thus be enabled to obtain knowledge of the advantages and disadvantages of each system; he will also be provided with the means of determining the way in which the various kinds of sugar are produced by the different modes of manufacture. Discuss the matter of the adoption of any one of these modes in relation to the production of marketable molasses, under conditions with which you are familiar. Where central factory methods are employed, discuss the question of the extent to which maceration may be used, particularly in regard to the additional expenditure on fuel that is necessitated by its adoption.

As has been mentioned before, it is probable, in some districts, that at the present time opportunities will be available for studying the life-history and habits of the moth borer of the sugar-cane (*Diatraea saccharalis*). Evidence should be obtained as to the nature of the damage that is suffered by the sugar-cane from the attacks of this insect, as well as of the way in which such damage results in interference with the life-processes of the plant. Give an account of methods for reducing the numbers of this pest, as well as of the nature of the estate sanitation that should be effected toward the same end. Information concerning the pest may be obtained from the references given on page 109 of the last volume of the *Agricultural News*, and attention is drawn to the details that are presented there concerning a means of investigating the way in which the moth borer of the sugar cane is parasitized by other insects.

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) Why is it impossible to remove all the water in a soil, except by heating it?

(2) What relationships does the depth of a soil bear to the root-systems of the plants that it sustains?

(3) What uses have you noticed for the stipules of a plant?

INTERMEDIATE QUESTIONS.

(1) Describe a good method for storing cotton.

(2) How would you show that living plants alter the composition of the air?

(3) In what chief ways may it be determined if a soil is deficient in lime?

FINAL QUESTIONS.

(1) Give plans and details of a storehouse for seed cotton on an estate where about 30 acres of cotton is grown from year to year, and where there are no ginning facilities.

(2) Supply an outline of the measures for plant sanitation on a lime estate.

(3) State what you know of the ways in which variations in plants are made use of for their improvement.

FUNGUS NOTES.

DISEASES OF PINE-APPLES.

PART II.

In an article which appeared in the last number of the *Agricultural News*, three diseases of pine-apples were dealt with, all of which are due to the fungus *Thielaviopsis paradoxa*; in this article it is intended to deal with some other diseases found in Hawaii, and attributable to different organisms. These are described in Bulletin 10 of the Hawaiian Sugar Planters' Association, to which reference was made in the last article, and they should be of interest, since the same, or, in some cases, very similar diseases are known to occur in certain of the West Indian islands.

BROWN ROT. The symptoms as described by Larsen, are very similar to those of the disease known in Antigua as black heart or core rot. The symptoms of brown rot are as follows (to quote the description in the Bulletin to which reference has been made):—

'Affected pines are, as a rule, quite normal in external appearance. On cutting them open, there will be seen anywhere from one to a dozen or more dark-brown patches in the tissue, ranging in size from a small spot to an inch and a half or two inches in diameter. The affected tissue does not become soft and disintegrated, as is the case with soft rot, but remains nearly as firm as the healthy tissue. It lacks, however, the crispness of healthy tissue, and has a somewhat tougher texture. It often occurs just at the base of the flower tubes, in a manner which suggests that this may have been the point of infection. Sometimes that part of the tissue representing one ovary may be involved, while the adjoining tissue is perfectly healthy. The same rot may also infest the fleshy sepals and scales which cover the surface of the fruit. In such cases, it is apparent externally as a brown discoloration over the affected area.'

Stockdale, in a paper in the *West Indian Bulletin*, Vol.VIII, p. 161, reports a species of Penicillium in connexion with the black heart disease in Antigua, and recent investigations have shown that a species of this genus is a common saprophyte on decaying pine apple tissue. It may be found on dead portions of the florets, such as the stamens or the remains of the petals. The theory in connexion with black heart seems to be that it is due to this Penicillium, which gains an entrance through punctures made at the base of the flower tube by mites, or by mealy-bugs, since a species of Pseudococcus (Dactylopius) is of common occurrence inside the flowers. This theory has not yet been definitely established; it may however be recorded, that on one occasion during the recent investigations referred to above, fructifications of the Penicillium were found in the natural cavity between the flower stalks, underneath an eye which had been damaged by the insects mentioned. The tissue of the floret beneath the surface was discoloured dark-brown, and was somewhat soft; the symptoms were, however, not quite typical of black heart. In Queensland, a species of Penicillium caused a similar disease of the Smooth Cayenne variety, while on the Prickly variety the damage was attributed to a species of Monilia, accompanied by a mite. In Hawaii, in thirteen out of fifteen cases examined it was found that a species of Fusarium was responsible for the damage; in the remaining two cases a species of Penicillium was found, but in these the affected tissue was decidedly darker in colour than in the other instances. Inoculation experiments showed that the Fusarium obtained from infected fruit tissue was able to enter ripe, or nearly ripe, pine-apples and produce all the symptoms of brown rot. It would not, however, infect green fruit nearly as readily. Another Fusarium, obtained from the roots, would act in the same manner. Larsen sums up the position in general, as follows:—

'It seems quite probable, therefore, that several different organisms, when present in the flower tubes, can enter the tissue as the pine ripens and produce a brown discoloration like the one in question. In the brown rot met with in Hawaii, however, it is evident from these cultural studies, that Fusarium is the organism most generally present.'

RIPE ROT. This is a disease which only attacks ripe pines, and is not of a dangerous nature unless careless methods of harvesting are employed. The symptoms are similar to those of soft rot caused by Thielaviopsis, but ripe rot may be distinguished from the latter by the following characters, according to the Bulletin:—

'1. With ripe rot the affected tissue does not become as soft and as thoroughly disintegrated as is the case with soft rot.

2. The colour of the affected tissue is lighter and more like that of normal tissue.

3. The line of demarcation between the healthy and the affected tissue is not as distinct.

4. The black spore formation does not appear when diseased tissue is exposed to atmospheric conditions.

5. An odour of alcoholic fermentation is always present, which is not the case in the earlier stages of soft rot.'

The disease is believed to be due to an unidentified yeast-like organism, but this has not been quite definitely established.

SUN SCALD. As is indicated by the name, this is a condition which is due entirely to the direct effect of the sun. When pine-apples become bent over for any reason so that one side is exposed to the direct rays of the sun, the upturned surface becomes pale-green at first and then gradually turns pale-yellow. In advanced cases, the epidermis turns brown and becomes dry in spots, while eventually the whole area is brown, dry and depressed. A pale yellow border surrounds this area, and this gradually blends into the normal colour of the fruit. The damage often stops at the yellow colour stage. Internally, the tissue beneath the sunburnt surface is less juicy and crisp than the normal, and has a decided lack of flavour; while in advanced cases it becomes dry and spongy.

Care should be taken to prevent the growth of suckers in positions where they may push the fruit on one side; if the fruit stalks are bent by the wind or any other agency, the fruits may be protected from damage by covering them with hay.

WILT. This disease often commences with the softening and wilting of the central leaves of young plants: gradually, all the leaves wilt and the plant dies. In some cases, it is first visible as a change of colour of the leaves from green to reddish or yellow. The roots of affected plants are always dead and filled with the mycelium of a fungus. The cause of this disease has not yet been determined definitely.

Diseased plants should be removed as soon as they appear. It is claimed in Hawaii that affected plants can be cured at an early stage, by pulling them up, cutting back their leaves, retrimming their butt ends and replanting. Stirring the soil is also claimed as an efficient remedy.

TANGLE ROOT. This disease is characterized by the fact that the lateral roots wind themselves round the plant instead of growing into the soil, while the basal roots appear to be killed by fungi or unsuitable soil conditions. The leaves of diseased plants turn yellow at the tips and gradually dry up. It has been suggested from the Virgin Islands that tangle root may arise through the careless planting of suckers. The remedies usually recommended are good cultivation and stripping the plants of their basal leaves.

Preliminary experiments indicated that *Thielaviopsis paradoxa* could act as a wound parasite of roots, destroying the tissue in a very short time. A species of Fusarium also produced a brown discoloration of wounded roots, and appeared to cause injury that might be of some importance. Another fungus, *Trichoderma lignorum*, caused a similar discoloration, but spread very slowly, and appeared to be only a saprophyte. Galls due to nematode worms (*Heterodera radicola* = *H. radicicola*) are often met with on the roots of pine-apples.

Finally, it may be mentioned that pine-apples grown on certain black soils in Hawaii often show a peculiar yellow discoloration of the leaves. This is not accompanied by a loss of turgidity, though in some cases the leaves, and eventually the plants, die. The trouble, known as manganese yellows, is due to the high manganese content of the black soil, which produces a poisoning effect on the plant

This concludes the account of the diseases of pine-apples as found in Hawaii; while the work done undoubtedly throws much light on similar diseases in the West Indies.

MOTOR TRACTION IN RELATION TO AGRICULTURE.

A paper on this subject was read at a meeting of the Antigua Agricultural and Commercial Society, on April 7, 1911, by Mr. H. A. Tempany, B.Sc., Superintendent of Agriculture for the Leeward Islands, who has furnished an account from which the following note has been prepared.

Mr. Tempany commenced by drawing attention to the extent to which motor traction for agricultural purposes has been taken up in Canada and the United States, mainly on account of labour difficulties. He also pointed out that the matter is receiving increasing consideration in relation to intensive cultivation, particularly in Europe.

He then proceeded to give a short sketch of trials of motor traction that he had witnessed at Bygrave in Hertfordshire, in August last, conducted under the auspices of the Royal Agricultural Society, England. In these trials, machines employing both steam and gasolene engines were included, the nature of the work being the hauling of agricultural implements and of ordinary loads along a road or on the land, and the driving of agricultural machinery, such as a threshing machine or harvester. Six different firms made eleven entries, and, in the result, the gold medal of the Royal Agricultural Society of England, was awarded to Messrs. J. & H. McLaren, of Leeds, in respect of a 5-ton compound engine. Other firms in competition were the Cyclone Agricultural Tractor Co., Ltd., the Ivel Agricultural Motor Co., Mann's Patent Steam Cart and Wagon Co , H. P. Saunderson & Co., and Wallis, Stevens & Co., Ltd. Catalogues published by these firms were produced at the meeting by Mr. Tempany, for the information of members of the society.

In regard to agricultural motor traction for the West Indies, Mr. Tempany stated that the main difficulties, as far as Antigua was concerned, were caused by the existence of the open drains which form an essential feature of cultivation in that island, and by the frequent turns that are necessitated by the relatively small size of most of the fields. He pointed out, however, that the subject is worthy of interested attention by planters, and likely to present important developments in the near future.

In the discussion which followed, the difficulty was mentioned of using motor tractors on clay soils after heavy rains—an objection which applies, however, to a large extent in cattle ploughing. An opinion was given to the effect that light oil-driven stationary engines, for the cable haulage of implements, appeared to be best suited to conditions in Antigua. Attention was also drawn to the importance of the consideration of the supply of pen manure when any matters were receiving attention in regard to the substitution of cattle by motors, for hauling implements on estates.

At the end of the discussion, a vote of thanks was accorded to Mr. Tempany for his paper.

TRADE AND AGRICULTURE OF BARBADOS, 1909-10.

Particulars of the trade and agriculture of Barbados for this period are contained in Colonial Reports—Annual, No. 660, and reference is made here to several of the matters, for the purposes of record.

The information regarding the exports shows that the shipments of muscovado and dry sugar in 1909 were 16,968 and 827 hogsheads, respectively, the total value being £152,911; the similar figures for 1908 were 34,942, 870 and £288,436. These figures show that the shipments of sugar in 1909 were smaller than those of 1908 by 18,017* hogsheads, while the value of the crop of the former year was less by £135,525. There was an increase, however, in the output of molasses; in 1909 this was 69,036 puncheons, value £345,180, against 54,428 puncheons worth £217,712 in 1908. The distribution of the sugar exported, among different countries, is shown as follows: Canada, 12,420 hogsheads, value £107,222; Great Britain, 3,013, value £25,610; Holland, 843, value £7,165; United States, 762, value £6,477; other countries, 757 hogsheads, value, £6,436. The molasses was taken as follows: Canada, 48,265 puncheons, value £241,325; Newfoundland, 14,312, value £71,560; United States, 4,934, value £24,670; United Kingdom, 545, value £2,725; other countries, 980 puncheons, value £4,900.

The area planted in cotton during 1909 was 4,121 acres, from which, in the season 1908-9, 838,748 lb., of the estimated value of £41,937, was exported; these quantities show a decrease from those of the previous year, which were 5,768 acres, 988,443 lb., and £66,617.

The shipments of bananas to the United Kingdom in 1909 were 9,272 bunches, of which 307 bunches were exported by the Local Department of Agriculture, and the rest by a firm interested in the matter.

The following paragraph from the report is of special concern at present: 'In the exports from the island it is observed that out of a total of £576,330 in produce and manufactures of the Colony, Canada has taken £348,707, as compared with £237,916 in 1908, and £318,671 in 1907. Newfoundland coming second with £72,002, the United Kingdom third with £70,487, and the United States fourth with £37,218. It will be seen that exports to Canada have increased 79·8 per cent. between the two years, and exports to the United States have decreased.'

* Given as 18,037 in the Report.—Ed., *A.N.*

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR, April 25, 1911; Messrs. E. A DE PASS & Co., April 1, 1911.

ARROWROOT—2*d*. to $2\frac{3}{8}$*d*.
BALATA—Sheet, 3/7; block, 2/$7\frac{1}{2}$ per lb.
BEESWAX—£7 10*s*. to £7 12*s*. 6*d*.
CACAO—Trinidad, 56/- to 65/- per cwt.; Grenada, 49/- to 55/-; Jamaica, 49/- to 53/6.
COFFEE—Jamaica, 58/- to 70/6.
COPRA—West Indian, £22 10*s*. per ton.
COTTON—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, $15\frac{1}{2}$*d*. to $17\frac{1}{2}$*d*.
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—Common to good common, 48/- to 52/- per cwt.; low middling to middling, 53/- to 56/-; good bright to fine, 60/- to 70/-.
HONEY—No quotations.
ISINGLASS—No quotations.
LIME JUICE—Raw, 11*d*. to 1/1; concentrated, £18 2*s*. 6*d*. to £18 7*s*. 6*d*.; Otto of limes (hand pressed), 5/-, nominal.
LOGWOOD—No quotations.
MACE—2*s*. 2*d*. to 2*s*. 6*d*.
NUTMEGS—Quiet
PIMENTO—Common, $2\frac{1}{8}$*d*.; fair, $2\frac{1}{4}$*d*.; good, $2\frac{5}{16}$*d*. per lb.
RUBBER—Para, fine hard, 5/3: fine soft, 5/1; fine Peru, 5/1 per lb.
RUM—Jamaica, 1/7 to 5/- per gallon.
SUGAR—Crystals, 15/- to 18/-; Muscovado, 12/- to 14/6; Syrup, no quotations; Molasses, no quotations.

New York.—Messrs. GILLESPIE BROS. & Co., April 21, 1911.

CACAO—Caracas, $11\frac{1}{2}$c. to 12c.; Grenada, 11c. to $11\frac{1}{4}$c.; Trinidad, $11\frac{1}{4}$c. to $11\frac{3}{4}$c. per lb.; Jamaica, $9\frac{3}{4}$c. to $10\frac{3}{4}$c.
COCOA-NUTS—Jamaica, select, \$25·00; culls, \$15·00 to \$16·00; Trinidad, select, \$27·00; culls, \$15·00 to \$16·00 per M.
COFFEE—Jamaica, $12\frac{1}{4}$c. to $13\frac{1}{2}$c. per lb.
GINGER—9c. to 12c. per lb.
GOAT SKINS—Jamaica, $52\frac{1}{2}$c.; Barbados and Antigua, 48c. to 50c.; St. Croix, St. Thomas and St. Kitts, 45c. to 48c. per lb.
GRAPE-FRUIT—Jamaica, \$2·75 to \$3·50 per box.
LIMES—\$5·25 to \$6·00.
MACE—45c. to 50c. per lb.
NUTMEGS—110's, $9\frac{3}{4}$c. per lb.
ORANGES—Jamaica, \$2·25 to \$3·00.
PIMENTO—$4\frac{1}{4}$c. to $4\frac{1}{2}$c. per lb.
SUGAR—Centrifugals, 96°, 3·98c. per lb.; Muscovados, 89°, 3·48c.; Molasses, 89°, 3·23c. per lb., all duty paid.

Trinidad,—Messrs. GORDON, GRANT & Co., May 1, 1911.

CACAO—Venezuelan, \$11·75 per fanega; Trinidad, \$10·75 to \$11·40.
COCOA-NUT OIL—81c. per Imperial gallon.
COFFEE—Venezuelan, $16\frac{1}{2}$c. per lb.
COPRA—No quotations.
DHAL—\$3·30 to \$3·50.
ONIONS \$3·75 to \$4·00 per 100 lb.
PEAS, SPLIT—\$5·50 to \$5·60 per bag.
POTATOES—English, \$2·00 to \$2·10 per 100 lb.
RICE—Yellow, \$4·30 to \$4·35; White, \$5·20 to \$5·25 per bag.
SUGAR—American crushed, \$5·25 to \$5·50 per 100 lb.

Barbados,—Messrs. T. S. GARRAWAY & Co., May 8, 1911; Messrs. JAMES A. LYNCH & Co., May 3, 1911; Messrs. LEACOCK & Co., April 28, 1911.

ARROWROOT—St. Vincent, \$4·50 to \$4·70 per 100 lb.
CACAO—\$11·00 to \$12·00 per 100 lb.
COCOA-NUTS—\$16·80.
COFFEE—Jamaica and ordinary Rio, \$11·50 to \$14·50 per 100 lb., scarce.
HAY—\$1·40 to \$1·50 per 100 lb.
MANURES—Nitrate of soda, \$58·00 to \$65·00; Cacao manure, \$42·00 to \$48·00; Sulphate of ammonia, \$75·00 to \$76·00 per ton.
MOLASSES—No quotations.
ONIONS—\$3·00 to \$4·00 per 100 lb.
PEAS, SPLIT—\$5·65 to \$5·80 per bag of 210 lb.; Canada, \$4·00 to \$4·25 per bag of 120 lb.
POTATOES—Nova Scotia, \$2·50 to \$4·25 per 160 lb.
RICE—Ballam, \$4·60 to \$4·65 per 100 lb.; Patna, no quotations; Rangoon, no quotations.
SUGAR—No quotations.

British Guiana.—Messrs. WIETING & RICHTER, April 29, 1911; Messrs. SANDBACH, PARKER & Co., April 28, 1911.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	\$9·25 to \$10·00 per 200 lb.	\$10·00 per 200 lb.
BALATA—Venezuela block	No quotation	Prohibited
Demerara sheet	85c. per lb.	72c. to 80c.
CACAO—Native	11c per lb.	12c. per lb.
CASSAVA—	\$1·20	No quotation
CASSAVA STARCH—	\$6·50 to \$7·00	No quotation
COCOA-NUTS—	\$12 to \$16 per M	\$10 to \$16 per M., peeled and selected
COFFEE—Creole	16c. per lb.	15c. per lb.
Jamaica and Rio	18c. per lb.	18c. per lb.
Liberian	$10\frac{1}{2}$c. per lb.	10c. per lb.
DHAL—	\$3·75 per bag of 168 lb.	\$3·75 per bag of 168 lb.
Green Dhal	\$4·00	——
EDDOES—	\$1·44	——
MOLASSES—Yellow	None	——
ONIONS—Teneriffe	——	——
Madeira	No quotation	9c.
PEAS—Split	\$5·70 per bag (210 lb.)	\$5·80 per bag (210 lb.)
Marseilles	No quotation	No quotation
PLANTAINS—	20c to 60c.	——
POTATOES—Nova Scotia	\$3·25 to \$3·50	\$3·25 to \$3·50
Lisbon	—	No quotation
POTATOES-Sweet, B'bados	\$2·16 per bag	——
RICE—Ballam	No quotation	——
Creole	\$5·00 to \$5·25	\$5·00 to \$5·25
TANNIAS—	\$2·40 per bag	——
YAMS—White	\$3·00	——
Buck	\$3·24	——
SUGAR—Dark crystals	\$2·35 to \$2·40	None
Yellow	\$2·90 to \$3·00	\$2·65 to \$2·75
White	\$4·00	\$4·00 to \$4·25
Molasses	\$2·10 to \$2·30	None
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.

Mycology in Relation to Administration.

THE systematic study of the diseases of plants and its application to general agriculture has developed almost entirely within the last sixty years. Although the existence of various fungi has been recognized for many centuries, yet little if anything was known of their real nature until the middle of last century; their life-histories were almost entirely unstudied, and many of them were believed to be abnormal developments of the leaves and other parts of flowering plants. Under such circumstances, it was only natural that nothing should be known of their connexion with plant diseases, and that the latter were generally attributed to bad soil conditions, the occurrence of excessive rains or drought, and similar factors. In some instances, where large insects, such as the larvae of beetles, or of moths and butterflies, were found in considerable numbers in connexion with disease, it was realized that these were the cause; while in others, when the disease was of a violently epidemic nature, it was usually said that the plants were destroyed by a blight. Instances of this are the blights reported at various times on cacao in Trinidad, and that said to have destroyed the cocoa-nut palm in Antigua. The use of the term 'blight', referring as it does only to the general appearance of the affected plants, shows clearly the complete lack of information that existed among planters and farmers as to the real cause of the appearance. This lack of information continued even up to very recent times: while the confusion between insects and fungi, which occurred among eminent scientific men as late as the forties of the last century, may be found among planters at the present day. There is, however, much excuse for this, as no means were in existence, until comparatively very recent years, for rendering available to the practical man, to whom it was of so much importance, the information that was being rapidly accumulated by scientific investigators.

The real recognition of the important part played by fungi in connexion with plant disease dates from the publication in 1866 of De Bary's book on the comparative morphology and physiology of the fungi, in which details of life-history and parasitism in the case of many forms are clearly set forth. This gave a great stimulus to many investigators, so that during the subsequent thirty years an immense mass of information was accumulated both in connexion with the life-histories and pathological importance of many species and with their systematic classification and the nature of their reproductive arrangements. It should, however, be borne in mind that practically the whole of the work was carried out by private individuals, either working in their own laboratories or in those of various universities and academic institutions throughout the world. As a consequence of this, the information obtained was only available, through the medium of the more advanced teaching establishments or of the universities, to those engaged in the study of Natural Science, and its importance from a much wider agricultural point of view was not fully recognized. Along with this development in the knowledge of their parasites went a very rapid increase in the understanding of the nature of plants themselves, so that by about the year 1880 there were accumulated large stores of knowledge available for the right direction of a campaign against plant diseases.

Once the information had been obtained, the next step from the agricultural standpoint was to render it useful to the planting community. This was done by the recognition by Governments of the importance of the work that could be performed. In England such recognition consisted for a long time of the employment of a research mycologist on the Staff of the Royal Botanic Gardens, Kew. One of the first countries in which prominence was given by the Government to the practical application of mycological knowledge would appear to have been the United States. For the last thirty years this country has been employing an ever increasing number of plant pathologists in connexion with the Department of Agriculture of the Federal Government; while at the present time almost every State Experiment Station, supported largely from the funds of that State, has one or more mycologists on its staff.

When the Imperial Department of Agriculture was founded in 1898, it soon became evident that officers capable of dealing with the pests and diseases of plants were urgently needed, and this was well emphasized by the prevalent diseases of the sugar-cane. About the same time it became necessary to appoint a mycologist on the Staff of the Royal Botanic Gardens at Peradeniya in Ceylon, and at the present time almost every Government Department of Agriculture in the British Empire employs one or more such officers. In India, not only is there an Imperial Mycologist to the Government of India, aided by an assistant mycologist and several research students, but one at least of the Presidencies, Madras, has its own officer. Instances of the employment of Government Mycologists could be added from all parts of the world.

These Departments of Agriculture bring about the dissemination of what is known in connexion with fungi in two ways. They work directly through the association with planters of the scientific officers on their staffs, and indirectly by means of their publications: while at the same time, owing to their connexion with the Government, they are able to introduce the teaching of the requisite scientific knowledge into the curricula of the schools. This last point serves to emphasize the importance that attaches to the connexion of scientific knowledge with so thorough an instrument for inducing its spread as is provided in the form of the various Governments.

Further valuable assistance in the protection of plants from disease is rendered by Governments through the legislation which they are empowered to enact. Such legislation can prevent the importation, into any given country, of diseases likely to cause serious damage to its crops. At the same time it can enforce, if necessary, the adoption of adequate measures for eliminating or eradicating the more serious diseases which do exist. In both these cases the technical knowledge of the scientist is necessary, though this alone is powerless without the aid of the Government machinery for enforcing the necessary measures, and without the general appreciation of the reasonableness and wisdom of the measures on the part of the community.

The recognition of the importance of mycology on the part of Governments has been followed by similar recognition on that of the general public. As a consequence of this, there exist to-day several associations of planters, and more than one private company engaged in agriculture, who maintain a scientific staff, including a plant pathologist, at their own expense. The Hawaiian Sugar Planters' Association may be cited as an instance of this. Moreover, the tendency on the part of private companies to employ their own mycologists is distinctly increasing. This tendency, although a step in the right direction, is not to be advocated without qualification. There is considerable probability that the money necessary would be much better spent in contributing to the maintenance of a larger number of such officers on the staffs of the various Government Departments. There are several reasons for this. In the first place, it is far easier to work in a large and properly equipped central laboratory than in small isolated ones. At the same time, the work receives material assistance from the concentration of effort, the free access to literature from all parts of the world, containing information on mycological subjects, and the sympathetic intercourse between men engaged in similar study, all of which are only obtainable at a central laboratory.

The increasing demand for plant pathologists makes it important that some sufficient means should be found for supplying properly trained men, and in this it would be of great assistance if the Universities would provide adequate courses of instruction, not only in the methods of mycology and in those of its application, but also in general tropical agriculture. The demand for such men will in course of time become limited, but it will always be constant. Such a training might with advantage be followed by a year's research work at the laboratory of one of the tropical Departments of Agriculture. Facilities for this exist at Pusa in India, and also in Ceylon, and Java, for the East, and in the Imperial Department of Agriculture, for the West.

Although very rapid progress has been made in recent years, both in the actual knowledge of plant diseases, and in the recognition by the world at large, and by Governments in particular, of the importance of this, yet much more work must be done, and many more men must be employed, before the full advantage of the scientific knowledge which is even now available can be obtained by agricultural communities.

DRY FARMING IN INDIA.

In certain parts of India a good crop is obtained by cultivators with 15 inches of rain if it is properly distributed, and there are many cereal and other crops which are suitable for dry land cultivation. But a systematic knowledge of each of the operations which go to make dry farming possible is highly necessary to enable the Agricultural Departments to see whether local methods of dry farming are susceptible of improvement. In 1908 the Department of Agriculture, Bombay, commenced experiments in this connexion at Rahuri in Ahmednagar district which has an average rainfall of about 20 inches. These experiments have since been transferred to a plot near Ahmednagar for more convenient supervision. They are being conducted on the following lines: (1) to increase the capacity of the soil to store water, (a) by deeper and more thorough preparatory tillage, (b) by packing the soil by subsoil packer and heavy roller; (2) to prevent evaporation by better intertillage; (3) to allow the individual plant to get more water by thinner seeding and wider spacing and thus admit of more nearly perfect development; (4) to assist germination by (a) moistening seed, (b) firming after planting; (5) to attempt to increase the amount of stored water by bunding and impounding. Deeper ploughing before the rains for a 'rabi' crop has been found to give an increased yield of about 60 per cent. By practising interculture every week from sowing time till the plants are too large for passing bullocks between them, a substantial increase in the yield was obtained. With the use of the drill 18 inches apart the results obtained were much better than with the 9 inches drill. The increase in the yield by the reduction of the seed rate to half gave striking results, the yield being increased by 75 per cent. This might be an advantage in localities where grain has a higher value than fodder.

In view of the importance to India of dry farming, steps have been taken for the representation of the Government of India on the International Dry Farming Congress of America, and the Inspector General of Agriculture has been made Vice-President for the Indian Section of the British Empire with Mr. H. C. Sampson, Deputy Director of Agriculture, Madras, as corresponding Secretary. (*Report on the Progress of Agriculture in India for 1909-10*, p. 75.)

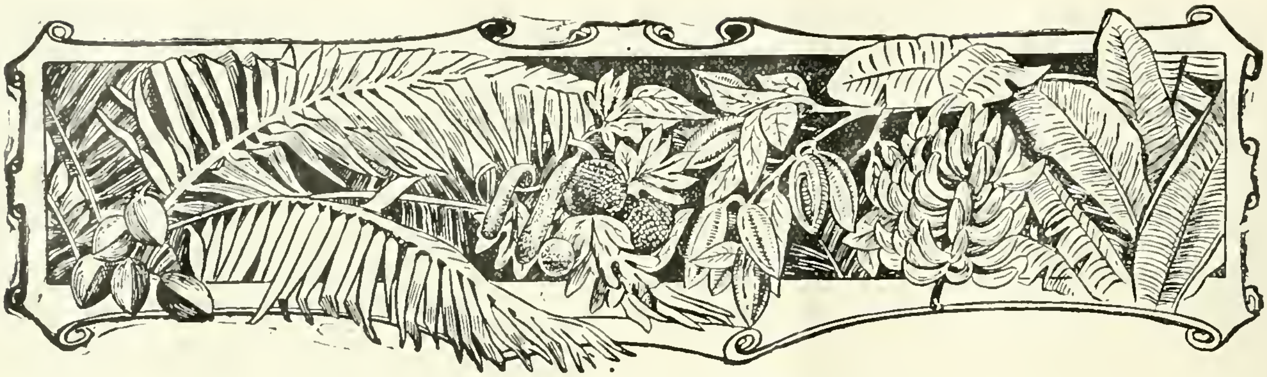
LEGISLATION AGAINST NOXIOUS WEEDS.

The subject of legislation against noxious weeds periodically arouses interest in parts of the West Indies, when various suggestions are put forward in connexion with it. In relation to proposals for such legislation, the following passage contains information of importance; it is taken from Farmers' Bulletin No. 54, of the Transvaal Department of Agriculture, entitled *Noxious Weed Regulations*, which has been received through the courtesy of Mr. J. Burtt-Davy, Government Agrostologist and Botanist for the Department of Agriculture of the Union of South Africa:—

At congresses and meetings it is sometimes suggested that the Government is not taking sufficiently active measures to cope with the noxious weeds of the country, and many additions to the list have been suggested.

I am convinced, however, that in such matters it is best to pursue a conservative policy. It is an easy matter to proclaim a weed as noxious, but a very different thing to enforce the law, especially in a country as thinly populated as South Africa. To tax the farmer heavily for the eradication of weeds, before it is well established and his farm improved and well stocked, might greatly hinder agricultural development. Moreover, weeds like the Mexican marigold (*Tagetes minuta*), cosmos (*Cosmos bipinnatus*), and darnel (*Lolium temulentum*) may be kept in check with little difficulty by proper tillage of the soil. Better tillage would be to the farmer's advantage, but it would not be advisable to pass legislation to force him to till his soil. The remedy lies in the hands of the farmer himself: for such cases he does not need protection against his less enterprising neighbour.

With burweed, cockle-bur and dodder, and some other weeds, however, the case stands on an entirely different footing. These weeds ruin the veldt for grazing purposes; they damage wool and mohair, two staple products of the country; they cannot be eradicated by ordinary farm practice, but extra labour and extra expense, of an unremunerative character, are required to get rid of them. Against such pests, therefore, it is desirable for the State to legislate.



FRUITS AND FRUIT TREES.

ADDITIONAL METHODS OF VEGETATIVE PLANT PROPAGATION.

The Seedling-inarch and Nurse-plant Methods of Propagation is the title of a Bulletin (No. 202) that has just been issued by the Bureau of Plant Industry of the United States Department of Agriculture. It describes methods that are stated to be inexpensive, and of such simplicity that they can be employed by persons who do not already possess a knowledge of plant propagation. The claim is made that their adoption will bring about the saving of much time in determining the value of varieties of plants about which little is known. They are also said to be useful in crossing experiments; as plants propagated by their aid produce flowers much sooner than if they were growing on their own roots alone. It appears, however, that the most remarkable feature of the methods described is the certainty with which satisfactory unions of stocks and scions may be obtained, even in the case of plants which have not so far shown themselves to be capable of being propagated by grafting or budding.

Reference is made to the delay of the cultivation of the mango on a large scale, that has arisen from the want of inexpensive and neat methods of propagation, and there is also mention of the somewhat similar experience with cacao. In the latter connexion, the Bulletin adverts to Pamphlet No. 61 of the Department Series, entitled The Grafting of Cacao, by J. Jones, Curator of the Botanic Station, Dominica, in which a method is described by which cacao plants may be propagated by inarching, at the comparatively low price of 3*d*. each, and draws attention to the fact that, where old mango trees are in existence, there is no reason why this plant should not be propagated almost as cheaply. The bulletin goes on to describe new methods for the vegetative propagation of about half a dozen plants. Of these the mango (*Mangifera indica*), the mangosteen (*Garcinia Mangostana*), and the litchi (*Nephelium Litchi*) will be dealt with here, as being of more particular interest.

PROPAGATION OF THE MANGO BY INARCHING. When the seedlings have attained a diameter of about ¼-inch, they are taken from the pots, together with the ball of soil around the roots. The part of the soil, generally near the top, where there are no roots, is removed, and the ball is covered with old cocoa-nut fibre, decomposed staple manure or something similarly useful. A piece of thick cloth sacking about 10 inches square is then spread out and covered with some of the cocoa-nut fibre or other material, the ball of earth is placed on the sacking, which is then wrapped round it, soil being packed in where required while this is being done; finally the sacking is secured firmly with a piece of string. In this way the seedling and the soil are obtained in the form of a handy package weighing about 1 lb., which can be tied anywhere in a tree or supported on stakes stuck in the soil: there is no need for the erection of a staging. The directions for inarching are given in the following paragraph, taken from the Bulletin.

First select the branchlet to be inarched, taking care that the diameter of the stem is not greater than that of the seedling stock. It should be fairly well ripened and have several healthy leaves Make a cut in the stem, beginning at a point 2 to 3 inches from the terminal bud; in taking a slice from the stem, cut into the wood not more than one-third of its diameter. The slice removed may be about 2 inches in length; any leaves which hinder this operation should first be cut off. Make a cut of similar length and depth near the base of the stem of the seedling. Bring the stock and scion neatly together, the bark meeting on both sides if possible, and tie firmly with a piece of soft string or strand of raffia. After this is done it only remains to secure the ball of the seedling to the lower part of the branch; or if the inarched branch is a short one, the ball may be tied to the older wood. It will often happen that the seedling will need no further support; but when necessary a cane stake for further tying may be utilized, or a strong cord may be fastened to a stout stake driven into the soil in a convenient position and the inarched seedlings attached to it. Many little devices of like nature will suggest themselves to suit the peculiarities of each mother tree on which it is desired to make inarches.

The subsequent attention required by the plant is very careful watering of the seedling stocks until they have united with the branches. When union has commenced, the stock is cut half way through immediately above the union and on the opposite side; the branch should then be cut one-third of the way through, immediately below the union; the branch and the top of the seedling are finally cut through when it has been ascertained that complete union has taken place.

PROPAGATION OF THE MANGOSTEEN BY INARCHING. For this plant, the method just described for the mango is reversed. It has been found that the most promising species of Garcinia to be used as stocks for the mangosteen are *G. tinctoria*, *G. Morella* (Ceylon gamboge) and *G. Livingstonei*; of related plants of different genera, *Platonia insignis* has given the best results. The propagation of seedlings for inarching the mangosteen is similar to that for the mango, the most important difference being that the roots of the former plant need only be kept alive sufficiently long to give some support to the seedling while the union is being made. The following paragraph gives the instructions that are detailed in the Bulletin for carrying out the inarching.

Place the stem of the seedling mangosteen close to that part of the stem of the stock where it is desired to make the union, then tie the root of the seedling, enclosed in a piece of sacking, to the stem of the stock plant with a strand of raffia. After making the tie, and before cutting the ends of the strand of raffiia, put in the wire support, and make secure with raffia. Cut a slice from the stem of the stock, going into the stem about one-third of its diameter. The length of the slice is regulated by the length of available stem in the seedling; 2 inches is desirable, but less will suffice. Next, remove a piece of the stem of the seedling exactly opposite the cut in the stock, exercising extreme care in making one side of the cut on the scion fit evenly with one side of the cut on the stock. Pay no attention to the other edges of stock and scion, but bind firmly together and the operation is complete. If the inarching is performed in summer, and this seems the best time, make a puddle of adhesive clay, mixing it with some raw cotton which has been cut up fine with a pair of shears, apply this around the parts to be united and allow it to dry. The clay serves two purposes—it excludes air and it absorbs all the sap exuded from the cut portions. The raw cotton prevents the puddled clay from disintegrating while the union is taking place.

It is stated to be useful for a few leaves on the stock to be left growing after the removal of the top of this, and of the roots of the seedling. The removal of the top of the stock is brought about by cutting it partly through on the side opposite to the seedling and then by severing it completely, ten days later. Where it is intended to remove the roots of the seedling, the soil in which this is growing should be allowed gradually to become dry. It is a matter of some interest that seedlings made to grow on stocks in this way often show a tendency to form roots of their own.

PROPAGATION OF THE MANGOSTEEN BY THE NURSE-PLANT SYSTEM. In this method, both the seedling and the plant to which it is attached (the nurse plant) are permitted to grow on their own roots after union has been effected. The instructions given for this method of propagation are contained in the following paragraph, taken from the Bulletin.

The nurse plants of *Garcinia tinctoria* should be grown in small-sized pots, not larger than 4 inches, previous to placing them in the 6 inch size. When getting their final shift the ball should be manipulated so that the stem of the seedling will be a little to one side, so as to make room for an empty 3-inch pot to be placed in the soil beside the stock plant. When the stock plant is established in the soil, after perhaps three or four weeks, that is, when the new roots have had time to develop, the empty 3-inch pot is removed and the root of a mangosteen taken from a pot of the same dimensions is placed in the empty space and the soil carefully but firmly rammed around it. Generous treatment will result in further development of the root action of both mangosteen and nurse stock. They are then inarched, and when the union is satisfactory, which will be in about five weeks, the top part of the stock above the inarch may be gradually removed. The roots of both nurse plant and scion are left undisturbed because, if the stock dies, the root system of the seedling mangosteen will probably have become strong enough to sustain the plant by reason of the assistance given to it by the nurse plant during its precarious stage; and if, on the other hand, the roots of the seedling succumb, it probably will be due to the fact that the stock is supplying enough root action for the mangosteen.

It is not claimed that either of these methods for propagating the mangosteen will continue to show success when the plants are placed out in the open; further work is required to determine this, and the present information is only published on account of the promising nature of the results obtained so far.

PROPAGATION OF THE LITCHI BY INARCHING. This is very similar to that already described for the mango. The following account of the details of the method is taken from the Bulletin.

The method of propagation in its essential features is like that described for the mango. The seedlings to be used as stocks are taken from 3 inch pots, the soil on the upper part of the ball removed, and a large handful of cocoa nut fibre secured around the roots, by wrapping in a piece of sacking about 8 inches square. These seedling stocks are fastened to the stout branches of the parent litchi, or to stakes set in the soil of the pot. The branchlets are then inarched to the seedlings and tied with raffia, and the parts to be united are covered with clay. During the few weeks occupied in uniting, the roots of the seedlings make rapid headway in the cocoa-nut fibre. The unions are invariably good when seedlings of the same species are used. If the compound leaves on the scion are large, it is advisable to trim them back slightly before severing the inarch from the parent tree. After severing, the inarched plants may be potted and placed in a close frame in the greenhouse, or they may be put in shallow boxes and the roots covered with cocoa-nut fibre, the atmosphere being kept moist. The sacking should not be removed, because, when the scions have united, the white roots of the seedlings will be found to have pierced the covering, so that to remove this sacking would necessarily injure the roots. The balls should be put in 5-inch or 6-inch pots, as may be necessary; the soil should consist mainly of decomposed leaves.

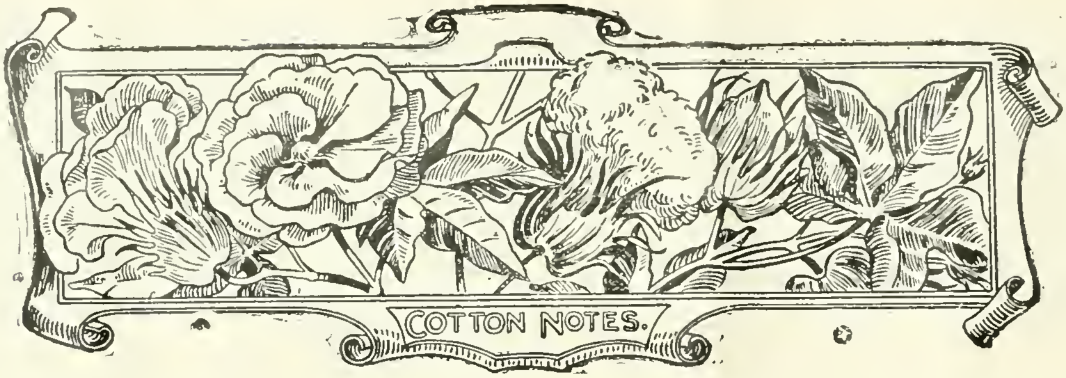
It seems, as is claimed in the Bulletin, that the adoption of these methods is likely to result in the simplification of methods of propagation, and the saving of time in obtaining planting material, and it appears that extension of the methods would be useful, both in regard to the future propagation of plants in this way, and its application to other species.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture returned to Barbados by the R.M.S.'Clyde' on May 17, 1911, from Grenada, after a visit to that Colony for the purpose of conferring with His Excellency the Governor of the Windward Islands on general agricultural matters.

The Secretary of State for the Colonies has been pleased to appoint Mr. P. T. Saunders, M.R.C.V.S., as Veterinary Officer on the Staff of the Imperial Department of Agriculture for the West Indies. The duties of this Officer will be to investigate the veterinary conditions in the colonies whose agricultural departments are linked up with the Imperial Department of Agriculture.

Mr. Saunders left England on May 24, and will arrive in Barbados, to take up the duties of his appointment, on June 5, 1911.



WEST INDIAN COTTON.

The article entitled The Cotton Market and Cotton Planting, which appeared in the *Agricultural News* for April 29, p. 134, was subsequently submitted, with correspondence on the subject, to the British Cotton Growing Association and Messrs. Wolstenholme and Holland, for criticism and suggestions.

A telegram has now (May 25) been received from Manchester, strongly advising that there should be no reduction in acreage in respect of cotton planting for the coming season.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date May 8, with reference to the sales of West Indian Sea Island cotton :—

At the present reduced level of prices there has been more disposition to purchase Sea Island growths, and some business is passing in medium qualities at about 16*d*., with occasional sales of superior cotton from 17*d*. to 18*d*.

There is still, however, a considerable stock of unsold cotton in Charleston, which acts as a drag upon the market, particularly as spinners are afraid of too extensive a cultivation of the new growth of fine cotton which is being cultivated in Egypt, and which they are afraid may flood the market next season.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending May 6, is generally as follows:—

There was some demand this week, taking about 200 bales of odd bags of Fully Fine and several crop lots of Fully Fine and extra Fine, running the sales up to about 300 bales. There is some inquiry for the remaining crop lots, which may result in further sales, and also for the odd bags of Fully Fine. The slightly off, and the off and stained cotton of the crop of which the stock is now largely composed, continue to be neglected, but Factors are refusing to further lower their asking prices, hoping in time there will be some demand for them.

ANNUAL REPORT OF THE BRITISH COTTON GROWING ASSOCIATION, 1910.

A copy of the Sixth Annual Report of the British Cotton Growing Association, for the twelve months ending December 31, 1910, has just been received, and it is the purpose of this article to draw attention to some of the points presented that are of more general interest.

After giving an account of changes that have taken place in connexion with the personnel of the Association, the Council of the Association records its thanks to His Majesty's Government and to the officials of Government Departments, both at home and in the colonies, for the great assistance rendered in many ways, and draws attention to the usefulness of the conferences that have been held at the Colonial Office. Further, acknowledgement is given of the indebtedness of the Association for the support and assistance of the President of the Association, the Right Honourable the Earl of Derby, G.C.V.O.

Reference is made to the promise of His Majesty's Government, in 1909, to effect a grant in aid of £10,000 per annum for a period of three years to assist in the pioneering and missionary work of the Association, on condition that the latter should raise additional capital to the amount of £150,000, and establish and maintain seven pioneer ginning and buying stations in West and East Africa, at the same time supplying, free of charge, seed for sowing. It is now known that the attempt to raise the capital required has failed, so that other arrangements may have to be made in relation to the matter.

No new work was undertaken in 1909, owing to the inadequacy of the funds at the disposal of the Council, so that no large results were expected for 1910. Satisfactory progress has been made, nevertheless, and particulars are given in the report of schemes which were under consideration provided that the additional capital necessary to gain the Government Grant was obtained. In relation to such matters, it is pointed out that several subsidiary companies have been formed already, with the assistance of the Association. These are: The British Cotton Ginning Company, Ltd., and the British East Africa Corporation, Ltd., each with a capital of £100,000; the East African Cotton Syndicate (1911), Ltd., with a capital of £35,000; and the Rhodesia Cotton Company, Ltd., and Ernest Thorne, Ltd., Barbados, with a capital of £30,000 and £10,000, respectively. The total amount of the capital of these companies is £275,000. A large number of other cotton-growing companies of a similar nature has been floated separately, and it is proposed by the Association to assist in the formation of additional companies as the occasion arises. Matters of this kind have relation to a proposal that a large company should be formed with a Government guarantee, the plan being for the capital to be raised on a commercial basis while the Government would provide capital for railways and other means of transport, and the funds for experimental and scientific work. The opinion is given, however, that the Government should only be approached if success was obtained in raising the additional capital of £150,000 already mentioned.

The next part of the report has reference to meetings and conferences of the Council, and to the financial state of the Association. It is succeeded by a more detailed report on the work of the Association in the colonies. The chief general matters in this part of the report may be given here as follows.

INDIA AND CEYLON. The cultivation of Egyptian cotton in Scind has been disappointing, and it has been suggested that the Association might usefully establish an experimental plantation and a cotton buying and ginning centre for this district; the question is before the Secretary of State for India, and proposals are being awaited by the Council. The Secretary of State for India has also been approached on behalf of the International Federation of Master Cotton Spinners' and Manufacturers' Associations, with the proposal that every endeavour should be made to carry out, in India, the recommendations of the International Cotton Congress at Brussels. These recommendations are confirmatory of the opinions expressed in a letter addressed to Lord Curzon by the British Cotton Growing Association in 1904, a copy of which is given is an appendix to the report. In Ceylon arrangements have been made with a firm at Colombo to take over and work the ginning plant of the Association, and to act as its agents. (The results of this are noted on p. 172, below.)

WEST INDIES. The statement is made that the cotton-growing industry of this part of the world is progressing in a satisfactory manner, and that though there has been no large increase in the cotton-growing area, this is not without its advantages, because of the circumstance that the demand for the best qualities of Sea Island cotton is not unlimited. The report states further, in regard to this demand: 'The Council are watching this question most carefully, and would at once advise the Imperial Department of Agriculture if they thought there was any danger of permanent over-production. As far as can be judged at present, there seems to be no fear of not being able to dispose of the whole of the West Indian crop at prices which are satisfactory to the planter.'

WEST AFRICA. Exceptional harmattan winds during the end of the growing season of 1909 caused severe damage to the crop, which was, however, of satisfactory quality.

GOLD COAST. The small quantity of cotton produced caused it to be decided to abandon the work. The existence of better possibilities in the Northern Territories, however, caused arrangements to be made to open up a new centre at Tamale, assistance being given at the same time in the form of a contribution from the Imperial Government. It is stated that the quality of the native cotton is very satisfactory, and reference is made to the valuable aid that has been afforded by the Chief Commissioner of the Northern Territories.

LAGOS. The crop suffered from the harmattan winds mentioned above, so that it reached only 6,100 bales, whereas the output in 1909 was 12,000 bales. Though the quantity was thus inferior to that of the previous crop, there was no decline in the quality of the cotton, most of which met with ready disposal on arrival. Much more satisfactory prospects exist for the coming crop, and a matter of use is that the Council has been able to renew its buying agreement with the Lagos merchants. In relation to this, it is given as the conviction of the Council that the co-operation of the mercantile community is necessary in other colonies, as well as in Lagos.

SOUTHERN NIGERIA. Here again, the crop suffered on account of the harmattan winds; nevertheless, the quality of the cotton is excellent. Much more promising reports have been received in relation to the next crop.

NORTHERN NIGERIA. It was in this territory that the greatest damage was suffered from the harmattan winds, which adversely affected not only cotton, but all other crops, so that there was actual starvation in many districts. After giving information concerning ginning and transport arrangements, the report states that the quality of the Northern Nigeria cotton is similar to that of Lagos, which is rather high in colour and rough in fibre, but extremely strong, and an excellent substitute for middling American. The product from Northern Nigeria is, however, much whiter; it is of excellent grade, and most suitable for Lancashire spinners.

BRITISH EAST AFRICA. The main work of the British East Africa Corporation, which is receiving very large financial support from the Association, has been conducted in Uganda, so that no great progress has been made in cotton-growing along the coast. A matter of no little interest is that the Council of the Association has recently discussed with Colonel Sir Percy Girouard, R.E., K.C.M.G., the possibility of developing largely the country near the Juba River, and a proposal has been made to form a small syndicate for the purpose of carrying out preliminary experiments. The syndicate would also investigate, under the best expert advice, the possibilities of adopting a very large irrigation scheme, to cost £1,000,000 or more.

UGANDA. The statement is made that cotton-growing in Uganda continues to progress by leaps and bounds, and it is expected that the crop for the season ending March 31, 1911, will be about 15,000 bales—the largest production in any one season from any of the new areas opened up by the Association. This remarkable progress, during the five years, is attributed largely to the efforts of the late Governor, Sir H. Hesketh Bell, K.C.M.G., and his Staff, and the remark is made that: 'for rapid results it is essential that one should receive the active and hearty co-operation of the Government officials.' There is the confident expectation of the Council that the rapid progress will be continued, and that dependence can be placed on Uganda shortly to produce large quantities of cotton.

NYASALAND. During 1910 the success in cotton growing has increased and the quality is excellent, with most satisfactory prospects for the future, and thanks are expressed to the Government Inspector of Agriculture for his assistance.

RHODESIA. Arrangements have been completed for co-operation with the British South African Company and this fact, together with the help that is being given by the Administrator of Northern Rhodesia, should ensure good progress. From other parts of Africa the exports have been confined to samples which show that a very good cotton can be grown.

EGYPT AND THE SUDAN. Attention is given to the problem of the falling off of cotton production in Egypt which took place up to the last crop. In regard to the Sudan, important experiments are about to be commenced with a view to finally growing cotton under irrigation.

The remaining portion of the report states that the Council has been in communication with parts of the Empire other than those mentioned, but that no important developments have taken place so far. Finally, the satisfactory progress that is being made in regard to the purely commercial work of the Association is indicated, and attention is drawn to the large numbers of new ventures mentioned in the report. The claim is made that the Association has, now, 'proved beyond dispute that given time and money the Empire can produce all the cotton that Lancashire requires.'

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. X. SATURDAY, MAY 27, 1911. No. 237.

NOTES AND COMMENTS.

Contents of Present Issue.

The editorial deals with Mycology in Relation to Administration. It shows the gradual growth of interest that has taken place in regard to practical work in connexion with the prevention of plant diseases, and indicates the most expedient ways in which such work may be undertaken.

On page 163 there is presented a short article on dry farming in India.

The same page contains an interesting note on legislation in South Africa against noxious weeds.

Attention is drawn to a review of the Annual Report of the British Cotton Growing Association, 1910, on pages 166 and 167.

The Insect Notes appear on page 170. They contain two articles, dealing respectively with Economic Entomology at the Imperial College of Science and Technology, and with experiments that have been made recently in the United States with the moth borer of the sugar-cane.

Two short articles, containing information of present interest, are given under the heading Rubber Notes, on page 171.

The Fungus Notes, on page 174, deal with arrowroot diseases, as considered in a memorandum to the Imperial Commissioner of Agriculture from the Mycologist, after a recent visit of the latter officer to St. Vincent.

Calcium Cyanamide and Nitrate of Lime.

In the last volume of the *Agricultural News*, and on page 57 of the current one, notes have been given on trials with calcium cyanamide and nitrate of lime, undertaken for the purpose of comparing their respective manurial values, and of finding the relation between these and the similar values of nitrate of soda and sulphate of ammonia. Notes on further work of the same kind are given in the *Experiment Station Record* of the United States Department of Agriculture, Vol. XXII, No. 8. The first investigations mentioned showed that there was little to choose between nitrate of lime and sodium nitrate, in quantities containing equal amounts of nitrogen, for beets, Irish potatoes, rye, oats and barley; if any difference was found, it was slightly in favour of the sodium nitrate.

The second paper deals, among other matters, with the use of calcium cyanamide, nitrate of lime and nitrate of soda as manures for sugar beet. It was shown that, when these were applied so as to give about 27 lb. of nitrogen per acre, the first and the last manures yielded very nearly the same results, while the returns with nitrate of lime were slightly better.

Sterilization of Tobacco Seed Beds.

Investigations into the sterilizing of the soil in beds for raising tobacco from seed have been conducted recently, at the experiment stations of the Tobacco and Cotton Division of the Transvaal Department of Agriculture. An account of the work in the *Agricultural Journal of the Union of South Africa*, Vol. 1, p. 77, shows that the observations were made on plots containing soil treated in four different ways, a control plot being provided in each case. The methods of sterilization employed were by burning wood or other waste material on the top of the soil, heating the soil in suitable receptacles, passing steam through the seed bed, or by pouring boiling water on the soil in the bed: in the last case two applications were made at an interval of three or four days.

The account of the experiment indicates that the first method of sterilization gave the best results, while this was followed immediately by the second, which was almost as effective. The steaming process came third; that in which hot water was used proved to be virtually useless. The particular forms of sterilization to which the trials had reference were the destruction of weed seeds, and of eel worms.

A general review of the results shows that the plants in the soil treated according to the first method usually made the best growth; this method and the second, namely, heating the soil in a suitable vessel, seemed to be most effective in regard to the destruction of eel worms.

In the interpretation of the results, however, no attention is given to the possible effects arising from the partial sterilization of the soil in relation to its microbial contents (see *Agricultural News*, Vol. IX, pp. 17, 33 and 369); the superiority of the growth in the plots sterilized by heating in the first way described, would seem to indicate that the destruction of the protozoal organisms in the soil had led to increased fertility, arising from the added activity of the nitrogen-fixing organisms, in accordance with the indications of the work of Russell and Hutchinson, described in the second of the references that have just been given.

Exports of Ceylon, 1910.

The last report of the Ceylon Chamber of Commerce shows that the amount of tea exported in 1910 was 181,682,817 lb.; the quantity for the previous year was 191,860,059 lb. The exports of rubber were similarly, 1,512 and 666 tons, and of cacao 70,278 cwt. and 80,107 cwt.

In regard to cocoa-nut products, the exports for 1910 and 1909 were as follows in order: cocoa-nut oil 616,377 and 581,478 cwt.; copra 766,906 and 772,032 cwt.; desiccated cocoa-nuts 27,201,074 and 25,978,844 lb.; cocoa-nut poonac (cake) 309,589 and 253,709 cwt.; cocoa-nuts 16,114,088 and 18,135,658. The quantities of citronella oil were 1,762,919 and 1,573,932 lb.

The Board of Trade Journal for March 23, 1911, from which the above figures are quoted, states also that, according to the Annual Report of the Planters' Association of Ceylon for 1910, the exports of tea for the present year are estimated at 183 million pounds, while those of rubber are expected to be about 2,232 tons.

Effects of Nitrogen, Potash and Phosphates on the Growth of Plants.

An investigation has been undertaken recently in connexion with this subject, the experiments being performed in culture solutions which contained nitrogen, potash and phosphate in different proportions; the results of these are given in the *Botanical Gazette*, 1910, p. 1.

The plants grew best, as may be expected, when all three nutrient elements were present; the best development was in solutions containing between 10 and 30 per cent. of phosphates, between 30 and 60 per cent. of nitrate, and between 30 and 60 per cent. of potash. Where the best growth was made, the least difference took place in the proportions of the above food elements, while, at the same time, the whole strength of the solution suffered much more alteration than when the growth was poorer.

In a general way, the tendency seems to be for the plant to remove the material from the solutions in those proportions which would lead to its most favourable development. Other indications of interest were, that the greater the amount of any one constituent in the solution, the larger is the extent to which it is taken up by the plant, and that while the absorption of phosphate is low and that of potash high at first, the greatest response toward the end of development arises from the presence of nitrates. It is easily seen that the last of these matters indicates that very young plants require phosphates to a comparatively small extent, while their need for potash is correspondingly great.

The Use of Potassium in the Body.

An abstract of a paper given in the *Experiment Station Record*, Vol. XXIV, p. 172 (February 1911), gives a note on work which was undertaken for the purpose of investigating the changes undergone by potassium compounds in the human body. It was shown that, if the amount of common salt in the diet is increased, there is also an increase in the quantity of potassium lost from the body; it is therefore concluded that the taking of large doses of common salt may enable the body to lose correspondingly large amounts of potassium. It seems to be certain that, when the weight of the body increases, the excretion of potassium is likely to increase also; this is of interest, in relation to a theory that the larger the amount of potassium in the body, the larger is the breaking up of sugars and starches, so that in this case there is a decrease in the tendency to form fat, and therefore to gain in weight.

The experiments show that the behaviour of sodium was quite different in this connexion: there was never an increased loss of sodium when gains in weight were being made. Finally, in contradistinction to sodium and calcium, potassium seems to be an element which tends rather rapidly to leave the body than to remain in it.

Cocoa-nut and Ground Nut Meals for Horses.

Circular No. 168 of the Bureau of Animal Industry of the United States Department of Agriculture gives an account of a short test that was conducted by this Bureau, early last year, for the purpose of finding the effect of substituting a mixture of 2 parts cocoa-nut meal and 1 part ground nut meal for oats, in feeding horses. The animals employed in the trials were ten Morgan yearlings and four heavy work horses. The test was of some interest financially as whole oats cost $43·75 per ton delivered, and cocoa-nut and ground nut meal $28 per ton at the railway station, which is distant 2 miles.

None of the horses took eagerly to rations containing the meals, and the team of working horses was off its feed for the first three weeks. There was no difficulty otherwise, and the animals remained in good condition.

In the case of the yearlings the gains were larger and cheaper with cocoa-nut meal and ground nut meal, and the best returns were obtained where all the oats in the ration was replaced. Fairly satisfactory returns were obtained with the work horses; this was in regard to a saving in cost of feed rather than to increases in weight.

It is considered that the test indicates that, at the prices paid for the food stuffs at the time, cocoa-nut and ground nut meal, in the proportion of 2 to 1 by weight, are capable of replacing oats, in feeding young horses, and may be found advantageous for work horses when they have become accustomed to the new ration.

INSECT NOTES.

ECONOMIC ENTOMOLOGY AT THE IMPERIAL COLLEGE OF SCIENCE AND TECHNOLOGY.

In a recent number of the *Agricultural News* (see Vol. X, p. 122), an article entitled The Control of Insect Pests gave an account of an address delivered by Mr. H. Maxwell-Lefroy, Entomologist to the Government of India. Mr. Lefroy, who is on leave in England, is offering a series of lectures with laboratory work, on entomology, extending over a period of fifteen months; the first lecture was given on March 2 last.

Circulars which have recently been received at the Head Office of the Imperial Department of Agriculture present an outline of the courses offered, which are five in number. These afford instruction as follows:—

Course 1, which provides a general introductory course of lectures, and practical work of an elementary nature dealing with the whole subject, was planned to consist of about twenty-five lectures, given on two days in each week from March 2 to March 30, and from April 25 to June 18.

This course, repeated in the Michaelmas term beginning October 3, forms Course 2.

Course 3. A special course for those intending to take up economic entomology abroad or at home. This course is especially arranged for those desiring to qualify for posts in agricultural and other departments. It will deal with practical matters which come within the scope of entomological administration, and will include (a) pests of the world's crops; (b) pests of domestic animals, etc ; (c) use and value of natural checks; (d) legislation—preventive and repressive; (e) the work of the Government Entomologist; (f) technique and office methods; (g) illustrations, how prepared and printed; (h) entomological literature.

The course will be held three times a week during July and August 1911, at times arranged to suit intending students.

Course 4. Special course of lectures and practical work on Diptera on Mondays, Wednesdays and Fridays, at 10 a m. to 1 p m., during July 1911.

Course 5. Advanced course of general entomology in continuation of 1 and 2, consisting of about fifty lectures, with practical work, to be given on Tuesdays and Thursdays, from 5 to 6 p.m., during January to June, 1912, beginning about January 15, 1912. The time for the practical work will be arranged later.

It will be seen that there is thus provided an excellent opportunity for any who desire to obtain instruction in entomology from an experienced and successful entomologist, and it is hoped that advantage will be taken of it.

EXPERIMENTS WITH THE MOTH BORER.

The United States Department of Agriculture has established a special experiment station at Audubon Park, Louisiana, for the purpose of investigating the insect pests of sugar-cane. According to the *Louisiana Planter and Sugar Manufacturer* for April 8, 1911, this special experiment station will co-operate in carrying out experiments to devise cultural methods which shall reduce the numbers of the moth borer and the amount of loss from its attacks.

It is planned to establish demonstration areas, with the aid of planters, on private estates where certain recommendations can be carried out.

In noting the recommendations, readers of the *Agricultural News* should remember that in the Southern States, during the winter season when no cane is growing, the moth borer hibernates in the trash in the field, and burning the trash thus destroys many of the insects.

The experiments are likely to be of interest to planters in the West Indies, as they show how such an investigation may be carried out; but they do not seem likely to be useful in the control of the moth borer in these islands, since this insect is always to be found in the growing cane, for here cane is available for its food during the entire year.

In general, the owners of the land loaned for the demonstrations in Louisiana will be requested to carry out the following recommendations :—

(1) In harvesting, to cut the cane so that the tops will fall on the rows and not in the middles. After cutting, the trash will be raked out of the middles upon the rows, and after the tops are thoroughly dry, burned off clean. This will destroy all borers in the trash, and will also check the sprouting of the stubble.

(2) After burning, the ground must be gone over carefully; all pieces of cane left lying on the ground must be picked up or buried; all further trash that may act as a favourable wintering place for borers must also be removed.

(3) All planting in the demonstration area must be done in the autumn. This is to do away with windrowed cane, which gives the borers the best possible opportunity to pass the winter successfully. Also, adult cane borers cannot escape from fall plant cane, as they are not strong enough to make their way to the surface, and they thus perish in the ground.

(4) No cane is to be windrowed within 100 yards of the limits of the demonstration area. This is to prevent moths from coming from the windrowed cane and infesting the demonstration area

(5) All ditches and turnrows in the demonstration area must be thoroughly cleaned up.

BROOM CORN IN THE UNITED STATES AND QUEENSLAND.

The April number of the trade publication *Brooms, Brushes and Handles* states that the results of the 1910 crop of broom corn in the United States, have caused discouragement to planters, so that there will probably be a decrease in the area of this plant grown during the present year. It is considered, however, that the policy to be followed should be to keep a good average area in the crop year by year, to make additional efforts to produce good plants, and to take special care of the product when it has been obtained.

In regard to Queensland, it is stated in the *Queensland Agricultural Journal* for March 1911 that the supply of broom millet, as it is more correctly called in that State, has been quite unequal to the demand, so that prices have risen to £40 per ton, or more, for fibre of good quality. The average yield of fibre in Queensland is 600 lb. of broom and 1,500 lb. of seed, per acre, within four months after sowing, while a second crop can be obtained three months later, giving an additional 500 lb. of broom.

In order to meet the demand for broom in Queensland, amounts to the value of £8,000 have to be imported every year. 'The average annual demand in this State amounts to nearly 300,000 lb., and the supply from 200 acres planted amounted to 139,772 lb., of a value, at rates ruling at the end of the financial year of 1910, of £1,455.'

RUBBER NOTES

INTERNATIONAL RUBBER AND ALLIED TRADES EXHIBITION.

The last number but one of the *Agricultural News* contained an announcement that the Kolonial Wirtschaftliches Komitee of Berlin is offering its gold medal, for services rendered to colonial economic development, at the above exhibition, for the best process of obtaining and preparing rubber from Manihot and Funtumia. It is learned that Ficus rubber has been added, and the following rules for the competition are now issued :—

1. The competitors shall show their methods at the Exhibition by samples of prepared rubber, which shall weigh not less than 10 lb., also samples of the tools and appliances, together with full and detailed descriptions and drawings or photographs showing the processes by which the rubber is extracted, coagulated and prepared.

2. The competing exhibits will be brought together in one collection, and located in any part of the Exhibition that the management may deem suitable.

3. Not only private persons, but also companies and institutions may compete, provided they or the Government of the country in which they are domiciled are exhibiting in the ordinary way. Such Governments are also eligible to compete.

4. The medal will be the absolute property of the successful exhibitor, and will be presented to him at the International Rubber Exhibition Dinner, which will be held in London during the course of the Exhibition.

5. Judges have the right of testing every sample, tool or appliance; their decision shall be final and without appeal.

6. The management of the Exhibition will take care to protect the exhibits, but will not be responsible for loss or damage

All entries must be made to the Award Committee, International Rubber and Allied Trades Exhibition, Ltd., 75, Chancery Lane, London, W.C., by Thursday night, June 1, 1911. Entries should be sent by registered post, or be delivered by hand, so that a receipt may be given for them. Exhibits for competition must be sent direct to the Award Committee, Royal Agricultural Hall, Islington, London, N., but should not reach that building before June 15, and not later than June 20. Carriage must be paid on all exhibits.

TIME OF FLOW OF LATEX AND YIELD OF RUBBER.

The length of time which latex flows from a freshly made cut has a direct connexion with the yields on estates. It is unfortunate that the latex flows only for minutes, instead of hours. The length of time which latex flows is dependent upon many factors; some—the anatomy of the plant, the tissue tension and atmospheric pressure—are beyond our control, whilst others, such as water content of the latex, can be modified during collecting operations. The time is shortened by the dryness of the air, by heat and by sunlight. The former often necessitates the stopping of tapping operations in dry seasons, but can be partially controlled by the use of water from drip tins, to retard the coagulation of latex at the cut ends of the latex tubes. The bad effects of heat and sunlight can to some extent be minimized by choosing certain times of the day for tapping, and by combining this with compass tapping, while some intercrop can shade the trunks of the trees. Atmospheric humidity depends almost entirely upon the location of the estate, but something might be done to influence this in normally dry districts, by the retention of a definite proportion of the original forest to serve as a windbreak, or planting wind-belts or bushy intercrops that will have a similar effect. By thus impeding the circulation of air, there will be a partial retention of moisture that has come from the soil and from the leaves.

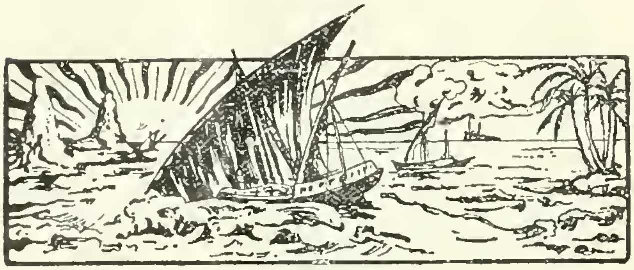
In some reports of tapping on the Amazon, reference is made to the renewal of the flow by picking off the scrap before it has become too thick; a second, and even a third flow, can sometimes be obtained by this means. Hart reported this in some of his Trinidad experiments, and Vernet also appears to have 'refreshed' the cuts twice on a certain day, with a gradually decreasing yield. In these experiments time enters as a factor, the interval being sufficiently long to permit of an accumulation of latex, of varying richness in caoutchouc, towards the cut ends of the latex tubes.

The subject is not so trivial as it may on first consideration appear. The larger the quantity of latex obtained per incision, the greater is the bark economy effected. So far, the only feasible operation appears to be to maintain open latex tubes by the passage of water alone, or water containing ammonia, along the tapped surfaces as soon as the flow begins to lessen. (*The India-Rubber Journal*, April 1, 1911, p. 24.)

MOLASSES AS FOOD FOR STOCK.

The *Bulletin of the Bureau of Agricultural Intelligence and of Plant Diseases*, International Institute of Agriculture, No. 2, pp. 307 and 308, contains reviews of three papers that have appeared recently in connexion with the use of molasses as food for stock. In the first of these, there is reference to a proposal that has been made for the protection of the trade in molasses for cattle-feeding in Germany. It appears that the doubtful value of many of the molasses feeding stuffs in that country has led farmers to distrust such foods to a very large extent. To correct this tendency, it is proposed that pure products containing molasses should be protected by adding the patented name Molassin to the names of the other substances in the mixture. The suggestion has also been made that a special commission should be appointed for the purpose of determining the guaranteed content of molasses and sugar in the products protected in this way.

The second paper has relation to feeding experiments with draft horses in Sweden, using molasses and Molassin, which in this case is a mixture containing four-fifths molasses and one-fifth pulverized peat. It was found that there was no advantage in the employment of the Molassin in the place of the molasses, as regards nutrition. An interesting indication was received to the effect that molasses, at any rate in limited quantities, gives in draft horses a greater amount of energy than was hitherto believed to be obtainable. The third paper describes experiments, with tank steamer molasses from Porto Rico, in regard to the digestibility of hay and of hay and concentrated foods. In the result, it was found that small amounts of molasses usually caused as much depression of the digestibility of the hay as large amounts, the loss having an average value of 8 per cent.



GLEANINGS.

From a communication received from the Superintendent of Agriculture, Barbados, it appears that the total area of cotton grown in that island during 1910 was 4,740 acres. Of this, 4,416 acres was planted in new cotton.

During last month, a meeting of peasant proprietors was held at Soufrière in St. Lucia, in connexion with the Prize-holdings Scheme, when fourteen entries for the next Prize-holdings Competition were received by the Agricultural Superintendent.

The report of the Government Veterinary Surgeon, St. Vincent, for last month shows that, of seventy-four animals which died in the island during that time, only one was found to have succumbed to anthrax. The deaths of cattle were twenty-three, and it was among these that the case of anthrax occurred.

The extent to which the planting of limes is being taken up in Dominica is indicated by a statement, on the part of the Curator of the Botanic Station in that island, that in response to an offer of 20,000 lime plants by the Agricultural Department, applications have been received from planters for no less than 50,000.

The distribution from the Antigua Botanic Station during April last included cane cuttings 1,200, lime plants 500, miscellaneous 79, different seeds 4 packages. Work for future distribution included the sowing of 2,500 seeds of Jéquie Manicoba rubber (*Manihot dichotoma*), received through the Imperial Department of Agriculture, and of about 5,000 lime seedlings in bamboo pots.

Information received from the Curator of the Botanic Station, Montserrat, shows that a considerable area of cotton has been planted between canes, in the Gages and Lees district of that island. This planting is, however, simply experimental at present, but should eventually afford interesting results in connexion with the consideration of the feasibility of its adoption.

In reply to an enquiry, the Curator of the Botanic Gardens, Dominica, states that, after making a very close examination of the cocoa-nut trees growing at the Botanic Station and Agricultural School in that island, and after obtaining information from several planters from different districts, it appears that Dominica is at present remarkably free from insect pests and fungus diseases of the cocoa-nut palm. It is further stated that no case has been recorded of trees dying from disease.

The late Mr. J. H. Hart's recently completed treatise: *Cacao: A Manual on its Culture and Preparation*, is to be published during this month by Messrs. Duckworth & Co. The price is 7*s*. 6*d*. net, and the book may be obtained through the West India Committee, 15, Seething Lane, London, E.C. A preliminary notice as to the publication of this work was contained in the *Agricultural News*, Vol. IX, p. 220.

A matter of some interest to producers and shippers of muscovado sugar has relation to the marking of bags, where these are used in the export trade. It is commonly recognized that by the time the bags reach their destination, whether in Canada or Great Britain, they are almost black in colour, on account of the separation of molasses from the sugar in them. The interesting suggestion has therefore been made that such bags should be marked with white paint instead of black ink, in order that the designations on them may be legible when they are required for reference at the port of entry.

The *American Sugar Industry and Beet Sugar Gazette* for April 1911 draws attention to an article in the *Réforme Economique* for February 10, 1911, which shows that beet sugar manufacturers in France are faced by a totally unexpected crisis on account of the difficulty of buying beets at a profitable price. This has arisen from the fact that sugar beets are largely used in the production of alcohol, and owing to the present high prices of this product the distillers can afford to pay sums for beets which are above those that can be given when the roots are employed in sugar manufacture.

It is stated in the *Tropical Agriculturist* for December 1910, that a large increase of interest in cotton-growing in Ceylon has taken place since the appointment of local agents of the British Cotton Growing Association. Toward the end of last year, the agents imported 5 tons of seed of Sea Island, Egyptian and Upland varieties; the demand for this was exhausted in a few weeks, and many further applications for seed were received subsequently. The increased interest in connexion with cotton cultivation is being shown both by Europeans and natives in the island, and there are enquiries, as well, from outside sources

The *Experiment Station Record* of the United States Department of Agriculture, Vol. XXIII, p. 231, gives an abstract of a paper describing experiments on the influence of lime on soil bacteria. The work showed that the nitrogen, both in ammonia and nitrates, could be used by the bacteria for producing the more complex nitrogenous bodies, that in ammonia being more effective than the nitrogen in nitrates. The formation of such bodies, using the nitrogen in sulphate of ammonia, was aided by the presence of calcium carbonate, but not to any great extent. The influence of quicklime on soil bacteria was shown to be much greater than that of calcium carbonate.

Particulars have been received from Messrs. William Douglas & Sons, Ltd., Putney, London, S.W., of a cooling plant, which has been devised for the purpose of supplying the needs of those who require cold storage on a comparatively small scale. The plant, including the cold room and other appertainances, is stated to cost less than £100, and gives a space which can hold more than a ton of solid perishable food. The further claim is made that the compressor can be run directly, coupled to any ordinary form of power-producing machinery, and that it practically represents the limit of simplicity in refrigerating machines, as regards the number of parts that require attention.

STUDENTS' CORNER.

JUNE.

First Period.

Seasonal Notes.

Make a consideration of the preliminary measures that are required for preparing bush land that is eventually to form a lime, orange, cacao, or rubber plantation. Discuss the best methods of clearing such land from bush or forest. How would you arrange for the land to be lined, holed and planted? At what time of the year is it best for this to be done, and why? When land is being opened up in this way, it is necessary to realize the importance of the provision of a good system of drainage. Give an account of any simple way of surveying land with the intention of obtaining such information as will enable the drains to be dug where they will best fulfil their purpose. Would you be likely to obtain suggestions as to the varying need for drainage, over the area dealt with, from the kind and state of the plants found growing there? If so, what will probably be the nature of these indications? It is important that the work of road-making needed in the first season should be completed before the crop is harvested, in order that the latter may be removed easily and quickly from the plantation.

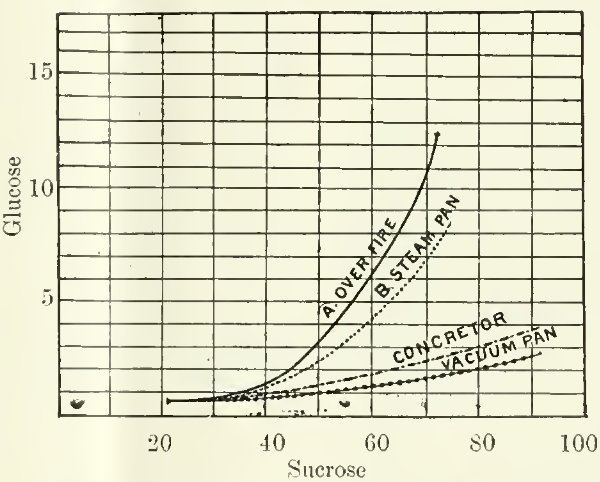


Fig. 5. Formation of Glucose in Making Sugar.

In relation to sugar production, it will not be out of place at the present time to give a few suggestions in connexion with the principles of sugar-boiling and the way in which the method of boiling that is employed effects the product obtained and the proportion of sugar recovered. In order to simplify the matter, Figs. 5, 6 and 7, taken from Watts's *Introductory Manual for Sugar-Growers*, are reproduced here. In the first of these, the curves show the relation between the percentages of glucose and sucrose in the syrup, in the case of muscovado manufacture, the steam pan or St. Croix method, the making of concrete sugar, and in the vacuum pan method. The slope of the curve shows that the proportion of glucose formed, and therefore of crystallizable sugar lost, is greatest in the first-mentioned method and decreases in the order given. As the formation of glucose is related to the temperature to which the juice has been subjected, it is easily understood that the extent of this may be reduced by making the juice boil at as low a temperature as possible. This leads to the consideration of the use of the triple effect and the vacuum pan, in which the juice is boiled under continually decreasing pressures so that its temperature is kept from rising, as far as is possible. Reference to Figs. 6 and 7 will easily explain the principle of the triple effect and the vacuum pan.

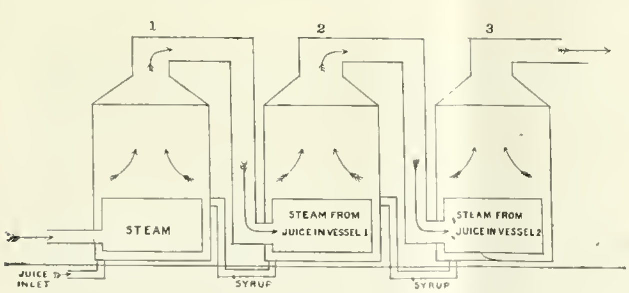


Fig. 6. Diagram of Triple Effect.

In the former, the diagram shows how the juice in the second and third vessels is heated by the steam from the evaporating juice in the preceding one—a matter that is rendered feasible by reducing the pressure in the successive parts of the apparatus. As the liquid boils when the pressure of its vapour reaches that of the pressure on its surface, the temperature of the juice is always kept below about 120° F. by decreasing the air pressure until this is least in the vacuum pan. Fig. 7 presents an explanation of the working of the last-mentioned piece of apparatus, where the pressure is decreased by means of the pump D, and the vapour which arises in the pan A is condensed in the pipe C and the condenser E. By keeping these simple diagrams in mind when examining the actual apparatus, an understanding of the working of the latter will be more readily obtained.

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) State the precautions to be taken in mixing manures.

(2) What is the use of chlorophyll to plants?

(3) Explain what is meant by 'plant food'.

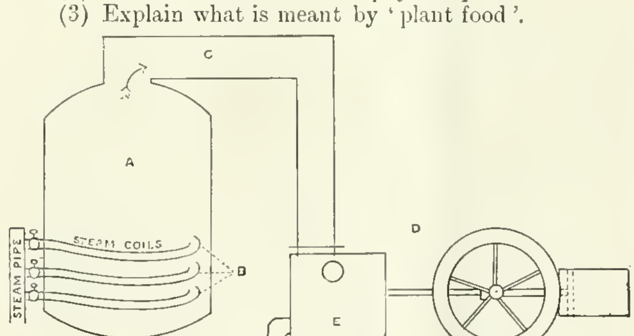


Fig. 7. Diagram of Vacuum Pan.

INTERMEDIATE QUESTIONS.

(1) Give a classification of manures.

(2) What are the advantages of the rotation of crops?

(3) Describe methods for preparing starches.

FINAL QUESTIONS.

(1) Give an account of what is meant by 'dry farming'.

(2) Discuss the conditions of an agricultural industry well known to you, in relation to the existence of the vegetative propagation of plants.

(3) Indicate the actual effects of continuous seed selection, in the case of a crop with which you are familiar.

FUNGUS NOTES.

ARROWROOT DISEASES.

The following information on the subject of a disease of arrowroot in St. Vincent is taken from a report by Mr. F. W. South, B.A., Mycologist to this Department, submitted as a result of a recent visit to the island mentioned. This visit was undertaken partly with the object of investigating the disease under consideration.

1. The fungoid disease known as the 'burning' of arrowroot has been recognized in St. Vincent for many years, and appears to be of fairly wide distribution. In patches here and there in the field, the plants appear to have fewer leaves than the healthy ones growing in their vicinity, while these leaves are often rolled up and somewhat wilted. When such plants are dug up, it is seen that the scale leaves of the rhizome are blackened almost throughout. The disease penetrates to the rhizome, and there forms small black spots, which become wider in extent, and eventually cover most of its surface. On cutting across such a diseased rhizome, it is seen that narrow, dark-brown streaks, ½-mm. wide, run inward from the surface in a radial direction for varying distances, which may be as great as the complete radius of the section. These dark lines originate from the black spots on the epidermis of the plant stem. On examining carefully the outside of the scale leaves, it is found in some instances that a brown mycelium is present, running in narrow strands along their surfaces, while, under damp conditions, a white mycelium may often be found between the surface of the creeping stems and the inner surface of the scale leaves. The component hyphae often occur in a small tuft springing from the black spot on the surface of the rhizome, which marks the extremity of one of the black lines mentioned above. These observations, and the fact that a white mycelium starting from diseased plants was to be found in the soil itself, leave little doubt that the disease is of a fungoid origin.

2. The infected spots in the fields appear to extend but slowly in the majority of cases—a fact which would seem to be due to the comparatively slow growth of the fungus. They vary in area from a few to several hundred square feet, and appear to be fairly constant in position from year to year. I was informed that the symptoms of the disease did not make themselves apparent in affected spots until the rhizomes were nearly ripe for digging. Even were arrowroot the only crop affected by this disease, the matter would be of considerable importance, as in some cases the number and extent of the infected spots in a field are fairly large, so that a considerable proportion of the crop obtained is diseased, and since the fungus appears to affect the starch content, is rendered practically useless. But there is another important feature to be considered, which is that the host plants of this fungus appear to be extremely numerous. Specimens were shown me of cassava, tannia and yam which were all diseased in a similar manner and had been growing on ground known to be infected. Indian corn, pigeon peas, plantains and coffee are also said to be attacked, while I myself saw a similar disease on bananas growing in a field in which the arrowroot in the neighbourhood was attacked by this disease, and on cacao seedlings and bush plants growing on the borders of the same field. I am of the opinion that there can be very little doubt that all these host plants, with the possible exception of coffee, were attacked by the same disease. With regard to coffee, I am not as certain, as I was unable to examine any specimens. I was, however, informed that the disease would attack this plant, and avocado pear trees; while it is worthy of record that it has certain symptoms in common with the well known West Indian root disease of cacao, which also attacks avocado pear trees. No definite statement, however, can be made as to the connexion between the arrowroot fungus and the root disease of cacao until much further investigation has been carried out. An illustration of the importance of the fact that the arrowroot fungus can attack several host plants was afforded me in the following information. A certain field of arrowroot in which the attack of the fungus had become very extensive was thrown out of cultivation and allowed to remain in bush fallow for twenty-five years. At the end of that time it was replanted in arrowroot. The resulting crop contained, during the first year, a certain number of 'burnt' rhizomes occurring in patches; at the end of the second year it had again become badly diseased. In this case, if the fungus was continually present in the soil during the twenty-five years, it probably continued its existence at the expense of certain of the bush plants growing there. The only alternative hypothesis is that the arrowroot used for replanting was infected with the disease. The number of host plants of, and the considerable extent of the damage caused by, this fungus render it important that adequate measures for its control should be undertaken on all estates where it is known to cause damage. At the same time, the multiplication of host plants renders the determination of such measures a matter of considerable difficulty, which is increased by the fact that the complete removal of arrowroot rhizomes from infected soil is not easily accomplished.

3. The fungus causing the disease has, so far, not been found to produce any definite fructifications. It is, however, at present under cultivation at this laboratory, and it is hoped that further information with regard to its life-history and classification will be obtained in the course of a few months. In the *Kew Bulletin* of August 1893, No. 80, there is a short report by the late Professor Marshall Ward on some specimens of this disease of arrowroot from St. Vincent which were submitted to him by the Director of the Royal Botanic Gardens, Kew. In this report the fungus is referred to the form genus Spicaria, but no other fructifications were obtained from which its systematic position could be more definitely determined.

4. As regards remedial measures, the following course might be undertaken experimentally. Where the disease is of a wide-spread nature, that is in fields where the infected spots are both large and numerous, the whole field might be isolated by a trench 3 feet deep and 2 feet wide. This trench should be kept open during all the operations to be described below, in fact, until arrowroot is replanted. All the arrowroot in the field should be dug up as thoroughly as possible, and the diseased plants heaped up together: the field might then be covered with bush, the trench mentioned above filled with it, and the whole, including the diseased arrowroot, set on fire, so as to produce, if possible, sufficient heat to sterilize the surface soil to the depth of a few inches. The field should then be thoroughly ploughed or forked: the soil stirred thoroughly once a fortnight with a cultivator or with hoes: and a crop of cotton planted. When the cotton has been harvested, the plants, mixed with a large amount of additional bush, should again be burnt, and the soil again ploughed or forked and cultivated or hoed. A green dressing such as Bengal

beans might follow these operations, and then a second crop of cotton should be planted. After this has been harvested, the burning, ploughing and cultural operations should be repeated for the third time; after this the field might be replanted with arrowroot. The arrowroot plants for this purpose should be carefully selected, as being free from disease, and might with advantage be obtained from a specially formed nursery placed on soil in which arrowroot had not been grown for many years. On sugar estates, sugar-cane might be used as a rotation for the eradication of the arrowroot disease, and in this case, when the cane crops have been removed, the cane stumps should be dug up and burnt, together with the trash lying on the field. It is probable that, if this burning is done thoroughly, and is followed, as in the case of cotton, by adequate cultural operations, it will not be necessary to grow more than one crop of canes before re-planting the field in arrowroot. In fields where the infected areas are few in number and not of large extent, it might be found advisable to surround each with a trench as before, to cover it with bush obtained from elsewhere, and to sterilize its surface soil by burning the bush as above; while in small areas of this kind, it should be possible to remove completely all portions of the infected arrowroot. An alternative course, after removing the arrowroot and surrounding the spots with trenches, would be to try the effect of some soil fungicide, such as Fungal, scattered broadcast over the infected soil, and hoed in. I was informed that lime was useless as a fungicide in connexion with this disease, though I cannot but think that, if used in as large quantities as the nature of the soil will permit, it might be found to produce more effect than has been the case up to the present; while it is possible that such a dressing applied to a large field, immediately after the removal of the arrowroot, and immediately prior to the rest of the treatment suggested above, might be of material assistance in destroying the fungus present in the 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 April:—

The general tone of the markets during April has been dull and uninteresting, and deducting the occurrence of the Easter holidays from the period under review the month may be said to have had but little to record, either in the matter of drugs or spices. In direct West Indian products nothing calls for comment. In fact, the only drug that has excited interest in the market has been Buchu leaves, which at the close of the month were commanding 4*s.* per lb. for short broad green. Considering the demand for the leaves, and the continued diminution in the supplies from the Cape, and further considering that they are the produce of a small evergreen shrub, it seems remarkable that one of the species, if not all three that furnish the commercial leaves namely, *Barosma betulina, B. crenulata* and *B. serratifolia* should not have been introduced and established in other suitable climates besides that of its native habitat. It is stated that though the shipments from Cape Colony during January and February of this year, amnounted to only 55,213 lb. against 86,945 lb. during the same period of last year, the values have been £7,947 this year against £6,578 in 1910 owing to the advance in price.

The following are the details regarding West Indian products:—

GINGER.

There have been large offerings of ginger during the month but it has been met with very little demand. At the first spice auction on the 5th, out of 879 bags of Cochin offered, only 165 sold; hard brown Liberian characters realizing 40*s.* to 40*s.* 6*d.*, and lean 31*s.* 6*d.* to 32*s.*; 55*s.* was the price at which bold and medium brown rough was bought in, and 51*s.* for small to bold washed. A week later 211 bags of washed roughed Cochin were partly sold at 41*s.* per cwt. On the 26th the offerings amounted to 816 bags of Cochin, 352 bags of China, Liberiau character, 102 bags of Japanese and 30 bags of Sierra Leone. Smallish washed Cochin sold at 41*s.* 6*d.* to 42*s.*, and 10 bags of the China fetched 30*s.* per cwt.; 12 cases of selected bold scraped Calicut were bought in at 90*s.* per cwt., all the Japanese at 48*s.*, and the Sierra Leone at 38*s.*; no Jamaica has been offered.

NUTMEGS AND PIMENTO.

At auction on the 12th, nutmegs were represented by 233 bags of West Indian and 42 packages of Eastern. The former sold at the following rates: 56's, 1*s.* 3*d.*; 59's, 1*s.* 2*d.*; 62's, 1*s.* 1*d.*; 70's, 5*d.*; 78's, 6*d.*; 89's to 90's, $5\frac{1}{4}d.$ to $5\frac{1}{2}d.$; 105's to 108's, 5*d.* to $5\frac{1}{4}d.$ The latter were only partly sold at: 74's, $7\frac{3}{4}d.$ to 8*d.*; 84's, $8\frac{1}{4}d.$; 90's, $5\frac{1}{4}d.$ to $5\frac{1}{2}d.$; and 136's, $4\frac{1}{4}d.$ to $4\frac{1}{2}d.$ At the sale on the 26th, these prices for West Indian had slightly advanced. There has been very little doing in pimento, at the last auction in the month 86 bags were offered, and all bought in at $2\frac{3}{8}d.$ per lb.

ARROWROOT.

There has been but very little business in this article throughout the month. At the last auction on the 26th, some 13 cases of Madagascar were offered, and bought in at 10*d.* per lb. Of St. Vincent, private sales have been effected at from 2*d.* to $2\frac{3}{4}d.$ per lb.

SARSAPARILLA.

Genuine grey Jamaica continues scarce, and much in demand. Several bales, it has been reported, have arrived, but will not be offered for sale till the first auction in May. The offerings of other kinds during the month have been: on on the 6th, native Jamaica 38 bales, Honduras 4 and Guatemala 8 bales. Of the native Jamaica, 13 bales were disposed of, fair red fetching 11*d.*, dull red 8*d.*, and common grey 6*d.* to 7*d.* per lb. All the Guatemala was bought in at 8*d.* per lb., and the Honduras at 1*s.* 3*d.* At the end of the month it was reported that 22 bales of grey Jamaica and 36 of Lima Jamica had arrived.

OIL OF LIME, LIME JUICE AND TAMARINDS.

At auction on the 5th, oil of lime was represented by a single case of West Indian distilled, which sold at 1*s.* 3*d.* per lb., while good hand-pressed was quoted at 5*s.* 3*d.* A week later the former had advanced to 1*s.* 4*d.* for good, while hand-pressed, for which it was stated there was no demand, had dropped to 5*s.* Both these prices held good at the close of the month. There has been a firm market in, and a fair demand for, West Indian lime juice, raw being quoted at from 1*s.* to 1*s.* 2*d.* per gallon, and concentrated at £18 2*s.*6*d.* to £18 7*s.* 6*d.* Tamarinds have not been abundant during the month, having been represented only at the first auction by 81 casks of East Indian, all of which were bought in at 12*s.* 6*d.* per cwt.

MARKET REPORTS.

London.—The West India Committee Circular, May 9, 1911.

Arrowroot—2d. to 3¾d.
Balata—Sheet, 3/8; block, 2/9 per lb.
Beeswax—No quotations.
Cacao—Trinidad, 54/- to 62/- per cwt.; Grenada, 47/6 to 53/6; Jamaica, no quotations.
Coffee—Jamaica, 60/6 to 67/-.
Copra—West Indian, £23 10s. per ton.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 16d. to 18d.
Fruit—No quotations.
Fustic—No quotations.
Ginger—No quotations.
Honey—No quotations.
Isinglass—No quotations.
Lime Juice—Raw, 1/-. to 1/2; concentrated, £18 2s. 6d. to £18 7s. 6d.; Otto of limes (hand pressed), 5/3, nominal.
Logwood—No quotations.
Mace—2s. 2d. to 2s. 8d.
Nutmegs—Quiet.
Pimento—Quiet
Rubber—Para, fine hard, 4/11; fine soft, 4/9; fine Peru, 4/9 per lb.
Rum—Jamaica, no quotations.
Sugar—Crystals, no quotations; Muscovado, no quotations; Syrup, no quotations; Molasses, no quotations.

New York.—Messrs. Gillespie Bros. & Co., May 5, 1911.

Cacao—Caracas, 11c. to 12c.; Grenada, 10¾c. to 11¼c.; Trinidad, 11¼c. to 11⅝c. per lb.; Jamaica, 10c. to 10¾c.
Cocoa-nuts—Jamaica, select, $25·00 to $26·00; culls, $12·50 to $13·00; Trinidad, select, $27·00 to $28·00; culls, $15·00 to $16·00 per M.
Coffee—Jamaica, 12¼c. to 13¼c. per lb.
Ginger—9c. to 12c. per lb.
Goat Skins—No quotations.
Grape-Fruit—Jamaica, $2·00 to $4·00 per box.
Limes—$5·00 to $5·50.
Mace—42c. to 50c. per lb.
Nutmegs—110's, 10c. to 10¼c. per lb.
Oranges—Jamaica, $2·00 to $2·25.
Pimento—4½c. per lb.
Sugar—Centrifugals, 96°, 3·79c. per lb.; Muscovados, 89°, 3·29c.; Molasses, 87°, 3·09c. per lb., all duty paid.

Trinidad,—Messrs. Gordon, Grant & Co., May 15, 1911.

Cacao—Venezuelan, $11·65 per fanega; Trinidad, $10·75 to $11·25.
Cocoa-nut Oil—78c. per Imperial gallon.
Coffee—Venezuelan, 15c. per lb.
Copra—$3·10 per 100 lb.
Dhal—$3·60 to $4·00.
Onions—$5·75 to $6·00 per 100 lb.
Peas, Split—$5·50 to $5·60 per bag.
Potatoes—English, $2·75 to $3·00 per 100 lb.
Rice—Yellow, $4·35 to $4·40; White, $5·20 to $5·25 per bag.
Sugar—American crushed, no quotations.

Barbados,—Messrs. T. S. Garraway & Co., May 22, 1911; Messrs. James A. Lynch & Co., May 17, 1911; Messrs. Leacock & Co., May 12, 1911.

Arrowroot—St. Vincent, $4·50 to $4·70 per 100 lb.
Cacao—$11·00 to $12·00 per 100 lb.
Cocoa-nuts—$16·80.
Coffee—Jamaica and ordinary Rio, $11·50 to $14·50 per 100 lb., scarce.
Hay—$1·30 to $1·50 per 100 lb.
Manures—Nitrate of soda, $60·00 to $65·00; Cacao manure, $42·00 to $48·00; Sulphate of ammonia, $75·00 to $76·00 per ton.
Molasses—No quotations.
Onions—$2·20 to $3·50 per 100 lb.
Peas, Split—$5·65 to $5·80 per bag of 210 lb.; Canada, $4·00 to $4·25 per bag of 120 lb.
Potatoes—Nova Scotia, $3·00 to $4·00 per 160 lb.
Rice—Ballam, $4·60 to $5·00 per 100 lb.; Patna, no quotations; Rangoon, no quotations.
Sugar—No quotations.

British Guiana.—Messrs. Wieting & Richter, May 13, 1911; Messrs. Sandbach, Parker & Co., May 12, 1911.

Articles.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	$10·00 per 200 lb.	$10·00 per 200 lb.
Balata—Venezuela block	No quotation	Prohibited
Demerara sheet	85c. per lb.	65c.
Cacao—Native	11c per lb.	12c. per lb.
Cassava—	$1·20	No quotation
Cassava Starch—	$6·50 to $7·00	No quotation
Cocoa-nuts—	$12 to $16 per M	$10 to $16 per M., peeled and selected
Coffee—Creole	16c. per lb.	15c. per lb.
Jamaica and Rio	18c. per lb.	18c. per lb.
Liberian	10½c. per lb.	10c. per lb.
Dhal—	$3·75 per bag of 168 lb.	$3·75 per bag of 168 lb.
Green Dhal	$4·00	——
Eddoes—	$1·32	——
Molasses—Yellow	None	——
Onions—Teneriffe	——	——
Madeira	No quotation	9c.
Peas—Split	$5·70 per bag (210 lb.)	$5·80 per bag (210 lb.)
Marseilles	No quotation	No quotation
Plantains—	20c. to 40c.	——
Potatoes—Nova Scotia	$3·50	$3·50
Lisbon	——	No quotation
Potatoes—Sweet, B'bados	$2·16 per bag	——
Rice—Ballam	No quotation	——
Creole	$5·00 to $5·25	$5·00
Tannias—	$2·40 per bag	——
Yams—White	$3·00	——
Buck	$3·50	——
Sugar—Dark crystals	$2·50	None
Yellow	$2·90 to $3·00	$2·65 to $2·75
White	$3·80 to $4·00	$4·00 to $4·25
Molasses	$2·10 to $2·30	None
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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FOR THE WEST INDIES.

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in 1904-5, No. 42, price 4*d.*; in 1905-6, No. 47, price 4*d.*;
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The 'Agricultural News' contains extracts from official correspondence and from progress and other reports; and, in fact, any information indicating what is going on in each colony, and the progress made in Agricultural matters throughout the West Indies.

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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 Period of Maturity of the Sugar-Cane.

IT has been recognized fairly generally for some time that all sugar-canes do not ripen within the same number of weeks after planting, and that some come to maturity slowly, while others do so very rapidly: in other words, that the rate of ripening varies considerably in different varieties of canes, and would appear to be approximately constant for any given variety. The actual rate in each case must, of course, be dependent on external conditions to some extent, and will change slightly from year to year, under their influence: but it may well be a character of sufficient constancy to have an important bearing on several points of interest, both practical and theoretical, in connexion with the sugar-cane.

Some interesting work on the subject, by C. S. Taylor, B.A., Agricultural Chemist to the Government of Bengal, has recently appeared in No. 3 of the Departmental Records of that Presidency, entitled Notes on Classification and Examination of the Canes at Present Indigenous to Bengal. In this, the author describes experiments conducted to determine the period of ripening of several indigenous varieties of cane, as judged by three factors: comparative rates of change of sucrose in juice, comparative rates of change of reducing sugar content, and comparative juice extraction. He claims to have found that some varieties can be grouped as early ripeners, others as ripening at a medium period and others again as late ripeners. This factor in itself is important from a practical point of view, but its significance is considerably enhanced by a second, namely, the actual time taken by the cane to attain its maximum maturity, once it has commenced to ripen. The bearing of this fact is easily recognized, as is pointed out by Taylor, if such a point as the increase of sucrose in the juice due to ripening is considered. In a slow ripening cane this increase will be slow, so that there will be but little difference in the percentage of sucrose in the juice, whether the cane is cut at an early date or not until two months later. On the other hand, in the case of a cane that attains maturity rapidly and somewhat later, the difference will be very considerable, as much of the increase will take place in a very short space of time, at the end of the total life period. Lastly, in the case of rapid and early ripening cane, the value would be high when the cane was cut at an early date, but would have fallen off, owing to over-ripeness, two months later.

In order to determine the period of ripening for the Bengal varieties, Taylor planted them in long rows and cut, as samples, every tenth stool of each, at intervals, from the time the canes were nine months old until they were fully ripe. No concentrated manure was used on the experiment plots, as such manures produce considerable differences in the date of maximum maturity. The importance of the work attaches, however, more to the period of maturity than to the exact date.

This question of the period of maturity has several important applications, and may prove to be of considerable significance, should it be found to be a fairly constant character for each variety. If the value of the percentage of sucrose in the juice is considered, it means that this would not attain a maximum until a certain time after the cane had commenced to ripen, and that this time would vary in length according to the variety examined. In like manner, different varieties of canes in the same year and under similar external conditions would have definite maximum values for this percentage. Consequently, in making a comparison of different varieties in regard to the percentage of sucrose in the juice, correct results would only be arrived at by comparing these maximum values.

From a practical or estate point of view, it should now be evident that losses are bound to result if a late and rapidly ripening cane is cut at an early date, or if an early and rapidly ripening cane is cut too late. This point is recognized in Bengal where, in one district according to Taylor, the more intelligent cultivators have definite seasons for reaping different kinds of cane. Thus in considering the order in which the fields shall be cut on an estate on which several varieties are grown, it is clear that the early ripening varieties must be cut first, the slow ripening varieties next, and the late and rapidly maturing canes last. Such a proceeding is somewhat difficult of application under estate conditions; it would depend to some extent on the quantity of each variety grown, whether it was possible or not to get each reaped within the period during which the percentage of sucrose in its juice was at or near a maximum. On estates where one variety alone is grown, the reaping must extend over some time, so that a cane ripening slowly is probably the most suitable for such conditions, as in this case there is but little difference in the richness of its juice during a long period.

As has been pointed out already, the question of early or late ripening is one which would seem to affect comparative experiments on seedling and other canes, and experiments with manures. In the first case, it would appear to be necessary to compare varieties of canes only when each has arrived at the condition of maturity which accords with the most favourable values of the percentage of sucrose in the juice, glucose ratio, and such other points as may be under consideration. If this condition is attained by different canes at different dates, the results will not be immediately reliable if all the varieties are reaped and tested at about the same time. The question of comparing the results obtained with the use of different manures would appear to become even more complicated, as not only is there the probability that the period of maturity of the various canes used must be taken into consideration, but if this is an important point, it is influenced in turn, by the several manures, each of which would probably alter it to a different extent.

Lastly, there is the question of the importance of this point in relation to the possible segregation of different characters of the sugar-cane as a result of hybridization on Medelian lines. Definite evidence of such segregration is not at present forthcoming, mainly because insufficient experiments have as yet been conducted to determine if it does or does not occur. But in the future, in dealing with a high percentage of sucrose in the juice as one possible character of a Mendelian pair, it is clear that, if the maximum value of this percentage is definitely dependent on the period of maturity, this factor will have to be taken into consideration, as only the maximum value can be expected to be a proper measure of the character.

The various points indicated above must be regarded as put forward from a theoretical point of view, and as merely suggestive rather than actually definite. The subject is very complicated, and only one aspect of it has been considered here. It would appear, however, that some weight may have to be attached to the period of maturity in dealing with the sugar-cane in relation to experimental investigation and estate practice.

THE CANADIAN NATIONAL EXHIBITION, 1911.

Cabled information has been received from Messrs. Pickford and Black to the effect that non-perishable exhibits for the forthcoming Canadian National Exhibition, to be held at Toronto from August 26 to September 11, should be forwarded by the S.S. 'Oruro', leaving Demerara on July 16, and Barbados on July 21. Exhibits of a perishable nature must be forwarded by the steamer which follows.

SUGAR INDUSTRY.

THE INFLUENCE OF MOLASSES ON SOIL FERTILITY.

In the last volume of the *Agricultural News*, p. 339, an article appeared, describing results that have been obtained in Mauritius from the application of molasses to soils in which sugar-cane is grown, and in this article it was stated that attention would be given, in a future number of the *Agricultural News*, to the work which is being carried out in connexion with this subject at the Station Agronomique, Mauritius.

In accordance with this, the following facts are taken from the Annual Report of that Station, for 1908, to which reference is made in the article quoted. It is pointed out that the amount of potash contained in molasses and scums, as well as the fact that such a mixture is already a good manure in itself, makes it inexpedient that it should be applied in quantities greater than 1 litre (about $1\frac{3}{4}$ pints) to each hole. It would even seem better, where there is a shortage in the supply for manurial purposes, to use less than this quantity, in order that the opportunity may be given for the treatment of a larger area of land. Where molasses is used with mixed manure, its relatively high potash content should be allowed for in making the mixtures. Where molasses and scums are used together as a manure, their composition easily explains the way in which a largely improved growth of the plants follows their application. It is considered that their employment provides an excellent means of stimulating the growth of backward plants.

The report goes on to state that, as has been pointed out before, the use of molasses results in an increased growth of the crop which cannot be explained from considerations alone of the plant food which is added to the soil in the molasses. The experiments described show that the influence of the molasses is not exhausted during the first crop, but continues to exhibit itself for some time. This influence is seen best in the case of plant canes, and is well shown with ratoons. Where molasses and other manures were used together, the action of the former was found to be strongest in plots which had not received potash, and in those to which no nitrogen had been given; these results are to be expected from the fact of the comparatively high potash content of the molasses and its influence in stimulating the fixation of nitrogen.

In Mauritius, the molasses is generally applied in the cane holes before planting; but when it is not found possible to do this, it is placed between the rows, either after planting or when the cane has attained a certain amount of growth. The adoption of this scheme is possible because molasses has not been found to possess any caustic action such as was attributed formerly to it; nor does it damage the plants in any way, provided that it is used carefully and in reasonable quantities.

The suggestion is made that, on account of the action of molasses in stimulating the nitrogen-fixing organisms in the soil, there would be some advantage in using it after dilution and in small doses at frequent intervals. In relation to this, however, there has to be considered the increased cost of the method, and the fact that definite experimentation is necessary in order to decide if there is likely to be any gain from its adoption.

It will be remembered that experiments are being carried out in Antigua for the purpose of investigating the influence of molasses on soil fertility. The results in these obtained during the second season (1909-10) are now available; they will appear in Pamphlet No. 68 of the Department Series, entitled *Manurial Experiments with Sugar-cane in the Leeward Islands*, 1909-10, which is about to be issued. The experiments continue to show, as a mean of the two seasons' results, that there is some increase in weight of cane on the plots receiving the molasses. In the second season, however, the effects of the application are not as well marked as in the first: the employment of 200 gallons of molasses to the acre did not increase the yield, while that of 400 gallons gave an additional 1·2 tons of cane per acre.

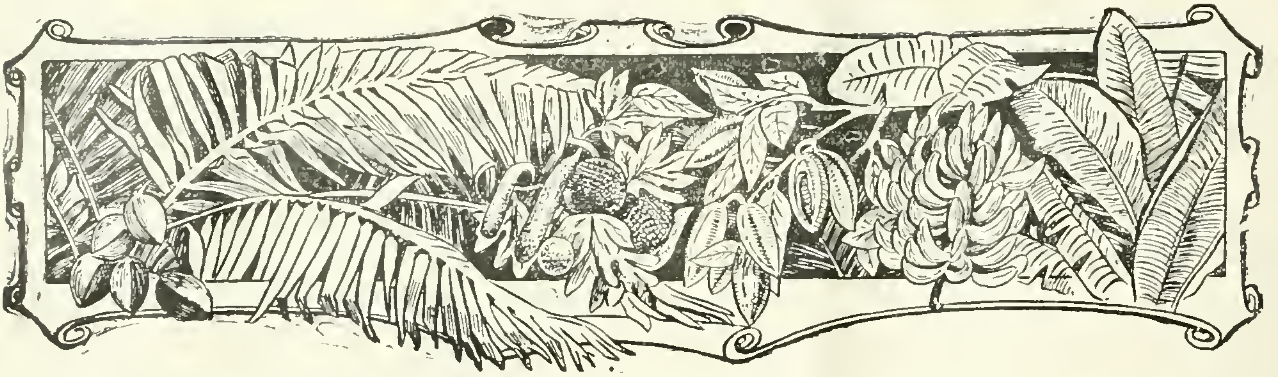
In regard to the suggestion of residual action of the molasses, mentioned above, a definite experiment was made in Antigua in the latter of the two seasons, in order to decide if this exists. For this purpose, on one of the experiment stations, second ratoons were reaped from plots on which the canes had received molasses as first ratoons only. The results show that there was a decided increase in the yields of the plots receiving molasses, although as is pointed out, no definite conclusions can be drawn from one experiment.

In the description of the experiments in Antigua, attention is drawn to a Bulletin entitled *Some Biochemical Investigations of Hawaiian Soils*, issued recently from the Experiment Station of the Hawaiian Sugar Planters' Association. A summary of the conclusions reached as a result of the work, given at the end of the bulletin, shows that 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.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture left Barbados on Saturday, June 3, 1911, by the S.S. 'Guiana', for Dominica, on official business having relation to general agricultural matters, and connected with the re-organization of the instruction of agricultural pupils. Dr. Watts is expected to return to Barbados, by the S.S. 'Korona', on the 10th instant

Mr. H. A. Ballou, M.Sc., Entomologist on the Staff of the Imperial Department of Agriculture, left Barbados on May 27 by the S.S. 'Sobo', for Antigua, for the purpose of making investigations in connexion with the insect pests of sugar-cane in that island. Mr. Ballou will probably return to Barbados, by the S.S. 'Korona', on June 10.



FRUITS AND FRUIT TREES.

NEW MANGOES FOR THE WEST INDIES.

During last year, efforts were resumed on the part of this Department for the purpose of obtaining the best varieties of mangoes from India for propagation in the West Indies. With this object, the Inspector General of Agriculture in India was approached, and this officer subsequently communicated with Mr. A. Howard, M.A., F.C.S., F.L.S,, then Imperial Economic Botanist at Pusa, who was in charge of the fruit experiments at that place, with the request that he would select good varieties. Mr. Howard was not, however, in possession of the required number of mango plants, so that it was suggested by the former officer that communication should be made with the Superintendent of the Royal Botanic Garden, Calcutta, with a view to the provision of the mangoes from this source. Subsequently, arrangements have been made at this Garden for the shipment of twelve grafted mango plants for propagation in Dominica, the following kinds being included: Alphonse, Langra, Kheershapottee and Bhadoorea.

In the meantime, Dr. H. A. A. Nicholls, C.M.G., of Dominica, has obtained several grafted mango plants from Bombay, through Sir Evan James, K.C.I.E. Most of these were dead when they reached Dominica; the others were placed in the care of Mr. J. Jones, Curator of the Botanic Station, Dominica, through whose efforts they were saved and brought into a state of vigorous growth. The plants include two of the Alphonse, one of the Damaria and one of the Pairi variety. The two first-mentioned were retained, to be grown at St. Aroment, by Dr. Nicholls. The others have, however, been very kindly presented by him to the Botanic Gardens, with the condition that he should be supplied with plants from the first grafts taken from them. Thus, through the public-spirited action of Dr. Nicholls, Dominica is now in possession of propagating material of three of the finest Indian mangoes.

In connexion with this presentation, it is of interest to mention that an article on the last of the three varieties just enumerated, namely the Pairi, appeared in the *Agricultural News* on April 15 of this year (Vol. X, p. 116). In this article, which was taken from the *Agricultural Journal* of India, Vol. VI, p. 27, the Pairi fruit is indicated to have a more regular shape than that of the Alphonse, and to possess a well marked beak. The colour of the fully ripe Pairi fruit varies from red on the shoulder to yellow at the beak.

THE AVOCADO PEAR.

Under the title of The Avocado in Southern California, an interesting article appears in the *Pomona Journal of Economic Botany*, Vol. I, No. 1. This deals more particularly with the plant in relation to its propagation and culture in Southern California, and commences by pointing out that the results obtained with seedlings planted fifteen to twenty-five years ago, and in recent trials with budded plants, indicate that the prospects for the establishment of an avocado industry in this part of North America are good.

The article draws attention to the fact that the avocado has always been grown in Mexico and other tropical countries from seed alone, and this has caused the existence of a large number of varieties. The types grown in California, so far, may be divided into two classes: the Mexican, or smooth and thin-skinned varieties, and the Guatemalan, with a very thick skin and a rough exterior. This classification merely relates, of course, to the well established plants that exist in California. It is of interest that the fruits of most of the Mexican varieties are of small size, with a dark purple colour, but of good quality: they are considered by some to exhibit a richer and better flavour than the larger varieties; they are also somewhat hardier than these, but possess a serious commercial drawback in that they are thin-skinned, and do not stand shipment. The avocados of Guatemala are very different from all other kinds, mainly in the possession of an unusually thick and tough skin—a feature that is likely to make them particularly valuable from a commercial standpoint. The finest variety in this group, yet grown in California is known as the Lyon: this produces fruit of good size and excellent qualities. The characteristic differences between Mexican and Guatemalan avocados extend to the plant itself, for the trees of the latter type possess a more spreading habit, particularly when young, and their leaves are more narrowly lance-shaped. Information is given to show that seedlings of West Indian and Hawaiian varieties have been grown in California, but the plants are not sufficiently old to afford definite indications as to their value.

Up to the present, avocados in California have been most usually propagated by seed. For this purpose, the seeds should be planted as soon as possible after they have been removed from the fruit. A useful means of hastening germination is to bury the seeds in moistened sand or sawdust for two to four weeks, before planting them in pots. An added advantage of this method is that no labour is wasted in giving sustained attention to seeds that will not germinate, as it is not until those in the sand or sawdust show signs of sprouting that they are removed to the pots. In this removal, the seeds should be placed in the pot with the pointed end upward; in the case of round seeds, the end that was nearest to the stem of the fruit should be uppermost. In any case, about one-quarter of the length of the seed should be left to project above the surface of the soil, which should be rich and thoroughly moist, but never allowed to hold standing water.

Directions for the propagation of the avocado by budding are given in the article, where it is stated that results have shown that the raising of the plant in this way is no more difficult than that for citrus plants. (It may be mentioned that information concerning the budding of the avocado has been given recently in the *Agricultural News*, Vol. IX, p. 116.) On a commercial scale, in California, the plants are grown from seed in pots, as has been explained, until they are about 12 inches high, at which stage they are set out in nursery rows 3½ to 4 feet apart, and 14 inches in the row. They are grown in this way and budded, and allowed to remain until they are large enough to be sold. When this is the case, they are balled, or transplanted into pots, and not sold until they have become established.

Among other methods of propagation that have been tried in California are inarching, grafting, and by cuttings, but no great success has been attained from any of these, while it is very likely that the last mentioned produces plants that are weaker than those obtained from seed, or by budding.

In plantations, experience has demonstrated so far that the trees should be placed about the same distance apart as orange trees, or if there is plenty of space, at a somewhat greater distance. Budded plants require much less room than those raised from seed, and may therefore be planted more closely. In any case, the tree should be kept to a convenient size by pruning; only the strongest branches should be allowed to develop, those which are weak being cut out every year. The top should also be cut back regularly, in order to facilitate the picking of the fruit. All transplanting should be done at a time when the plant is quiescent, and no new growth is being formed.

Among the points which should be considered in selecting varieties for planting on a commercial scale, a matter of importance is that those which yield ripe fruit at the time corresponding to mid-winter will obtain the best prices, on account of the greater demand for avocados in North America at that time of the year. The best size of fruit for practical purposes appears to be that giving a weight of about 1 lb. The quality of the product is naturally one of the most important matters in making the choice; the variety should also be prolific, and should possess fruit with good keeping properties, having a smooth, thick, leathery skin, and a small seed which completely fills the space in the centre of the fruit. There will be, in addition to varieties of this kind, those for the cheaper markets, as well as for local consumption.

The article from which the above information is obtained is well illustrated, and concludes with a list of varieties, which receive attention in the shape of a detailed description in each case.

The S.S. 'Korona' has taken an expedition from the American Museum of Natural History. It will stop at Dominica for several weeks, spend seven weeks in the interior of British Guiana, and attempt the ascent of Mount Roraima. It will make collections of flora and fauna. (Public Telegram, May 30, 1911.)

AGRICULTURE IN TRINIDAD, 1909-10.

CACAO. The exports of cacao continue to increase in quantity, 51,575,000 lb. having been exported during the year ending December 31, 1909.

A large number of manurial experiments was started at River Estate by the Department of Agriculture and the results are looked forward to with considerable interest.

Spraying experiments have been carried out by the Board of Agriculture and the results are reported to be satisfactory. The Mycologist and the Entomologist have also been engaged in studying the diseases of cacao, and recommending remedies.

SUGAR. The exports during 1909 amounted to 45,330 tons; 11,401 cane farmers produced 154,000 tons of canes, which were sold to the estate factories for the sum of \$337,000, at the average rate of \$2·19 per ton.

Special attention has been given during the year to the study of the 'frog-hopper' insect, which is most destructive to the cane crops, with a view to discovering the most effective means of minimising the attacks of this pest.

COCOA-NUTS. The demand for these continues to increase, and the prices obtained are remunerative. Exports during 1909 were over 20,300,000 nuts.

RUBBER. The following statistics of rubber cultivation have been supplied by planters. The trees vary in age from one to fifteen years:—

Hevea	80,000 trees
Castilloa	600,000 „
Funtumia	25,000 ,,

Hevea having been found to grow well, a large consignment of seeds was imported from the Malay States, but only a small number (about 3,000) germinated. As it is intended to grow Hevea on a larger scale, a further supply of seeds will be obtained.

Castilloa trees grow well, and rubber has been exported in small quantities for the past few years. Tapping on a larger scale is about to be undertaken.

RICE. This cultivation is entirely in the hands of small growers, who grow mostly for their own use.

BANANAS. Experiments in manuring bananas have been carried out by the Government on its lands known as St. Augustine, and it has been shown that a profitable return can be obtained from heavy applications of pen manure. The variety of banana known as 'Governor' has been shown to possess several advantages over the 'Gros Michel' variety.

About 110,000 bunches have been exported during the year, showing a large increase over any previous year.

AGRICULTURAL SHOWS. Five shows were held during the year in different districts and a remarkable improvement in the quality of the exhibits was shown.

GOVERNMENT FARM. Additions have been made to the breeds of stock at the farm by the importation of Holstein, Guernsey and Jersey bulls and cows. A second sire jack has also been imported. The hackney and thoroughbred stallions continue to be highly appreciated. (*Colonial Reports—Annual*, No. 664, p. 9.)

WEST INDIAN COTTON.

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

Since our last report, there has been a fair enquiry for West Indian Sea Island cotton. The sales chiefly comprise Barbados and St. Kitts, prices ranging from 16*d.* to 18*d.*, the latter only for very superior cotton. A fair quantity of stains has been sold at 9*d.*

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

There was a good demand this week, resulting in sales of 2,800 bales, being composed chiefly of various grades of off cotton ranging in prices from $22\frac{1}{2}$c. to $25\frac{1}{2}$c., and several crop lots at 30c. The market closes firm with Factors refusing to go on to make further sales except at an advance, which has not yet been paid, and therefore we renew our last quotations, viz:—

Extra Fine odd bags = No Stock.
Extra Fine crop lots 32c. to 34c. and upwards = 18*d.* to 19*d.* c.i.f. & 5 per cent.
Fully Fine odd bags 28c. = $15\frac{3}{4}$*d.* c.i.f. & 5 per cent.
Selected odd bags Fine 27c. to 28c. = $15\frac{1}{4}$*d.* to $15\frac{3}{4}$*d.* c.i.f. & 5 per cent.
Off grades 23c. to $25\frac{1}{2}$c. = 13*d.* to $14\frac{1}{4}$*d.* c.i.f. & 5 per cent.

THE WORLD'S COTTON STOCKS.

Mr. Arno Schmidt, the Secretary of the International Federation of Master Cotton Spinners' and Manufacturers' Associations, published on April 1 the statistics of the stocks of cotton in spinners' hands throughout the world on March 1, 1911. The figures show that, compared with those of twelve months ago, the stocks are smaller in practically every country. In Great Britain the total supplies amount to 399,021 bales, as compared with 415,182 bales at the same time last year. The figures for the United States are 1,525,000 bales, against 1,674,000 bales twelve months ago. The figures for all countries are 4,060,740 bales, as compared with 4,166,688 bales in 1910. The analysis of the statistics on the basis of stocks in each country calculated per 1,000 spindles, gives Great Britain as 8·20 bales, against 8·50 last year, and 9·72 in 1909. The figures for Germany are 30·62 bales as compared with 34·51 bales last year and 40·86 in the year before. For the United States the figures are 53·51 bales, against 59·79 twelve months ago and 65·78 in the year before. The country which holds the largest stocks is Japan, the figures being 166·79 bales, as compared with 120·85 last year and 131·77 bales in 1909.

It says a great deal for the efficient working of the Federation, and for the pitch of perfection to which the system has been brought, that out of the estimated spinning spindles of the world in work of 135,596,724, returns have been secured from firms owning 122,226,091 spindles. In Great Britain, returns have been sent in from the owners of 48,688,061 spindles, out of a total of 53,859,247 spindles. There are 35,565,127 spindles engaged on American, East Indian, and sundry cottons, whilst the spindles engaged on Egyptian cotton number 13,122,934. It may be said that the Federation has a membership of twenty countries, which practically comprise the whole cotton-spinning industry of the world. (From *The India-Rubber Journal*, April 1, 1911.)

COTTON-GROWING IN BRAZIL.

Cotton can be grown in the nine states of Brazil, from Bahia to Maranham, in the north, where perhaps the finest cotton is grown. Cotton is also grown in the States of Minas Geraes and São Paulo: in the latter State the crop this year will be larger than it has ever been. São Paulo cotton is of shorter staple than than that grown in the north of Brazil, but that of Minas Geraes is as good as that of Pernambuco. The cotton produced in São Paulo and Minas Geraes is all consumed by the local mills. Cotton has also been grown as far south as Santa Catharina, but only in very small quantities.

In the 'sertãos' (the open country right in the interior) of Parahyba and Rio Grande do Norte, a certain quality of wild cotton is grown, of particularly long staple, which fetches a much higher price than the cotton grown in the 'matto' (the open country nearer the ports).

The zone in Brazil where cotton can be grown is far larger than the cotton zone in the United States. With the increased demands made on American cotton by American manufacturers and the consequent limitation of the amount for export from the United States, more attention is being paid to cotton-growing in Brazil (see *Board of Trade Journal* of April 28, p. 194), and from the President's Message to Congress, in which he refers to the subject, the Brazilian

Government would seem likely to take steps to hasten its development. It is stated that the Government will grant subventions annually to syndicates undertaking cotton-growing; at the same time the North Eastern States are being opened up by an extensive network of railways, and irrigation works are in progress. In Alagoas and Pernambuco especially, the Great Western of Brazil Railway Company is opening up important cotton-growing districts. The Government has founded an experimental station in Maranham.

Cotton fields as known in the United States and other countries are not to be found in Brazil, where cotton is, as a rule, grown by small farmers in conjunction with other crops, such as maize, beans and mandioca, the cultivation being of a primitive kind. Progress is retarded chiefly by lack of capital and also by the absence of skilled labour; the Government have recently contracted with some United States experts to visit the plantations and give practical instruction. Progress is retarded also by the want of improved machinery for the cleaning of the cotton; most of the ginning machinery in the north of Brazil is antiquated, and the fibre suffers in consequence.

In states such as Ceará, which are devastated by drought, cotton is being grown on fields watered almost entirely by irrigation, and seed imported from Egypt produces cotton which sells in Liverpool for almost the same prices as that from Egypt. (*The Board of Trade Journal*, Vol LXX, p. 600.)

OXIDATION IN SOILS.

One of the most recent publications of the Bureau of Soils of the United States Department of Agriculture, namely Bulletin No. 3 entitled *Studies in Soil Oxidation*, contains the results of work that has been undertaken for the purpose of determining the ways in which the addition of oxygen to substances in soils takes place. A summary of the conclusions shows that different kinds of oxidation have an important share in both the mineral and organic changes that take place in soils. It is the purpose of the following abstract to draw attention to the chief matters in this summary.

Roots in soils were shown to have the power of producing either oxidation or its opposite, reduction, these kinds of action being capable of taking place together and being dependent on the state of the soil. Demonstration was also made of oxidation within the soil itself, and it is stated that this appears to take place mainly without the interference of living organisms, as the result of actions between inorganic bodies in the soil and certain types of organic matter, as well as by those of inorganic or organic substances alone. This kind of oxidation was found to be increased by the addition of salts of manganese, iron, aluminium, calcium and magnesium, especially in the presence of such acids as citric, tartaric, malic, glycollic, or their salts. Manganese salts gave the best oxidation, and this is stated to provide an explanation of the stimulating action of such salts used as manures, where the manganese acts by improving the conditions in the soil, rather than by possessing a nutritive value itself. Salts used as manures may increase or decrease the power to oxidize of the soil; and some kinds of organic matter reduce this power, although the presence of such matter in plentiful amounts generally increases it. In regard to the plants in the soil, excessive oxidation is harmful. Another matter that was found with respect to salts used as manure was that they increase the oxidizing power of roots, and the soil that has been treated with them has a greater oxidizing power after the crops have been removed than it possessed before they were grown.

Evidence is adduced to show that soils oxidize substances in much the same manner as this is done by the oxidases, and as these substances play an important part in the life-processes of plants, it is easily seen, from analogy, that the power of the soil to oxidize forms a measure of its ability to support plants. This leads to the final conclusion in the bulletin, namely: 'Whatever decreases the oxidation in soils tends also to bring about the conditions which decrease growth, and the factors which favour oxidation are the factors which favour soil productivity.'

THE INFLUENCE OF RADIOACTIVE SUBSTANCES ON PLANTS.

A paper giving information relating to this subject is contained in the *Journal of the Department of Agriculture*, Victoria, for March 1911, p. 155. It points out that the large amount of work that has been done already in connexion with the matter has not taken cognizance, for the greater part, of the kinds of radiation, or of the possible difference between the action of direct contact of the radium emanation from radium itself and from radioactive minerals. This probably accounts for some of the variations in results obtained by different investigators.

The award of a Government research scholarship under the Department of Agriculture of Victoria has enabled definite work to be done on the subject during the past year. Before the results of this are given, attention is drawn to the fact that investigators have generally found that intense radiations of the kind cause the death of plants, while, when they are less intense, they bring about a stimulation of the growth, thus possessing much the same effect as plant poisons. The latter fact suggested that it would be of interest to determine: 'whether the addition of small quantities of radioactive minerals to the soil would sufficiently stimulate the growth of such plants as wheat, for example, to make their use profitable on an agricultural scale.' For the purpose, finely ground and strongly radioactive rock was applied to different plots of wheat singly, as well as in conjunction with superphosphate, and finely ground phosphate rock.

In the result, the plants on all the plots were slightly attacked by corn mildew (*Erisyphe graminis*), showing that the presence of a radioactive mineral in the soil does not afford protection to plants against parasitic fungi. In regard to the effect on the yield of wheat, the results are not concordant, and the experiments require repetition, but they seem to indicate that the presence of the radioactive mineral in fairly large quantities tends to increase the weight of the crop; the composition of the mineral shows that this effect could not be due to any manurial value that it may have possessed. The suggestive matter is that the greatest increase occurred where the seed was placed immediately upon the radioactive mineral. It is not possible, however, as has been mentioned, to draw definite conclusions from the results of the experiments, so far. Enough has been indicated to show, nevertheless, that economically useful results may ultimately be obtained from experimentation of the kind.

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 treats of The Period of Maturity of the Sugar-Cane. The matter that is presented is important, both in regard to work on sugar estates, and investigations in connexion with manures for sugar-cane and the comparative value of seedlings.

On page 179, interesting facts are given in relation to the influence of molasses on soil fertility.

A note on new mangoes that have been, and are being, obtained for growing in the West Indies, is contained on page 180.

The Insect Notes, on page 186, consist of an illustrated article on Peripatus—a curious animal that has been found in several parts of the West Indies. As is stated in the article, specimens of this animal are required for scientific work in connexion with it.

Page 187 contains some of the latest information concerning artificial and natural camphor.

Special attention is drawn to the article appearing under Fungus Notes with the title Miscellaneous Fungi Found Recently. This presents the results of very interesting observations concerning fungi that have been made principally in recent months in the Mycological Laboratory at the Head Office of the Department.

Page 191 contains an account of experiments that have been conducted in Antigua, in relation to methods for storing onions.

Selection of Soluble Plant Food by Roots.

A paper recently presented before the Académie des Sciences, Paris, contains details of an investigation of the absorption of different substances by the roots and cut stems of the haricot bean. The solutions employed were sodium, potassium and calcium chlorides at one-tenth of the normal strength.

It was found that the cut stems absorbed all the salts equally, in remarkably large quantities. In the case of roots, the amounts varied with the salt used, being 0·6 for calcium chloride and 0·55 for sodium chloride, reckoning the extent of absorption of potassium chloride as unity.

Machines for Extracting Citrus Essential Oils.

In the *Agricultural News* for May 13, 1911, p. 156, it was announced that Messrs. W. A. D. Allport and T. J. W. C. Davenport had invented machinery for extracting the essential oils from the rinds of limes and oranges. The patent rights for the machines having now been obtained, a circular has been prepared which gives information concerning them. This shows that these machines are made in three kinds, referred to as Model I, Model II, and Model IV; of these, the first is for limes or oranges, the second for limes only, and the third for oranges only. Models I and IV are worked by hand or power and possess a gravity feed; while Model II is operated by power only, under a force feed.

It is claimed that the capacity in each case amounts to 20 barrels, 60 barrels and 60 barrels per hour, respectively. The yield of oil to be expected from Model I is as follows: with limes, 2½ to 4 oz. per barrel according to the state of the fruit, 75 per cent. of the oil being free, and the rest in the mucilage for subsequent extraction: with oranges, treated twice, 7 to 12 oz. of oil per barrel, according to the state of the fruit. The yield in the case of Model II is the same as that for Model I, but as has been stated, this can be used for limes only. Model IV, for oranges, gives the same yield as Model I for these fruits, but the material receives only one treatment.

Among the conditions that are necessary to ensure maximum yields with limes are the provision of good fruit which has been handled as little as possible and the elimination of rotten and badly damaged fruit and foreign matter; in addition, the fruit should be clean, and it is most important that it should be dry, as well. The conditions for maximum yields with oranges are similar to those just stated for limes.

Good reports on samples of oil obtained with the aid of the machine have been received from Messrs. Schimmel & Co. The prices are as follows: Model I for limes £125, for oranges £137; Model II for limes only, £240; Model IV for oranges only, £185. These prices do not include the cost of gearing for the machines. For the arranging and setting up of the machines, in Dominica, the inventors are willing to give their services and advice to purchasers, free of charge.

Rice Cultivation in Ceylon.

According to *Progress Report*, No. LIII, of the Ceylon Agricultural Society, the popularity of improved iron ploughs in Ceylon is increasing, and this arises from the demonstrations with such implements that have been made in different parts of the island. It was shown, in regard to one district, that two such demonstrations resulted in the ordering of at least twenty-three additional ploughs.

In a report by Dr. R. H. Lock on a tour in one of the districts, the Meston plough is mentioned as being an excellent implement on paddy fields when used at the right time. A recommendation is made that cross ploughing might well be tried, to be followed by the breaking of the clods by means of a fairly large log dragged over the surface, as this operation prepares the ground well for sowing.

It may be mentioned, by the way, that success is reported in relation to the use of carbon bisulphide for the destruction of rats in paddy fields.

Rubber and Balata in British Guiana.

A copy of an attractive publication with the above title has been received; this has been prepared, by direction of His Excellency the Governor of British Guiana, by Professor J. B. Harrison, C.M.G., etc., Director, Department of Science and Agriculture, British Guiana, and F. A. Stockdale, B.A., F.L.S., Assistant Director.

The publication is issued by the Department of Science and Agriculture of British Guiana. It sets forth, in a cautious but thorough manner, information concerning the rubber and balata industries of the Colony. This information is contained in forty-six pages of matter, well illustrated by half-tone reproductions, on art paper. After an introduction is given, dealing with general matters, details are afforded concerning the state and prospects of the Para rubber industry in the Colony. These include references to the plant producing the rubber (*Hevea brasiliensis*), the provision of seeds, the condition of the plantations in different parts of the Colony and at the Government Agricultural Experiment Stations, yields of plantation Para, Crown lands available and terms of leases, and particulars as to cost of cultivation and labour.

The succeeding part of the publication gives very similar details in connexion with Sapium rubber (from *Sapium Jenmani*), both wild and cultivated in experiment stations. Further, regard is had to Central American rubber (*Castilloa elastica*), African rubber (*Funtumia elastica*), and Ceara rubber (*Manihot Glaziovii*), none of which have given satisfactory results, so far, in British Guiana. The last portion of the information relates to balata, particularly in reference to the methods of its collection, the labour required for the purpose, the exports from the Colony, and the composition of the product. Finally, four appendixes are included, relating to the meteorological conditions of the Colony, the terms for obtaining Crown lands for rubber cultivation, conditions for the issue of licences for balata, rubber and similar substances, and giving a list of recent publications in British Guiana. The inclusion of two useful maps completes a pamphlet which should prove of much effect in arousing and sustaining interest in that Colony.

St. Lucia and the Coronation Exhibition.

At a special general meeting of the St. Lucia Agricultural Society, held on May 9, 1911, the secretary read a report on the general exhibits forwarded to the Coronation Exhibition per R.M.S 'Berbice' on April 30. This shows that the number of separate exhibits was 154, and that they represent thoroughly the products of St. Lucia, both major and minor. The material was carefully put up in attractive receptacles, which were fully labelled with details including the market prices of the produce and the addresses of exhibitors. Ten strong, white pine cases were used for forwarding the packages, and the greatest care was taken to prevent the breakage of bottles and damage to the labels.

An interesting feature in connexion with St. Lucia and the exhibition is that it is intended to forward about 4 barrels of green limes every month, until its close in October, provided that the Agricultural Society consents to this course.

Mr. Algernon E. Aspinall, Secretary to the West India Committee, has undertaken the arrangement of the material at the exhibition. The exhibits were conveyed by the Royal Mail Steam Packet Company, free of charge as far as Southampton.

The Resistance of Plants to Wind.

The *Bulletin Agricole*, of Mauritius, for February 1911, has an interesting note on the effects, on various plants, of the hurricane that visited the island at the beginning of that month. It states that cocoa-nut palms showed a useful power of resistance to the wind, while the tamarind trees, although they had attained their full leafage, merely suffered a scorching of the leaves and soon sprouted again. In an area where much harm was done to plants of every kind, several acres of cotton were completely destroyed, though generally this plant exhibited reasonable behaviour under the trying conditions: the wind scorched the leaves, but new buds quickly opened: the position in regard to cotton is summarized by saying that this plant has proved its possession of a power of resistance to high winds.

The note, it may be stated also, has reference to a large snail which is a pest of cotton in Mauritius. This, according to information contained in a letter from Mr. J. H. Lee, who is in Mauritius on behalf of the British Cotton Growing Association, is *Achatina fulica*. In regard to this animal, it is of interest that an outbreak of the pest took place in Ceylon, in 1910; this is described in *Circulars and Agricultural Journal of the Royal Botanic Gardens*, Ceylon, Vol. V, No. 7, where however, it has shown itself a scavenger rather than an enemy of plant life.

INSECT NOTES.

PERIPATUS.

The name at the head of this article is used to designate a genus of animals closely related to the insects. They belong, in fact, to the group Arthropoda, or animals with jointed limbs—the group which, as has been explained already in the *Agricultural News* (see Vol. VIII, p. 346), includes the insects. Peripatus, however, cannot be classed as an insect, on account of the great differences from the structure of this group which are exhibited by its body. It forms, as a matter of fact, a group entirely by itself, which is between the Arthropoda and the worms (Annelida).

Although this animal is not classed as an insect, and is not known to be of any economic importance, even from harm that it may do, it is nevertheless of interest from its peculiar characteristics, and from the fact that it was originally described (by Guilding in 1826) from the West Indies, the first specimen having been obtained from the island of St. Vincent. Guilding was deceived as to its proper affinities, for he regarded it as a mollusc, probably because its antennae give it a slug-like appearance. In any case, the concern of Peripatus to scientists, on account of its peculiar nature, and its interesting historical connexion with the West Indies, form sufficient excuse for information to be given concerning it on this page of the *Agricultural News*.

Figure 8, which is reproduced after Sedgwick, represents a South African species (*P. capensis*) in a life-sized illustration. In a description given in the *Cambridge Natural History*, Vol. V, p. 6, from which much of the information in this article is taken, it is stated that the head, which is not sharply marked off from the rest of the body, bears three pairs of appendages, a pair of simple eyes, and a mouth placed underneath. The body is worm-shaped, and is borne on a number of paired appendages, each ending in a pair of claws, and all exactly alike; the number of these varies in the different species. The colour of the animal also differs considerably among the species, and even in the different individuals of the same species. The under surface is nearly always flesh-coloured, while the colour of the upper one is darker. The variations in colour are greatest in the South African and Australasian species, being less in those from the West Indies and South America. There are ridges in the skin of the animal running from side to side, and the body bears wart-like papillae everywhere, but most thickly on the back: a well marked spine projects from each papilla. The appendages of the head include the antennae, the jaws and the papillae of the mouth; of these the last are particularly interesting, as will be shown later. As a general rule, the males are smaller and fewer in number than the females, and it is a noticeable fact that where the number of legs (appendages) varies in the species, these are fewer in the male than in the female.

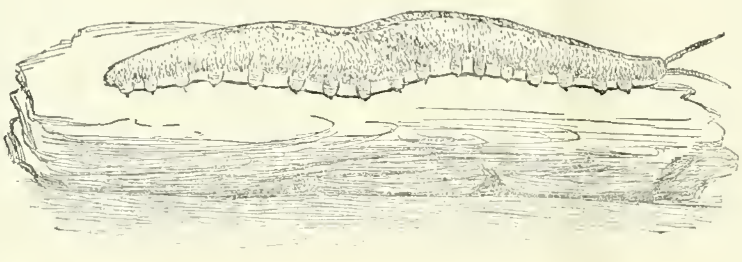


FIG. 8. PERIPATUS. (After Sedgwick.)

The above description should serve as a means of identifying Peripatus wherever found. It is, however, more plainly characterized by its habits. Peripatus, where it exists, is invariably found in damp places—usually beneath the bark of rotten tree stumps, in rock crevices or beneath stones. It cannot exist under dry conditions, and always keeps away from light. The animals move slowly, using their very sensitive antennae for finding out the nature of the surface over which they are passing, and their eyes to enable them to avoid the light. They possess 'slime reservoirs', the contents of which they eject with considerable force, when disturbed, from the papillae of the mouth, mentioned above. The distance to which the slime can be squirted is as much as 1 foot, the method of ejection being by means of a muscular contraction of the body. Observations show that the slime is employed as a defensive weapon, although some authorities are inclined to hold the opinion that it is used for catching flies in order that the animals may suck the juices from these insects; some support is given to the latter supposition by the fact that the slime, though apparently harmless, is very sticky. A picture of the animal is well presented in the following paragraph, which is taken from page 5 of the work to which reference is made above.

Peripatus, though a lowly organized animal, and of remarkable sluggishness, with but slight development of the higher organs of sense, with eyes the only function of which is to enable it to avoid the light—though related to those animals most repulsive to the aesthetic sense of man, animals which crawl upon their bellies and spit at, or poison, their prey—is yet, strange to say, an animal of striking beauty. The exquisite sensitiveness and constantly changing form of the antennae, the well-rounded plump body, the eyes set like small diamonds on the side of the head, the delicate feet, and above all, the rich colouring and velvety texture of the skin, all combine to give these animals an aspect of quite exceptional beauty. Of all the species which I have seen alive, the most beautiful are the dark green ndividuals of *capensis* and the species which I have called *Balfouri*. These animals, so far as the skin is concerned, are not surpassed in the animal kingdom. I shall never forget my astonishment and delight when on bearing away the bark of a rotten tree stump in the forest on Table Mountain, I first came upon one of these animals in its natural haunts; or when Mr. Trimen showed me in confinement at the South African Museum a fine fat, full-grown female, accompanied by her large family of thirty or more just born but pretty young, some of which were luxuriously creeping about on the beautiful skin of their mother's back.

It will be of interest to readers of the *Agricultural News* to learn that it is desired to obtain West Indian specimens of Peripatus for scientific purposes. With this object, they are requested to send any specimens found by them to the Officers of the Department, in order that they may be forwarded to the Head Office. When they are only required to travel a short distance, the specimens may be placed, with a few pieces of damp bark, in a box having a tightly fitting lid (see *Agricultural News*, Vol. II, p. 168); for long distances they must be put in bottles, preferably with wide mouths, containing alcohol or a 4-per cent. solution of formalin, the bottles being packed carefully in order to prevent breakage.

The receipt of good specimens of Peripatus, packed in this way, will be welcomed by the Department.

ARTIFICIAL AND NATURAL CAMPHOR.

The *Journal d'Agriculture Tropicale*, for January 1910, contains an article by V. Cayla, in which the position is considered regarding the likelihood of the entry of artificial camphor into serious competition with natural camphor. After giving evidence from various authorities to the effect that such competition is not likely to exist, it draws attention to one of the chief reasons for this, namely the high price of turpentine, which is the raw material required for the production of synthetic camphor. Although this price has recently become 60 per cent. less than that in 1907, even under such favourable conditions, the artificial product has not been able to be made profitably. Another factor has also made itself felt: that is the lowering in the price of the natural product. It was certain that this, which had reached the level of 4*s.* 10*d.* per lb. in March 1907, could not remain as high for long. It was partly due to an attempt to make a monopoly of the production, with the result that the manufacturers of celluloid, and other consumers of camphor, renewed their efforts for the cheap production of synthetic camphor. This led the Japanese Monopoly (see *Agricultural News*, Vol. IX, p. 280) to lower its price, and it was also caused to do this in order to get rid of the large stocks on hand.

There are other considerations besides those mentioned that have helped to discourage the production of artificial camphor. Among these is the fact that its quality is not as good as that of natural camphor, so that it is usually quoted at 1*d.* to 2½*d.* per lb. below natural camphor, because it can only be used in a limited way for the production of articles of inferior quality. On the other hand, there is evidence that means have been found for purifying artificial camphor from the free chlorine that it used to contain; though the fact that this has to be done must increase the cost of manufacture.

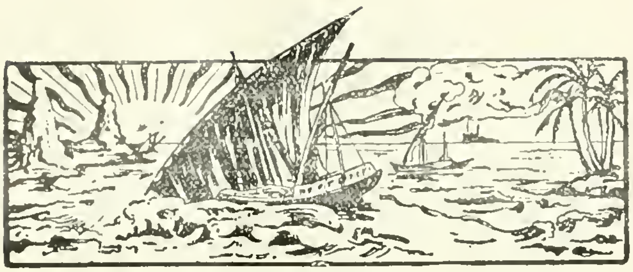
Attention is drawn to the circumstance that those who encourage artificial production draw a parallel between the conditions that are likely to exist in the camphor industry and those which have obtained in the indigo industry, whereby the growers were forced to give up cultivation on account of the appearance of the cheap manufactured article. It is held that the circumstances are not parallel, on account of the difference in the conditions of production: the Japanese possess special knowledge in regard to the distillation of camphor, as well as information that is not generally available as to the cultivation, exploitation and refining of the product.

The only recent certain facts are that increased areas are being planted, which are controlled by the Japanese, not only with the true camphor plant but with Borneo camphor (*Dryobalanops Camphora*), and species of Blumea; that new camphor forests have been discovered in the Japanese archipelago; that Japan gained a complete victory in its struggle against Chinese camphor; and finally, that the desire on the part of the Government to continue to rule the market is making it show a disposition to forbid the sale and exportation of camphor seed.

As the question is therefore only concerned with the natural product, it becomes solely a matter for considering how long the forests that are now being exploited in the Japanese Empire will last, and when the young plants will be ready for employment in production. If the old method of cutting down the trees continues to be adopted, the younger cultivation cannot be useful before a period of thirty years has passed; and the further question is suggested as to whether the supply from the existing forests can continue for such a time. This leads to the consideration of work that is being done, particularly by the English in several parts of their Asiatic possessions, as well as in the West Indies, for the purpose of discovering if camphor can be produced remuneratively by the distillation of the leaves only. In connexion with this, the article from which these facts are being taken refers to investigations made at Batu-Tiga, Selangor, to which attention has been called already in the *Agricultural News*, Vol. IX, p. 233. The experiments show that trees five years old, and probably those which are younger, yield leaves in regard to which at least 1 per cent. of camphor, as well as a certain quantity of oil, can be obtained from the fresh material. Information is given, further, in the article in the *Journal d'Agriculture Tropicale*, with respect to another experiment which was undertaken by the same investigators, in order to find the yield of camphor from the different parts of a whole plant five years of age. The results were to show that the following percentages of camphor were obtainable: leaves 1·00, twigs 0·22, large branches and wood 0·66, roots 1·20. It is pointed out that these results show completely that, other than the roots, which cannot be considered as being exploitable, the leaves have the chief interest in regard to the production of camphor, and there is the further result of the work, namely, that distillation is only required, for these, for three hours. Attention is also drawn to Bamber's suggestion to bruise the leaves and twigs thoroughly, before distillation. Reference is made to similar experiments that have given comparable results, in Jamaica and Antigua (see *Agricultural News*, Vol. VIII, p. 328); *West Indian Bulletin*, Vol. IX, p. 275, and in Ceylon (*Circulars and Agricultural Journal of the Royal Botanic Gardens*, Ceylon, I [1901], No. 4). Experiments on a larger scale, conducted at Kuala Lampur, in which a plantation of camphor trees about eighteen months old and 5 feet in height was thinned in order to make room for the remaining plants, gave 1,226 lb. of material for distillation per acre, which furnished 0·6 per cent. of camphor.

In concluding, the article refers to the fact that all these investigations show the possibility of obtaining camphor from the leaves, and suggests that in the future the circumstance that such a long time must elapse, before camphor can be obtained from trees that are cut down, will cause the abandonment of this method for that in which the leaves alone are employed.

Ceara Rubber from Uganda.—In October 1910, a sample of Ceara rubber was forwarded from Uganda to the Imperial Institute, in order that it may be analysed and compared with a previous sample. The report on the former is contained in the Uganda *Official Gazette* for March 15, 1911, and shows that the sample consisted of sheet rubber, prepared with water only, and weighing 1½ lb. The physical properties of the rubber, which contained 86·1 per cent. of caoutchouc when received, were satisfactory. The sample, however, had not completely dried on its arrival, so that the composition of the dry rubber showed a percentage of 89·3 of caoutchouc; the percentages of resin, proteids and ash in this dry rubber were, respectively, 5·9, 3·7 and 1·1. The rubber was valued at 4*s.* 3*d.* to 4*s.* 6*d.* per lb. in London, with fine hard Para at 5*s.* 2*d.* per lb. It was much superior in composition to the previous sample which contained higher proportions of resin, proteids and ash, and therefore a lower percentage of caoutchouc. A useful result of the investigation is to show that the coagulation of the latex of Ceara by means of water is a suitable method for adoption in Uganda.



GLEANINGS.

At a meeting of the Legislative Council of Grenada, on March 3, 1911, the following resolution was passed unanimously: 'That this Council is of opinion that a systematic effort should be made to stamp out malaria in this Colony, and that a committee should be appointed to report upon the organization necessary for the purpose.'

A paper in the *Comptes Rendus de la Société de Biologie*, Paris, for 1909, p. 367, gives the results of investigations with grains heated to certain temperatures, in order to find out the effect on their malting power. It was discovered that grains still possessed this power, even when they had been heated in water to a temperature of about 150° F.

A copy of a catalogue issued by Messrs. T. A. W. Clarke, Ltd., Engineers and Rubber Plantation Machinery Makers, Havelock Iron Works, Leicester, has been received. This contains particulars of six kinds of washing, crêping and sheeting machines, as well as of a macerator, for use on rubber plantations. The firm also manufactures powerful hand-power blocking presses, for employment in connexion with rubber.

The *Experiment Station Record*, Vol. XXIII, p. 724, presents an abstract giving the results of work that has been performed in connexion with the direct absorption of nitrites by plants. Different nutritive media were used in the experiments, and it was found that rice and maize seedlings, grown in a sterilized, nutrient medium, containing dilute sodium nitrite, were able to absorb this compound directly, without suffering any injury.

The publication has been made recently of an Ordinance, No. 7 of 1911, Grenada, which has been drawn for the purpose of amending the Cacao and Nutmegs Ordinances, 1896-1909, mainly in order to provide for the inclusion of cotton under the provisions of the former Ordinances. The new Ordinance may be cited as 'The Cocoa, Nutmegs and Cotton Ordinance, 1911', and is to be construed as one with the older Ordinances just mentioned.

Ordinance No. 1 of 1911, St. Vincent, has been made in order to provide for the collection of export duties, and has received the short title The Export Duties Ordinance, 1911. It provides for the levying of the following amounts on the products mentioned, for payment for the public use of the Colony: arrowroot, 3*d.* per cwt.; Sea Island cotton, 2*s.* per cwt.; Marie Galante cotton, 1*s.* per cwt.; cotton seed, 3*d.* per cwt.; cacao, 6*d.* per cwt. This Ordinance repeals the Export Duties Ordinance, 1900, and will come into force on October 1 of the present year.

According to *The Board of Trade Journal* for April 13, 1911, it is stated in a publication issued by the German Colonial Office that increasing efforts are being made to cultivate American varieties of cotton in the Russian provinces in Central Asia, but that the product is inferior to the best American lint as regards length, lustre and strength. The rapid development of cotton-growing in Russian territory is shown by the circumstance that the area devoted to this increased from 2,700 acres in 1885 to 158,919 acres in 1890, and 738,846 acres in 1900.

In a communication received from Mr. J. H. Lee, who was recently engaged in cotton-planting in Antigua, and is now stationed in Mauritius on behalf of the British Cotton Growing Association, an interesting statement is made in regard to a use for vetivert or khus-khus grass (*Andropogon muricatus*) in that island. It appears that this grass is usually planted all round the cane fields in Mauritius, in order to prevent the spread of devil's grass (*Cynodon Dactylon*) from the estate roads on to the cultivated land. It is also used in the colony for thatching coolie huts.

A report of H.M. Consul at Ciudad Bolivar, shows that the amount of block balata shipped from Venezuela in 1910 was 1,880 metric tons, of the value of £451,275. This is a larger quantity than the record amount for 1909, which was 1,624 tons. In a few years, there is likely to be a large decrease in the amount produced, as the chief districts from which balata is obtained in Venezuela are now situated far from the coast, and the supply is rapidly becoming exhausted. At the present time, even, it would not pay to collect the product, if the prices happened to fall below 1*s.* 9*d.* or 2*s.* per lb.

Gardening is now taught in forty-six of the forty-nine county areas in England, and in eleven of the thirteen in Wales. The number of schools where this subject is taught, and the number of scholars instructed, show a considerable increase. The complete returns for 1907-8 show that grant was paid for 18,134 scholars. During 1908-9 instruction was given in 1,587 school courses, and grant was paid for 24,925 boys and 485 girls. During 1909-10 instruction was given in three centres and 1,928 school courses. (*Report of the Board of Education*, England, for the year 1909-10.)

The Bengal Chamber of Commerce has published the final official forecast of the rice crop in Burma for 1910-11, dated February 15. The area under rice cultivation in the fifteen principal rice-producing districts is reported as 7,485,853 acres—an increase of 19,274 acres as compared with the actual area last season, and the produce per acre is estimated at 90 per cent. of the normal. It is estimated that 2,580,000 tons of cargo rice, equivalent to 43,750,000 cwt. of cleaned rice, will be available for export. (*The Board of Trade Journal*, March 23, 1911.)

The *Leeward Islands Gazette* for May 4, 1911, contains a notification, for general information, that by an Order made by the Governor-in-Council on March 11, 1911, under the provision of section 4 of Ordinance, No. 10 of 1899 of the Legislature of Antigua, the disease known as Yaws has been included in the expression 'infectious disease' within the meaning of that Ordinance. It is therefore now necessary for the head of the family to which any person suffering from the disease belongs, or the nearest relative available of such persons, to notify the case to the medical officer of the district in which that person is situated.

STUDENTS' CORNER.

JUNE.

SECOND PERIOD.

Seasonal Notes.

Discuss the differences between the cultivation of a temporary crop like sugar or cotton and that of a permanent crop such as cacao, limes or nutmegs. In the former kind of cultivation, how can the growing of ground provisions aid in the cultural operations on the estate as well as in keeping the soil in a good state of tilth? Discuss the advisability, or otherwise of forking cacao orchards. Is forking necessary for opening up heavy soils in cacao cultivation? Suggest any means that you know by which soil may be turned over without disturbing it mechanically.

Give an account of the different ways of conserving soil moisture. Under what conditions may plants be actually raised for this purpose? What kind of tillage possesses an intimate connexion with the work of preventing the soil from losing water, as far as possible? In what ways may the quantity of water in a soil be reduced, and under what circumstances may such a reduction be advisable? A soil will lose water either if it is opened up too frequently, or if on the other hand it is made too firm. In connexion with this matter, state how the water-holding capacity of a soil may be diminished. Give a description of the circumstances that are likely to arise in a soil which is kept too wet, and mention any useful plants with which you are acquainted that thrive well in situations where the soil is likely to remain wet. At what periods of the life of a plant do the moisture conditions of the soil possess their greatest effect in relation to its development? Describe methods by which you could compare in a simple way the capacity of soils of various kinds to hold water.

One of the most important problems for the agriculturist is often that of finding a means of increasing the amount of water in the soil. In what way may this be done? What would be the effect, in relation to this matter, of increasing the water-holding capacity of the soil, and how may such an increase be brought about? What measures may be taken to enhance the flow of water in a soil from the lower to the upper layers? In what ways does this matter refer to the kinds of cultivation that are practised on estates? With reference to these subjects, although irrigation has not attained importance as yet in the West Indies, the affair is of sufficient interest from a general point of view to make it worth while to obtain an elementary knowledge of it, and to take notice of any matters having reference to it that may occur from time to time. Discuss the relationship between the organic content of the soil where irrigation is used, and that under conditions with which it is not employed.

Much of what has been said above will show that the too frequent cultivation of soils is undesirable, especially after the protective mulch has become quite dry. In this matter, there has to be considered not only the effect on the soil, but the economic condition that arises from doing work (of cultivation) for which there cannot be any return. Another circumstance which requires consideration in the same connexion is the state of development of the plants on the land which is being cultivated. Many plants, as they attain maturity, produce large numbers of fine roots close to the surface of the soil, so that it is easily understood that any cultivation which injures these merely has the effect of reducing the ability of the plants to take up water, and therefore of minimizing their effective supply.

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) State what you know of the different kinds of seeds.

(2) How does water travel through the soil?

(3) How would you show that plants breathe? What necessary condition would have to be fulfilled in the experiment?

INTERMEDIATE QUESTIONS.

(1) What are the chief elements (a) taken in, (b) given off, by plants during life?

(2) Describe any way in which the mode of germination of the seed of a plant may influence the treatment of the soil after it is sown.

(3) Give an account of the ways in which mulching is performed. What is the use of mulching?

FINAL QUESTIONS.

(1) Discuss the requirements of any cultivated plant with which you are familiar, in regard to the supply of water at different periods of its growth.

(2) Write an account of the best methods of storing the seed of any crop with which you have worked.

(3) State, as far as you can, the significance of the fact that plants give off carbon dioxide.

WEED DESTRUCTION IN THE PHILIPPINES.

From an article in the *Philippine Agricultural Review*, for February 1911, it appears that the plant *Lantana Camara*, which is one of those known as 'wild sage' in the West Indies, has been introduced, together with other tropical American weeds and ornamental plants, into the island of Negros, in the Philippines. This plant, by its rapid spread and luxuriant growth, has already caused trouble to agriculturists in Hawaii, where insect pests have been introduced for the purpose of diminishing its spread.

The measures that are proposed for the eradication of the weed before it becomes disseminated beyond control consists in the process of loosening the root system, which is very weak, by means of a pick or a strong wooden stake, and then cutting through the roots just below the collar; the plants treated in this way are allowed to become dry in the sun, and are then burned as soon as they are fit for this to be done.

The article draws attention to the characteristic inflorescence of the plant, which consists of a small bunch of reddish or yellowish flowers, borne near the tips of the branches; the flowers in the centre of the bunch open first, when their colour is pinkish or yellowish, but reddish or purplish after a few days. The most potent circumstance in the spread of the plant is the fact that the fruits are eagerly eaten by birds, which do not however digest the seeds.

As is well known, the plant is a perennial and attains in the West Indies a height of 5 to 7 feet. In Hawaii, it has been known to grow as tall as 15 feet, but the specimens in Negros were only 6 to 9 feet high, at the time of publication.

FUNGUS NOTES.

MISCELLANEOUS FUNGI FOUND RECENTLY.

It is proposed in the following article to deal with certain miscellaneous fungi which have been found in some of the West Indian Islands mainly during the last few months. Of such miscellaneous fungi, those parasitic on plants are not at present of any serious importance but are recorded as being of local interest and possibly worth watching in case they should show a tendency to spread at a later date.

FRUIT SPOT OF MANGO. The fruits of a large mango tree growing in the Botanic Garden, St. Vincent, were observed to be affected by a disease which took the form of small dark-brown or nearly black circular spots about $\frac{1}{8}$-inch in diameter. They occurred on fruit of all ages, from that just formed to that which was half-grown or nearly fully grown. When the diseased fruits were kept, the spots extended largely and ran into one another, forming discoloured areas nearly $\frac{1}{2}$-inch across. At the same time, the tissues became sunken, over the infected portion, and numerous very small pink or yellowish pustules appeared all over the surface. These burst through the epidermis of the fruit, and consisted of the spores of a species of Gloeosporium, which was most probably *G. mangiferae*, and may be regarded as the cause of the disease. The members of this genus, and of the closely allied Colletotrichum, cause anthracnose and spotting of many fruits, and are responsible for diseases of several kinds. In addition to the spots on the fruits, a dying back of the fruit stalk was often observed, which is probably attributable to the same fungus.

LEAF SPOT OF BENGAL BEANS. A short time ago specimens of the leaves of the Bengal bean (*Stizolobium aterrimum*) were forwarded from Grenada for examination at the Head Office. These showed the presence of fairly numerous spots, approximately circular in shape and 2-4 mm. in diameter. The centre of each spot was occupied by colourless semi-transparent tissue, and was surrounded by a broad band of dry tissue of a light-brown colour: the whole spot was enclosed by a dark-brown ring dividing it from the healthy green portion of the leaf. The spots were mostly separate, but occasionally two or three, or even more, would run into one another. The disease was caused by a species of Cercospora, the conidiophores of which appeared in tufts in the central white portion of the spots. They were to be found on both sides of the leaf, but were commonest on the under surface. Leaf spots of this nature are common on many weeds in the West Indies, and there is always a reasonable possibility that the same fungus as attacks the Bengal bean may have other host plants.

GUINEA CORN RUST. A short time ago, specimens of the well known rust on Guinea corn leaves were forwarded to Kew and identified as *Puccinea purpurea*, Cke.—a rust common on Sorghums in North America and the West Indies, and also found on Indian corn. Only the uredospores and teleutospores are known, though it is possible that an aecidial stage occurs on some other host plant. The affected spots on the Guinea corn leaves showed the presence of small black pycnidia, in addition to the rust fungus. These pycnidia contained hyaline bicellular spores, spindle-shaped and having small appendages at their ends. They belong to a fungus identified at Kew as *Darluca filum*, (Bivon). Cast., which is a well-known parasite on several of the rust fungi. Another species of rust fungus, also reported as occurring on Guinea corn in the West Indies, is *Puccinia sorghi*, Schw., which is supposed to be a native of America and an original parasite on Indian corn. The complete life-cycle of this fungus is known, as its aecidial stage has been found to occur on Oxalis and to be identical with *Aecidium oxalidis*, Thüm.

ENTOMOGENOUS FUNGI. An intersting fungus has recently been found on the leaves of trees of mango and star apple (*Chrysophyllum Cainito*) in Dominica, and on those of Java plum (*Eugenia Jambolana*) in St. Lucia. It forms small, light pink masses or stromata from which several small spherical bodies project. These are closed at first, but later on extrude short cone-shaped, rose-coloured masses of spores. Later still, the spheres open out into shallow cups, lined with the rose-coloured masses of spores. The spores themselves are borne on short conidiophores, lining the cavities of simple or branching pycnidia sunk in the bottom of the cups. Each spore is hyaline when seen by itself, and colourless, and is pointed at either end. This fungus was identified at Kew as the conidial (Aschersonia) stage of *Hypochrella oxyspora*, Massee. Its method of occurrence on the leaves in St. Lucia, which were examined in the fresh state, as well as the fact that the leaves did not appear to be much diseased, suggested that it was a parasite on some scale insect, possibly the mango shield scale (*Coccus mangiferae*), which was found on the leaves. This hypothesis is borne out by its systematic position. Two species of Aschersonia, to which genus its conidial form belongs, are well-known parasites of scale insects and white fly in Florida, while several species of Hypochrella occur on scale insects in Ceylon and Java. It is probable, therefore, that another useful parasite of scale insects has been added to the list of those already known (see *Agricultural News*, Vol. VIII, pp. 299 and 411).

An unidentified mycelium, of cottony consistency and a very pale-yellow or almost white colour, was found to occur on the larvae of a beetle—a species of Cryptorhynchus, which tunnels into the stems of crotons, in St. Vincent. As many as 50 per cent. of the insects are said to be attacked normally, so that the fungus must contribute considerably to keeping them in check. No fructifications of any kind were found in connexion with the mycelium, though there is reasonable ground for expecting that it belongs to a species of the genus Cordyceps.

TWO FUNGI ON LIME TREES. Two bracket fungi found on dead or dying lime trees in Dominica are recorded in that portion of the 'A B C of Lime Cultivation', Pamphlet Series No. 53, devoted to the consideration of pests and diseases. These are *Polystictus hirsutus* and *Fomes lucidus*. The former is recorded as causing hairy sap rot of red gum timber in the United States (Bulletin No. 114, Bureau of Plant Industry, United States Department of Agriculture) and is usually saprophytic. In identifying the specimens from Dominica at Kew, Massee remarked, however, that this fungus might very possibly be parasitic in habit, and recently it has been found as a wound parasite on the mountain ash in the United States, which it kills by slowly destroying the cambium. It is possible, therefore, that this fungus may attack lime trees in a similar manner. The second fungus, *Fomes lucidus*, found in Trinidad and Dominica, was not thought to be a parasite when identified at Kew, but Petch has since shown that it is responsible for root disease of cocoa-nuts and of flamboyant trees in Ceylon.

EXPERIMENTS ON THE STORAGE OF ONIONS.

The following article, describing experiments in storing onions, has been received from the Superintendent of Agriculture for the Leeward Islands. It deals with work that has been performed by Mr. T. Jackson, Curator of the Botanic Station, Antigua:—

During the year 1910, certain experiments were carried out at the Experiment Station, Antigua, on the storage of onions.

The onion industry occupies a position of some importance in Antigua, and, to a less extent, throughout the whole of the Leeward Islands, at the present time, and one of the chief difficulties with which cultivators have to contend is that the product rapidly deteriorates in storage; in consequence of this, it is impossible to store onions so that they may be available for disposal locally at periods of the year during which the crop is not in season, and, moreover, it also seriously handicaps producers, inasmuch as it renders it impossible to raise the crop from sets (i.e., small onion bulbs)—a form of cultivation which has been productive of excellent results in other parts of the world where onions are grown.

Accordingly, a series of experiments was undertaken, at the suggestion of the Imperial Commissioner of Agriculture, with a view to ascertaining if it might be possible to retard the processes of bacterial decomposition, which usually ensue when onions are stored for any length of time under the conditions obtaining in tropical climates.

As usually imported into the West Indies from other parts of the world, onions are attached together in the form of long strings, and it was thought that when the onions are connected in this way and suspended from the roof, the freer circulation of air thus caused might materially assist in preserving the bulbs. It was first thought that it might be the case that treatment with various forms of preservative agencies would assist to maintain them in a sound condition. Accordingly, experiments were undertaken with two sets of onions, A and B: in the A series of experiments, the bulbs were stored in thin layers on shelves; in the B series, they were strung together after the fashion of the Madeira produce, and suspended from the roof. In both the A and B series bulbs free from disease were subjected to six different forms of treatment: in each case 12 onions were utilized. The various forms of treatment received by the bulbs are given below:—

1. Control, 12 onions. No treatment.
2. 12 onions dusted with slaked lime.
3. 12 onions dusted with flowers of sulphur
4. 12 onions treated with carbon dioxide gas.
5. 12 onions treated with Bordeaux mixture.
6. 12 onions treated with 1 in 1,000 corrosive sublimate.
7. 12 onions treated with sulphur dioxide gas.

The room in which the onions were stored was a wooden building with a boarded floor and galvanized roof; three sides of the room were secured with slats of wood arranged in the manner of jalousies, the room itself measured about 15 feet × 12 feet; the doors and partitions did not fit very closely, and there was an open space of about 1 inch under one edge of the roof. It will thus be seen that the conditions of storage were calculated to secure good ventilation.

A record was made each month of the number of bulbs that decayed in each experiment; in all cases the decay took place from the outside. The following table summarizes the record, by giving the number of decayed bulbs on the dates of examination, in the case of both the series A (onions on shelves) and B (onions strung and hung):—

	April 27.		June 21.		July 23.		Aug. 20.		Sept. 18.		Oct. 27.	
	A.	B.	A.	B.	A.	B.	A.	B.	A.	B.	A.	B.
Control	0	0	2	3	4	3	5	7	8	8	9	10
Lime	0	0	2	1	3	5	5	9	7	9	10	9
Sulphur	0	0	2	3	2	5	5	6	5	6	7	8
Carbon dioxide	0	0	12	10	12	10	12	10	12	10	12	12
Bordeaux mixture	2	1	9	9	12	12	12	12	12	12	12	12
Corrosive sublimate	0	2	2	2	3	3	10	7	10	8	12	12
Sulphur dioxide	0	0	4	6	2	2	12	11	12	12	12	12

Examination of the results shows that none of the methods of treatment have materially affected the rate of decay of the bulbs, with the possible exception of the second, in which the bulbs were dusted with flowers of sulphur; here, some slight beneficial action appears to have resulted. No advantage seems to have been gained by stringing the onions together. No observations were made after the month of October, when all the onions were bad, with the exception of two treated with lime, one from the control, and one from those treated with sulphur; the four good onions were planted in November 1910 and grew.

To sum up the results of this investigation, it would appear that none of the methods of treatment tried in the course of the experiments possesses any marked power of retarding the decay of the bulbs under ordinary conditions of storage. It would seem likely that the agencies responsible for their deterioration are normally present in the atmosphere; sterilization of the bulbs and preservation of them from access of air would probably assist them to retain their condition unchanged, but a method yet remains to be devised for carrying this into effect on a commercially practicable scale.

The Production of Cotton Goods in Great Britain.—The statistical tables recently published relating to British self-governing Dominions, Crown Colonies, Possessions, and Protectorates, give some interesting figures relating to the trade in cotton goods between the United Kingdom and Great Britain. Out of a total trade valued at £36,671,000, foreign countries supplied only £4,241,000. Last year the increase in the value of Lancashire exports was £12,471,000, and as regards quantity alone £2,981,000, the average increase in the ten years up to 1909 being £2,400,000. Of cotton waste we send to the colonies nine times as much as foreign countries; of yarn, twist, and thread nearly eight times; of piece goods over twelve times; of miscellaneous goods two and a half times; and of unclassified goods nearly two and a half times. Britain sends to the colonies nearly thirty-nine times as much plain piece goods as foreign countries do, but only seven times as much dyed and printed piece goods. British predominance is greatest in the East Indies, the African possessions (outside South Africa), Australia, New Zealand, and Newfoundland. It is less in South Africa and the West Indies, where the total trade is small, and least of all in Canada, where the United States are such formidable competitors. (*Journal of the Royal Society of Arts*, April 7, 1911, p. 535.)

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR, May 9, 1911.

ARROWROOT—2*d.* to 3¾*d.*
BALATA—Sheet, 3/8; block, 2/9 per lb.
BEESWAX—No quotations.
CACAO—Trinidad, 54/- to 62/- per cwt.; Grenada, 47/6 to 53/6; Jamaica, no quotations.
COFFEE—Jamaica, 60/6 to 67/-.
COPRA—West Indian, £23 10*s.* per ton.
COTTON—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 16*d.* to 18*d.*
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—No quotations.
HONEY—No quotations.
ISINGLASS—No quotations.
LIME JUICE—Raw, 1/-. to 1/2; concentrated, £18 2*s.* 6*d.* to £18 7*s.* 6*d.*; Otto of limes (hand pressed), 5/3, nominal.
LOGWOOD—No quotations.
MACE—2*s.* 2*d.* to 2*s.* 8*d.*
NUTMEGS—Quiet.
PIMENTO—Quiet.
RUBBER—Para, fine hard, 4/11; fine soft, 4/9; fine Peru, 4/9 per lb.
RUM—Jamaica, no quotations.
SUGAR—Crystals, no quotations; Muscovado, no quotations; Syrup, no quotations; Molasses, no quotations.

New York.—Messrs. GILLESPIE BROS. & Co., May 19, 1911.

CACAO—Caracas, 11c. to 12c.; Grenada, 10¾c. to 11c.; Trinidad, 11¼c. to 11¾c. per lb.; Jamaica, 10c. to 10¾c.
COCOA-NUTS—Jamaica, select, \$25·00 to \$26·00; culls, \$14·00 to \$15·00; Trinidad, select, \$26·00 to \$27·50; culls, \$15·00 to \$16·00 per M.
COFFEE—Jamaica, 12c. to 13½c. per lb.
GINGER—9c. to 12c. per lb.
GOAT SKINS—No quotations.
GRAPE-FRUIT—Jamaica, \$3·00 to \$3·50 per box.
LIMES—\$6·00 to \$6·50.
MACE—44c. to 50c. per lb.
NUTMEGS—110's, 10c. to 10¼c. per lb.
ORANGES—Jamaica, \$2·25 to \$2·75.
PIMENTO—4¼c. 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., May 29, 1911.

CACAO—Venezuelan, \$11·50 per fanega; Trinidad, \$10·90 to \$11·25.
COCOA-NUT OIL—86c. per Imperial gallon.
COFFEE—Venezuelan, 15c. per lb.
COPRA—\$3·25 per 100 lb.
DHAL—\$3·60 to \$4·00.
ONIONS—\$4·00 to \$4·75 per 100 lb.
PEAS, SPLIT—\$5·50 to \$5·60 per bag.
POTATOES—English, \$2·40 to \$2·75 per 100 lb.
RICE—Yellow, \$4·35 to \$4·40; White, \$5·40 to \$5·50 per bag.
SUGAR—American crushed, no quotations.

Barbados,—Messrs. JAMES A. LYNCH & Co., May 31, 1911; Messrs. LEACOCK & Co., May 26, 1911.

ARROWROOT—St. Vincent, \$4·60 to \$4·70 per 100 lb.
CACAO—\$11·50 to \$12·00 per 100 lb.
COCOA-NUTS—No quotations.
COFFEE—Jamaica and ordinary Rio, \$13·00 to \$14·50 per 100 lb., scarce.
HAY—\$1·30 per 100 lb.
MANURES—Nitrate of soda, \$60·00; Cacao manure, \$42·00; Sulphate of ammonia, \$76·00 per ton.
MOLASSES—No quotations.
ONIONS—\$3·59 per 100 lb.
PEAS, SPLIT—\$5·65 to \$5·75 per bag of 210 lb.; Canada, \$3·70 to \$4·10 per bag of 120 lb.
POTATOES—Nova Scotia, \$3·00 to \$3·50 per 160 lb.
RICE—Ballam, \$4·90 to \$5·00 per 100 lb.: Patna, no quotations; Rangoon, no quotations.
SUGAR—No quotations.

British Guiana.—Messrs. WIETING & RICHTER, May 27, 1911; Messrs. SANDBACH, PARKER & Co., May 12, 1911.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	No quotation	\$10·00 per 200 lb.
BALATA—Venezuela block	No quotation	Prohibited
Demerara sheet	85c. per lb.	65c.
CACAO—Native	11c. per lb.	12c. per lb.
CASSAVA—	\$1·20	No quotation
CASSAVA STARCH—	\$6·50 to \$7·00	No quotation
COCOA-NUTS—	\$12 to \$16 per M	\$10 to \$16 per M., peeled and selected
COFFEE—Creole	16c. per lb.	15c. per lb.
Jamaica and Rio	18c. per lb.	18c. per lb.
Liberian	10½c. per lb.	10c. per lb.
DHAL—	\$3·60 per bag of 168 lb.	\$3·75 per bag of 168 lb.
Green Dhal	\$3·50	——
EDDOES—	\$1·32	——
MOLASSES—Yellow	None	——
ONIONS—Teneriffe	——	——
Madeira	—	9c.
PEAS—Split	\$5·70 per bag (210 lb.)	\$5·80 per bag (210 lb.)
Marseilles	\$4·50	No quotation
PLANTAINS—	20c. to 40c.	——
POTATOES—Nova Scotia		\$3·50
Lisbon	——	No quotation
POTATOES-Sweet, B'bados	\$1·20 per bag	——
RICE—Ballam	No quotation	——
Creole	\$5·00 to \$5·25	\$5·00
TANNIAS—	\$2·40 per bag	——
YAMS—White	\$3·24	——
Buck	\$3·60	——
SUGAR—Dark crystals	\$2·40 to \$2·45	None
Yellow	\$2·90 to \$3·00	\$2·65 to \$2·75
White	\$3·80 to \$4·00	\$4·00 to \$4·25
Molasses	\$2·10 to \$2·30	None
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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A FORTNIGHTLY REVIEW OF THE IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

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CONTENTS.

The Effect of Soils in the Distribution of Plants.

IT does not require much observation to show that different kinds of plants flourish best in certain regions and on particular kinds of soil; though in finding a reason for this circumstance the work of investigation is not as simple as may be at first considered. Nevertheless, the matter is of practical importance, for if a good knowledge is attained of the requirements of a plant in regard to its surroundings, the agriculturist will not be led to the mistake and waste of time caused by the attempt to grow plants in which he is interested, in places which are entirely unsuited to them.

The matter forms the subject of two interesting papers delivered as two Masters Lectures of the Royal Horticultural Society, by A. D. Hall, M.A., F.R.S., and printed in the Journal of that Society, Vol. XXXVI, p. 1: it is to these that the following article is indebted for most of its facts. The lecturer drew attention, first of all, to manured and unmanured grass land, at Rothamsted, which has borne this crop continuously since 1856. With regard to this land, the facts that the manured parts have received the same manurial treatment since the beginning of the experiment, and that a redistribution of the plants on the land, which is being fully investigated, has taken place, make it possible to draw interesting deductions from the experiment. It is easy to understand why certain plants have increased in number as the result of definite kinds of treatment; for instance, why leguminous plants have increased where there has been no addition of nitrogen, or why, on account of its retention in the upper layers of the soil, shallow-rooted plants have ousted other kinds to a great extent where ammonia has been used, whereas the opposite is the case with the less readily retained nitrate of soda. It is also easy to account for the abundance of plants having an acid sap, containing potassium oxalate, where potash has been applied. There are, however, associations of plants and definite habitats which cannot be accounted for in this simple way. It might be thought that an explanation can be found in the circumstance that the soil and the plant, where they are associated, contain some special substance in common. This, however, is shown to be an incorrect view, by the following considerations: firstly, that all plants exhibit much the same composition in regard to the substances provided by the soil; secondly, that a plant grown under different conditions shows as much variation in the composition of the ash as obtains between that of the ash of entirely different plants: thirdly, that where plants are found in nature always to contain some definite substance such as silica and potash, or where they are found to flourish specially on lime soils, as with leguminous plants, there is generally no advantage, under the conditions of experimentation, in affording to these plants a special supply of the particular constituent, or of growing them under the definite condition that seems to be demanded in nature; lastly, as with plants, the chemical examination of different soils shows them to be much alike in composition.

The true explanation of the definiteness of the distribution of plants in nature is found in the circumstance of the large competition that is always taking place where there has been no modification of conditions by the interference of man. This is so much the case that plants are found growing in waste and barren soils, or on exposed sea beaches, simply because they cannot there be further ousted by the competition of other plants. There is nothing intrinsic in the nature of these situations such as to favour their growth in any particular way; this may be shown by rearing the plants in a rich soil, where they are relieved from the competition of other plants, when they grow better than in what is generally termed their native habitat.

In a general way, the physical and chemical attributes of a soil have the largest influence in the limitation of plants to certain areas. The former govern the water content of the soil, and often to some extent its temperature and the humidity of the atmosphere. In the chemical aspect, it is the acidity or alkalinity of the soils that exerts the greatest influence; though with some plants there are special circumstances, such as the possession of fungi associated with their roots (Microrhiza), which serve to modify this condition.

Much more work remains to be done before the subject can be definitely described or understood, and there is an added difficulty owing to the fact that in making investigations the experiments must include the element of competition among plants, much as it exists in nature. As has been indicated, the matter is of practical importance, more particularly as an efficient substitute is required for the empirical method of ascertaining the composition of soils on which certain plants are known to flourish, and of comparing this with that of the soils on which it may be intended to grow those plants. The work of the future must be to ascertain the reasons which underly the choice that has to be made in giving the plant the soil conditions that are best suited to it.

THE IMPERIAL DEPARTMENT OF AGRICULTURE AND WEST INDIAN PROSPERITY.

At a dinner given by the West India Club on the 16th instant, to the West Indian representatives at the Coronation, the Prime Minister, Mr. Asquith, in proposing prosperity to the West Indies, delivered a speech, in which he expressed the following facts and sentiments, more particularly in regard to the Imperial Department of Agriculture and the West Indies:—

'In the last twelve years Parliament had voted over one and a quarter millions, in one form and another, to West Indian purposes. It must, he thought, be a source of congratulation to all concerned, that for the last six years no grant-in-aid of general revenue had been required, and that, with the exception of what was contributed to the Imperial Department of Agriculture and to the transatlantic mail subsidy, the West Indies were now independent of financial assistance from Imperial funds. The toast he was now going to ask them to drink might well be—not prosperity—but continued prosperity, to the West Indies. For the attainment of that happy result the main share of the credit was due to those who had persevered with courage, enterprise and patience in the face of adverse circumstances. Far from letting sugar estates go out of cultivation in the bad years of the nineties, they had improved methods, in many cases at great expense and with no little risk; had rebuilt factories, renovated and remodelled their machinery and processes, and had now placed themselves in a position in which, as he understood, they could face with equanimity the competition of beet sugar. Nor were all the eggs any longer placed in one basket. Fruit, cacao, cotton, arrowroot, rubber, were all contributing to the general prosperity. He desired to refer for a moment with the warmest appreciation of the work of the central Department of Agriculture, established in 1898 at the cost of the Imperial Government, presided over with distinguished ability, first by Sir Daniel Morris, and now by his successor, Dr. Francis Watts. The work of that Department was universally and gratefully acknowledged by the planters to be largely responsible for the improved state of affairs in all branches of agriculture. He believed it would be difficult to find any case in which any analogous experiment made by the Home Government had attained such speedy and satisfactory results. The outlook was thus full of promise, and it was not less so by reason of the fact that the Panama Canal was now approaching completion.'

SUGAR INDUSTRY.

A NEW METHOD OF DESICCATION.

A new method of desiccation, for laboratory use, particularly in relation to the drying of organic matters, is described in the *American Sugar Industry and Beet Sugar Gazette*, for May 1911, from *Der Zeitschrift für Zuckerindustrie in Böhmen*. It may not be out of place to give here an outline of the process, which has been used chiefly for dehydrating the beet and its products.

The apparatus consists of a glass jar having a capacity of 2 or 3 litres, provided with a circular trough round the rim, in which mercury may be placed, and into which a glass lid is fitted, making the vessel air-tight. The desiccator contains a porcelain dish, or other support, on which rests a coarse wire basket. The other apparatus required is a piece of filter paper or fine silk gauze, laid upon a piece of wire gauze of such a size that it can be easily lowered into the jar.

The desiccator is filled with ether, at the bottom of which, resting in the coarse wire basket, are several sticks of ordinary caustic soda. When the apparatus is being used for drying, the substance to be dried is placed on the filter paper or the silk gauze, which is supported on the wire gauze, and then lowered to within a few centimetres of the basket containing the caustic soda; the vessel is then closed by means of the lid, in the way described above.

The fact on which the apparatus depends is that ether will dissolve from 1·6 to 3·0 per cent. of water, according to the temperature. In this way, it removes water from the substance to be desiccated, and the mixture of water and ether, being heavier than ether alone, sinks to the bottom of the jar, where the water is absorbed by the caustic soda. In any ordinary period of use of the apparatus, all the attention required is to remove the solution of caustic soda from the bottom of the jar, by means of a pipette, to replace the dissolved caustic soda by fresh sticks, and to make up for the loss of ether from time to time.

It is claimed that such a desiccator, containing ether, is more efficient and rapid in action than the ordinary form, because firstly, ether takes up water more quickly than this is done by air, and secondly, the wet ether sinks to the bottom of the vessel where it is dried by the caustic soda, whereas moist air, in an ordinary desiccator, rises to the top out of the way of the substance that is intended specially for the purpose of making it once more dry.

The Japanese Government has adopted, in Formosa, a system inspired by the Dutch in Java. Any company desiring to establish a sugar factory must obtain the authority of the Sugar Bureau. There is an inspector for each district, and the native cultivators (chiefly Chinese) cannot sell their cane outside the district in which it is grown. The cultivator must not use his sugar-cane for any other purpose than sugar-saking (distilling is, therefore, forbidden), and he can only mll it to the company having a control over the land. He must not, under any conditions, create a mill of his own. (The *American Sugar Industry and Beet Sugar Gazette*, April 1911.)

PURIFICATION OF CANE JUICE BY MEANS OF BURNT FILTER PRESS SCUM.

The *International Sugar Journal*, for May 1911, contains a translation of a preliminary note by J. J. Hazewinkel, Director of the West Java Sugar Experiment Station, describing work which had for its object the investigation as to the possible efficiency of filter press scum, burned in a suitable manner, for the purpose of purifying sugar-cane juice, on account of the probable possession by the material of properties similar to those of animal charcoal.

On being burnt, the dried filter press scum gave 46 per cent. of carbonaceous residue, which was treated with suitable quantities of a dark syrup of 31·5° Brix., twelve times in succession. Decolourization took place in every case, the colour of the different fractions of the syrup varying in intensity from 25 per cent. of that of the untreated syrup, in the case of the first fraction, to 80 per cent. in that of the twelfth. A determination of the average colour value of all the filtrates together showed that more than one-third of the colour had disappeared. It was not indicated by the colour of the first fractions that a very considerable decolourization would have taken place if the mixed filtrate had been once more subjected to the action of the burnt scum. It is claimed that the above figures show that, in practice, the work could be done in batteries of three filters, at the most.

Figures are given to show the capacity and time of running of the batteries, with a given production of thick juice. The calculation, however, assumes a certain rate of filtration which may be greater than that in practice, and that no large time is required for the reaction. In relation to these matters, no investigations have been carried out as yet, so that there is still uncertainty as to the applicability of the method on a practical scale.

In the experiment, it was found that the juice must be filtered hot, and that the burned filter scum should be washed before being used. Commencement has been made already of the investigation of the applicability of the method in practice.

A report received from the Agricultural Superintendent, St. Kitts, states that the reaping of the cane crop has been delayed during May by constant showers; the general return is, however, good, and the young cane crop is well advanced and healthy. As regards cotton, a large area is being planted for the coming season; some has been sown already, and is making good progress.

With reference to the McMullen process for the manufacture of sugar from shredded and dried cane, the following editorial note is contained in the *International Sugar Journal* for April 1911: About forty years ago desiccating experiments with beets were made in factories in Europe; but were unsuccessful. Moreover, cane desiccation is by no means a new idea, since many years ago efforts were made to dry cane in the West Indies and ship the product to England, for extraction there Thus British Patent 12,033 of 1848 describes a method of 'extracting the sugar from the sugar-cane by first drying and pulverizing, and afterwards extracting the sugar therefrom by passing water through it in vessels'. This project was likewise a failure.

FRUITS AND FRUIT TREES.

DOMINICA AND THE FESTIVAL OF EMPIRE EXHIBITION.

As was stated in the *Agricultural News* for May 13, 1911, p. 156, the Permanent Exhibition Committee of Dominica has been making efforts in connexion with the provision of an exhibit to represent the island at the Festival of Empire Exhibition, which is being held at the Crystal Palace. The results of these efforts are shown in a report published in the Dominica *Official Gazette* for May 19, 1911. This contains a letter and a list of the exhibits, compiled by Mr. J. Jones, Curator of the Botanic Garden, who fills the post of Honorary Secretary to the Permanent Exhibition Committee of the island.

The information shows that the exhibits were forwarded in order to make more complete the collection of products from Dominica that is kept at the Imperial Institute, and to cause it to be more easily possible for the Director of that institution to release, for some months, a part of the Dominica collections held there, in order that the island may be represented at the Exhibition.

The list of exhibits which is given shows that the number of these was sixty-two. They included lime juice and lime oil, the former both concentrated and raw, and the latter prepared in the several ways that are in vogue in Dominica; nutmegs; mace; coffee of several varieties; different kinds of cacao; jumbie bead seeds (*Abrus precatorius*); Job's tears (*Coix lachryma-Jobi*); cassava starch; bay oil; Carib baskets; honey; ground nuts; kola nuts; and seeds of the West Indian necklace tree (*Ormosia dasycarpa*).

With reference to information contained on pages 156 and 184 of the current volume of the *Agricultural News*, relating to apparatus for extracting lime oil, it is of interest that Messrs. Allport and Davenport supplied, for the purposes of exhibit, one bottle each of otto of limes and otto of oranges, extracted by machinery.

In addition to the firm just mentioned, the following estates assisted by presenting samples of the produce of Dominica: St. Aroment, La Haut, Antrim Valley, Everton, Melville Hall and the Bath. Exhibits were also sent by the Dominica Permanent Exhibition Committee, the Agricultural School and the Botanic Gardens.

LIME CULTIVATION IN MARTINIQUE.

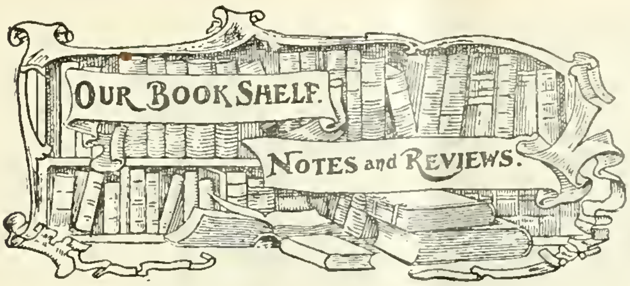
L'Agriculture Pratique des Pays Chauds, for April 1911, states that the cultivation of the lime in Martinique has entered upon the experimental stage: demands for planting material have been received from several planters, and these have been satisfied by the experiment stations in the island, which possess large stocks of the plants required. The records show that, during 1910, these stations distributed nearly 22,000 plants for cultivation in the island. Certain planters have taken up the matter keenly, and have put in considerable areas of limes.

The journal mentioned, and from which this information is obtained, states that this tendency in the colony of Martinique toward the adoption of a diversified agriculture is a favourable feature, and that the lime plant is particularly suited to the conditions which obtain in the island.

After giving attention to the chief diseases and pests of the lime, to the conditions required by the plant itself, and to the making of concentrated juice and citrate of lime, the article draws attention to the possibility of the exportation of carefully packed fruits, as well as of limes preserved in sea-water or brine. It proceeds to make suggestions concerning the kinds of plants that may be grown while the trees are attaining maturity, quoting in this case the experience of Dominica and Montserrat. It also refers to the uses of citric acid (from citrate of lime) in dyeing, as a substitute for tartaric acid in wine-making, in the manufacture of magnesium citrate, and in connexion with photography.

In relation to the commercial aspect of the matter, reference is made to the fact that both the English and the American markets are open to limes and lime products from Martinique. As regards France, enquiries are being made for information concerning the openings that may exist in that country for the produce, and this information is being sought from both official and scientific sources.

The *Proceedings of the Agricultural Society of Trinidad and Tobago*, for May 1911, show that the export of cacao from Trinidad, up to the end of May 1911, was 29,885,529 lb. The amounts for the similar periods in 1908, 1909 and 1910 were 26,642,905 lb., 29,618,547 lb., and 32,507,935 lb., respectively.



NOTES ON SOIL AND PLANT SANITATION ON CACAO AND RUBBER ESTATES. By Harold Hamel Smith. *John Bale, Sons & Danielsson, Ltd., London.* 10*s.* net.

In its 630 odd pages, after an introduction by Professor Wyndham Dunstan and a preface by the author, this book contains sections comprising the subjects of estate practice before and after the planting of cacao and rubber, the use of protective belts, the utilization of waste products on estates, the possibility of employing inoculation against pests and diseases, the diseases and pests of cacao and rubber, the different varieties and species of cacao and rubber, and the preparation of the products for the market; with reference to the last, the volume concludes with a section giving an account of mechanical appliances for use on estates in connexion with these crops.

The question of protective belts on estates for the prevention of the spread of disease is important, and is treated at some length, while good illustrations are given from various parts of the world, of the ill effect of the destruction of trees over large areas. As regards estates, the best suggestion is the planting of such belts with other rubber trees, for Para, with timber plants or with Eucalyptus; where forest has to be cleared, belts of this may be left for the same purpose. It may be mentioned that cacao is quite unsuited as a belt for Hevea: both are subject to the same diseases, and neither would protect the other, so that, from the point of view of distributing risks, the combination is ineffective. As is pointed out by the author, cotton, either alone or under cocoa-nuts, is unlikely to grow in good Hevea or cacao land.

The section on the manuring of cacao is useful, and the same is true of what follows in connexion with plant foods, manuring for rubber and green manuring. In regard to the one dealing with the question of inoculation as a cure for pests and diseases, agreement must be expressed with Anstead, that at present the method is not practicable: no fungus antitoxins are yet available, and local fungicides would probably kill the part of the tree to which they were applied, without completely destroying the fungus. The effect of injections of iron, for chlorosis, is no argument on this question. The inoculation of scale insects with parasitic fungi is also a somewhat different matter. In relation to this, it may be pointed out that the work which is described was all originated by the Imperial Department of Agriculture, and not by the Department of Agriculture in Grenada.

In the section on the tapping of rubber, the subject is treated in a broad manner, with some useful illustrative facts; that on rubber diseases also contains some particularly helpful references to literature relating to the subject. (It may not be out of place to draw attention to the mixed metaphor which is quoted in italics on page 352.) The treatment of the matter dealt with in relation to Castilloa is fairly thorough. In the Ceara section, the subject receives some of the most detailed attention that is given to any in the book. Finally, taking the main subjects generally, it should be stated that the section on mechanical appliances is very good, and well illustrated.

It is a matter for regret that there is a large confusion of ideas indicated in the section on cacao disease. Among other matters, the brown or black rot disease of pods (*Phytopthora Faberi*) is confused with 'brown root' disease of Ceylon (*Hymenochaete noxia*); this confusion is clearly in the mind of the author and not due to a printer's error: it occurs in the bibliography on page 356, as well as on page 199. Then again, the manner of quotation of the Trinidad authorities on the subject of 'brown rot' disease would make it appear that the work was done in that island, whereas the information on page 200 is really taken from Petch's report on 'brown root' disease, in the Ceylon Adminstration Reports for 1906. Extracts from this were sent by Hart to the Trinidad Agricultural Society, and printed as Society Paper No. 264 in the *Proceedings of the Agricultural Society of Trinidad and Tobago*, Vol. VII, p. 179. Further, 'I', in the sentence beginning 'In spite of its frequent occurrence I have not' clearly refers to Petch, and on page 202 the same authority is responsible for what is given on the fungi connected with canker.

In any case, the information is out of date, as *Phytophthora Faberi* is now recognized as the cause of the disease, in Trinidad and Ceylon. It may be said that the whole section on cacao diseases would have gained by being treated much more concisely, while the confusion detracts seriously from its value. There is the additional point that the importance of the connexion of the diseases of this crop with those of Hevea should have been emphasized. As is stated, the information regarding the latter had to be curtailed owing to want of time. What has been said in regard to the diseases of cacao should show the importance of the careful treatment of those of Hevea, when they come to be included in future editions of the book.

A glance at the synopsis of contents will make it evident that the arrangement of the subjects is somewhat confused; there is a certain amount of carelessness in giving names; and the work generally would have been more valuable if it had been compiled in a less diffuse manner. This does not prevent the existence of the fact that the general principles advanced in the book on the subject of estate sanitation are thoroughly sound. In relation to this matter, the question of international legislation, which is strongly advocated by the author, is of much importance, notwithstanding its difficulties, and worthy of careful consideration. Attention must also be drawn to the excellent suggestion that a trained observer should be sent to Brazil to do work in connexion with insect pests, though the word Entomologist, on page XX, was surely meant instead of Mycologist. A valuable characteristic of the book is that plenty of good references to literature are given, as well as several selections from good papers and articles having relation to the subjects with which it deals. The index forms a fairly efficient means of reference, though its attention to the different subjects is somewhat uneven.

Altogether, the work forms a useful means of giving general information to those interested in cacao and rubber, more particularly from a plantation point of view, and is a guide to much of the more recently published literature on plant diseases—matters which make it indispensable to those for whom it is intended.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date June 2, with reference to the sales of West Indian Sea Island cotton :—

Since our last report, the bulk of the West Indian Sea Island cotton in stock has been sold, chiefly on the basis of 15*d.* to 15½*d.* for medium to good qualities from the majority of the Islands, the chief exception being St. Vincent, which was sold at 18*d.*

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending May 27, is generally as follows:—

There was a good demand again this week, especially for the odd bags classing Fine and Fully Fine, more or less off in preparation, taking nearly the entire stock at some advance over the prices ruling last week. There were also sales of about 400 lb. Planter's crop lots classing Fully Fine and Extra Fine.

The odd bags, off in class, sold at 24c. to 25c., and the crop lots at 28c. to 30c.

As the crop has been very largely disposed of, the Factors are firmer in their views for the limited unsold stock.

Cotton in the Virgin Islands.—With local assistance, the Agricultural Instructor in the Virgin Islands has held a series of very successful meetings in the more central districts, and in a few of the smaller islands, and has also, by means of informal conversations with interested cotton growers, found an opportunity of imparting useful information relating to the matter. The effect of the work has been to bring about a more intelligent and extensive effort in the islands, in regard to cotton cultivation. The meetings have been particularly useful, as they have formed a means of giving practical advice, and of answering numerous questions, having relation to individual difficulties that have arisen in the past.

As is well known, the efforts of this kind have made cotton-growing the chief industry of the Virgin Islands, and is having its influence, further, in giving the cotton growers the desire to attain a useful knowledge of the proper methods to adopt, in order that they may bring about an improvement in the yields from their plots, and in the staple of the product.

COTTON-GROWING WITHIN THE EMPIRE.

This subject is given attention in a paper which appears in the *Geographical Journal*, for February 1911, entitled Geographical Aspects of the Problem of Empire Cotton-Growing, by J. Howard Reed. After drawing attention to the importance of the supply of cotton to Lancashire, the author reviews the conditions that obtained not many years ago, when the cotton crops of the world were quite sufficient for the demand. At this time, as now, the cotton fields of the United States supplied about 80 per cent. of the raw cotton required in Great Britain, the rest being obtained from other parts of the world where cotton was grown. Even as recently as 1882-3, United States cotton was produced in a quantity less than 7 million bales, but this, with cotton from the other sources, was sufficient to supply the general demand, and to leave a surplus of about 250,000 bales, so that, at this time, the price of cotton remained fairly constant. By 1892, the production in the United States had reached more than 9 million bales, and steadily increased to 13¾ million in 1908-9, although it was reduced to not much more than 10½ million bales in 1909-10. This increase, however, has not prevented the present condition of shortage, which seems to be gradually becoming more serious. The reason for this shortage must be looked for in the great growth of cotton manufacture in certain countries other than Great Britain. This matter is illustrated by the fact that, whereas Great Britain, Europe and the United States used, respectively, 3,181,000 bales, 3,640,000 bales, and 2,431,000 bales in 1891-2, the similar quantities used in 1909-10 were 3,053,545 bales, 6,186,930 bales, and 4,707,000 bales. The fall in consumption during 1909-10 was doubtless caused by the increased price of cotton, on account of the smaller crop, by slackness of trade, and more particularly by short-time working on the part of manufacturers.

In relation to the supplying of this shortage, it is not likely that the United States can take a large part; this is also the case with the other well established cotton fields of the world. As far as the latter are concerned, Indian cotton is mostly used in that country, and in Japan and Germany; it is of little use to manufacturers in Great Britain. The cotton from Brazil, Peru, Mexico, Asiatic Russia, China, Japan and Corea is almost entirely used in local manufacture, and several of these countries have to import cotton, because the local supplies are insufficient for their own needs. In the consideration of the increase of area in cotton-growing, it must be remembered that Egypt, though producing largely, has almost reached the limit to which it can grow the plant, on account of the small additional area that may be made available, even with irrigation. It is pointed out in the article that it is the realization of these facts which has led to the formation of the British Cotton Growing Association.

After describing broadly the six classes to which all kinds of cotton may be referred, according to present ideas, the pioneer work of this Association is mentioned briefly—work which led it to decide to concentrate its main efforts on Nigeria, Uganda, Nyasaland and the West Indies. A review of cotton cultivation in the West Indies states that the reports of the progress of cotton cultivation in these islands are satisfactory, and highly encouraging. In this connexion, reference is made to the work of Sir Daniel Morris, K.C.M.G., late Imperial Commissioner of Agriculture, by which an export of lint and seed valued at £9,676, in 1902, has been increased to an amount worth £250,000 at the present time. It is pointed out that, although this indicates satisfactory development, the amount of production in the West Indies is naturally limited, chiefly by the area that is at liberty for, and suitable to, cotton-growing.

In relation to the three other countries mentioned, attention is drawn to the well-known fact that Africa is likely to become the largest of the new producers of cotton for Great Britain. On this continent, the part giving the greatest promise for cotton-growing is West Africa, where there are large areas of territory particularly suited, as regards soil and climate, for the plant; where cotton has been grown by the natives probably for many hundred years; where the population is comparatively dense: and lastly, where there are old established ports which are as well within touch of British ports as are those in the West Indies or the United States. The present is not the first time in which Africa has given assistance to British cotton manufacturers, for during the great cotton famine, Lagos, as was the case with the West Indies, produced cotton for their use, the amount of lint in 1869 from this source being valued at nearly £77,000. This West African colony has, in fact, made the greatest progress so far, among those in Africa, while all the other African areas except Gambia and Sierra Leone are giving large promise for future usefulness. In relation to these matters, reference is made to the recent work of the British Cotton Growing Association for the purpose of increasing its capital in order to obtain larger assistance from the Imperial Government.

What has just been said refers to the West African colony. No account would, however, do justice to the subject which did not give attention to the remarkable progress that has been made in Nyasaland, in East Africa. In this country, the export of cotton in 1902-3 was purely experimental in nature, and reached the inconsiderable value of £3. In 1908-9 it was valued at £28,353, when it formed the item of largest value in the exports.

After reference has been made to the large amount of work that is being carried on by the Agricultural Department in Nyasaland, attention is given to Uganda, where within a few years, the production of cotton has risen from nothing to £50,000, in value. The author quotes Sir Hesketh Bell, K.C.M.G., in his opinion that Uganda should form one of the greatest cotton fields in the Empire, and that it possesses natural conditions that are absolutely favourable to cotton-growing, and a population that is eager to take up the work. Consideration is then given to the prospects of cotton production in the East African Protectorate, and the Sudan, including the Atbara district and the Gezira plain.

Reference to conditions in South Africa shows that the main territories cannot be expected to produce much cotton for some time, though Rhodesia gives promising indications that a native industry will be developed eventually, under European guidance, much in the same way as this has been done in Uganda, Nyasaland and West Africa. In other fields, the work in India and Ceylon will have to be concerned chiefly with improvement of methods of production, and in the latter case an extension of the cotton-growing areas, as well. Mention is made of the other possible British cotton-growing countries, namely Australia, Borneo, Fiji, Straits Settlements, Malay States, the Seychelles, Mauritius, Cyprus, the Maltese Islands and St. Helena, from which no very great output or increase of output of fibre can be expected for some time to come. The article concludes by referring to the amount of cotton, namely $3\frac{1}{4}$ million bales of 500 lb., required for the demand in Great Britain, and by drawing attention to the fact that a much larger expenditure of money than that which is at present being made for the encouragement of cotton-growing will be required, if this demand is to be supplied from sources confined to the Empire alone.

COTTON IN CYPRUS.

The Cyprus cotton crop of 1910 was slightly in excess of that of the previous year, while the value of the cotton increased by about 48 per cent.

The final figures are not yet available, but they will be found to be approximately as follows: 1908, 6,176 cwt., value £14,028; 1909, 8,006 cwt., value £23,728; and 1910, 8,928 cwt., value £34,250.

Practically the whole of the crop is exported from Larnaca, and the export is in the hands of three firms.

Exporters are at the present time supplying three times the quantity of seed that they did last year, which, should conditions be favourable, augurs well for a record crop in 1911.

Since the new ginning machinery was imported, two or three years ago, European buyers have expressed great satisfaction with the quality of the Cyprus production, the cotton being much cleaner than was formerly the case.

Naturally, the prices obtained depend a great deal upon the state of the world's cotton supply. In 1910 the prices realized by exporters were 15 to 20 per cent. higher than in 1909, partly on account of a shortage in the supply, and partly on account of better trade conditions abroad. At the present time there is a very good demand for Cyprus cotton.

The quantity of cotton planted each year depends principally upon two things—good prices, and late rains in March and April.

There was a cotton spinning mill at Famagusta some years ago, and it is a matter for regret that it had to close, owing to competition with Italian yarns, which can be imported into Cyprus very cheaply. The latter are made from Indian cotton, and as the firms give credit of from four to six months, it would be almost impossible for a Cyprus manufacturer to compete with them.

There is hardly any crop from which the villager himself benefits so greatly as that of cotton, while the revenue derived from it is large, and easily collected. It is, therefore, much to be desired that every possible encouragement should be given to the industry, and it is to be hoped that the tendency of the last few years, for the rainfall to increase, will continue, and tend to promote the extension and development of this industry in the Island. (From the *Cyprus Journal*, April 1911, p. 542.)

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 deals with the subject of the Effect of Soils in the Distribution of Plants. Its chief purpose is to give some account of what is known at present in regard to the matter, as well as to indicate its importance to the practical agriculturist.

Under the heading Sugar Industry, on page 195, notes are presented on new methods for desiccation in chemical analysis, and for the purification of cane juice in the manufacture of sugar.

Page 196 includes a note describing the efforts of Dominica in connexion with the Festival of Empire Exhibition, being held at present at the Crystal Palace.

Pages 198 and 199 contain an article giving an abstract of a recent paper which presented an account of the position and prospects of cotton-growing within the British Empire.

The Insect Notes, on page 202, deal with facts relating to the parasitism of the black scale.

An interesting note on the general occurrence of anthrax is presented on page 203.

The Fungus Notes of this issue (page 206) deal with recent work that has been conducted in connexion with diseases of the Areca palm (*Areca Catechu.*)

Changes in Calcium Cyanamide in the Soil

A paper which is extracted in the *Journal of the Chemical Society*, 1910, II, No. 572, p. 537, shows that the first stage of the breaking up of calcium cyanamide follows the absorption of carbon dioxide from the air contained in the soil. Subsequently, the manure is decomposed into urea and similar substances.

This decomposition does not take place through the action of any of the living beings in the soil, but is brought about purely by interaction with substances in it, the most important of which is ferric oxide. The ultimate result is the formation of ammonia, and lastly nitrates, from the urea.

Work at Rothamsted in 1910.

The annual report for 1910, of the Rothamsted Experimental Station, has just been received, and it will be well to point out some of the chief matters that are of more special interest in the West Indies.

In the Preface, stress is laid upon the importance of the continuity of the experiments, particularly in that they perpetually afford a means of studying new problems, as progress is made in agricultural science.

In regard to the year under review, the season was very unfavourable for most of the crops: nevertheless, useful results were obtained in relation to several of these. Experiments with calcium cyanamide and nitrate of lime were continued, but the smallness of the yields in the trials has not enabled any further definite information to be obtained: under the conditions, nitrate of soda gave better results than these manures. Green manuring (for wheat) continued to show success, and the plants grown where it was employed exhibited freedom from the blight which attacked the wheat everywhere else. The pot experiments, for the purpose of finding the way in which the growing of a plant in a soil makes that soil less able to support a second growth, have been discontinued, as they do not seem likely to give any definite information on the subject; some results have been obtained, however, which are being collated.

The work relating to the effect of heat and disinfecting substances on soils has been maintained (see *Agricultural News*, Vol. IX, pp. 33 and 369), and trials have been made in the field, but without positive results, so far. It is of interest that a good deal of information has been obtained already, concerning the life-history and numbers of the protozoa in the soil.

The report shows that the following papers relating to work at the station have been published during the year: The Influence of Copper Sulphate and Manganese Sulphate upon the Growth of Barley, *Annals of Botany* 1910, p. 571: The Ammonia in Soils, *Journal of Agricultural Science*, 1910, p. 233; the Effect of Earthworms on Productiveness, *Journal of Agricultural Science*, 1910, p. 246 (see *Agricultural News*, Vol. IX, p. 401). The report concludes, as usual, with information as to the yields per acre in the different experiment fields.

Bacteria and Phosphoric Acid in the Soil.

An abstract of experiments that have been carried out for the purpose of ascertaining the part that is played by bacteria in the change of insoluble phosphoric acid into soluble phosphoric acid in the soil is contained in the *Journal of the Board of Agriculture* for March 1911, p. 1020. In the investigation, air free from carbon dioxide and ammonia was passed through sifted and sterilized soil kept in the dark at a temperature of 86° F. In one case, the soil was inoculated with a bacterial culture, while in that of the control this was not done. The energy of the bacteria was measured by ascertaining the amount of ammonia and carbon dioxide that was given off from the soil containing them.

The results showed that the quantity of soluble phosphoric acid in the soil was actually reduced to an important extent; there was, however, a continuous change of insoluble into soluble acid, but it was masked by the fact that its rate was smaller than that of the opposite process. The rate of formation of carbon dioxide indicated that the energy of the bacteria was greatest after the first five to ten days of the experiment. In the course of two months, this energy gradually weakened, and the total amount of carbon dioxide produced in the period was found to be between ten and twenty times greater where the bacteria were present, than in the case of sterile soils.

A Companion to Blackie's Tropical Readers.

A booklet bearing this title has been prepared in Jamaica by E. J. Wortley, F.C.S., with the object of providing hints for practical work in connexion with the information presented in *Blackie's Tropical Readers*, Books I and II. The contents include (1) the Introduction, comprising general hints to teachers and pupils, as well as on the use of apparatus; (2) the study of animal life; (3) the study of economic plants; (4) experiments in practical work in connexion with animals and plant life, based on the information in Book I; (5) experiments and practical work of the same kind, but referring to the matter in Book II; (6) the school garden; and (7) an appendix having reference to the botanical names of a few of the commoner plants.

The information in relation to the use of apparatus is somewhat scanty, and an inexperienced teacher would find himself in some difficulty, if he were dependent alone upon this for his work. The hints supplied in the two succeeding sections should be useful in giving teachers a knowledge of the way in which lessons should be conducted. Equally useful is the second sub-section of section IV, presenting short instructions for simple experiments relating to plant life; although it is unfortunate that the illustrations, which are generally the same as those in the Readers, depict mostly English types of plants instead of those with which the teacher and pupil are likely to be familiar: this circumstance applies as well to sub-section II of section V. The sub-section on Health contains usefully concise information; it is doubtful, however, that even the author himself would obtain success if he followed exactly the instructions for some of the experiments given under the heading Water, The Air We Breathe and Why the Wind Blows.

Altogether, this is a very useful little book, and forms an almost indispensable teacher's companion to the Tropical Readers.

Cassava from Brazil.

It is stated in the *Bulletin Agricole*, Mauritius, for March 1911, that, according to a British Consular Report on the trade of Brazil in 1909, up to the present, cassava has almost entirely been sent out in the form of farine, but it has been found that it is more remunerative, and safer, to export the root cut into small round pieces and dried in the sun, so that hardly any cassava is now shipped except that prepared in this way.

A New Means of Grafting.

The *Bulletin of the Bureau of Agricultural Intelligence and of Plant Diseases*, of the International Institute of Agriculture, December 1910, presents an abstract of a paper which describes a means of grafting, consisting simply in making oblique cuts in the stock and scion, and fitting the oblique surfaces closely together, the parts being kept in place by means of a small piece of rubber tubing: the tubing should cover the cut edges completely, so as to exclude air and prevent drying. In addition to the fact of its giving support, the advantages of rubber tubing used in this way are that it stretches and thus does not interfere with the growth of the grafted plant, while the weather causes it to rot, and drop away when it is no longer required.

The Stimulation of Plant Growth.

In experiments on the growth and breathing of plants, it has been known for some time that the action of small quantities of poisonous substances, in relation to these processes, is to increase the rate at which they take place. In reference to the subject, the *Experiment Station Record* of the United States Department of Agriculture, for February 1911 (Vol. XXIV, p. 138), contains an abstract of a paper describing work which, it is claimed, shows that such stimulation of plants may be brought about by means of nutritive substances, as well as by those which are poisonous.

A matter of some interest is that, while phosphates had been shown to have little or no influence on the respiration of living plants, they were found to possess the power of greatly stimulating this in the case of plants which have been killed: as regards poisonous substances, these were shown to have little effect on the respiration of killed plants.

A useful result of the work is to demonstrate that the respiration of plants, as influenced by different substances, affords a means of finding out whether a given stimulant is harmful to them, or otherwise.

INSECT NOTES.

PARASITISM OF THE BLACK SCALE.

During the past two or three years, a considerable amount of attention has been attracted to various forms of insect parasitism in the West Indies, chiefly on account of the beneficial effects which arise from the relation of parasite and host among insects. It is likely that all the species of scale insects which occur in the West Indies are attacked by other insects, which live within their tissues or under their protective covering.

The parasitized insect, or host, as it is called, is generally killed as the result of the feeding of the immature parasite. In many instances, the parasite is so small as to be observed only with great difficulty; but in the case of the black scale, it is sufficiently large to be seen by the ordinary observer by means of a pocket lens, or even with the unaided eye.

The black scale of cotton is very abundant in many localities at the present time, both on cotton plants and on Hibiscus. If an infested branch of one of these plants is carefully examined, it will be seen that the scale insects are present, in nearly all stages of development: the large, very convex, blackish-brown individuals are the adult females. The younger stages may be distinguished by their smaller size, flatter surface and lighter colour.

The parasite, *Zalophothrix mirum*, is a small hymenopterous insect. The adult is about $\frac{1}{8}$-inch in length and at the first glance appears to be very much like an ant; but it is easily seen to possess small wings which lie flat upon the back. These are very delicate, nearly transparent at the base, and are crossed by a broad transverse darker band, the tip of the wing being transparent like the base. The general colour of the insect is dark-brown, almost black; the head is reddish brown, and provided with dark-coloured eyes.

This parasite attacks only the older scales, that is the mature females which are about to begin, or have already begun, egg-laying.

If one of the young, very flat scales is raised from the bark by means of a needle or knife blade, the ventral surface of the insect will be found to be very flat; but if an older one is examined in the same way, it will be seen that this surface is very much arched or concave so that a considerable space is left between the insect and the bark of the plant. This space or cavity becomes filled with eggs, which hatch, and the young insects escape under the edge of the scale.

The parasite does not attack the flat scales. The egg of the parasite is deposited under the body of the mature female scale insect. The grub of the parasite is whitish in colour. The youngest form which can be seen with the unaided eye is slightly tinged with pink. Examination of a considerable number of scales will probably reveal the parasitic grub in various sizes up to about $\frac{1}{8}$-inch in length, when it is fully grown and ready to transform to the pupa.

The grub is very soft and fleshy in appearance, and seems to have no legs and no well defined head. The larger grubs will be seen to be lying in a curved or bent position; probably because of the narrow limits of the space occupied. The pupa is somewhat less than $\frac{1}{8}$-inch in length, motionless, without any cocoon or other covering, and is very dark—almost black—in colour. Examination of it will, however, reveal the well defined head and developing antennae, legs and wings, which are characteristic of the adult.

It is perhaps in the matter of its feeding that this parasitic insect presents points of the greatest interest. The egg is deposited in the cavity under the body of the female scale insect, and the grub which hatches feeds for the most of its life on the eggs, and probably also on the young, of the scale insect. The tissues of the adult scale are not attacked until the grub is fully grown, or nearly so. If parasitized scales are examined, it will be found that the grub of the parasite lives practically embedded in the mass of scale insect eggs, except in the case when the fully grown, or nearly fully grown, grubs are found. Then it will often be seen that very few eggs are present, and that the adult scale is dead, so that nothing remains but a shell, which gives protection to the parasite.

This seems to be a wise provision of Nature, which is illustrated in the case of nearly all parasites. That is, the host insect is not actually killed until the parasite has no longer need of it as a source of food. In this case, the scale insect is allowed to go on producing eggs as long as the grub has need of them, and then the parent scale is fed upon by the parasite.

When the changes in the pupae have become complete, and the adult, winged parasite is ready to emerge, escape from the protecting scale is effected by means of a small round hole, or puncture, and when scale insects are seen with these small circular holes in them, it may safely be assumed that those particular scales are dead, and that the parasites that caused their death have emerged through the hole in the scale.

The black scale will very rarely be found to contain more than one parasitic grub in a single scale: but in a few instances two have been observed. In such cases, it seems probable that one grub will devour the other, and that only one parasite will eventually emerge from that particular scale.

In a recent examination of a large number of black scales on cotton in one field in Antigua, it was found that nearly every scale insect which had reached the egg-laying stage harboured a grub of this parasite. There were very few punctured scales to be seen, and it was very difficult to obtain specimens of the adult parasite by means of the insect net.

The infestation of cotton by black scale, in this particular field, was most remarkable, nearly every plant was literally covered from base to tip with the insect. It was cotton which had yielded its full crop and should have been pulled up and destroyed some weeks previously. It may be that, as far as the black scale is concerned, considerable benefit might be derived from allowing this cotton to stand until the majority of the parasites had completed their development and had begun to escape. If the cotton bushes could be cut and left in the field just at this time, the immature scales would be killed, and the parasites, as they emerged, would fly away into the wild land in search of scale insects in which to deposit eggs; the old cotton plants could then be burned and the parasites from the scales in the wild land would be within convenient distance to come back into the field and parasitize the black scale on the succeeding crop of cotton.

Every grower of cotton should make himself familiar with the appearance of this parasite in its different stages. At this time of the year, the grubs may easily be discovered by examination in the field, and the pupae are often to be found in the same way. The adult parasites may be obtained by placing scale-infested twigs in a glass covered with fine muslin. In the course of four or five days, these small winged insects may be seen on the walls of the glass, or walking about on the scale-infested twigs.

THE GENERAL OCCURRENCE OF ANTHRAX.

Anthrax attacks all animals, and natural cases are met with in all the higher domesticated animals and in man, but most frequently in cattle. In Great Britain, it is mostly met with in cattle, and after cattle in pigs, while horses and sheep are together next in order of susceptibility. A curious fact is that in experiments, it is found that sheep are more susceptible than cattle, the reason that they do not so often contract the disease under ordinary circumstances probably being that they are less exposed to infection, and also to the fact that in sheep the disease is not so easily recognized and is less often reported.

A constant feature is that the disease occurs in cattle two years old or more, and except in the case of outbreaks, it is quite rare in the calf. This is not due to any greater susceptibility of adults, but rather to the fact that they are more exposed to infection from such sources as feeding cakes, etc. It is probable also that horses are almost, if not quite, as susceptible as cattle; but here again, their exposure to infection is far less. Dogs are the most resistant of the domestic animals, especially old dogs, and it is very doubtful if natural cases occur in poultry, the fowl being almost immune. Of the smaller animals it is an interesting fact that white rats are immune to anthrax, while the brown and black rats are easily killed by it.

Some idea of the virulence of the anthrax bacillus may be gained from the fact that a single bacillus introduced under, or merely into, the skin, is sufficient to kill a mouse or a guinea pig.

In the human being, anthrax is commonly met with in two forms: one is 'wool-sorters' disease', well known in Bradford and other places where wool is handled. The wool may be infected to a very great degree, and the explanation is that, in some countries, it is badly clipped, and even torn off, so that blood gets into it; subsequently the germs are scattered into the air from the dry wool when it is handled, and infection occurs by inhalation or by their entry through scratches or wounds. The other form of the disease is known as 'hide-carriers' disease', and is the result of carrying infected hides on the back; infection here takes place through an abrasion in the skin, giving rise to what is known as 'malignant pustule'. Malignant pustule also occurs in wool-sorters' disease, when the infection is through the skin. 'Intestinal anthrax' is a rare form of the disease and is the result of eating the flesh of animals dead of anthrax.

In St. Vincent, at the present time, anthrax is in abeyance, because of rigid legislation as to the destruction of anthrax carcasses, the extent to which vaccination has been conducted, and also because of the fact that animals become, after some time, more or less immune to the disease. This does not mean that they will not take the disease, but that they have acquired a greater resistance to it than before. In this connexion, it may be mentioned that one of the principles of natural immunity is, that a race of people or herd of cattle is immune to any disease in direct ratio to its previous experience of it—in other words the more experience they have of it, the less likely they are to take it. The probability in St. Vincent is that sporadic cases will occur from time to time, but that anything in the nature of an outbreak is, for the present at least, unlikely.

CANDELILLA WAX.

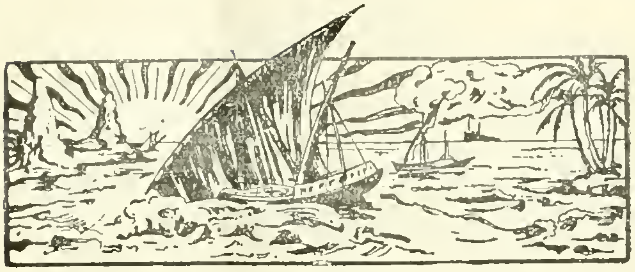
Mention was made of Candelilla wax in the *Agricultural News*, Vol. IX, pp. 104 and 124, while material for planting the species (*Pedilanthus* sp.) from which it is obtained has been distributed among some of the Botanic Stations by the Imperial Department of Agriculture. The following note on the plant appears in the *Chamber of Commerce Journal* for May 1911:—

A trial parcel of candelilla wax has been prepared for shipment to New York from San Luis Potosi, says the American Consul there. A local firm has fitted up a rendering outfit and is extracting the wax, pending negotiations as to price, quantities and form in which delivery is desired. The shrub is being delivered to the local firm from neighbouring haciendas and waste mountain lands. The plant has been pulled up, as the easiest method of gathering it, but as the subsoil is a mass of tangled roots it is said that its destruction is almost impossible. The local dealer has thus far recovered about 3 per cent. in weight of wax. The entire shrub is fed into boiling tanks and the wax skimmed from the surface. The waste is used as fuel to heat the tanks. The wax is of a brown slate colour, but by rolling it into thin sheets it can be bleached in the sun to a very light shade. It is proposed to instal means of filtering, to remove cellulose and foreign matter. It is also proposed to arrange the rendering tanks so that they can be set up and moved about in candelilla districts, to avoid the expense of cartage of the shrub and obtaining fresh material. As the use of the wax is still experimental, its industrial application cannot yet be defined. It is expected that it will prove a cheap and satisfactory substitute in the manufacture of varnishes, insulators, lacquers, sealing wax, dental wax, and waterproof papers and inks. The shrub grows in great profusion on the mountain sides and waste lands in San Luis Potosi. It is locally said that the wax seals the plant against evaporation and enables it to flourish on thin soil and with a minimum of moisture. The yield is estimated at 12 to 18 tons per acre, and it replaces itself rapidly. The following data are condensed from a pamphlet issued by the Department of Public Instruction: The candelilla is a species of Euphorbia. It contains a small amount of rubber: less than one-half of 1 per cent. Near the coast it increases in size but yields less wax. The wax is harder and more brittle than beeswax and possesses a high coefficient of expansion. Its melting point is from 67° to 80°C., specific gravity 0·982 to 0·9856, saponification value 35 to 86·5, hydrocarbons 42·5 to 59·7; dissolves in turpentine, chloroform, hot ether, and benzene.

DEPARTMENT NEWS.

Mr. H. A. Ballou, M.Sc., Entomologist on the Staff of the Imperial Department of Agriculture, returned to Barbados from Antigua, where he had been conducting investigations into the sugar-cane pests of the island, by the S.S. 'Luristan', on June 10, 1911.

Mr. P. T. Saunders, M.R.C.V.S., the newly appointed Veterinary Officer on the Staff of the Imperial Department of Agriculture, arrived in Barbados to take up the duties of his office, by the R.M.S. 'Magdalena', on the 5th instant.



GLEANINGS.

It is reported from St. Lucia, that the lime crop is late, although the trees are in a healthy condition. As far as cacao is concerned, this is flowering well and there is promise of a good crop. Cane-planting for the coming season is almost finished.

At a meeting of the Legislative Council of Grenada, held on March 3, 1911, His Excellency the Governor of the Windward Islands presented certificates to those candidates in Grenada who had been successful in the last examinations held in connexion with the Courses of Reading of the Department.

A report from the Agricultural Instructor, Nevis, states that the area of cotton in the Presidency will be increased for the coming season. In connexion with this, over 100 acres of bush land have been cleared specially for the purpose in one part of the island, while about 50 acres of pasture land, in a district near the windward part, is intended to be devoted to cotton-growing.

According to a return prepared in the office of the Director-General of Commercial Intelligence for India, the total area under coffee in the year ended June 30, 1910, was 203,610 acres, as compared with 204,585 acres in the previous year. The reported production in 1909-10 was 34,983,569 lb., as against 27,648,357 lb., in 1908-9. (*The Board of Trade Journal*, April 13, 1911.)

The *Liverpool Journal of Commerce* for May 18, 1911, contains an announcement to the effect that, on the day previous, Messrs. Workman, Clark & Co., Ltd., Belfast, had launched a large steamer, built to the order of the Tropical Fruit Steamship Co., Ltd., Glasgow, of which Messrs. Clark and Service are managers. The vessel, which is named La Senora, is especially designed for the general fruit and refrigerated freight trades between the West Indies and the United States. It possesses, incidentally, accommodation for about 160 first class passengers.

Information has been received that the Sixth Annual National Dairy Show of the United States of America will be held in Chicago from October 26 to November 5, 1911. A circular issued in connexion with this show refers to the fact that the National Dairy Show Association has expended, so far, more than $200,000 in promoting the dairying industry of the United States. One of the chief objects of the show is to work in co-operation with the efforts of all other similar organizations and agencies for the support and extension of the dairying industry in that country.

It is reported by H.M. Consul at Tahiti that a new law has been made for the purpose of regulating the picking and curing of vanilla in French Oceania, the reason being that the prices of vanilla, from this source have become lowered, mainly because of the gathering and curing of immature beans. To prevent this, the new law prohibits green vanilla from being handled for commercial purposes, while the curing of the beans is to be done only by those who have shown the possession of ability for the work by gaining a special license. Further, all vanilla for export is to be inspected before shipment.

The *Journal de la Société Nationale d'Horticulture de France*, for 1910, p. 554, describes experiments that have been conducted for the purpose of dealing with chlorosis, or the lack of green colouring matter owing to a want of iron, in pear trees. The method employed was to drill an inclined hole about one-half way through the trunk or branch that was being treated, and to place sulphate of iron in the hole thus made. After the operation, the bark around the hole is scraped and covered with grafting wax. It is claimed that the method is permanently successful, except in the case of old trees or those weakened by the attacks of insects or disease.

The *Field* for April 29, 1911, gives directions for making and using a weed killer, as follows: 1 lb. arsenious oxide, 1 lb. sodium hydroxide, water 6 pints: these are boiled for half an hour, allowed to cool, and then the solution is put into a large stone bottle, corked and labelled Poison. When a path is to be treated, either a large watering pot with a fine rose, or a barrel with a perforated pipe on the principle of a road sprinkler, is used, according to the area of the path. The mixture is diluted in water, in the proportion of 1 pint to 6 gallons of water, this quantity being sufficient to treat about 30 square yards of path. It is most effective when applied towards evening, and when the path is dry.

The Agricultural Department in St. Lucia has issued a leaflet containing a revised list of prices charged for plants supplied by it for planting in St. Lucia. The plants include Central American and Para rubber, citrus plants, cacao, coffee, spices, mangoes and various ornamental kinds; particulars as to the seeds that are obtainable are also included. A useful feature of the leaflet is a table indicating the best time to order the plants, and the period after which they will be available for distribution. It should be noted that the prices given refer to deliveries at the Botanic Station; an extra charge will be made for special packing for transport, and further, special rates will be asked for plants that are required for export.

The *Experiment Station Record* of the United States Department of Agriculture for December 1910, p. 625, contains the following abstract of recent work that has been done in Germany in connexion with the effect of manures on the activity of nitrogen-fixing organisms (Azotobacter): 'Experiments on the decomposition of green manures indicate that the addition to the soil of small quantities of barnyard manure to be ploughed under with the green crops will hasten decomposition by furnishing fermenting organisms which immediately act on the green material. At the same time, if small amounts of potash and phosphoric acid are used, they will quicken the fermenting and rotting processes and furnish avilable food for Azotobacter.'

STUDENTS' CORNER.

JULY.

First Period.

Seasonal Notes.

It is necessary that seedlings of limes in nurseries, as well as those of other plants, should be examined frequently in order to ascertain if they are suffering from attacks of scales or other insects; where scale insects are found, such plants should be sprayed before they are set out in their permanent positions, as this course saves a large amount of labour that will be necessitated later, for the removal of the scales, if it is not followed. In what way do scale insects injure plants? How do they reach healthy plants, from those which have been infested? In the case of mature lime trees, how would you employ the Bengal bean as a means for combating the attacks of scale insects? Give an account of the observations that you have made in regard to the employment of Bengal beans in this connexion.

The planting out of limes should take place during the early rains, in order that the plants may be well established before the dry season commences. What is meant by the establishment of plants, in this sense? Compare the readiness to resist the effects of dry weather of a plant which has been only recently set out, with that of trees which have occupied their present position during several seasons. As a general rule, when arrangements are being made for transplantation, the holes to receive the plants that have been removed from the nursery should be made ready some little time before they are required. Why is this? For limes, these holes should be wide and shallow. State why holes of this kind are better for the purpose than those which are deep and narrow, and give an account of the general results which occur from the planting of lime seedlings deeply. Where they are available, remove plants of the lime, cacao, cotton or of some, similar economic plant, in such a way as to injure the roots as little as possible; write a description of the root system that you have an opportunity of observing, and compare it with the similar system of a monocotyledon such as corn, the sugar-cane or a palm.

At this time, the pruning of cacao should have been completed. It is important that careful examination of the trees should be made in order to ascertain if the tarring of the wounds has been properly carried out. Why are the wounds, made in pruning, covered with tar? Every opportunity should be taken to make careful notes of the appearance of diseases and pests in cacao as well as in other cultivations. The records thus obtained will often show that a sudden disappearance of pests and diseases has taken place in the case of certain individual plants. Give any reason that may account for this, and state the use of the circumstance in practice. In connexion with the lime crop, preparations will have been made for concentrating the juice, and where the harvesting and manufacturing processes have not been completed already, the grass beneath the trees should be cutlassed in order to facilitate the collection of the fruit. Where green limes are gathered, they must be picked with care. What is the reason for this? In cases where limes have to be packed for export, it will be useful to wrap a few of them in fairly thick brown paper, and others in tissue paper, and to compare the keeping qualities of the fruit in the two cases. Where lime seedlings have been planted out, mulch a few of the plants, or where mulching is generally carried out, leave a few of them without a mulch. In dry weather the difference between the mulched and unmulched plants will be very evident. At a suitable time, conduct a series of observations on the development of lime fruits and of those of cacao; the observations should include the making of sections through the fruit in order that a knowledge of the manner of growth of the interior may be obtained, and that the information at the student's disposal should not be confined to facts concerning the external growth of the fruits, only.

Plants, in different degrees, show a tendency to vary from the normal type. What is meant by this, and what may be the most common causes of such variation? Give as many instances as you can of this variation, that have come before your notice, making mention of any probable causes of the change, where it is possible for this to be done.

Where cotton is planted, a careful note should be taken later of the improvement through the use of selected seed for sowing. The possession of such information will make it easy, at the end of the crop, to compare the yields from unselected plants as well as to contrast the value of the different products. In seed selection, why should seed without fuzz be discarded? Mention any diseases of cotton that are likely to be carried over from one season to another, through the medium of the seed. What practical measures would you take in order to minimize, as far as possible, the chances of the transmission of diseases in this way? Where this is feasible, give a description of methods for growing cotton as an intervening crop with sugar-cane, with particular reference to the time of year for the different agricultural operations, the manner of preparation of the land, and the planting and reaping of the two crops.

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) What substances in the atmosphere are used by plants, and for what purposes?

(2) Give an account of what you know concerning the use of seaweed as a manure.

(3) State the chief qualities of a plant that make it suitable for employment as a green manure.

INTERMEDIATE QUESTIONS.

(1) Give a description of the most important subsidiary industry that is carried on in the neighbourhood in which you live, stating why you consider it to be important.

(2) Write an account of what is described as symbiosis in leguminous plants, indicating its practical value.

(3) State, with examples, what you know concerning the dispersal of seeds, in nature.

FINAL QUESTIONS.

(1) Give an account of the use, as manure, of any of the waste products, in the case of an estate with which you are familiar.

(2) Of what advantage is it to plants that arrangements often exist for the scattering of seeds to a distance from the plants that have borne them?

(3) Make a review of the information that you have at your disposal as to the usefulness, or otherwise, of soil inoculation with nitrogen-fixing organisms.

FUNGUS NOTES.

DISEASE OF THE ARECA PALM.

Interesting work has been conducted recently by L. C. Coleman, M.A., Ph.D., Mycologist and Entomologist to the Government of Mysore, on the diseases to which the areca palm (*Areca Catechu*) is subject, in that State. The first of these is Koleroga or rot disease; an account of it has been published in Bulletin No. II of the Mycological Series of the Department of Agriculture of Mysore. The subject-matter of this paper is interesting in many ways, but one of the main points is that the fungus causing the disease is closely related to that responsible for canker and black rot of cacao. In fact, the second and more technical portion of the Bulletin contains a description of the cacao fungus and of comparative cross-inoculation experiments with it and with the areca nut fungus. An account of the conclusions arrived at as regards both is given below, as well as of the disease which formed the primary object of the investigation.

SYMPTOMS. The areca nut is cultivated in gardens or estates in the hilly regions of the State of Mysore where the rainfall varies from 100 to 300 inches in the year. In these districts, as the monsoon commences (this is usually early in July), a serious disease breaks out on the nuts and destroys a varying proportion of the crop, while in severe cases the whole may be destroyed. This disease is known as Koleroga, but has no connexion with the Koleroga of coffee. The first sign is a dropping of the nuts from attacked bunches. Such nuts on examination are found to have lost more or less completely their clear green colour. If they are in an early stage of the disease, it is seen that part of the surface of the shells, usually at the base of the nuts, is of a darker green colour and has a water-soaked appearance: at a later stage the surface is covered with a whitish mass of mycelium, easily removed by scraping with a knife or with the finger nail. This mass of mycelium commences to appear on the water-soaked area at the base of the nut, and gradually spreads over the whole surface. Various saprophytic organisms, both fungi and bacteria, quickly follow the original, causative fungus and complete the destruction of the nuts. In addition to the nuts, the flowers and flower stalks may be attacked: furthermore, the fungus may in rare cases spread down the flower or fruit stalks into the tree and thence upwards into the terminal bud; as a consequence the tree is killed. In even rarer cases, infection may start on the leaf sheaths and spread directly into the terminal bud, with the same result. Altogether about 1 per cent. of the trees in many gardens were killed in this way.

THE FUNGUS. The disease is due to a variety of *Phytophthora omnivora*, which has been provisionally named by Coleman *P. omnivora*, var. *Arecae*; it lives in and between the cells in the tissue of the nut. The portion of the mycelium between the cells puts out short, finger-like haustoria, which penetrate the cells. These haustoria may be straight or curved, and are occasionally branched. As the disease progresses, the mycelium bursts its way through the epidermis in small tufts. These tufts then grow out, and produce the white superficial covering found in more advanced stages of the disease. It will be remembered that a mass of superficial mycelium is also produced by *Pythium palmivorum*, Butler, the fungus causing bud rot of the Palmyra palm (*Borassus flabellifer*), and to a less extent of cocoa-nut and areca nut palms in Travancore (see *Agricultural News*, Vol. X, pp. 14 and 30). In some cases, the erumpent tufts of mycelium give rise to sporangia borne on very short stalks, while these organs are also produced on short sporangiophores among the mass of superficial hyphae. They are more or less lemon-shaped structures, with a blunt, hyaline projection at one end. In damp conditions, under the influence of light their contents are extruded through a hole formed in this projection. These break up, on emerging, into 10 to 40 minute spores, which swim about in drops of rain-water by means of two small whip-like appendages, or flagellae. After swimming for some time, they come to rest and germinate, the germ tube growing out until it reaches a stoma, through which it enters the nut, and produces a new infection. The fungus also possesses a sexual method of reproduction, by means of antheridia and oogonia. The contents of the antheridium pass into the oogonium, and as a result a thick-walled resting oospore is formed. The oospores are capable of resisting drought, and it is by their means that the fungus is enabled to survive from one monsoon to the next. Coleman was unable to state definitely where they are produced, as he never found them on the nuts or in the soil. He believes, however, that they are formed in the nuts, and also in the tops of trees attacked in the bud region; while there is also a possibility that they are produced on other plants, as infection experiments showed that the fungus could attack many of the hosts of *Phytophthora omnivora*, and in addition young tomato plants.

METHOD OF SPREAD. When the sun is shining between falls of rain, in the monsoon, the sporangia formed on the surface of a nut liberate their zoospores into the rain-drops left by the last fall. This is done under the influence of the sunlight, and occupies about fifteen minutes. In the dark, zoospores are not liberated. Soon, another rain-cloud comes up, the rain falls very heavily, and the drops are blown by the strong wind. In this way drops of water infected with zoospores are carried to healthy trees to leeward of the unhealthy group, and the disease is spread. Insects and birds may also assist, but the part played by them is small, as they do not fly much in the wet weather.

PREVENTIVE MEASURES. The first precaution is the removal and burning of all diseased nuts and branches, and the tops of trees that have been killed. Two other precautionary measures were investigated. The first consists of covering the bunches of nuts, before the monsoon breaks out, with special coverings known as 'kottes', made by sewing together the bases of two leaf sheaths. This is a practice in general use and helps to prevent an outbreak, but is not of much avail in stopping the spread of the disease. The second and more successful method is to spray the bunches with Bordeaux mixture to which a strong adhesive has been added.

COMPARISON OF THE ARECA AND CACAO FUNGI. This fungus is so like *Phytophthora omnivora*, to which species the cacao canker and black rot fungus were formerly referred, that Coleman made a comparative investigation of the two forms, and also carried out inoculation experiments, with both, on various hosts of *P. omnivora*. He found that the cacao fungus possessed the peculiarity that it appeared never to form antheridia, while its oogonia developed oospores without any fertilization taking place. In consequence of this and other characters, and of the fact that it could not attack areca nuts with any vigour, he considered it different from the areca fungus, and worthy of being regarded as a new species. The areca fungus could not attack cacao pods vigorously, but both caused the death of many of the host plants of *Phytophthora omnivora*, especially when in the seedling stage. This last point is interesting, as it may well be that the cacao fungus, *P. Faberi*, common in the West Indies, is responsible for the damping off of various seedlings—an occurrence frequently noted in some of these islands in the wet weather. In addition, the extension of the list of host plants of the cacao fungus is always a matter of importance, for it has recently been shown that the same fungus also causes canker of Hevea and immortel, in Ceylon, and attacks the fruits of the former and the bread fruit. (See *Agricultural News*, Vol. X, p. 78.)

PLANT INDUSTRY IN THE UNITED STATES.

The following extracts contain a few of the many matters of interest to which reference is made in the *Report of the Acting Chief of the Bureau of Plant Industry*, United States Department of Agriculture, for 1910:—

WORK WITH NODULE-FORMING BACTERIA Pure cultures of nodule-forming bacteria for inoculating legumes have been distributed during the year, and additional data have been gathered concerning the limitations of successful inoculation. Especially with alfalfa in the eastern States, it has been found that successful inoculation is correlated very closely with the reaction of the soil to neutral litmus paper The inoculation of crimson clover seems to show no correlation with the litmus reaction, while the inoculation of vetch is about half-way between these extremes. More detailed field work in connexion with the experimental distribution of pure cultures for inoculating legumes will be undertaken during the coming year.

RELATION OF ACIDITY OF SOILS TO GRAZING PLANTS. In the progress of the co-operative experiments between the Forest Service and the Bureau of Plant Industry on the artificial re-seeding of denuded grazing lands in the National Forest, it had been found in 1908 and 1909 that the failure of certain forage plants on certain experimental areas could not well be attributed to improper conditions of moisture and temperature. On the suspicion that the conspicuous differences of success or failure might have been caused by differences in the acidity of the soil, a study of the acidity of these areas was made in 1910, with wholly conclusive results. It was found that the areas on which Kentucky bluegrass and timothy failed were acid, and that on these same areas redtop grew with great success. It was found, on the other hand, that the areas on which redtop made a poor growth and timothy and Kentucky bluegrass succeeded were neutral or slightly alkaline in their chemical reaction. It is clear from the season's study that acidity of the soil is a factor of the greatest importance, hitherto unconsidered, in the seeding of these mountain grazing lands. Hereafter, experimental sowings will be made with reference to conditions of acidity as well as those of temperature and moisture.

Fortunately, nature herself has furnished a guide to the acidity of these areas. There are certain wild plants which grow only on acid lands, others which grow only on neutral or alkaline lands, and the presence or absence of these indicative plants is an excellent practical guide for field work.

TESTING METHODS OF CORN BREEDING. The various methods of corn breeding that have been put to practical tests during the past ten years are showing their comparative merits. The yields of this fall will show the relative production of corn that has been undergoing improvement by different methods of close breeding and crossing. It is well established that the retention of half the seed of ears tested as to production is important. It allows further testing under different seasonal conditions and isolation or crossing of individuals of improved merit. Indications have been found that power to yield well is, with corn, a Mendelian character and that when two homozygous individuals, related or unrelated, are mated the progeny produces heavily.

FLORIDA CITRUS FRUITS. Field investigations were made a feature of the season's work. In several districts the Bureau workers made careful inspections of the work of picking gangs and packing houses, pointing out the amount of injury due to careless work and the effect of such injuries. As a result of these demonstrations and instructions, the work done by picking gangs showed material improvement during the season.

The results of the washing experiments show considerable variation, depending upon the character of the work. In some sections only slight decay resulted from the washing of fruit, while in others where the work was carelessly done, a material loss from decay followed. Where the machinery was operated at high speed, or where the wash water was not changed often enough to ensure cleanliness, decay was always materially increased. An appreciable percentage of long stems in the fruit to be washed always resulted in increased decay. A summary of all the data obtained shows that washing increases the chance for decay, and should only be resorted to when absolutely necessary to place the fruit in marketable condition. When fruit must be washed, the work should be done with the greatest care, both in the handling and the operation of the machinery, and in using clean water.

The shipping experiments consisted of the forwarding of a series of boxes to Washington, each series containing carefully handled and selected fruits, packed very carefully under the supervision of the Bureau workers, and the same fruit picked, handled and packed under ordinary commercial packing-house conditions. The effect of delay in packing and shipping was investigated. Inspections were made on the day of arrival at Washington, and one, two and three weeks thereafter, the fruit being held under ordinary market conditions. While the data obtained this season are rather meagre, they are consistent and clean-cut, and show (1) that the least decay follows immediate packing and shipping; (2) that there is least decay in carefully handled and packed fruit, and most in injured fruit; and (3) that less decay follows delay in packing carefully picked and handled fruit than in packing commercially handled or injured fruit.

The following list of goats for sale in Barbados and Dominica is published for general information:—

In Barbados, to be obtained from Mr. Tom Manning: ewe, 153 ℔., by Black Rock, the imported Anglo-Nubian, guaranteed to give 8 pints, now in kid to Rajah, the imported Indian goat; ewe, 178 ℔., by Rajah, guaranteed to give 6 pints; ewe 138 ℔. by Rajah, has given six pints for over seven months, due to kid shortly from Jensen, a pure-bred Toggenburg imported in 1910; ewe, 135 ℔., by Bruce, the imported pure-bred Toggenburg, with 2 kids from Jensen; ewe, 99 ℔., by Rajah, now in kid to Rajah.

In Dominica, to be obtained from the Curator of the Botanic Station: ram, born August 14, 1908, by Wallace, the pure-bred Toggenburg.

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR May 9, 1911.

ARROWROOT—2*d.* to $3\frac{3}{4}$*d.*
BALATA—Sheet, 3/8; block, 2/9 per lb.
BEESWAX—No quotations.
CACAO—Trinidad, 54/- to 62/- per cwt.; Grenada, 47/6 to 53/6; Jamaica, no quotations.
COFFEE—Jamaica, 60/6 to 67/-.
COPRA—West Indian, £23 10*s.* per ton.
COTTON—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 16*d.* to 18*d.*
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—No quotations.
HONEY—No quotations.
ISINGLASS—No quotations.
LIME JUICE—Raw, 1/-. to 1/2; concentrated, £18 2*s.* 6*d.* to £18 7*s.* 6*d.*; Otto of limes (hand pressed), 5/3, nominal.
LOGWOOD—No quotations.
MACE—2*s.* 2*d.* to 2*s.* 8*d.*
NUTMEGS—Quiet.
PIMENTO—Quiet
RUBBER—Para, fine hard, 4/11; fine soft, 4/9; fine Peru, 4/9 per lb.
RUM—Jamaica, no quotations.
SUGAR—Crystals, no quotations; Muscovado, no quotations; Syrup, no quotations; Molasses, no quotations.

New York.—Messrs. GILLESPIE BROS. & Co., June 2, 1911.

CACAO—Caracas, 11c. to 12c.; Grenada, $10\frac{3}{4}$c. to $11\frac{1}{4}$c.; Trinidad, 11c. to $11\frac{1}{2}$c. per lb.; Jamaica, $9\frac{1}{2}$c. to $9\frac{3}{4}$c.
COCOA-NUTS—Jamaica, select, \$25·00 to \$26·00; culls, \$13·00 to \$14·00: Trinidad, select, \$26·00 to \$27·00; culls, \$14·00 per M.
COFFEE—Jamaica, $12\frac{1}{4}$c. to $13\frac{1}{4}$c. per lb.
GINGER—10c. to 12c. per lb.
GOAT SKINS—No quotations.
GRAPE-FRUIT—Jamaica, no quotations.
LIMES—\$7·25 to \$8·00.
MACE—48c. to 50c. per lb.
NUTMEGS—110's, 10c. to $10\frac{1}{4}$c. per lb.
ORANGES—Jamaica, \$1·50 to \$2·25 per box.
PIMENTO—$4\frac{1}{2}$c. 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., June 12, 1911.

CACAO—Venezuelan, \$11·40 per fanega; Trinidad, \$11·00 to \$11·50.
COCOA-NUT OIL—90c. per Imperial gallon.
COFFEE—Venezuelan, 15c. per lb.
COPRA—\$3·25 per 100 lb.
DHAL—\$3·60 to \$4·00.
ONIONS—\$3·25 to \$4·00 per 100 lb.
PEAS, SPLIT—\$5·50 to \$5·60 per bag.
POTATOES—English, \$2·25 to \$2·70 per 100 lb.
RICE—Yellow, \$4·35 to \$4·40; White, \$5·40 to \$5·50 per bag.
SUGAR—American crushed, no quotations.

Barbados.—Messrs. JAMES A. LYNCH & Co., June 14, 1911; Messrs. T. S. GARRAWAY & Co., June 2, 1911.

ARROWROOT—St. Vincent, \$4·50 to \$4·70 per 100 lb.
CACAO—\$11·00 to \$12·00 per 100 lb.
COCOA-NUTS—\$16·80.
COFFEE—Jamaica and ordinary Rio, \$11·50 to \$15·00 per 100 lb., scarce.
HAY—\$1·30 to \$1·50 per 100 lb.
MANURES—Nitrate of soda, \$60·00 to \$65·00; Cacao manure, \$42·00 to \$48·00; Sulphate of ammonia, \$75·00 to \$76·00 per ton.
MOLASSES—No quotations.
ONIONS—\$3·00 to \$3·58 per 100 lb.
PEAS, SPLIT—\$5·70 to \$5·75 per bag of 210 lb.; Canada, \$4·10 per bag of 120 lb.
POTATOES—Nova Scotia, \$3·00 per 160 lb.
RICE—Ballam, \$4·60 to \$4·65 per 100 lb.; Patna, no quotations; Rangoon, no quotations.
SUGAR—No quotations.

British Guiana.—Messrs. WIETING & RICHTER, May 27, 1911; Messrs. SANDBACH, PARKER & Co., June 9, 1911.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	No quotation	\$10·00 per 200 lb.
BALATA—Venezuela block	No quotation	Prohibited
Demerara sheet	85c. per lb.	65c.
CACAO—Native	11c per lb.	12c. per lb.
CASSAVA—	\$1·20	No quotation
CASSAVA STARCH—	\$6·50 to \$7·00	No quotation
COCOA-NUTS—	\$12 to \$16 per M	\$10 to \$16 per M., peeled and selected
COFFEE—Creole	16c. per lb.	15c. per lb.
Jamaica and Rio	18c. per lb.	18c. per lb.
Liberian	$10\frac{1}{2}$c. per lb.	10c. per lb.
DHAL—	\$3·60 per bag of 168 lb.	\$3·75 per bag of 168 lb.
Green Dhal	\$3·50	——
EDDOES—	\$1·32	——
MOLASSES—Yellow	None	——
ONIONS—Teneriffe	——	——
Madeira	——	$7\frac{1}{4}$c.
PEAS—Split	\$5·70 per bag (210 lb.)	\$5·85 per bag (210 lb.)
Marseilles	\$4·50	No quotation
PLANTAINS—	20c. to 40c.	——
POTATOES—Nova Scotia	——	\$4·25
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—	\$2·40 per bag	——
YAMS—White	\$3·24	——
Buck	\$3·60	——
SUGAR—Dark crystals	\$2·40 to \$2·45	None
Yellow	\$2·90 to \$3·00	\$3·00
White	\$3·80 to \$4·00	\$4·00 to \$4·25
Molasses	\$2·10 to \$2·30	None
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.

Methods of Agricultural Education.

THE subject of agricultural education has received useful attention and enlightenment in the recent issue, by the Board of Education, England, of a Memorandum on the Principles and Methods of Rural Education. Many of the ideas and facts which receive expression in this are worthy of attention here, for they apply, in a broad manner, to conditions in the West Indies. This is true all the more because the Memorandum gives attention to every side of rural education, as it exists in England at the present time, thus making the treatment of the subject very comprehensive.

In relation to rural schools, experience in England is directly reflected by that in the West Indies, in the circumstance that the agricultural and other teaching of a practical nature has been evolved from small beginnings—often under circumstances where the knowledge of the teacher himself has had to be acquired along with that of his pupils, until, with the aid of proper advice, he has been able to formulate a definite scheme to be employed in his school. As is stated in the Memorandum, the necessary matters for such a beginning and development are, firstly, a real interest in the affairs of the surrounding district, and, secondly, 'willingness and sufficient courage to try experiments and to learn from others.' This keenness on the part of a teacher gives a vital interest to his work, and makes it a matter of living concern to his pupils.

The main principle for adoption is that the teaching should have connexion with the life of the child and his daily experience. This principle can be carried out in most, if not all, of the different subjects taught in the school. Thus in English, descriptions will be included of surrounding incidents and circumstances, and of observations and work in nature study experiments with plants in pots and boxes and in the school garden. The school garden, too, will serve as a prolific source of arithmetical examples with which the interest of the pupil will be actively and personally concerned. Geography will no longer be a mere matter of book learning, with examples drawn from foreign countries which the pupil will never see, but will have relation to the features of the district in which he lives and the illustrations that he can view with his own eyes. These considerations are true, though in a small degree, of other subjects that may be taught in the school.

Continuing, with reference to the circumstances of elementary schools, all this is connected with the main matter at issue, namely the pursuit of Nature Study. Here, the teacher can never complain of a want of variety in the circumstances and conceptions that are needed for the work that is required for this topic. He must beware, however, of the tendency to confine the work of observation and experiment to what is done in the class room and the school garden: it is of much importance that proper attention should be given to the general facts of nature that have their existence in the district served by the school. The active work in relation to these will include the making of notes, drawings and paintings by the pupil, and the keeping of simple records. The scope of such work will naturally vary with the knowledge of the teacher and with the district in which he finds himself; the fact that it is simple, if it is thorough in quality, will not, however, detract from its value.

The conditions of secondary schools must now be given attention. It is interesting that attempts to teach subjects connected with agriculture and horticulture as extra subjects, in schools in England, have resulted in disappointment. That this might be the case was already realized, in the West Indies, in planning agricultural work for such schools as the Grammar Schools in Antigua, St. Kitts, and St. Vincent. It is of further interest that the Memorandum advocates the provision of a general course of chemistry, biology and physics as a preliminary to definite agricultural teaching—a plan which has, as in the case of the circumstance just mentioned, been always advised and adopted by the Imperial Department of Agriculture in its dealings with West Indian schools.

Finally, as regards secondary schools, the advice given for methods of teaching is similar to that for elementary schools, namely: 'The principles of science should be taught by means of experiments which make their appeal to the rural student as having a definite application to his environment, and this can best be done if experimental work is carried on, not only in the laboratory, but also in the field and garden.' The adoption of this method gives the teaching the necessary agricultural bias, and prevents it from being dissociated from the useful illustrative circumstances that surround the pupil.

The last section in the Memorandum, possessing a more direct interest for the West Indies, deals with farm schools. Institutions of this nature, or those having any of the more definite association with such schools, are rare in the West Indies. The facts which are given show that, at the present time, completely satisfactory results are by no means being obtained in England with the aid of these institutions. There is the circumstance that in all cases the lines of work are too specialized in nature. Further attention to this matter is not expedient here: it is of more use to draw attention to the Cadet System and Courses of Reading and Examinations in Practical Agriculture, of the Imperial Department, which, like farm schools, are intended to continue or supplement what is done in the ordinary schools. In the first, agricultural students in the secondary schools, toward the end of their period at school, may be relieved from participation in the ordinary subjects of the curriculum, and the time thus placed at their disposal is spent at the Botanic and Experiment Stations in the acquirement of agricultural knowledge, under the more particular direction of the officer-in-charge, while they still attend the agricultural classes at the school. This is only a brief statement of the scope and meaning of this system, and the same can only be afforded of those possessed by the Courses of Reading and Examinations in Practical Agriculture. The latter are a means by which overseers on estates are enabled to pursue their theoretical and practical studies, under advice, according to a definite plan, and to obtain certificates of progress from the Department at the end of the different stages in the course.

This is only a brief review of some of the contents of the Memorandum, in the light of experience and conditions in regard to agricultural education, more particularly in the islands administered by the Department. It may well be concluded with a general statement of the Memorandum, with reference to the work in England at large: 'Wherever such work has been effectively done, farmers declare that the expenditure is trifling compared with the financial benefit to the agricultural community.'

DEPARTMENT NEWS.

Mr. P. T. Saunders, M.R.C.V.S., Veterinary Officer on the Staff of the Department, left Barbados by the S.S. 'Ocamo' on the 27th ultimo, for Antigua, and other islands, subsequently, where he will conduct an investigation into the veterinary conditions in the colonies visited by him.

SUGAR INDUSTRY.

MOLASSES AS FOOD FOR STOCK.

The use of molasses as a food for stock has existed for many years, and in earlier times the general method for for feeding it was to mix the molasses, either raw or diluted, with the ration for the stock. In late years, however, continually increasing attention has been given to the making of proprietary articles, in which the molasses is absorbed by being mixed with a medium, which may or may not possess a nutritive value in itself. In relation to the employment of molasses in these ways, a useful article appears in the *Journal of the Board of Agriculture*, Vol. XVIII, p. 97. It is first pointed out, in this, that the great development in England of the employment of molasses for the feeding of animals has taken place during the last twenty-five years, and that the reason for this has been largely due to the growth of beet sugar manufacture in Europe. Even before this, molasses had been used in certain parts of England for the purpose of fattening cattle, but the frequent rises in price prevented the demand from being continuous.

Proceeding, the article gives a comparison of the molasses from beet and cane sugar, pointing out that these are almost identical, both in appearance and physical properties, although the colour of the former is usually a little darker than that of cane molasses, while the latter possesses a more pleasant smell. It is well recognized that the improved methods of manufacture that have been adopted for both beet and cane sugar have caused the sugar content of the molasses that is produced nowadays to be lower than that of the product which was obtainable formerly. In comparing the amounts of carbohydrates (chiefly sugar) in the two kinds, it is usually found that these are about the same; this statement, of course, refers to vacuum pan molasses, and not to that produced in the muscovado process. An average analysis of beet molasses is given in the article; this may be usefully presented here, and is as follows:—

	Per cent.
Nitrogen-free extract (chiefly sugars)	60·5
Crude protein	10·3
Ash	7·2
Water	21·5

The composition of molasses from different sources naturally varies from that which has just been given. The variation is mainly due to differences in the amount of water contained in the product; the calculation of the composition of most kinds of molasses, on the dry matter, gives remarkably constant figures as regards the sugar content.

Since September 1, 1903, the duty of 1s. per cwt., on imports of molasses into the United Kingdom, has been removed, in the case where the product is intended to be used solely as stock food or in the manufacture of cattle food. This circumstance has enabled cane molasses to compete more favourably with that from beet, especially as buyers prefer the former to the latter, for feeding purposes.

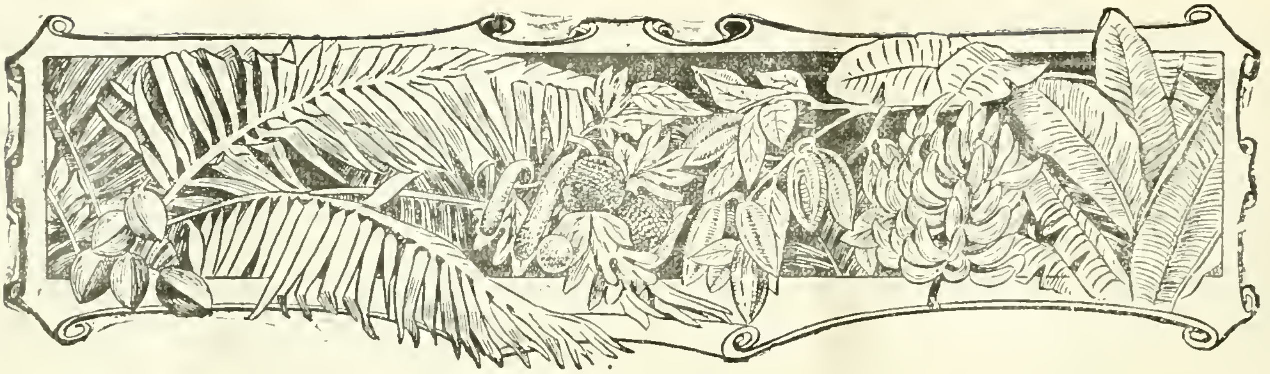
In regard to the value of sugar as food, attention is drawn to the fact that the conclusion reached in 1855, by Lawes and Gilbert, namely that this is about equal to the similar value of starch, has been virtually upheld by the results of recent work. Kellner, however, has conducted investigations which lead him to conclude that, for fat production, sugar has a smaller value than starch, the reason being that there is more loss in the case of sugar than with starch through fermentation in the digestive tract.

With reference to the nitrogen-containing substances in molasses, it is important to remember that these are not all present as proteids or albuminoids such as those provided by bean and other cakes. They belong to the class of substances known as amides, whose food value is far inferior to that of the proteids. Modern investigations have, however, shown that amides, in passing through the wall of the intestine, may be converted into proteids, so that in the case of healthy animals, these possess a certain feeding value. The chief point to remember is that, in calculating the feeding value of a sample of molasses whose composition is given, that of the nitrogenous bodies in it cannot be found by multiplying the percentage of nitrogen by the usual factor (6·25), and expressing the result as proteids, for the nitrogen is not present to any extent in the form of such bodies, but as has been stated, in that of amides. In considering the presence of amides in molasses, attention must be given to the possession of properties by them which cause the molasses to possess a laxative action. Notice must also be taken of the fact that the alkaline salts in molasses, particularly in beet molasses, serve as irritants to the kidneys, with the effects that may be expected from them. The question of the fats in molasses may be dismissed, from the consideration that these are entirely absent, or present in such small quantities that they cannot possess any calculable nutritive action.

In choosing molasses for stock-feeding, some of the greatest importance is to be attached to the percentage of water, particularly as, when the molasses is being bought on a declared analysis, the latter is frequently misleading in this respect. One of the reasons why molasses bought in Europe is likely to contain a comparatively high percentage of water is that it has probably, as a matter of convenience, being made more fluid by blowing steam through it. The food value of such molasses in inferior, and it is very likely to ferment and become useless for the purpose for which it is required.

The article refers to the fact that there is ample proof that in moderate quantities molasses is a useful and economical food for all classes of larger stock. It is necessary, however, to give proper attention to the fact that the feeding of large quantities of molasses, even where the laxative effect does not become great, is likely to be uneconomical, on account of the reduction of the digestibility of the other foods, through the presence of large amounts of sugar. In referring to the actual use of raw molasses for feeding stock, the article gives a hint for reducing theft by attendants; this consists in mixing the molasses with a little coal-dust—a method that may be more effective in England than in the West Indies.

The somewhat objectionable nature of molasses, owing to its sticky properties, and the cost of the package to contain a liquid substance, has led to the invention of various mixtures in which the molasses is absorbed into a solid medium. Among substances used for the purpose are: (1) palm oil and cocoa-nut oil meal from which the oil has been extracted; (2) offals from corn and wheat milling; (3) dried peat; (4) fibrous substances such as megass, ground nut shells and crude cellulose. It is important to remember that it is only in the case of the first two kinds of bodies that the solid medium can possess any useful nutritive value; in the case of peat and fibres, that of the molasses is likely to be actually lowered, owing to their enabling a certain proportion of it to pass through the digestive system in an unaltered condition. Finally, these mixtures do not take account of those in which molasses is used as a binding ingredient in compound cakes, and for increasing their palatability. Even in the case of these, caution is required, as the molasses may have been actually added for the purpose of disguising the taste of some unpalatable bodies in the cake.



FRUITS AND FRUIT TREES.

THE RELATION BETWEEN THE WEIGHT OF THE SEEDS AND THE PODS IN CACAO.

It is pointed out in a recent article that, in deciding as to the relative value of different kinds of cacao, little attention has been paid in the past to the relation which the weight of the seed in the pods bears to that of the pods themselves. This article, which is by M. A. Fauchère, Director of the Experiment Station of Tamatave, Madagascar, describes briefly the work of the author, which has been undertaken since the year 1906, for the purpose of obtaining definite knowledge of the subject, as well as of employing the relationship in the selection of different varieties of cacao for planting. Although the work is incomplete, it tends to show that, if consideration is given to this factor in selection, the relative value of the known kinds of cacao will have to be regarded very differently from the way in which they are viewed at present.

Attention is drawn to the fact that a cacao fruit is composed of two parts: the fruit covering, which is worthless from a commercial point of view, and seeds, which are the portion bearing the chief interest for the producer. This leads to the conclusion that the aim of the planter should be the production of seed, and not of husks; whereas the opposite often appears to be the case, for it is everywhere sought to obtain large fruits, and therefore large husks. In this connexion, it is the opinion of the author that the varieties of cacao having the best reputation in the West Indies are those which produce the least seed in comparison with the total weight of the fruits. It cannot be agreed, however, that this state of affairs exists to the extent that would appear to be indicated by M. Fauchère.

An account of definite experiments that were undertaken in regard to the matter is followed by the statement that these show clearly that the kinds of cacao known as Calabacillo are the richest in seed, when the weight of this is referred to the gross weight of the fruits. Three kinds of Calabacillo examined gave 31·1 kilos., 29·7 kilos., and 26·7 kilos., per 100 kilos. of fruits; whereas two forms of Criollo from Trinidad only gave 15·9 and 19·0 kilos. It is consequently evident that if the fruit-bearing powers of the trees are regarded as being equal, the advantage remains with Calabacillo, even if the seeds of this variety are considered to be of inferior quality to those of the other—a matter which, in the opinion of the author, has probably not been demonstrated.

It remains to be found if the fruiting capacity of Criollo plants is sufficiently large to compensate for the smaller richness of the fruits in seeds. This point is to be made the subject of an investigation by M. Fauchère, who expresses the certainty that the advantage will be in favour of Calabacillo, which shows itself to be extremely prolific at Tamatave. The article to which reference is made appears in the *Journal d'Agriculture Tropicale*, No. 118, p. 106.

GRAPE FRUIT FROM EAST AFRICA.

The following information concerning grape fruit from East Africa is given in the latest issue of the *Bulletin of the Imperial Institute* (Vol. IX, p. 15):—

A small box of grape fruit grown at Nairobi was forwarded to the Imperial Institute by the Director of Agriculture in the East Africa Protectorate in July 1910, with a request for information as to the condition of the fruit on arrival, its quality, and as to whether there is a market for such fruit in London.

The box contained ten fruits of various sizes, which were submitted to experts immediately on arrival

The condition of the fruit was stated to be practically perfect, and its quality to leave little to be desired. The only point to which attention was drawn was that these fruits from Nairobi contained more pith than the grape fruit received from Jamaica and California, and this fact might detract a little from their value when placed in competition with fruit from those countries. This slight defect will, however, probably not exist in fruit gathered from older trees.

The commercial value in the United Kingdom of grape fruit from the East Africa Protectorate will depend on (1) the time of year at which it can be placed on the market, and (2) the grading and packing of the fruit.

During the months of July and August there are practically no arrivals of grape fruit in Europe. If any quantity of the fruit could be landed in this country from the East Africa Protectorate during those two months (in the present case the fruit reached London on August 24), a very profitable business would result, and prices averaging from 15*s.* to 20*s.* per case could be obtained. During the other months of the year Jamaica, and California send fair supplies of grape fruit, which realize prices ranging from 10*s.* to 14*s.* per case.

The fruit is graded into several sizes. The largest size, which is larger than any of the fruits in the present sample from Nairobi, is packed in boxes, each containing 54 fruits. The 'count' increases as the size diminishes, and the smaller grades comprise 64, 72, 80, 90, 96 and 112 fruits in a box. The small 'counts', which consist of the larger fruits, are of course the more valuable. The boxes in which the fruits are packed measure 2 feet × 1 foot × 1 foot, and each box has a partition in the middle to strengthen it.

The fruits are wrapped in tissue paper and packed diagonally to avoid crushing, and it is essential that each box should be packed quite full, whatever grade of fruit it contains, so that the fruit does not get shaken about and bruised. The care taken in packing will be well repaid by the superior condition of the fruit on arrival.

There is a steady increase in the demand in this country for grape fruit, which has been growing in popular favour for some years past, and a constant supply from the East Africa Protectorate would find a ready sale.

AGRICULTURAL MATTERS IN DOMINICA

The following facts, of more general interest, are taken from a report by Mr. H. A. Tempany, B.Sc., Superintendent of Agriculture of the Leeward Islands, on a recent visit by him to Dominica, in connexion with the agricultural interests of that Colony.

On one estate which was visited, a large amount of trouble had been experienced in former years from the fact that oranges were eaten by a caterpillar; these attacks have now abated, apparently in a perfectly natural way. On the same estate, the rind of the orange fruits tends to be coarse, and attempts are being made to remedy this by the employment of a manure which is stated to have given good results in the Southern States of America; it is probable that the defect will be remedied, in time, as the trees grow more mature. The plants themselves are healthy and free from scale insects; among fungi parasitic on the scales, *Sphaerostilbe coccophila* and *Ophionectria coccicola* were present in large amounts, and it is well recognized by those in charge of the estate, as well as by many other practical agriculturists in Dominica, that these fungi are of the greatest importance in the work of combating scale insects. On another estate, indications were obtained that these fungi can do their work effectively, even where the plants are wind-swept, provided that there is a high rainfall.

After referring to the necessity for still more improved means for the transport of produce in Dominica, as well as to certain schemes that are being proposed in connexion with this, the report proceeds to draw attention to the extent to which Para rubber is being planted in the island. The area in which the greatest activity is being exhibited in this direction is situated along the Imperial Road, and the suggestion is made that a product has been found, in Para rubber, which meets the special requirements of this district, in the circumstance that it possesses a small bulk compared with its value, and is therefore easy of carriage. The total area of Para rubber planted in this district is estimated to be about 200 acres, and there are prospects of a considerable extension in the near future. It is considered by Mr. Tempany that the suitability of Hevea, for planting in Dominica, as compared with that of Castilloa and Funtumia, appears to have been clearly demonstrated. Funtumia is less successful, while the small progress made by the Castilloa plant shows it to be unable to grow successfully without high cultivation, and under conditions of heavy rainfall.

A visit was paid to a lime estate where a small Hornsby-Akroyd oil engine has been installed recently for the purpose of driving the mill for crushing the limes. Hitherto, water-power has been used in this connexion on the estate; the apparent anomaly of the introduction of mechanical power, where free, naturally provided energy is available, is explained by the fact that only small quantities of water are required for use on lime estates, so that a heavy fall of rain is often followed by accidents which interfere with the power supply and cause great inconvenience in the works. Where liquid fuel can be obtained with moderate ease, the economy obtained by the regular working consequent on its employment makes its use more suitable than that of water power. On the same estate, a cable way about 800 feet in length has been made for the purpose of conveying limes to the works, and the success obtained with this leads to the suggestion that such means of transport may well be adopted more widely in Dominica.

Several others matters receive attention in the report, which are not, however, of general interest. It only remains to refer to an interesting attempt that is being made to develop the vanilla industry in Dominica. This is being done with the expert assistance of a grower formerly interested in vanilla production in Réunion, and a considerable portion of the area has already been planted, physic nut (*Jatropha Curcas*) being used for supporting the plants; the planting material is supplied from the Botanic Station. The matter is of more particular concern, in that it will give indications as to the possibility of the future development of a vanilla industry in Dominica.

Plague and the Manchurian Soy Bean Trade.—The British Acting Consul at Dairen states that probably no great influence from the plague will be felt during the present season. So far as can be ascertained, the total export of beans and bean cake has been larger this year than last, in spite of adverse conditions, but the trade has been practically limited to the ports of Japan and South China, Europe taking some 7,000 tons only, as compared with 228,000 tons during the corresponding period of last season. The Harbin bean has been selling at 10s. per ton cheaper than the southern bean. This season's large export to Southern China has caused considerable surprise in view of the high prices which have ruled throughout. From October 1910, to February 1911, 333,977 tons of beans arrived at Dairen, as compared with 387,236 tons in the corresponding period of the previous season, while the quantities of bean cake which arrived were 85,793 tons, against 43,629 tons last season. The exports of beans during the same period were 175,354 tons and 268,480 tons, respectively, and of bean cake 181,893 tons and 72,480 tons, respectively.

It is in the coming season and possibly in the one following that the real effect of the plague will be felt. It is already time for beginning to prepare the land for next season's crop; labour, however, is scarce, and the quarantine restrictions in Shantung and Manchuria will probably result in a great reduction of coolie immigration at a time when it is most essential. There are large stocks of beans still in the country, but the farmers will not be persuaded to bring them in, and owing to the exceptionally mild winter that is just closing, the roads will break up earlier than usual, with the result that these stocks will for the most part be held over until next winter, at the expense of considerable deterioration from imperfect storage. It is, of course, possible that, with steady and rapid improvements in plague conditions, these stocks may yet be brought in and stored in places convenient for shipment on demand. (From *The Board of Trade Journal*, April 27, 1911.)

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date June 20, with reference to the sales of West Indian Sea Island cotton:—

Since our last report about 80 bales Fancy St. Vincent cotton have been sold, chiefly 20*d.* to 24*d.* per lb., with one lot at 25*d.*, and about 100 bales Stains at 9*d.*

The market remains steady with a very small stock offering, but there is no demand at the moment for cotton over 16*d.*, the sales of Superfine St. Vincent being quite exceptional.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending June 17, is generally as follows:—

There was a recount made of the stock by the Cotton Exchange and 1,347 bales had to be added for corrections. The stock on hand is 1,547 bales, of which exporters hold 219 bales, leaving in factors' hands 1,328 bales.

There have been no sales during the week, and the market remains quiet. The stock is composed chiefly of Planters' crops held at 30c. and above, and of cotton held off of the market under instructions from owners. But there is still remaining in stock about 150 to 200 bales of stains and the lower grades of off cotton, which factors are holding at 20c. to 24c., and also about 100 bales Fully Fine at 28c., so that we can still buy in a limited way:—

Fully Fine 28c. = 15¾*d.* c.i.f. & 5 per cent.
Fine 26c. = 14½*d.* " " " "
Stains and off Grades = 20c. to 24c. = 11½*d.* to 13½*d.* c.i.f. & 5 per cent.

THE PRESENT COTTON-GROWING SEASON.

In most of the cotton-growing districts of the West Indies, sowing will have been completed by the end of last month, while, in some cases, seed will have been planted as early as May. In all cases, the seed should have been carefully selected and disinfected, either by the planter himself or by the Agricultural Authority in the island; in some cases, this will have been done, under expert supervision, at the ginnery from which it was purchased. Where the cotton has not yet been sown, great care should be taken to ensure that proper selection and disinfection of the seed to be employed has been carried out. In connexion with the disinfection of seed, it may be useful to remind the grower that the strength of the corrosive sublimate solution to be used for the purpose is 1 part of corrosive sublimate in 1,000 parts of soft water or rain water, that is 1 oz. of corrosive sublimate to 7 gallons of water, or 1 lb. to 100 gallons; where the water is hard, and rain water is not obtainable, the solution should be slightly stronger. The best way to make up the solution is to dissolve the corrosive sublimate in a suitably small quantity of water, and then to add this to the larger quantity of water that is required to bring the solution to the proper strength. As is well understood, the tubs for disinfection should be made of wood, and should have been allowed to stand for a few hours, filled with some of the solution, before they are used for treating the seed. This is then poured away, freshly made solution added, and then the seed is stirred into the solution and left for ten to twenty minutes.

In planting, two or three seeds are usually placed in holes about 2 feet apart, in rows about 4 feet apart. This is a distance that has been found generally useful, though in any particular instance, the nearness of the plants to one another will depend on the nature of the soil: in poor land they will be farther apart than in rich soil. A fortnight after sowing, provided that the plants have made reasonable growth, they are thinned out, so as to leave one in each hole. Where for any reason, such as the lack of rain after sowing, the seeds have not germinated, the empty holes should be supplied by sowing fresh seed: it is of little or no use to attempt to do this by transplanting.

A short time after the plants have been thinned out, they should be moulded up, in order to enable them to resist the wind, and this should be done again when they are somewhat more than a foot high. In using the hoe for moulding up, the labourers should be careful not to injure the plants, particularly where they are likely to be attacked by black arm or red maggot.

The cotton should be weeded regularly throughout the season, until the bolls begin to open, and during dry weather it should be given light cultivation, where this is feasible, in order to maintain a soil mulch for the conservation of water. In this weeding and cultivation the same precautions must be taken, against injuring the plants, as are indicated above for the first weeding.

The chief matter to be realized in cotton-planting and cultivation in the West Indies is that the plant requires continuous attention—an attention almost as intimate as that needed in what is sometimes termed garden cultivation. It is only by fulfilling this requirement that an adequate watch for insect and other pests can be maintained, and the receipt of a profitable return may be ensured.

THE BRITISH COTTON GROWING ASSOCIATION AND THE GOVERNMENT GRANT.

In the *Agricultural News* for May 27, 1911, p. 166, a review was given of the Sixth Annual Report of the British Cotton Growing Association, 1910, in which there appeared the following paragraph:—

'Reference is made to the promise of His Majesty's Government, in 1909, to effect a grant-in-aid of £10,000 per annum, for a period of three years, to assist in the pioneering and missionary work of the Association, on condition that the latter should raise additional capital to the amount of £150,000, and establish and maintain seven pioneer ginning and buying stations in West and East Africa, at the same time supplying, free of charge, seed for sowing. It is now known that the attempt to raise the capital required has failed, so that other arrangements may have to be made in relation to the matter.'

The statement in the last sentence of this paragraph was based on a public telegram, dated London, April 27, which was as follows:—

'The British Cotton Growing Association has announced its failure to raise funds in Lancashire, upon which the Government grant and Colonial culture are dependent.'

In consequence of what is stated in this telegram, the Commissioner of Agriculture addressed a letter to Mr. J. A. Hutton, Chairman of the British Cotton Growing Association, requesting further information in connexion with the matter. In reply, Mr. Hutton writes, drawing attention to a statement on p. 8 of the report mentioned above, which shows that the Association has fulfilled the conditions attached to the Government grant of £10,000 per annum, namely, that additional capital to the amount of £150,000 should be raised. The confusion seems to have arisen from the statement, in the same paragraph of the report, to the effect that the balance of the £500,000 required for the work of the Association has not yet been raised; this, however, was not a condition of the Government grant.

It is thus evident that, as the conditions have been fulfilled, the Government will assist the Association to the extent of £10,000 for three years. Whether this had been a fact or not, there was little need for apprehension in the West Indies, as the money is to be used entirely in connexion with cotton-growing in Africa.

Cotton in Uganda.—The Assistant Superintendent of Cotton Cultivation for the Eastern Province, in his report for the month of February 1911, states that instructions have been issued to growers that all old cotton plants must be uprooted and burned by the end of March; a great number of these have already been pulled up and stacked in the middle of fields ready for burning, and it is not anticipated that any difficulty will be experienced in having the instructions carried out.

Very full instructions have been issued with regard to the coming crop. In areas affected last season by boll worm, advice has been given to sow a trap crop of Indian corn. Growers have been told to commence sowing cotton any time after April 15, to finish before the end of July. Preparation of land has been begun early, and in some localities large numbers of plots have already been broken. Given a favourable season it is anticipated that the increase in next season's output will be enormous. (From the Supplement to the Uganda *Official Gazette*, March 31, 1911, p. 144.)

AGRICULTURAL PRODUCTION IN UGANDA, 1909-10.

The increase in the export trade is most satisfactory, and is the outstanding feature of the year in the trade of the Protectorate. The domestic exports show an increase in value of £28,906 over the previous highest year, viz., 1907-8. This increase is mainly due to increased exports of cotton, hides and rubber, which are all staple articles of trade.

The net increase in food, drink and tobacco was £11,548. The trade in chillies revived considerably during the year. Part of the increase in the value shown is, however, due to the enhanced value of this article. The exports of ground nuts, ghee (clarified butter), and sesame seed were the highest the Protectorate has yet had.

The net increase in raw materials, unmanufactured, was £36,367. There was a decrease in cotton seed, due to a local firm having started crushing the seed and exporting oil, and to the retention of considerable quantities of seed for planting. A decrease in sheep skins is due almost entirely to fall in prices.

The large increase in the exports of cotton is again a prominent feature of the export trade. Calculating that cotton loses about two-thirds of its weight in ginning, the total quantity of ginned cotton exported during the year would amount to 1,158 tons, or 6,488 bales of 400 lb. each. This is an increase of 433 tons over the previous year.

The exports of rubber, hides and goat skins are the highest on record. The total quantity of rubber exported was 47 tons. Of this quantity, 36 tons was shipped by the Mabira Forest Company, who have a lease of a large forest area. Their rubber is chiefly obtained from the West African rubber tree (*Funtumia elastica*), and it compares favourably with the best Para rubber. Another company has been formed to work another large tract of land, and negotiations for other forest areas are going on.

Amongst new articles of export which appear for the first time, and which give promise of success, may be mentioned beeswax, cotton-seed oil and sesame oil. (*Colonial Reports—* Annual, No. 670, p. 10.)

It is reported by H.M. Consul-General at Manila that the amount of hemp produced in the Philippines has been steadily increasing during the past few years. In 1909, the output was about 1,280,000 bales of 280 lb.; this increased to 1,340,000 bales in 1910, and it is estimated that the production for this year will reach at least 1,400,000 bales. The increased output is taking place in consequence of the lowering of prices, which causes the natives to manufacture more of the fibre in order to obtain a remunerative return. No machinery is used in the production of hemp in the Philippines, chiefly because a machine sufficiently light to be transported into the hemp country has not been invented

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.

The editorial of this issue treats of the subject of Agricultural Education, with particular reference to the West Indies, in the light of a report issued recently by the Board of Education, England.

On page 211, under the heading Sugar Industry, there appears an article containing useful information in relation to the employment of molasses as a food for stock.

Page 213 contains an account of the present conditions in Dominica in connexion with several agricultural matters of greater importance.

Attention is drawn to the article entitled The Present Cotton-growing Season, on page 214.

The Insect Notes, on page 218, present illustrated articles, having reference to the root borer of the sugar-cane and entomology in Southern Nigeria.

On page 219 will be found an article describing a complaint of stock, common in some countries, which is known as navel-ill or joint-ill.

The Fungus Notes of this issue are presented on page 222. They are in the nature of a treatment of several miscellaneous subjects of interest to agriculturists in the West Indies.

Publications of the Imperial Department of Agriculture.

Pamphlet No. 68 of the Department Series is just being issued under the title Manurial Experiments with Sugar-cane in the Leeward Islands, 1909-10. It presents, in an abridged form, the chief results of the sugar-cane experiments that are described in Part II of the large Report on Sugar-cane Experiments in the Leeward Islands, 1909-10, which is now in the press.

The Pamphlet is obtainable from the agents for the publications of the Department, price 4*d.*, post free, 5*d.*

The Agricultural Conference, 1912.

As is well known, it was the intention to hold an Agricultural Conference in British Guiana, in January of this year; but that this was rendered impossible by the sudden changes in the times of sailing of the steamers of the R.M.S.P. Co. It will also be remembered that efforts have been made since this time to hold the Conference in that Colony at some other period in the current year. These efforts have failed, and it has not been found possible to arrange for a further scheme, whereby the Conference should be held in British Guiana, in January 1912.

Under the circumstances, the proposal has been made that, subject to the approval of the Secretary of State for the Colonies, the next Agricultural Conference shall be held during the same month (January 1912) in Trinidad, and the Authorities in that Colony have expressed their acquiescence in the suggestion. The Commissioner of Agriculture has subsequently received the sanction of the Secretary of State for this plan to be carried out, so that arrangements will now be made for the holding of an Agricultural Conference in Trinidad in January 1912, and, subject to any alterations that circumstances may render necessary, it is proposed that the meetings shall be held from the 23rd to the 30th of that month.

This opportunity is taken of informing those who are interested in, or connected with, the Conference as to the course that is to be followed, and the definite announcement will now make it necessary for Delegates to the Conference, and the various Agricultural Officers, to commence at an early date the preparation of papers to be read, as well as the revision of any that have been held over from the proposed Conference for 1911. The same is true of the preparation of exhibits, either for use in connexion with papers or for general display—an important matter, to which increased attention may well be given. It is convenient to state, here, that all papers should be accompanied by an abstract, made as brief as possible, the provision and use of which will ensure the more complete and efficient discussion of the papers.

Further announcements in connexion with the Agricultural Conference, 1912, will be made as the work of preparation progresses, and as they are required.

St. Lucia and the Coronation Exhibition.

A note with this title was given recently in the *Agricultral News*, on page 185. In relation to this, it should be stated that in addition to the work, which is there described in connexion with the representation of the island at the Exhibition, the effort has included the preparation of a small pamphlet by Mr. J. C. Moore, Agricultural Superintendent, having the title Notes on St. Lucia, West Indies, and Hints to Settlers.

This pamphlet, which has been issued by the Permanent Exhibition Committee of St. Lucia, and has been placed in the care of the West India Committee for distribution in England, presents first of all a general description of St. Lucia, followed by information regarding means of communication, climate, clubs and amusements, and religion. Succeeding sections deal shortly with agricultural instruction, labour and industries, the last mentioned being particularly helpful; while there is a final section entitled 'Hints to Settlers'.

This little pamphlet should be effective in drawing interested attention to St. Lucia, and in showing the kind of information to be acquired by those who intend to take up planting in the island, while directing such persons to the sources from which the information may be gained.

The Recent Rainfall in St. Kitts.

In regard to the rainfall of St. Kitts for the current year, Mr. A. D. C Adamson, of Brothersons estate in that island, has kindly sent, for the use of this Department, a table giving comparative rainfall records through the years 1891 to 1910, taken by means of a rain gauge near sea-level. In forwarding the material, Mr. Adamson points out that it shows that there has been more precipitation during this year than in any similar period since 1891, in the districts to which the records refer: not only is the total precipitation greater, but this has been more equally distributed over a larger number of days of rainfall, causing particular difficulties in reaping the canes, especially on the windward side of the island.

Analysis of the figures shows that during the year, in every case, the monthly rainfall has been greater than the average of that month for the last twenty years; in addition to this, the total fall until the end of May has been 27·24 inches, whereas the total of the average falls for the same period, for twenty years, is only 15·87 inches. There is the further interesting fact that the highest record from 1891 until this year, for the period up to the end of May, was made in 1896, when the rainfall amounted to 25·30 inches. This figure is to be compared with the total of 27·24 inches, mentioned already.

As has been stated, these figures are for a gauge at a low altitude. It is of interest that Mr. Adamson remarks further that, at a gauge situated at 1,000 feet above sea-level, he has recorded more than 70 inches of rainfall, to the end of May, for the present year—a total amount that it has heretofore taken until the middle of August to complete.

The Land Settlement Scheme in Grenada.

A copy of a report of the newly appointed Land Officer for the Land Settlement Scheme of Grenada, relating to May 1911, has been received from the Colonial Secretary. This shows that, during the month, this officer has paid frequent visits to the areas under the scheme, and proceeds to give an account of the applications for land received, and sales of land effected, during the period under review. After a short account is presented of the improvements that are to be carried out by the Government in those areas, reference is made to the progress of the work on the holdings. In connexion with this, clearing has not yet been completed, though there are places where crops such as sugar-cane, corn and peas are being grown. Seed is being obtained for cotton-growing, and cultivation has commenced for this crop on some of the plots. As regards individual owners, one peasant has formed a small tobacco nursery, and another intends to take up bee-keeping.

The scheme includes the conduct of trials on an economic experimental plot, for which the work of general preparation and making drains has been completed. As soon as the land has been cleared of tree stumps, the plot will be divided into four parts, each having an area of 1 acre; these portions will be plainly divided from one another, for the proper regulation of the areas for experimentation.

Changes in Nitrogen Compounds in the Soil.

An abstract of an experimental study of this subject is given in the *Experiment Station Record* of the United States Department of Agriculture, Vol. XXIV, p. 222. The main object of the investigations was to ascertain definitely the influence of quicklime, chalk and air on nitrification, denitrification, the fixation of nitrogen, and the decomposition of organic matter containing nitrogen, in different kinds of soil. The work was done with soil suspended in culture media.

The results showed that quicklime and chalk possess a favourable influence in regard to all the bacteria that take part in the changes in nitrogen compounds, in the soil. It was shown, as well, that the kind of soil exerts an influence independently of the treatment which it has received.

The power to fix nitrogen, and for nitrification, appears to be greater in chalky soils, and in those containing humus, than in sandy soils: while the ability for denitrification seems to be about the same with all the different kinds of soil. The effect of lime in soil in increasing the power to decompose organic matter containing nitrogen was greatest in soils containing a high percentage of humus, while sandy soils came next in order.

The author of the work does not claim any practical value for the employment of the methods described by him, in order to determine the condition of soils in regard to nitrification, etc., as this can only be ascertained by means of actual direct tests.

INSECT NOTES.

THE ROOT BORER OF THE SUGAR-CANE.

The root borer of the sugar-cane (*Diaprepes abbreviatus*), which appeared as a serious pest in a limited area in Barbados at the end of 1909 and early in 1910, was again in evidence and caused serious injury to ripening sugar-cane during the first months of the present year.

General accounts of these occurrences of the root borer have appeared in the *Agricultural News* (see Vol IX, pp. 10, 58, 106 and 410). In the *West Indian Bulletin* (Vol. IV, p. 37), a paper was published, by the Rev N. B. Watson, F.E.S., on the root borer of the sugar-cane, in which the life-history of this interesting pest was given in detail. Mr. Watson observed that the root borer adult weevil (Fig. 10) was to be found during August and September, and it was at this time that the eggs were laid which provided for the next generation of grubs (Fig. 9). This year, the weevils have appeared earlier than the time given in previous records: perhaps on account of the unusual rains which fell during the early months. Since about June 20, Mr. A. A. Evelyn, Manager of Spencers plantation, has been finding these insects in abundance, and he has adopted the plan of

FIG. 9. GRUB OF ROOT BORER.

collecting and destroying them. They are found hiding in the throat of young corn and under the base of the leaf of older corn. They also conceal themselves among the leaves of other plants, and it is during this period of hiding that mating of the sexes takes place. Eggs have not been found in the field, but in the entomological laboratory of the Imperial Department of Agriculture these were obtained on June 27, and they were observed to hatch on June 30. These eggs were obtained from weevils, brought in on June 23, and were laid between the 24th and 27th. The time spent in the egg in this instance was not more than six days.

Planters in any district where the root borer is known to occur would do well to keep a careful look out for these insects, and to have them collected when they appear. The weevils are easily found and readily captured; but once the eggs are hatched, proper control becomes next to impossible.

A crop of Indian corn might well be planted where badly attacked canes have been reaped, and this would serve as a trap where the adults could be captured. The period of pupation is passed in the ground, and when this is completed and the weevils emerge, the corn plants furnish a suitable hiding place for them. If no such convenient hiding place is found, the weevils probably fly away in search of some suitable location, and thus become so scattered as to render collection impossible.

In the laboratory, the eggs have been laid on leaves of Indian corn, imphee and sweet potatoes. They are generally covered by a fold of the leaf, or by two leaves fastened together. The number of eggs in a cluster varies from very few to about 150. The total number of eggs laid by one female probably often exceeds 250; these are laid in several clusters at different times.

The eggs are about four times as long as broad, the length being about $\frac{3}{4}$-mm. The grubs, on hatching from the egg, at once drop to the ground, and it is likely that ants capture and devour a very large percentage of them before they can penetrate into the soil. When it is first hatched, the grub is considerably larger than the egg from which it has emerged. Its colour is white, except for the head, which is pale-brown.

Every effort should be made to discover the eggs, and to collect these as well as the weevils. It is during these two stages of the root borer's existence that it exposes itself to easy and successful control by man. The long period of nearly a year, when the grub and pupa are underground, is the time when the pest is so protected by its mode of life as to be very safe from attack.

ENTOMOLOGY IN SOUTHERN NIGERIA.

The first annual report of the Government Entomologist for Southern Nigeria has been received. Mr. C. W. Jemmett, who was for six months, in 1908-9, attached to the staff of the Imperial Department of Agriculture assumed the duties of his office in May 1909 and established his headquarters at Olokemeji. His report covers a period of nine months to February 1910. During

FIG. 10. ROOT BORER OF SUGAR-CANE.

the period under review Mr. Jemmett spent his time in travel, and in becoming familiar with the conditions in the agricultural districts of the country in which he is working.

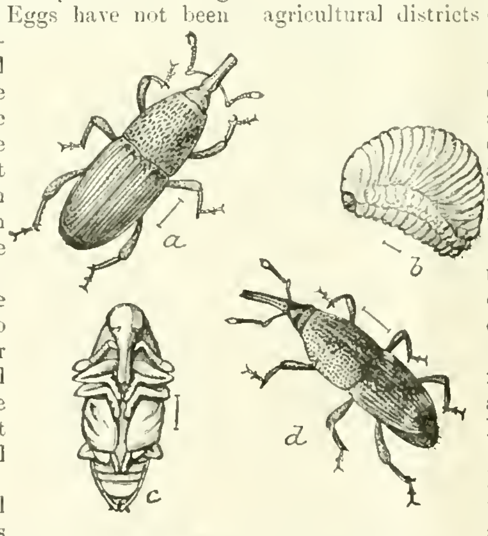


FIG. 11. GRAIN WEEVILS (*Calandra* spp.).

Mr. Jemmett's report gives a summary of the important insect pests, and emphasizes the need of an immense amount of entomological work in Southern Nigeria. A classification of insects according to economic concern is given, and notes on a few of the most important insects noticed in 1909.

It is of interest to note that the nature of the attack on several tropical crops such as cacao, cotton, maize, cocoa-nuts, etc., is the same as in the West Indies. The insects are not identified, so it cannot be stated whether they are of the same species as the West Indian forms.

In addition to the annual report, Mr. Jemmett has issued a preliminary report on the insects affecting maize, a report on those observed on cotton, and one on insects found on cacao in 1909.

Maize seems to be attacked by two kinds of insects: one the grain weevils, the other lepidopterous larvae. The lepidopterous larvae would seem to be similar to the boll worm (*Heliothis obsoleta*) and the corn ear worm (*Laphygma frugiperda*) in the manner of attack on the corn. The caterpillars of the corn, in Southern Nigeria, tunnel into the stem of the plant and the ripening ears of the grain, and since they occur in large numbers they are able to cause a very large amount of loss to the farmers.

The grain weevils (*Calandra granaria* and *C. oryzae*) are of very general occurrence in many parts of the world as pests of stored grain (Fig. 11). In Southern Nigeria, however, these small insects are reported as pests of corn in the field. This is said to result from the practice of leaving the corn standing after the grain is ripe, and the remedy suggested is to harvest the grain as soon as it is ready.

Cotton in Southern Nigeria is attacked by many of the same pests as in the West Indies. There the boll worm, cotton stainers and aphis are among the serious pests. The principal recommendation made is the destruction of the old cotton plants promptly when the crop has been reaped.

Cacao is attacked by borers and termites which injure the wood of the stem and branches, and by a moth and fruit fly which attack the pods and cause a considerable amount of injury. Two species of scale insects are recorded as attacking cacao in Southern Nigeria.

The collecting and burning of all old pods, the disposal of the shells from which the beans have been taken, and the removal of all dead wood and careful tarring of cuts, are among the remedial measures recommended. The collecting of the borer beetles, after the manner employed in the West Indies, is also suggested.

LIVE STOCK.

NAVEL-ILL OR JOINT-ILL.

This disease, which is also called navel-evil, joint-evil and specific arthritis, is due to septic organisms entering the system by the umbilicus (navel), and is a very serious affection commonly fatal to foals, calves and lambs. It is known to persist in some breeding establishments, where it causes a heavy annual loss. The disease does not seem to be well known in the West Indies, but in some other countries it is a formidable scourge to young animals; it is characterized by inflammation of the umbilical cord, and usually by a swelling of one or more joints, and lameness.

CAUSES. There are many predisposing causes, such as bad weather, poor feeding and weakness. It seldom arises when the cord is normal, but usually when it is too short. It is likely that infection occurs after the cord is separated, and that dirty surroundings, soiled litter, etc., are the more common causes.

SYMPTOMS. The young animal is seen to be dull and listless; it refuses to suck, and remains lying down almost constantly. There is fever, with its accompanying dryness of the lips and mouth, the breathing is hurried and the pulse quick and feeble; some constipation occurs at first, followed by diarrhoea and frequent urination in small quantities. There is a good deal of inflammation and swelling at the navel and some abscess formation; probably also a thin watery matter will be seen dripping from it. In light-coloured animals, the skin under the abdomen is often stained yellow. The affection then becomes general throughout the system, the result being that abscesses are formed in various parts of the body, and internal organs more rarely; when the animal is about a month old, the disease assumes a chronic form: the health is not so much affected, and a large abscess forms at the navel. The young animal shows a tendency to sleep continually, and later dies from weakness and exhaustion. In the form particularly affecting the joints, nothing may be seen until it is noticed that the young animal is lame; such lameness is often thought incorrectly to be due to injury, such as a kick from the mother. The stifle is perhaps the most commonly affected joint, though others are also involved. On examination, it will be found that this is hot and tender, and exhibits a fluctuating swelling. The animal is less keen to suck, and the temperature rises two or three degrees. If two legs are affected, the condition is worse and a general feverish state is evident, accompanied by hurried breathing, some uneasiness and some constipation. The navel, if examined, will be seen to be moist and not healed, or occasionally, it is quite dry and appears to be healthy.

In another case, the animal may sicken without visible lameness, but with dullness, fever and often some constipation; and here the breathing is more affected. The infection spreads through the system, and the condition of the patient gets rapidly worse, as the lungs and other organs become involved. A foetid diarrhoea may set in, and the animal dies without the joints being affected. In either case, the disease is very fatal; even animals that recover may be deformed, though many accomplish this well, especially foals.

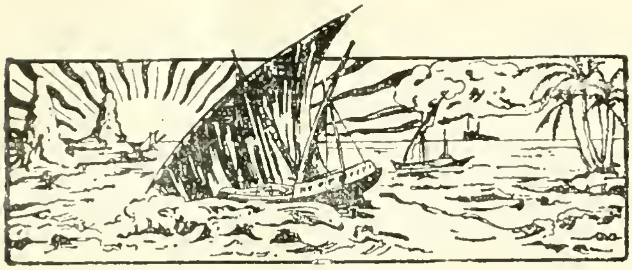
TREATMENT. Laxative medicines should be given and measures for reducing the fever taken; in addition, hot fomentations and liniments should be applied to the joints, and antiseptics to the navel.

PREVENTION. This is much more important than treatment. It is of the utmost concern to see that the place where young animals are to be born is scrupulously clean, and to this end it is advisable to limewash the walls (adding 5 per cent. of carbolic acid to the whitewash), to remove all soiled litter, and to provide a good clean bed for the mother. In the case of animals born in the open, it should be seen that a good place is provided without any contamination such as pen manure. Fresh air and sunlight are also valuable aids to the destruction of germs, and are insisted upon in temperate countries, while in the West Indies there is usually no difficulty in this connexion.

As soon as the young animal is born, the cord should be washed in an antiseptic solution (carbolic acid 5 per cent., or corrosive sublimate 1 in 1,000). Then the cord should be tied, $\frac{3}{4}$-inch from the skin, by a linen tape which has previously been soaked in the antiseptic. The cord is then clipped with scissors, about $\frac{3}{4}$ inch below the ligature, and the end saturated with the solution. In the absence of proper antiseptics, the cord may be smeared with common wood tar. The ligature should be examined every day (twice if possible) and dressed with the solution, or pure carbolic acid may be applied to the stump daily for four or five days, until it separates. If after this, any matter is seen to be accumulating in the cord, it must be washed out, and dressed with the antiseptic. The dressing may be discontinued when the cord is dry, that is probably in seven to ten days after birth; but if the cord is not dried up it should be continued, as experience has shown that the disease may appear seven to twenty days after birth. It will be found that attention to hygiene and cleanliness will certainly decrease the risks from this disease. Lastly, the mother must be liberally fed to ensure a supply of good milk, in order to keep the young animal in a strong condition.

POST-MORTEM APPEARANCES. The vein leading from the navel may contain a dirty-grey, thick fluid, or there may be a small abscess. The liver is large and friable, and may have several small abscesses in it. The lungs are also badly affected in some cases. The joints are always inflamed, and may contain matter; matter is also occasionally found in the cavities of the brain.

It is recorded in Pamphlet I of the Indian Tea Association that Dhaincha (*Sesbania* spp.—see *Agricultural News*, Vol. VIII, p. 271, etc.) has shown itself superior to woolly pyrol (*Phaseolus Mungo*) as a green dressing, in that it has been reported as making very good growth in many places where the yield of woolly pyrol has been poor.



GLEANINGS.

According to a report received from the Agricultural Instructor, Tortola, there has been a record sale of cotton seed during the past month, and the sowing of this is in full progress. It is also stated that there are indications of a good lime crop, and that sugar-canes are making favourable growth.

The report of the Government Veterinary Surgeon of St. Vincent, for May 1911, shows that there were no deaths from anthrax among the stock in the island during that month, nor was there any suspicion of the presence of the disease in the case of five deaths, the causes of which were not ascertained.

The official returns of the Government of Ceylon show that the amount of rubber exported during February 1911 was 5,768 tons, as compared with 2,307 tons in the same month, in 1910. The exports for the eight months ended February 1911 were 32,113 tons; for the similar period in 1910 they were 14,133 tons.

A report from the Agricultural Superintendent, St. Vincent, states that peasant growers have bought a large quantity of selected and disinfected cotton seed from the Central Cotton Ginnery, and that as far as this class of grower is concerned, at any rate, there will not be any decrease in the area of cotton planted in the island.

A circular has been received from Alexander Heyne, Naturalist and Bookseller, Berlin-Wilmersdorff, Landhausstrasse 26a, Germany, requesting collections of insects of every description, particularly butterflies, moths and beetles, and in addition such animals as scorpions and millipedes. It is stated that the best prices will be given for collections that are in good condition.

The *Experiment Station Record* of the United States Department of Agriculture, Vol. XXIII, p. 741, presents a note on a paper describing work in which trap crops were used for controlling eel worms on land employed for growing sugar-beet. The trap plants were rape and turnips, and they were effective in bringing about a marked decrease in injury from eel worm to the main crop.

Supplement No. 3 (1910) of the *Annales du Jardin Botanique de Buitenzorg* contains an account of an investigation in tapping with V-shaped incisions and double herring bone cuts, for the purpose of determining if the latex varies in its composition at different periods of the year. The results indicate that the amount of solid matter in the latex decreases with the advance in the tapping period. On the other hand, the mineral and the nitrogenous matter increase.

At a meeting of the Legislative Council of Grenada, held on March 3, 1911, it was resolved unanimously that assistance should be given by the Government to the Home Industries Association, which is a society for assisting the women in the island, of all classes, who are in poor circumstances. In consequence of this, a Grant-in-aid to the amount of £50 was included in the estimates, for the Home Industries Association of Grenada. (See the Grenada *Government Gazette*, May 1, 1911.)

The Board of Trade Journal for May 18, 1911, shows that the experimental cultivation of Para rubber is to be greatly extended in the equitorial regions of the Congo State, especially where the rainfall is abundant, and for the purpose considerable quantities of seeds of *Hevea brasiliensis* have been imported from Ceylon. In the same State, satisfactory results are being obtained with Ceara and West African rubber; although in the latter case repeated tapping has been found to cause a gradual decrease in the yield.

It is stated by the Agricultural Superintendent of St. Kitts that the area planted in cotton in that island, for the present season, will not decrease, but that there is rather a tendency for an increase to take place. He further states that the following average yields of lint have been obtained by some of the estates during the past season, on the areas mentioned: 318 lb. of lint over 60 acres, 300 lb. over the same area, 324 lb. over 39 acres and 275 lb. over 50 acres. One estate disposed of all its cotton at 1*s*. 8*d*. per lb.

The St. Vincent Arrowroot Growers' and Exporters' Association (see *Agricultural News*, Vol. IX, p. 285) is advertising for samples of arrowroot, from the island, to be sent to enquirers in Canada, the United States and Europe. The samples are to be accompanied by the stated prices of grocery and best manufacturing quality arrowroot; they must each weigh not more than ½-lb., should contain the name and address of the grower or exporter, and should also show on the outside of the package the owner's name and shipping mark, and the grade.

An abstract of a paper in the *Bulletin of the Bureau of Agricultural Intelligence and of Plant Diseases*, of the International Institute of Agriculture, for December 1910, p. 206, describes work in which it was shown that, in the case of green leaves, the amount of light required to commence the building up of plant food bodies in the leaf is greatest where chlorophyll (leaf green) is present in the least amount. Further, the rate of building up of such bodies increases with the amount of chlorophyll, up to a certain maximum, and then decreases.

The *Cairo Scientific Journal*, No. 37, p. 241, contains an article which records that the blocking of the current of the White Nile and the overflow of the Blue Nile, have caused large numbers of mosquitoes to be carried to Khartoum in steamers. Most of the mosquitoes were the yellow fever mosquito (*Stegomyia fasciata*); the filarial mosquito (*Culex fatigans*) was also common, and *Pyretophorus costalis* was found. It is suggested that the sudden incidence of these mosquitoes accounted for an outbreak in Khartoum of blue tongue or horse sickness, as this disease was prevalent at the time up the Blue Nile. (From the *Experiment Station Record*, Vol. XXIII, p. 663.)

STUDENTS' CORNER.

JULY.

Second Period.

Seasonal Notes.

The recent preparation of the soil for the reception of the planting material of the different staple crops, in some of the West Indian Islands, will naturally have led the student to consider the reasons underlying the methods employed in such preparation, and will have turned his thoughts to the results that accrue from the adoption of these methods. This will be true, as well, of the operations subsequent to the planting of the crop. A careful discrimination must be made between the reasons for the carrying out of work in the two cases. What is meant by the mechanical condition of a soil? What circumstances tend to improve this, or on the other hand, to make it less favourable for the growth of plants? State the means that are employed for ameliorating the mechanical condition of the soil, having reference more particularly to the agricultural conditions with which you are familiar. Mention any estate products that may be usefully employed for keeping the soil in good condition. What functions may they exert in addition to this? How does water travel through soils, and how is it that, even where water is continually running on to a soil, it may be effectively removed without the existence of any apparent definite channel of exit?

How is the size of the particles of a soil related to its capacity to hold water? Give an account of the way in which the aeration of soils is assisted by draining. What are the most common results of the imperfect supply of air to soils? Give a description of the best means for the encouragement of the work and growth of nitrifying organisms in the soil. What are the essential differences between nitrifying and nitrogen-fixing organisms?

State what is meant by pruning, and give an account of the different kinds of pruning with which you are familiar, both in the garden and on the plantation. What are the objects of root pruning, and when is this usually performed? What circumstances in the life-history of the plant give indications as to the proper time for the removal of any of its parts by pruning? State what results may be expected from pruning plants at the wrong time of the year. In removing a large branch from a tree, what is the proper place at which the cut should be made?

It must be remembered that pruning may be done with several objects. Its purpose may be to change the shape of the plant in regard to its outline or to the amount of branching; in the latter connexion the matter is usually related to the question of shade. Where it is required to stimulate the growth of some special part of a plant such as the wood, or flower buds, pruning is often employed. Further, where it is evident that parts of plants are suffering from disease, these parts are removed in order to protect the remaining portions of the plants. State what special precaution is important in such removals. Lastly, the purpose of the pruning may be to lengthen or lessen the period of maturity. These broad statements naturally refer to the more general kinds of pruning, such as are employed on plantations. The removal of parts of plants by pinching, trimming detasselling, disbudding, ringing, thinning, deflowering and defruiting are all forms of pruning, properly considered. The kind of pruning employed for protection against strong winds has its principle in the provision of many smaller branches in the place of a few large branches, whereby the pressure of the wind on the leaves is taken up by a larger number of arms of the tree (branches), and the loss of any one branch is made less serious than that where there are only a few of these.

In pruning for flowers or fruit, the expedient is often adopted of pinching the terminal vegetative buds during the time that the plant is growing actively. Where new wood is being produced too quickly, through the richness of the soil or for other reasons, the new growth is cut back in order to stimulate the development of flower buds. A similar stimulation is obtained by root pruning, as well as by making cuts in the stem which reach from the exterior to the cambium. These kinds of pruning are rarely employed in the West Indies; they are of more particular use in orchard practice, in temperate latitudes.

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) What is meant by the mechanical condition of a soil?

(2) How would you show that the provision of a certain amount of iron is necessary to growing plants?

(3) Give a general account of the grafting of plants.

INTERMEDIATE QUESTIONS.

(1) How do plants obtain part of their food from the air?

(2) Give an account of the manures calcium cyanamide and nitrate of lime.

(3) What are the chief circumstances in the life of a plant that make possible such operations as pruning, budding and grafting?

FINAL QUESTIONS.

(1) State what you know of the general effectiveness of calcium cyauamide and nitrate of lime as compared with that of sulphate of ammonia and nitrate of soda.

(2) Give an approximate estimate, with details, of the cost of making an estate cart, of a type with which you are familiar.

(3) Discuss the methods that are most commonly employed for conserving the plant food in the soil.

THE CANADIAN NATIONAL EXHIBITION, 1911.

Further information received from Messrs. Pickford and Black, concerning the despatch and carriage of exhibits for the forthcoming Canadian Exhibition, necessitates a revision of the statement made in a note in the *Agricultural News* for June 10, last. In this, the S S. 'Oruro', leaving Demerara on July 16, was mentioned as the steamer by which non-perishable articles should be sent. Owing, however, to the uncertainty of the movements of this steamer, it is advised that all goods should be sent by the S.S. 'Woolwich', leaving Demerara on July 29. Although this boat is not scheduled to call at St. Lucia and St. Vincent, the Commissioner of Agrculture has been advised that Messrs. Pickford and Black have agreed that these islands shall be served by her, for this voyage. In the case of those islands at which the S.S. 'Woolwich' will not call, there will be an opportunity for goods to be sent to Antigua or St. Kitts, by Royal Mail Steamer, for transhipment to her at those islands.

FUNGUS NOTES.

MISCELLANEOUS POINTS OF INTEREST.

In the following article is contained information on several points, either contributed by various observers in the different islands, or obtained as a result of the examination of various specimens forwarded for this purpose to the Head Office of the Imperial Department of Agriculture.

WHITE RUST OF SWEET POTATO. Some specimens of leaves of the sweet potato, showing peculiar blisters, were received recently from the Curator of the Botanic Station in Montserrat. These blisters were irregular in shape, though usually roughly hemispherical, and were either concave or convex, when viewed with the upper surface of the leaf upwards. When they were carefully examined with the naked eye, or with a hand lens, it was seen that they were studded with small, white, irregularly shaped pustules, occurring on both surfaces of the leaf, and varying in number according to the size of the blister. Some of the leaves also showed the presence of these pustules without the blister-like malformation. In this case, each was well separated from the other, was roughly circular in shape, and measured from ½-mm. to ¾-mm. in diameter. These pustules were the fructifications of one of the white rust fungi, *Cystopus* sp., probably *C. Ipomoeae-panduratae* (Schw.) Stev. and Sw. This fungus occurs on sweet potatoes in many parts of the world, including the United States and Brazil, and is also found on various other members of the Convolvulus family. It is closely related to *Cystopus candidus*, the white rust found commonly on cruciferous plants, such as the radish, cress, turnip, mustard, watercress and several others found in temperate countries. Hypertrophy of the host, owing to the presence of the mycelium, is common, and takes several forms, according to the species attacked. In this instance it appears as the blisters mentioned above.

The fungi of this genus belong to the Order Peronosporales, which includes the genus Phytophthora. They have an intercellular mycelium, provided with haustoria which penetrate the cells of the host; the mycelium is rarely septate. When about to produce fruit, the hyphae form a small pad beneath the epidermis, from which numerous short, erect, basally branched sporangiophores are produced. These give rise to chains of rectangular zoosporangia, or conidia, formed in basipetal succession. As the pustules develop, they rupture the epidermis, and the zoosporangia are thus set free. These germinate, in the presence of moisture, and liberate their contents through a terminal or basal pore in the form of a few free-swimming zoospores, each provided with two whip-like cilia attached laterally. The zoospores come to rest, and germinate by putting out a hypha which is capable of causing fresh infection. The fungus may also reproduce itself sexually, in an additional way, by means of antheridia and oogonia. As a result of fertilization an oospore is formed. This has a thick and warty outer wall, and requires a period of rest before germinating. It gives rise to free-swimming zoospores, as does the zoosporangium, and these are capable of producing a fresh infection. The oospores serve to carry over the fungus from one crop to the next, and help it to tide over unfavourable conditions. They are usually formed in the stems of the host plants attacked, but in some instances they are produced on the leaves.

The fungus on sweet potatoes does not appear to cause any very serious damage, but its spread could probably be checked, if this is required, by spraying the infected plants, and healthy plants in their neighbourhood, with Bordeaux mixture. As the fungus is known on several members of the Convolvulus family, which is well represented in the West Indies, records of its occurrence on other hosts would be of interest.

ROOT DISEASE OF CASTILLOA AND OTHER PLANTS. Recently, specimens of young Castilloa trees have been received from Grenada, which had died from the effects of a root fungus. This formed hard, brownish-black masses of a stromatal nature on the surface of the bark, and black streaks running into the wood, which was also turned grey in colour. The bark and cambium of the main root were completely destroyed as far as the ground level, and, as is stated above, the mycelium had penetrated the wood. This fungus had many points in common with that causing root disease of cacao, described in the *Agricultural News*, Vol. IX, p. 366; though the fan-shaped masses of mycelium between the wood and the bark which characterize the latter were not present in this instance. There were also many points of resemblance between the fungus found on Castilloa and that on arrowroot in St. Vincent (see *Agricultural News*, Vol. X, p. 174). It may be worthy of note that two other fungi were found on some of the specimens. One was a Nectria, probably *N. vulgaris*, which is often found on decaying tissues killed by root diseases in the West Indies; the other a species of Lasiodiplodia—almost certainly *L. theobromae*. In addition, numerous shot borers, probably *Tomicus* sp., were present. These beetles were probably also saprophytes. In any case they were not sufficiently numerous to have caused the diseased condition.

In connexion with this disease, interesting information was recently received from the Hon. G. S. Hudson, in St. Lucia. He stated that a tree of *Castilloa elastica*, which was growing among a group of cacao trees badly infected with root disease, died suddenly, and all the evidence pointed to its having succumbed to the same fungus as that which killed the cacao trees. Examination of specimens forwarded to the Head Office by Mr. Hudson left little doubt that the Castilloa had been killed by the disease found on cacao and that Mr. Hudson's conclusions were correct. Even more recent information on the subject of this fungus and its host plants has been received from Mr. J. C. Moore, Agricultural Superintendent, St. Lucia. This was communicated to him by Mr. L. Mallet Paret, who observed that an orange tree died suddenly, and that its roots were infected with a fungus similar to one that had caused the death of cacao trees on adjoining land. Mr. Mallet Paret also stated that a nutmeg tree died from the same disease a short time ago. In his description of the fungus causing root disease of cacao in the *West Indian Bulletin*, Vol. II, p. 207, Howard records its presence on nutmegs in Grenada, and expresses the opinion that it is probably identical with one found by Barber on cacao, mangoes, oranges, coffee and bread fruit in Dominica, in 1892-3. The observations given above would appear to confirm Howard's opinion.

It is also interesting to note that the fungus found on arrowroot in St. Vincent was stated by an observer in that island to attack coffee bushes, and if this proves to be the case, there is additional evidence for concluding that the cacao root disease fungus is the cause of the 'burning' of arrowroot. The full list of plants at present suspected of being susceptible to the attacks of this fungus is: cacao, limes, orange, Castilloa, nutmegs, mangoes, avocado pear, bread fruit, bread nut, pomme rose, pois doux, immortel, pigeon pea and coffee; while, if it is the same as that on arrowroot, several other plants will have to be added to this list.

ADVERTISEMENT IN AGRICULTURE.

The main ideas and illustrations in this article, which treats of advertisement in agriculture, are taken from a paper prepared by Mr. W. R. Dunlop, Agricultural and Science Master at the St. Kitts Grammar School. In this, it is pointed out, first, that there are many matters in connexion with the general appearance of an estate and those responsible for its working which serve to indicate whether its produce is likely to be of an acceptable nature, and secondly to form a means of attraction, or otherwise, for those by whom it may be visited. Among these matters are included the state of the cultivation in regard to regularity and freedom from weeds, the condition and state of repair of the buildings, the appearance of the working animals, and even that of those who are responsible for the work on the estate.

It is pointed out that the prosperity of an estate depends mainly upon its locality, its soil, its management and its labour. The existence of good management is often indicated by the extent to which new and improved methods of agricultural practice are being tried, although some of these may not be sufficiently well known to be regarded as of general application. In relation to this matter, the employment of observation and experiment, in an organized way, on an estate, may not only lead to direct financial gain, but will also be useful in that it attracts favourably the attention to that estate of those interested in its produce. This consideration has particular reference to the keeping of records, both in regard to the stock, implements and produce of the estate, and to the financial side of its working. A provident attitude toward the future serves also to increase the confidence of the owner or manager and of those who are in a position to criticize his methods and work; this attitude should be extended to a knowledge of the market in which he has to dispose of his products, in order that he may possibly, in the case of quickly growing crops, be able to foreshadow a shortened general supply of the particular commodities, which will have its natural results in the raising of prices owing to the difficulty of supplying the demand. With reference to all these matters, it may be that no direct financial gain will result for some time, but the adoption of a progressive attitude on the part of the planter will eventually lead to this, provided that his operations are conducted with the proper amount of caution.

Such a progressive attitude will, in many cases, lead the planter to undertake trials and experiments in co-operation with those whose duty it is to advise him on all matters of agricultural interest. Where the planter has an inclination toward writing, he will be able to assist progress and to increase his agricultural acquaintance by the contribution of letters or articles on subjects concerning which his experiments and observations have led him to possess particular knowledge, as well as by the preparation of papers to be read before the local Agricultural Society.

The sending of good exhibits to agricultural shows and exhibitions should benefit both the planter and the small holder; it has its special usefulness in relation to the latter, in that it provides a means of ascertaining the nature and extent of the local demand for the products in which he is interested. The small holder also possesses sources for encouragement and advertisement in the prize-holdings competitions that are held in several of the islands in the West Indies

The employment of the pages of newspapers and other periodicals for the purposes of advertising is restricted in the case of the West Indian planter; there is, however, no doubt that this means of bringing his estate and his produce before those interested in them might well be adopted more often. For this purpose, further, the preparation of advertisement leaflets, distributed through the stores or by other suitable means, is often useful. In any case, whether the advertisement is intended only to apply locally or on a much larger scale, a matter of the greatest importance where future orders are expected, is the proper grading of the produce for disposal, so that this is even, in the same or in separate shipments, and dependence can be placed by the buyer on the marks of the estate.

Proper advertisement on the part of an estate is bound to lead to that of all others, in a general way, in the same colony. In this wider sense of advertisement, however, assistance is often given by the Government, and the fact of the existence of Permanent Exhibition Committees is very helpful in relation to representation at large exhibitions, such as those held in England and Canada.

So far, consideration has been given to the way in which conditions on estates reflect upon the general attractiveness, or otherwise, of a country. Much importance attaches to the other view of the matter, namely, the way in which the general conditions of the country serve to make it easy, or more difficult, as the case may be, for the estates in it to effect improvements, and to bring about the increase of outside interest in them. Among such matters are the state of the circumstances which govern the keeping of health in the country, the supply and efficiency of labour, particularly in regard to that which is required for the handling of cargo for steamship companies, and the attractiveness, both natural and artificial, of the place to those who may intend merely to visit it, as well as to those who are thinking of making it the land of their permanent abode. The reputation of a country in regard to these circumstances is of the greatest importance, and has much to do in assisting or retarding the efforts of those who are attempting to bring about both a general and individual amelioration of the conditions in that country.

The Secretary of the Agricultural Society of Trinidad and Tobago stated recently that he was requested by Mr. A. L. Smith, a fruit expert from Jamaica, now in the Colony, to announce that he was under contract to supply 500 dozen Avocado pears weekly to the United States; and that that contract could be immediately increased to 2,000 dozen but for the fact that there was no cold storage available. The only steamers trading between Trinidad and New York with cold storage were those of the Royal Dutch Line and they were only able to spare 140 cubic feet, the remainder being under engagement by the United Fruit Company. Mr. Smith respectfully requested that the Society would make representations to the Government in the matter, so that full opportunity would be given for the development of the fruit trade of the colony. (From the *Proceedings of the Agricultural Society of Trinidad and Tobago*, May 1911, p. 280.)

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR, May 9, 1911.

ARROWROOT—2*d*. to 3¾*d*.
BALATA—Sheet, 3/8; block, 2/9 per lb.
BEESWAX—No quotations.
CACAO—Trinidad, 54/- to 62/- per cwt.; Grenada, 47/6 to 53/6; Jamaica, no quotations.
COFFEE—Jamaica, 60/6 to 67/-.
COPRA—West Indian, £23 10*s*. per ton.
COTTON—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 16*d*. to 18*d*.
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—No quotations.
HONEY—No quotations.
ISINGLASS—No quotations.
LIME JUICE—Raw, 1/-. to 1/2; concentrated, £18 2*s*. 6*d*. to £18 7*s*. 6*d*.; Otto of limes (hand pressed), 5/3, nominal.
LOGWOOD—No quotations.
MACE—2*s*. 2*d*. to 2*s*. 8*d*.
NUTMEGS—Quiet.
PIMENTO—Quiet
RUBBER—Para, fine hard, 4/11; fine soft, 4/9; fine Peru, 4/9 per lb.
RUM—Jamaica, no quotations.
SUGAR—Crystals, no quotations; Muscovado, no quotations; Syrup, no quotations; Molasses, no quotations.

New York.—Messrs. GILLESPIE BROS. & Co., June 16, 1911.

CACAO—Caracas, 11c. to 12c.; Grenada, 11c. to 11⅜c.; Trinidad, 11c. to 11½c. per lb.; Jamaica, 9½c. to 9¾c.
COCOA-NUTS—No quotations.
COFFEE—Jamaica, 12¾c. to 14¼c. per lb.
GINGER—10c. to 12c. per lb.
GOAT SKINS—Jamaica, 52c.; Antigua and Barbados, 50c. to 52c.; St. Thomas, St. Croix and St. Kitts, 46c. to 48c. per lb.
GRAPE-FRUIT—Jamaica, no quotations.
LIMES—$7·50 to $8·25.
MACE—50c. to 52c. per lb.
NUTMEGS—110's, 10c. to 10¼c. per lb.
ORANGES—Jamaica, no quotations.
PIMENTO—4½c. to 4⅝c. per lb.
SUGAR—Centrifugals, 96°, 3·89c. per lb.; Muscovados, 89°, 3·39c.; Molasses, 89°, 3·14c. per lb., all duty paid.

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

CACAO—Venezuelan, $12·00 per fanega; Trinidad, $11·75 to $12·00.
COCOA-NUT OIL—90c. per Imperial gallon.
COFFEE—Venezuelan, 15c. per lb.
COPRA—$3·50 per 100 lb.
DHAL—$3·90.
ONIONS—$2·25 to $2·50 per 100 lb.
PEAS, SPLIT—$5·50 to $5·60 per bag.
POTATOES—English, $2·00 to $2·25 per 100 lb.
RICE—Yellow, $4·35 to $4·40; White, $5·40 to $5·50 per bag.
SUGAR—American crushed, no quotations.

Barbados,—Messrs. JAMES A. LYNCH & Co., June 28, 1911; Messrs. T. S. GARRAWAY & Co., June 19, 1911; Messrs. LEACOCK & Co., June 23, 1911; Messrs. E. THORNE, Limited, July 3, 1911.

CACAO—$11·00 to $11·50 per 100 lb.
COTTON SEED—$24 per ton: meal, $1·50 per 100 lb.; 2½ per cent. discount.
COTTON SEED OIL (refined)—63c. per gallon.
COTTON SEED OIL (for export)—55c. per gallon (in bond).
HAY—$1·30 to $1·50 per 100 lb.
MANURES—Nitrate of soda, $60·00 to $65·00; Cacao manure, $42·00 to $48·00; Sulphate of ammonia, $75·00 to $76·00 per ton.
MOLASSES—No quotations.
ONIONS—$2·11 to $3·50 per 100 lb.
PEAS, SPLIT—$5·60 to $5·75 per bag of 210 lb.; Canada, $3·70 to $4·50 per bag of 120 lb.
POTATOES—Nova Scotia, $3·00 per 160 lb.
RICE—Ballam, $4·60 to $4·65 per 100 lb.; Patna, no quotations; Rangoon, no quotations.
SUGAR—No quotations.

British Guiana.—Messrs. WIETING & RICHTER, June 24, 1911; Messrs. SANDBACH, PARKER & Co., June 9, 1911.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	No quotation	$10·00 per 200 lb.
BALATA—Venezuela block	No quotation	Prohibited
Demerara sheet	70c. to 72c. per lb.	65c.
CACAO—Native	12c. per lb.	12c. per lb.
CASSAVA—	$1·20	No quotation
CASSAVA STARCH—	$6·50 to $7·00	No quotation
COCOA-NUTS—	$12 to $16 per M	$10 to $16 per M., peeled and selected
COFFEE—Creole	16c. per lb.	15c. per lb.
Jamaica and Rio	18c. per lb.	18c. per lb.
Liberian	10½c. per lb.	10c. per lb.
DHAL—	$3·00 per bag of 168 lb.	$3·75 per bag of 168 lb.
Green Dhal	$3·50	——
EDDOES—	$1·20	——
MOLASSES—Yellow	None	——
ONIONS—Teneriffe	4c. to 5c.	——
Madeira	6c.	7½c.
PEAS—Split	$5·70 per bag (210 lb.)	$5·85 per bag (210 lb.)
Marseilles	$4·00	No quotation
PLANTAINS—	20c. to 40c.	——
POTATOES—Nova Scotia		$4·25
Lisbon	—	No quotation
POTATOES-Sweet, B'bados	96c. per bag	——
RICE—Ballam	No quotation	——
Creole	$5·00 to $5·25	$5·00 to $5·25
TANNIAS—	$1·68 per bag	——
YAMS—White	$3·36	——
Buck	$3·60	——
SUGAR—Dark crystals	$2·50	None
Yellow	$3·00 to $3·20	$3·00
White	$3·80 to $4·00	$4·00 to $4·25
Molasses	$2·10 to $2·30	None
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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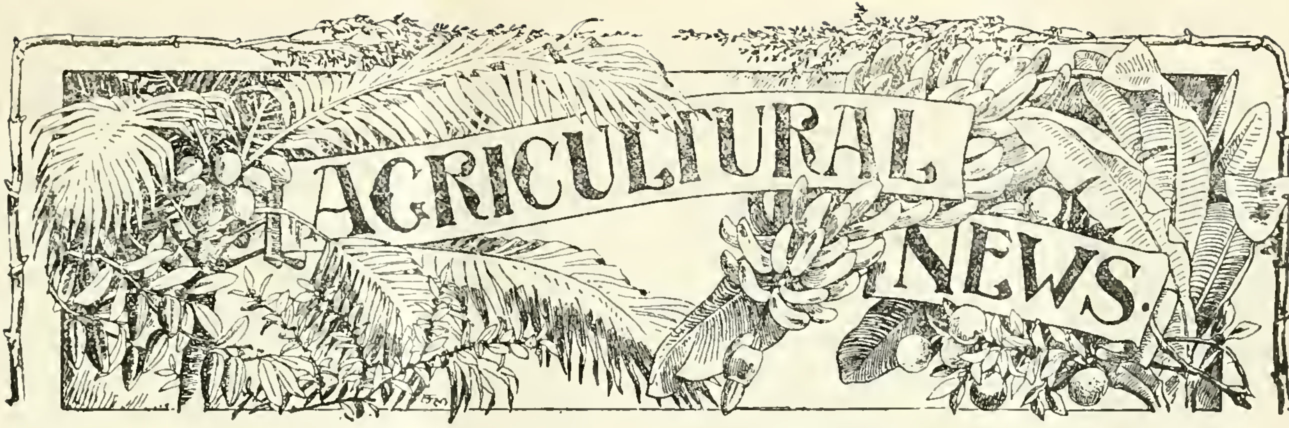

A FORTNIGHTLY REVIEW
OF THE
IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

VOL. X. No. 241. BARBADOS, JULY 22, 1911. PRICE 1*d.*

CONTENTS.

The Improvement of Citrus Fruits.

IT is commonly observed by growers of citrus and other fruits that the yield from different trees in the same orchard or plantation varies greatly; some plants continually produce a number of fruits which is above the average, while others seldom or rarely reach this average. The differences do not affect the yield alone, but exist also in relation to the quality and size of the fruit, the uniformity of the product, and the habit of growth of the trees. It is rare, however, that accurate and detailed observations are made for the purpose of comparing the trees in regard to these matters, and it is seldom the case that a sufficient reason is assigned for the existence of the variation.

In California, the subject has been brought to the notice of citrus growers with such frequency that they have expressed an earnest desire that the Bureau of Plant Industry of the United States Department of Agriculture should conduct an investigation into the causes of the variation among citrus plants grown under uniform conditions. In response to this, the work of observation has been commenced, and the results of the first season's efforts are presented in a preliminary report*, which has just been issued by the Bureau mentioned above. It is pointed out in this report that little or no selection of buds for citrus-growing has been practised in that State, so far; and that even where such selection has been made, it has had reference to the largest and most vigorous trees, rather than to the yield of fruit. In addition to this, the possibility of bud variation—a subject which receives attention in the present volume of the *Agricultural News*, p. 4—has not been considered seriously. The importance of careful selection work is indicated in an illustration given in the report, in which the owner of a pumelow grove obtained large yields of seedless and uniform fruit by the selection of buds from two trees possessing desirable characteristics.

These matters have led up to the work of the Bureau, which will consist in the study of the individ-

*Circular No. 77; *A Study of the Improvement of Citrus Fruits through Bud Selection.*

ual trees under observation, for a period of five years, as this time is necessary for the investigations in view of the fact that variation in the yield of trees is caused by influences in addition to those resulting from the special characteristics of the plants. It is expected that even the first years of the investigation will afford interesting and valuable results, and it is intended to issue reports from time to time which will present information concerning the progress of the work. The co-operation of citrus growers is invited, and has indeed been obtained already. For those who desire to make observations for themselves, the following equipment is suggested: a fairly accurate, easily portable scale for measurement: a set of rings for obtaining data for the classification of the fruits in the different sizes; and a note-book with a suitable tabular arrangement for recording the data. In work of the kind, it is important that all the fruit of any one tree should be picked at one time, and the observations made as soon as this has been done, by a responsible person who is likely to be able to do the work continuously for several years.

The data obtained during the past season show that the quantity, quality and value of the fruit yielded by different trees of the same variety, under uniform conditions, vary greatly from plant to plant. The important object of future work will be to determine if the special characteristics of each tree are transmissible: that is if the plants raised from material taken from these trees show similar behaviour. An extension of the work will be to propagate vegetatively plants from trees showing superiority, and to make observations to find out if this superiority is maintained in the progeny. A subject of further investigation will be the determination of the influence of stocks on the development of scions. This will all lead to the study of the selection of seedlings for stocks, as well as of material for budding.

In the experiments, the trees are marked conspicuously, in a suitable manner, and a map of the plantation is drawn which will make it easy for the selected plants to be found when they are required for observation. At the time of these, the tree is photographed, and all the fruit is picked by an expert picker, under the supervision of the experimenter: the tree is then again photographed with the boxes of selected and graded fruit at the foot, in a continuous row, slightly inclined so as to exhibit the fruit. The first photograph gives an idea of the distribution of fruit on the tree, while the second affords useful information concerning the quantity of good fruit which it has yielded.

In determining the quality of the fruit, that of each tree is sorted into three grades by the experimenter: these are as follows: (1) orchard grade, including all fruits of good size and shape, and without injury or blemish; (2) standard grade, comprising fruits irregular in shape, or with blemish or discolouration, but still suitable to be shipped as an inferior grade; and (3) fruits of such inferior shape or with blemishes so marked that they are not fit for export. Of these the first two are sized and placed in the boxes mentioned above. In this way, accurate information is obtained as to the quality of the fruit from the tree, and the inclusion of the two first grades, only, in the photograph of the tree gives at a glance some idea of the amount of saleable produce that it may be expected to provide. The details of the information which is finally obtained give the weight and numbers of the fruits that have been selected into all the different grades.

Most of the work shortly described above has been done with Washington Navel oranges. Investigations of the same kind could well be carried out in the West Indies in plantations of oranges and grapefruit, and even, to some extent, in those of limes; although the citrus fruit trade of these islands is small in comparison with that in California, while the produce is not raised in such a systematic manner. The need for these investigations can be readily understood when it is considered that the yield from an orchard may be maintained on account of the superiority of a few trees, while the others do not reach the average production and are thus being simply maintained at the expense of those having the better characteristics. In addition to this, the matter is important in relation to the selection of bud material for future planting, in order that the citrus grower may be provided with certainty, from the outset, with plants on which he can rely to give profitable yields of a uniformly good product.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture proceeded to England, on duty leave, by the R.M.S. 'Magdalena', on July 15.

Mr. F. W. South, B.A., Mycologist on the Staff of the Imperial Department of Agriculture, left Barbados on July 14, by the S.S. 'Sobo' for the Northern Islands, for the purpose of making investigations into the fungus diseases of various crops.

SUGAR INDUSTRY.

CROSS-POLLINATION OF THE SUGAR-CANE.

Interesting information in connexion with the flower of the sugar-cane and with the methods in use in Java for producing hybrids therefrom has been published in *Mededeelingen van Het Proefstation voor de Java-Suikerindustrie*, No. 6, entitled De geslachtelijke Voortplanting bij het Suikerriet, by G. Wilbrink and F. Ledeboer, the contents of which have been translated and abstracted by Mr. J. Lely, Chemist to the Antigua Sugar Factory. It is from this abstract that the following information is taken.

The flowers of the sugar-cane require moisture to enable them to open; arrows that are at all dried up will not flower. Flowering commences when the arrow is pushed out of the sheath—an event which may occur early in the season, or later, according to circumstances. The flowers themselves commence to open early in the morning, even before sunrise, and continue to do so, in Java, until about 8 a.m. It has been noticed that the first arrows to open are the stronger ones, while the first flowers produced on the arrow are also the most vigorous. As is now well known, certain varieties of the sugar-cane produce little, if any, fertile pollen; though abortion of the female organs is rare. The pollen itself consists of small yellow balls, each of which has a thick outer wall of a corky consistency and a thin inner membrane. There is an aperture in the outer wall through which the pollen tube is extruded on germination. Healthy pollen grains contain starch—a fact which is made use of in testing their fertility, in the following manner. A nearly ripe anther is opened with a needle in a solution of iodine in potassium iodide. The iodine imparts a blue colour to the starch in the pollen, if it is present. If starch is not present, the pollen is infertile. By this means, after testing the pollen in several anthers, it is possible to determine if any given variety of the cane possesses fertile pollen. (See also *Agricultural News*, Vol. IX, p. 195.)

Three methods for securing cross-pollination are described, in all of which a variety producing practically no fertile pollen is used as the female parent. According to the first method, the two varieties to be crossed are planted in alternate rows and arrows of the male variety are bent over, so that each occupies a position a little bit above, and to windward of, an arrow of the female variety. Bent sticks are tied below the growing joints of the male arrows, to prevent their breaking by lengthening. Furthermore, the male arrows are cut soon after they have been used, in order to preclude the contamination of the female arrows through seeds from the male arrows being blown into them. This natural method of crossing is simple, and gives rise to many seeds, but it can only be employed with varieties producing numerous flowers.

Another method employed is as follows. Male arrows are cut two or three days after they have commenced to flower, and are placed in a bamboo joint filled with water. The cutting takes place before sunrise, and one or two joints of the top of the cane are left attached to the arrows, in order that they may remain fresh for about two days. The bamboo pot is then tied to the female arrow in such a way that the male is above the female, and on the windward side. This operation is conducted when a few flowers at the top of the female arrow are open, as it is then certain that several will be open on the succeeding morning; it must be performed before the sun has any power. When much of this work has to be done, it is commenced in the late afternoon, or better, in the evening.

A further method for securing cross-pollination is to collect the pollen on a glossy paper, and subsequently to convey it to the stigmas of the female flowers by means of a soft brush. In order to obtain the pollen, the male arrow is bent down, on one evening, and on the next morning, as soon as it is dry, the arrow is well shaken over a piece of paper, from which the pollen is transferred to a small box, or a watch glass, lined with a fresh piece of leaf, or a moist piece of filter paper. This method, however, has not proved very successful.

When it is desired that the parentage of the seedlings shall be known with certainty, it is necessary to surround the female arrow with a screen. This is because the pollen is often carried a long distance by the wind. For the purpose, a special form of apparatus is employed, in Java, having an opening on the lee side, provided with a double over-lapping cover. The male arrow is introduced through this opening, preferably when there is no wind. It is interesting to note that some varieties do not give a good yield when fertilized within a screen.

The best method of collecting the seed has been found to be to surround the female arrow with a small muslin bag in which the seeds are allowed to ripen—a process occupying from two to three weeks. The seeds are allowed to dry for one to two days in the bag; afterwards all the ears are stripped from the arrow and sown at once in pans. These are 24 inches wide and 16 inches deep; they are half filled with rich mould, on the top of which is placed a mixture of dry sifted horse-dung and fine sand in equal quantities, forming a layer 6 inches deep.

All the seeds arising from one arrow are sown in one pan, unless they are too numerous, when two or three pans are used. The seeds are pressed down on the wet sand, but are not covered: they are carefully watered in the morning and evening, and are protected with a loose covering of trash when a shower is expected. They are exposed to full sunlight from the first. If there are no results at the end of fourteen days, it is certain that no fertile seeds have been produced on the arrow. In cases of success, the young plants are planted out, when 8 inches high, in pots 10 inches deep by 5 inches wide, filled with mould. One month later they are transplanted into the ground, being removed from the pot with the mould. If they are planted directly in the ground, on removal from the pans, large numbers of the seedlings die.

It should be noted that, while the methods described furnish an excellent means of obtaining numerous seedlings whose parentage on both sides is known with approximate certainty, yet none of them is sufficiently exact for conducting hybridization work on strictly accurate Mendelian lines, since none of them entirely precludes the possibility of the occasional formation of self-fertilized seeds on the female arrow through the agency of the fertile pollen grains which may occasionlly be produced in the anthers of varieties whose pollen is usually sterile.

FRUITS AND FRUIT TREES.

A METHOD OF PRUNING VANILLA.

An article appears in *L'Agriculture Pratique des Pays Chauds* for January 1911, p. 33, which describes the experience and observations of its author, in regard to the pruning of vanilla for the purpose of increasing its productivity. The observations took place in the island of Mayotte (Dapany), one of the Comoros, where the successful method that is described was originated.

The author points out, first of all, that he was struck by the different yields that were obtained from different plantations, in spite of their apparent uniformity; and by the fact that if a comparison was made of the produce of different plants in the same plantation, the variation of yield was even more striking. The reasons given by the planters for this variation was the excessive delicateness of vanilla, for they consider that it is impossible to express the behaviour of this plant in the form of a few simple statements, on account of its capricious manner of growth. The author, however, was enabled to make observations on the plantation where the regular system of pruning, about to be described, is employed, and his experience thus obtained led him to conclude, on the contrary, that the adoption of a method of pruning which had relation to the manner of growth and life of the plant would repress any tendency to irregularity, and enable the growth to be controlled in a regular manner. Without doubt, the delicate nature of the vanilla plant causes it to respond to the smallest variation in the surroundings in which it lives, but its irregularity of production is usually a result of the treatment it receives. As a matter of fact, there does not exist, properly speaking, a definite method of pruning for this plant, such as those which have been devised for fruit trees or for the grape vine; the ordinary methods are traditional rather than dependent upon facts in the life-history of the plant.

After referring to some of the methods of vanilla-pruning that are most generally in vogue, consideration is given to certain facts in the life of the plant, in order that it may be shown how these led to the invention of a method of pruning that has proved to be eminently successful. It is well known that the longer the distance the sap has to flow in a plant, the more does the fruiting become irregular and delayed. Between a vine having a very long stem branching only two or three times, and one of equal length but more branched, the advantage is with the latter with respect to facility in the circulation of the sap, the regularity of fruiting and the minimizing of the risk of accidents, as well as in other respects. Besides, the latter form, which can be obtained by a proper application of the pinching of the bud and of crooking the branches, allows the plant, to a certain degree, to assume an ordinary shape, with a definite stalk and branches. The application of the methods described gives a plant having the following characteristics: (1) absence of fruit from the principal stem, in which all the vigour is employed for the conduction of the sap; (2) fructifications borne on the secondary branches, the latter being easily regulated both as regards number and length; (3) opportunity for the suppression of branches as soon as they have borne fruit, the future fructifications being assured by the annual formation of fruiting branches.

The following is a description of the method that has been found successful:—

(1) At the time of planting, the cutting is placed in such a way that its extremity is left hanging over the support, and it is pinched back a few inches above the surface of the soil. The fact that vegetative activity will be greatest at the upper part of the bend will cause one or two branches to be formed at that place. If the hanging portion or 'bow' (arçon) shows a tendency, nevertheless, to grow in length at the end, it is pinched back afresh, in order to cause the sap to be driven back, so that the formation of fruit is favoured as well as the successful growth of the branches at the bend.

(2) When the bow (see above) has once formed fruit, it is removed, and the two new branches are rolled around the support (or crooked) in such a way that their ends, after pinching back, hang in their turn a few inches above the surface of the soil. Each of these branches will behave like the original cutting; that is to say, that at places near the upper parts of the bent portions new branches will arise, and at the same time the hanging portions will form new bows which will produce fruit. As before, when fruiting has taken place a second pinching back will be given.

(3) After the pods have been picked, the bows are again removed, and all or a certain part of the new branches are crooked in the same way as this was done before. This process is continued every year, so that the vanilla plant, if one were to imagine that it grew on a flat surface, would not appear, as in the ordinary case, in the form of a very long vine branched only two or three times, but as a kind of stubby tuft, with numerous short sprigs.

The following circumstances are mentioned in order to indicate the superiority of this method for pruning vanilla, namely, that by the simple process of pinching back and crooking the vine, those parts which are responsible for fruit-bearing are kept immediately in the course of the chief direction of the flow of the sap; their suppression after each picking does not change this arrangement in any way, so that it is always by means of a mother-branch which has never borne fruit that the sap circulates and reaches the different organs: and that it is always on new branches which have not yet fruited that the fructification of each year appears. It is claimed that the adoption of this method brings about a more regular and abundant production of pods and even a longer life for the plant itself.

THE EXTRACTION OF RUBBER FROM THE GUAYULE PLANT.

The following account of the extraction of rubber from the Guayule plant (*Parthenium argentatum*) is taken from the *Journal of the New York Botanical Garden* for May 1911:—

The guayule plant (*Parthenium argentatum*) occurs in the central plateau of Mexico, and in its extension, the Stockton plateau of Texas. There has recently been established at Marathon, Texas, a factory for the manufacture of rubber from the plants which grow in that vicinity, embracing the whole of the area of distribution in Texas. The more important steps in the process of manufacture are as follows:—

The shrub is collected in the field by pulling it up by hand. It is then brought to a central point, called a guayule camp, where it is packed into bales in the fashion of baled hay. From this point, it is hauled to the factory, a distance of 50 to 100 miles, according to the location of the camp. Arrived at the factory, the weight of each bale is recorded for the purpose of comparison with the field weight at the time of baling, and for the purpose also of establishing data so as to show the percentage of returns. The bales are stacked in the factory yard until seasoned, since the extraction does not go on well if the fresh shrub is used.

The first step in the actual factory process is a crushing of the shrub between corrugated rollers moving at differential speeds. The comminuted shrub is then placed in a pebble mill. This is a short drum, containing a charge of Norwegian or Mediterranean flint pebbles, a certain amount of water and the amount of shrub to be ground. The mill is rotated on its axis at a certain rate of speed for a certain length of time, at the end of which the shrub is found to be finely ground and the rubber more or less separated from the bagasse, that is, the fibre, etc., of the shrub, and occurs in the form of small rounded particles, more or less adherent to each other, called 'worm-rubber'. The mill is now discharged, the water, rubber and bagasse being led through ditches to a skimming tank

The material in part sinks, namely the waterlogged fibrous bagasse, and in part floats, the rubber, or rather the chief portion of it, and cork bagasse. It is thus that in the skimming tank the major portion of the ground shrub is separated from the rubber, which floats and is accompanied by flakes of cork (cork bagasse). The fibrous bagasse is then discharged, the floating material (rubber and cork bagasse) is boiled for one hour and then allowed to remain one or two days in a settling tank. The material which remains floating is then placed in a compressor with water and subjected to a pressure of 250 lb., with the result that the cork bagasse is waterlogged. The result of this operation is the practically complete separation of the rubber from bagasse. The practically clean rubber is then further cleaned by being passed through a beater-washer. This is merely an iron tank, with an undershot paddle-wheel with a great many blades. The wheel is rotated rapidly, thus causing the circulation of the whole mass and, by agitation, the separation of the rubber and bagasse which still remains associated with it. The now entirely clean rubber is finally run through a pair of finely corrugated steel rollers, which sheets it. In this condition it is ready for the market and is shipped in 200-lb. sacks.

THE USE OF MANURES IN FORESTRY.

This subject receives attention in a note in the *Journal of the Board of Agriculture* for May 1911, p. 137, based on a paper presented at the Sixth International Forestry Congress at Brussels. It was pointed out, in this, that the importance of manuring is by no means as great in forestry as in agriculture, for the following reasons: (1) the amount of mineral salts retained in timber is comparatively small; (2) there is a long period of time intervening between the planting and felling of the forest; (3) the fall of leaves and twigs causes the trees to return the greater part of their mineral constituents to the soil; and (4) the available mineral matter in the soil is continually, but slowly, replaced by its decomposition. As regards the Continent of Europe, the old forest soils are usually sufficiently rich in mineral salts, and remain so under the present system of forestry. An objection to artificial manuring, in itself, is that it increases the cost of planting by 50 to 100 per cent., with no possibility of return before the trees are cut down.

Where manure is required, there is the difficulty in the case of middle aged wood because of the depth of the roots; experience shows that the method to be adopted in this case is to hasten the decomposition of the fallen leaves and twigs, either by mixing them with the soil, or by applications of lime. Irrigation with sewage water has given varying results. A form of manuring in which the soil was covered with a layer of city refuse 8 inches thick has been tried by the city of Berlin, with much success.

Artificial manuring for forests is of the greatest importance with young plants growing in poor, sandy soils. Here the soil may be enriched by planting leguminous plants; dressing it with turf and other substances containing humus—a method that has given very good results; covering the soil with waste vegetable matter; and employing a species of tree having a heavy leaf fall, for interplanting. There is added to these methods that of planting, with the other trees, leguminous forest trees. Quickly acting nitrogenous manures are useless in ordinary circumstances, except where the soil has deteriorated or where the trees require to be carried over some critical period such as that subsequent to their suffering damage from any cause.

Attention is drawn to the fact that, in the fortnightly report on the produce markets, issued by Gillespie Bros. & Co., dated June 20, 1911, a quotation is given for: 'really fine clear, concentrated lime juice, suitable for direct use in calico-printing.'

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date July 3, with reference to the sales of West Indian Sea Island cotton :—

Since our last report, between 300 and 400 bales of West Indian cotton have been sold, including St. Croix, Nevis, Barbados, St. Kitts and Anguilla, at 15*d.* to 16*d.*, and a few superfine St. Vincent at 22*d.*; the sales also include about 100 bales of Stains, at 8½*d.* to 10*d.*

Prices remain steady at the decline, but spinners are not in any immediate want, and are only purchasing for stock.

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

With sales during the week of only 30 bales of off cotton, the market remains quiet and unchanged. The stock consists largely of planters' crop lots, and such cotton as is being held off of the market under instructions from the owners, leaving only very limited offerings of odd bags on the market, for which we quote :—

Fully Fine 28c. = 15¾*d.* c.i.f. & 5 per cent.
Fine 26c. = 14¾*d.* ,, ,, ,, ,,
Stains and off Grades at 20c. to 24c. = 11½*d.* to 13½*d.* c.i.f. & 5 per cent.

Cotton-Growing in the Western United States.—Experiments in cotton-growing are being conducted on the Pacific coast, from the Imperial Valley in Southern California to Klamath Falls in the State of Oregon. These experiments are being carried on under the supervision of a Federal Government Inspector. Most encouraging reports are being received from districts so far north that the idea of attempting to grow cotton had never before entered the heads of the landowners of those sections. Some of the cotton plants have frozen, but on the whole, the work is progressing so favourably that the inspector is sanguine of the results.

Egyptian long staple cotton is being planted, and is found to resist the cold much better than other varieties commonly grown in the United States, and at the same time it furnishes a fine quality of cotton with a long fibre.

Another feature that is encouraging to growers is that the value of the cotton seed is now equal to, or greater than, that of the cotton. In cases where the fibre proves of small value, the seed will often make the crop profitable. (*The Board of Trade Journal*, April 27, 1911.)

COTTON-GROWING IN PERU.

In a recent number of *Peru To day* (Vol. III, No. 2), there is presented an account of cotton production in Peru, which is partly a translation and partly an abstract, of a study of the subject prepared for the Bulletin of Fomento, of Peru. From this it appears that the most favourable lands for growing cotton, in the Republic, are situated in the river valleys, near the coast, where there is a deep and fine soil formed from the alluvium brought down by the rivers. The kind of cotton most generally grown is the species indigenous to the country, *Gossypium peruvianum*; this is particularly resistant to drought, on account of the possession of a large root development.

The article gives detailed information as to the rate of production of cotton in different parts of the area where it is grown. It is of interest that, in the district where Sea Island cotton (*G. barbadense*) is raised, the production varies between 386 lb. and 442 lb. per acre, while the Egyptian variety, Mit-Afifi, in this and other districts, has given a yield of 500 lb. to 830 lb. per acre. As is pointed out, these figures show that the yields of cotton in Peru are much greater than those of other countries. Practically, one may take as an average of Peruvian production per acre, 484·4 lb., against the highest average in the U.S.A. of 308 lb., in Egypt of 390·4 lb., and in India of 70 lb., per acre.

The growth of the cotton industry in Peru is shown by the fact that the exportation of 1903, which was 7,651 tons of lint, value £295,719, was nearly trebled by 1909, the export for that year being 21,370 tons, having a value of £1,211,081. The amount of Full Rough and Moderate Peruvian shipped in 1903 was 2,473 tons, value £103,869; in 1909 it was 7,011 tons, value £378,831. The similar figures for Smooth Peruvian are 1,906 tons, value £176,640, and 13,793 tons, of a value of £795,496. The statistics again show a matter of particular interest, in the West Indies, in the fact that 535,000 lb. of Sea Island cotton, valued at £36,752, was exported in 1909, whereas in 1903 the export was 271,000 lb., worth £15,209.

The growth in the production of lint has been accompanied by an increase in the exportation of cotton seed and cotton cake. Thus in 1903, the export of cotton seed was 5,318 tons, value £13,371, and in 1909, 7,761 tons, value £15,522. As regards cotton cake, the export for 1903 was 2,217 tons, valued at £8,989, while in 1909 it was 4,528 tons, valued at £22,840.

The extent of the cotton-growing industry of Peru may be estimated by combining the total exportation given above with the annual consumption in the factories of the Republic, which amounts to about 2,500 tons of ginned cotton. This gives a total production of about 23,870 tons of fibre, in 1909.

The factories possess 1,725 spindles, represent a capital of £300,000 and pay wages annually to the amount of £40,000; the annual value of the products from them may be taken as £220,000. In the oil factories, the extraction varies from 12 to 16 per cent.

A study has been made of four years' cotton production over a definite area, and this has led to the conclusion that the cost of growing a pound of Full Rough Peruvian is 5·7c.; this is very similar to the cost for upland cotton in the United States.

All the facts given in the article, particularly those which are afforded attention above, are employed to show the expediency of a large extension of cotton cultivation in Peru. The proposal is supported by the existence of large areas of land that are available for the purpose, and the fact that cotton grows well where sugar-cane and rice do not flourish on account of the lack of water. Finally, as in the case of the West Indies, the importance is recognized of the adoption of intensive cultivation, and this is recommended as an almost necessary circumstance wherever cotton is grown in Peru.

INDIA AND LONG-STAPLE COTTON.

The following was given in a report of the proceedings of the International Cotton Congress, held recently at Barcelona, which appeared in *The Textile Mercury* for May 20, 1911:—

Mr. Coventry (Officiating Inspector-General of Agriculture, India) said that, on the whole, it suits India to produce a short-staple cotton. He asserts that if we are to induce the cultivator to change his present methods and produce long-staple cotton, we have to bear in mind two things—first, that the price for the long-staple cotton must not only be higher than that for the short-staple, but it must be so high that it will cover the loss in yield which must inevitably occur in changing from a short to a long staple; and, secondly, we have to recognize that the existing foreign trade and market would have to be entirely shifted from Germany and Japan to England, for there are no buyers of long-staple cotton in India at present. Neither the Government nor the Agricultural Department can do either of these two things. It is for the trade itself to move in the matter.

What, however, has been found the most serious obstacle in the way of progress is that, there being no buyers of long-staple cotton in India, the grower does not get full value for his produce, with the result that, though the price paid may be higher than for the coarser, the net result is often against the cultivator, owing to the lower yield At the same time, it is known that, if full value were paid for the longer staple, or, in other words, if there were a market for long-staple cotton in India, which there is not, the cultivator in many cases would undoubtedly benefit more by growing it, in spite of the lower yield. The only possible solution of this difficulty is in the creation in India of a buying agency to buy, gin, bale, and export long-staple cotton. Until this is done, the valuable work of the Department must remain more or less at a standstill. Perhaps the British Cotton Growing Association may see their way to move in the matter.

DOMINICA AND THE INTERNATIONAL RUBBER EXHIBITION.

The Permanent Exhibition Committee of Dominica, with the large assistance of the Agricultural Officers in the island, has forwarded a representative set of exhibits to the International Rubber Exhibition in 1911. As will be seen from the following description, the collection is far larger than that prepared for the similar exhibition in 1908, when the only exhibits sent were two small samples of rubber about 3 lb. in weight, which had been obtained from trees growing in the Botanic Garden. According to a report forwarded to the Permanent Exhibition Committee by Mr. J. Jones, Curator of the Botanic Station, who is acting as Honorary Secretary to that Committee, the weight of the present exhibit of rubber is 64 lb., of which the Botanical Garden has furnished 24 lb, the rest having been obtained from seven estates on which experiments in rubber cultivation are being made.

The details of the exhibits show that the estates which have provided samples are: Stowe, Loudonderry, Point Mulâtre, Governor, Concord, Hatton Garden, and Imperial Road and Riversdale. These, together with the Botanic Garden, have furnished five samples of Central American rubber (*Castilloa elastica*), two of Para rubber (*Hevea brasiliensis*), six of Lagos rubber (*Funtumia elastica*), and one of Rambong (Assam) rubber (*Ficus elastica*). The Botanic Garden has also provided diluted latex of all these rubber trees, as well as that of *Ficus Vogelii*; also seeds and awns of *Funtumia elastica* and *F. africana*, and mounted herbarium specimens of *Hevea brasiliensis*, *Castilloa elastica*, *Funtumia elastica* and *Sapium Jenmani*. The share of the permanent Exhibition Committee in the exhibit is fourteen photographs of rubber trees, taken in Dominica.

THE VALUE OF FIELD EXPERIMENTS.

A short article of interest appears in the *Field* for April 1, p. 642, which deals with some of the objections that are urged against field experiments, particularly in relation to trials of different methods of manuring, on account of the irregularity of the results from year to year. It is pointed out that this very characteristic is connected with the uncertain circumstances that prevail in the different years, particularly in regard to rainfall. If it were possible for the planter or farmer to foretell the weather during the coming season, many of his difficulties would disappear, and the work of practical agriculture would be greatly simplified.

It is therefore unfair to argue that the irregularity of the results of such experiments necessarily detracts from their value. The existence of this very circumstance has been actually most useful in many cases, in that it has aroused the curiosity of the planter, and of those advising him, and has thus brought about the desire to make further experiments, in order to determine, if possible, the causes of such irregularity.

The article points out the usefulness of co-ordinating and publishing together the results obtained over comparatively large areas, in order that a general guide to practice may be afforded. It mentions the necessity, at the same time, of giving attention to peculiarities of soil and climate at each of the different centres of experiment, so that such results may be interpreted in the light of the special conditions. It is of interest to refer to the fact that work of this kind is at present being done in parts of the West Indies, particularly in relation to sugar-cane growing, where, with the co operation of planters, facts having a local value are elucidated and reported separately, while the whole of the investigation is considered in a broad way for the formulation of results that are of general application.

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 deals with work that is being carried out in connexion with the improvement of citrus fruits by means of bud selection. Several of the methods to which reference is made are capable of adoption in the West Indies, and may form the basis of interesting and useful investigations.

Information concerning methods in vogue for effecting the cross-pollination of the sugar-cane, particularly in Java, is given on page 227.

An article on page 228 describes a method of vanilla pruning. This seems worthy of trial by growers of vanilla in the West Indies.

Interesting information concerning the cotton-growing industry of Peru is presented on page 230.

The Insect Notes of this issue are in the form of an illustrated article, which describes the peculiar mode of pollination of an aroid plant (*Philodendron* sp.). They will be found on page 234.

Page 235 presents an interesting description of an apparatus for sampling glycerine, with the hint that it might be modified for use in connexion with the testing of molasses.

The Fungus Notes, on page 238, have for their subject The Sereh Disease of the Sugar-cane.

Examinations in Connexion with the Courses of Reading of the Department.

It is intended that the Preliminary written examination in connexion with the Courses of Reading of the Imperial Department of Agriculture shall be held on Monday, October 30, 1911; while the Intermediate and Final written examinations will commence on November 13, 1911.

The oral examinations having relation to these will be held at dates as near to each as possible, the actual times being determined locally by the convenience of the examiners and candidates at the different centres.

Candidates are reminded that, in the preparation for these examinations, help will be readily given to them, in connexion with their reading, by the local officers in the different agricultural departments, and they are advised to take advantage of this as far as may be expedient. In some cases, definite times of meeting for the purpose will have been arranged, on behalf of candidates, by these officers.

It may be well to draw attention to the Students' Corner, published regularly in the *Agricultural News.* This is intended rather to give suggestions in relation to problems and matters of agriculture, than merely to provide direct information. The student is advised to follow up the subjects that are indicated fortnight by fortnight, and to make as much use as possible of the questions that are appended to each article.

Calcium Cyanamide and Nitrate of Lime.

Several references have been made to these manures in former volumes of the *Agricultural News,* and in this volume on pp. 57 and 168, with special relation to experiments in which their effect on the yield of plants was compared with that of nitrate of soda and sulphate of ammonia.

The *Journal of the Board of Agriculture* for June 1911, p. 240, gives an abstract of work with these manures, described in *Farmers' Bulletin* No. 20, of the Agricultural Department of the Lancashire County Council Education Committee. It is of interest that the results seem to support those that have been obtained in several other experiment stations, namely, that where the different manures are applied so as to supply equal quantities of nitrogen, they are almost equally effective in the production of crops.

As has been stated before, this brings it about that the extension of the use of the newer manures, in comparison with that of nitrate of soda and sulphate of ammonia, will depend largely on the cost per unit of the nitrogen provided by them.

It is mentioned that calcium cyanamide and nitrate of lime suffer under the disadvantage that they are less convenient in use than the other manures, the former being easily blown about by the wind and sometimes injurious to young plants, and the latter having the property of absorbing moisture readily from the air and of thus becoming difficult to spread on the fields.

Prize-holdings Scheme in St Lucia.

Up to the present time, twenty competitors have entered the prize-holdings competition to be held at Soufrière, St. Lucia. According to a report of the Assistant Agricultural Superintendent, for the month of May, this officer has recently visited the district for the purpose of inspecting the holdings of those who are taking part in the competition.

The report shows that these holdings cover a larger area than has been the case previously. It appears that there is a large amount of room for improvement in the condition of most of them; though several of the owners are showing a keen interest in their work, and in the advice given to them. The continuation of the competition should do much toward effecting improvements in the general state of cacao cultivation in the district.

Protection of Birds and Fish in Grenada.

The Grenada *Government Gazette* for May 1, 1911, contains the draft of a Bill for an Ordinance intituled an Ordinance to Amend the Provisions of the Birds and Fish Ordinance, 1891. This provides for the extension of the close season to various birds and for oysters, turtle, fresh-water mullet and cray fish; it also prevents the exportation of any bird or any parts of a bird specified in the First Schedule to the Principal Ordinance. This schedule, which contains the names of birds that are absolutely protected by the law, is amended by the addition of the names of the ground dove, pea dove or perdrix, hawks and eagles, the pelican, and herons and egret. Among partially protected birds (in the Second Schedule to the Principal Ordinance), the Trinidad ground dove and the pea dove or perdrix are transferred to the lists of birds having absolute protection.

The Ordinance repeals the Birds and Fish Protection (Amendment) Ordinance, 1908.

Rubber Culture in Tobago.

A copy of a pamphlet with this title, issued by the Permanent Exhibition Committee of Tobago for the International Rubber Exhibition, has been received through the courtesy of Mr. W. G. Freeman, Acting Director of the Trinidad Department of Agriculture.

After giving a brief account of the history of rubber-planting in Tobago, and of its present extent, the pamphlet proceeds to deal with the following subjects: rate of growth of trees (*Castilloa elastica*); method of tapping; yield of latex; methods of rubber-curing; Hevea in Tobago; and concludes with a short account of the main agricultural conditions of the island.

The pamphlet is of a useful nature, and presents in a brief and concise form the main matters relating to rubber culture in Tobago. Reference should be made to the announcement with which it concludes, to the effect that the Honorary Secretary of the Tobago Planters' Association will be glad to give any information regarding the island to those who may enquire.

Calcium Silicate as Plant Food.

The extent to which the more insoluble substances occurring in soils are taken up by plants and usefully employed in their life processes has for a long time been of interest to agriculturists. The *Experiment Station Record* of the United States Department of Agriculture, Vol. XXIV, p. 325, contains a short abstract of work that has been done with oats in water cultures, in which part of the lime of the culture solution was provided by different forms of calcium silicate.

The investigation showed that, while there was no special variation in development with the different kinds of calcium silicate employed, the lime in the silicate was absorbed readily and did not cause any injury to the plants; more silicic acid than lime was taken up by the plants. The separation of the lime and the silicic acid took place through the action of the carbon dioxide normally excreted by the roots.

The chief matter of practical importance arising from the results of the experiments is that, in the consideration of the supply of plant food to roots, account should be taken of the provision of lime and silicic acid by easily decomposable calcium silicates in the soil.

Nature Teaching in Elementary Schools in the Leeward Islands.

The report of the Inspector of Schools for the Leeward Islands, for 1909-10, published in the Leeward Islands *Gazette* of May 18, 1911, points out that it is perhaps too early to estimate accurately the final result of the introduction of Nature Teaching into the elementary schools of the Colony, upon the education of the children by whom they are attended. It is remarked, however, that there are evidences of an improved ability on the part of the teachers to gain the interest of the children in the subject, and that the subject itself has helped to increase the general standard of intelligence in the schools. This matter naturally affects favourably the work of the teachers, as well as that of the scholars.

At the same time, mention is made of the fact that the methods used in Nature Teaching, in many of the schools, are very mechanical; in these cases the circumstance is due to the lack of provision of proper illustrative material and objects for demonstration. A partial corrective of this is being sought in the renewal of the supply of pots and boxes for practical experimentation.

At the time of reporting, there were thirty-six school gardens in the Colony, in which work was being actively done: twelve in Antigua, eight in St. Kitts, six in Nevis, four in Dominica and six in Montserrat. These details do not include schools where there are flower beds, kept in order by the children. The work done in the various gardens is stated to be of very unequal merit, mainly owing to the lack of system in conducting the classes. Two or three schools in Antigua, Montserrat and Nevis have, however, obtained excellent results.

INSECT NOTES.

INSECT POLLINATION OF AN AROID PLANT.

In 1894, Professor C. V. Riley and Mr. H. G. Hubbard visited Montserrat, to investigate the occurrence of scale insects on lime trees in that island. Mr. Hubbard, during his visit, which extended over a considerable period of time, made many notes and observations on the local insects and plants. One of these observations appeared as an article in *Insect Life* (Vol. VII, p. 340, March 1895), under a heading similar to that given above. The following account is abstracted from the article mentioned.

The plant observed was a species of Philodendron, which is related to the eddoe and the aroids, and is one of the largest of the climbing jungle plants. The flower case is flask-shaped (Fig. 12, a & b), and when cut open, 'is found to consist of a thick and leathery spathe, wrapped in a spiral about an upright, cylindrical spadix. The enveloping spathe tightly clasps in its embrace the upper, pollen-producing portion of the spadix, but, expanding below, leaves the fruiting portion free, in a cavity which is partly filled with a mucilaginous liquid. All evaporation is prevented by the overlapping of the spathe, and the floral organs thus seem to be destined to self-fertilization, most rigidly enforced. Indeed, it is difficult to conceive how any fertilization could be accomplished by the plant itself, since the pollen tubes of the spadix, being tightly inrolled by the inner folds of the spathe, are unable to give forth their fertilizing grains.'

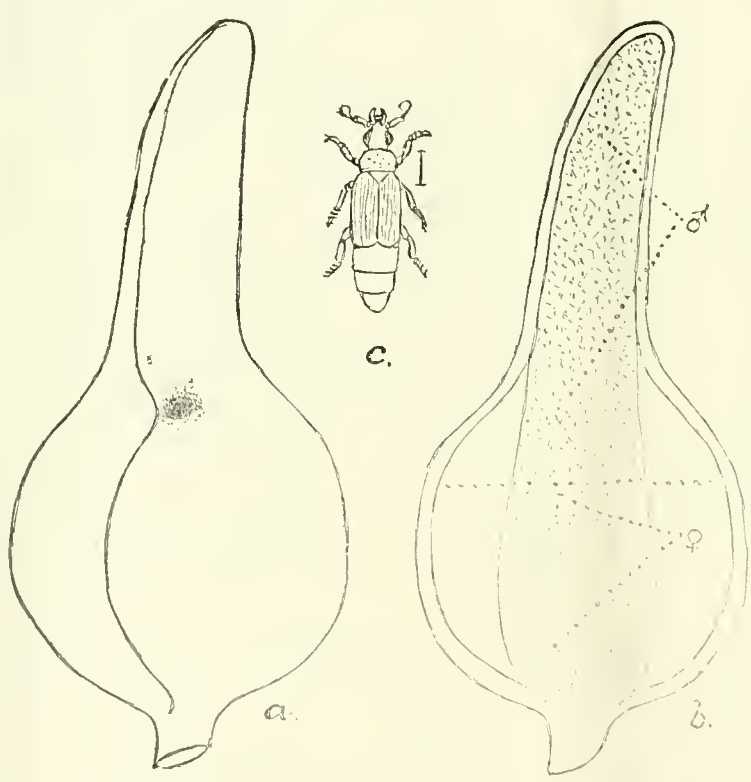


FIG. 12. POLLINATION OF PHILODENDRON.

Mr. Hubbard's article was illustrated by means of a plate prepared from diagrammatic drawings. Fig. 12 has been re-drawn from that illustration

The maturing flowers are infested by numerous larvae of sap-loving beetles and flies, which swarm in the flower cases, feeding upon the envelope and breaking it down, until the ripened fruits at the base of the spadix are entirely exposed, to be carried away by birds and other agencies for the dissemination of the seed.

The immature inflorescence at first contained no insects, but in every instance a brownish spot, apparently caused by a rot fungus, appeared at the same position on the spathe. This, as is indicated at a, in Fig. 12, is at the extreme edge of the overlapping portion of the spathe, just opposite a deep sinus in the margin.

It appears from the observations recorded that the fungus spot, which often grows to the size of a shilling piece, occurs at a point where a sap-feeding insect has gnawed the epidermis of the spathe, in an attempt to penetrate the floral organs within.

The insect which occurs in this relation is a small beetle, which has been identified as *Macrostola lutea*, Murray (see Fig. 12, c). Mr. Hubbard invariably found a pair of these insects between the folds of the spathe. The process of gaining an entrance to the inside of the spathe is a rather long one, but the choosing of the spot where the sinus in the edge reduces the distance to be traversed, and the action of the rot fungus in softening the tissues, makes it shorter than it would be otherwise.

The Macrostola beetles enter the cavity of the flower case, near the level of the surface of the contained liquid, and, strangely enough, they accomplish their entrance without leaving an opening for other insects to follow them. This is due to the fact that, in its early stage of growth, the fungus causes a shrinkage, which closes the slight aperture through which the beetles have entered.

Immediately on entering the flower case, this pair of beetles makes its way to the pollen-bearing portion of the spadix, forcing a passage between the inner surface of the spathe and the anthers. The female deposits eggs as she proceeds, and a numerous colony of larvae is soon produced. The larvae live and complete their growth within the flower case, feeding on the pollen, and by their feeding, and burrowing in the polleniferous portion, cause the spadix to liberate quantities of a mucilaginous liquid, which carries down masses of pollen to the cavity at the base of the spadix. Every portion of the interior of the cavity is covered with this sticky mixture of mucus and pollen.

The beetle larvae pass into the pupal stage, which is followed by the emergence of the adults of a new brood. The parents of this brood—the original invaders of the flower case—have penetrated to the tip of the spadix, where their dead bodies may be found.

About this time, the continued development of the spot of rot fungus has caused an opening in the spathe, permitting the entrance of a great number of insects, which feed on sap and dead tissue. As a result, the spathe breaks down and falls away, and the liquid escapes.

The beetles are then, by the demolition of their domicile, forced to betake themselves to neighbouring flowers of the same kind, where they mate and the processes just described are repeated. They bear with them, in the pollen paste with which their bodies are plentifully bedaubed, the material necessary for the fructification of the new inflorescence into which they enter.

The part played by the rot fungus is an important one, equally advantageous to the beetles and to the plant. It aids the former by first softening the tissues of the spathe, thus allowing the beetles to advance in their passage into the flower case, and afterwards hardening, and for the time, effectually closing the entrance against other intruders. After the Macrostolas, in undisturbed possession of the flower case, have accomplished the fertilization of the stigma and released the pollen, the fungus, in maturing, breaks the seal of the plant and admits destructive insects. The aroid thus secures the expulsion of its pollenizers, as well as the proper ripening and dissemination of its seed.

AN APPARATUS FOR SAMPLING GLYCERINE.

Mr. H. A. Tempany, B.Sc., Superintendent of Agriculture for the Leeward Islands, has kindly forwarded a copy of the following note, which appears in the *Chemical News* for May 5, 1911, and is a reproduction of an Appendix to the Report on Methods of Analysis of Crude Glycerine, agreed upon at the recent International Conference on the subject:—

The usual method of sampling crude glycerine hitherto, has been by means of a glass tube, which is slowly lowered into the drum with the object of taking as nearly as possible a vertical section of the glycerine contained in the drum. This method has been found unsatisfactory, owing to the fact that in cold climates viscous glycerines run into the tube very slowly, so that owing to the time occupied, it is impossible to take a complete section of the sample. Another objection to the glass tube is that it fails to take anything approaching a correct proportion of any settled salt contained in the drum

The sampler . . . . . . has been devised with the object of overcoming the objections to the glass tube as far as possible. It consists of two brass tubes, one fitting closely inside the other. A number of ports are cut in each tube in such a way that when the ports are opened a continuous slot is formed, which enables a complete section to be taken throughout the entire length of the drum. By this arrangement the glycerine fills into the sampler almost instantaneously. There are also a number of ports cut at the bottom of the sampler which render it possible to take a proportion of the salt at the bottom of the drum. The instrument is so constructed that all the ports, including the bottom ones, can be closed simultaneously by the simple action of turning the handle at the top; a pointer is arranged which indicates on a dial when the sampler is open or closed. In samples of larger section (1 inch) it is possible to arrange a third motion whereby the bottom ports only are open for emptying, but in samplers of small dimensions (⅝-inch) this third motion must be dispensed with, otherwise the dimensions of the ports have to be so small that the sampler would not be efficient.

In using the sampler, it is introduced into the drum with the ports closed, and when it has touched the bottom the ports are opened for a second or two, then closed and withdrawn, and the sampler discharged into the receiving vessel by opening the ports. When the drum contains suspended salt the ports must be opened before the sampler is pushed through the salt, thus enabling a portion to be included in the sample. It is, however, almost impossible to obtain a correct proportion of salt after it has settled in the drum; it is therefore recommended that the drum should be sampled before the salt has settled.

A sampler 1 inch diameter withdraws approximately 10 oz. from a 10-cwt. drum.

A sampler ⅝-inch diameter withdraws approximately 5 oz. from a 10-cwt. drum.

(The authorized makers of the apparatus are Messrs. Young & Co., 45-59, Stanley Street, Kinning Park, Glasgow.)

In forwarding the information, Mr. Tempany points out that the problems connected with the sampling of glycerine are very similar to those occurring in the sampling of molasses, so that it has appeared to him that a useful purpose might be served in bringing the above apparatus to the notice of those interested in the testing of the latter product.

PRODUCTION IN NORTHERN NIGERIA IN 1909.

The total value of the exports from the Protectorate was £406,722.

The notable increase in the export of shea nuts and rubber shown by the returns may be expected to continue. The country now being tapped by the Baro-Kano Railway abounds in the *Butyrospermum Parkii*, and many tons of nuts have hitherto been allowed to rot on the ground for want of transport.

The Bassa Province, in which most of the rubber exported is being obtained, has received a good deal of attention of late, and it may be confidently expected that, as inter-tribal feuds amongst the natives are stopped, trade will increase.

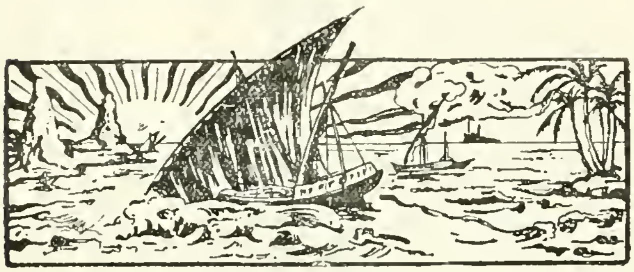
The advance of the railway towards Zaria, and the rapid opening up of the Bauchi tin fields, will certainly lead to a large increase in the export of tin ore at an early date.

Although the high prices obtainable for cotton in the local markets have up to the present made it impossible to obtain any large amount of this produce at a price that will allow of its purchase for export purposes, yet the enormous local production, variously estimated, but probably not less than 10,000 tons annually, ensures the future of this industry, once means of transport have been secured, buying depots established and the native has realized that he can always obtain in cash a reasonable figure for his cotton. The Emirs and Native Chiefs have been urged to encourage their people to undertake the planting of cotton, and the more intelligent of them are actively doing so.

The annual purchases, as returned by the British Cotton Growing Association, are as follows: 1905, 156 tons; 1906, 362 tons; 1907, 369 tons; 1908, 152 tons; and 1909, 375 tons.

A large quantity of selected seed has been distributed in the Provinces of Bassa, Kabba, Niger, and Ilorin. (From *Colonial Reports*—Annual, No. 674, p. 10, issued April 1911.)

It is stated in *La Quinzaine Coloniale*, Paris, for October 25, 1910, that in view of the opening of the Panama Canal and of the expected increase of traffic in agricultural products, the Chamber of Agriculture of Guadeloupe is establishing an experimental agricultural garden, and that a loan has been raised for the purpose. (From the *Bulletin of the Bureau of Agricultural Intelligence and of Plant Diseases*, of the International Institute of Agriculture, November 1910, p. 12.)



GLEANINGS.

A report of the work done at the Botanic and Experiment Stations, St. Lucia, during last month, shows that the planting was effected of $1\frac{1}{4}$ acres of Para rubber, while the distribution of Para rubber plants for use in the island reached the number of 490.

The report of the Government Veterinary Surgeon, St. Vincent, for last month, shows that of sixty-nine deaths of animals, reported in the island, none were caused by anthrax. There was only one case in which the cause of death was not ascertained, but to this there is attached no suspicion of the presence of the disease.

The distribution of plants from the Dominica Botanic Station during June 1911 was as follows: limes 6,725, spineless limes 1,050, cacao 420, grafted cacao 100, budded citrus plants 86, Para rubber plants 200, miscellaneous plants 432. The total number of plants distributed from the station during the month was 9,013.

The *Government Gazette* of the Federated Malay States publishes information to the effect that the amount of cultivated rubber exported during February and March 1911 was 1,490,849 lb. and 1,916,219 lb., respectively. In the period January to March 1911 the output was 4,736,238 lb.; for the similar period in 1910 the figures are 2,396,586 lb.

The Agricultural Superintendent of St. Kitts states in a report that the young sugar-cane and cotton crops in the island have made good progress during June, and that they were in good condition at the end of the month. The cotton worm (*Alabama argillacea*) has appeared in a few fields on two estates, but has been kept in check by the use of Paris green.

The plants distributed from the Botanic Station, Antigua, during last month were as follows: limes 500, cocoa-nuts 200, red cedar 183, mahogany 72, palms 2. It is worthy of mention, further, that 998 seed cocoa-nuts were imported at the same time for use in connexion with cocoa-nut planting—a minor industry that is receiving a fair amount of attention at the present time, in the island.

A copy of a bulletin of the condition of crops in Egypt on June 1, 1911, calculated on the returns from each province, has been received from the Director General of Agriculture. This shows that the state of the cotton crop in lower Egypt is between 'fair below average' and 'average'; in upper Egypt it is just above 'average'. The same bulletin shows that the condition of the sugar-cane crop is between 'average' and 'good'.

A meeting of planters and others interested in live stock was held in Antigua on July 7, 1911, in the room of the Agricultural and Commercial Society, for the purpose of meeting Mr. P. T. Saunders, M.R.C.V.S., Veterinary Officer on the Staff of the Department. At the meeting, the opportunity was taken by Mr. Saunders of giving information as to the objects and aim of his visit to Antigua; a small committee was appointed, to afford him assistance in his work, and an itinerary was drawn up for visits by him to different estates in the island.

The *Montreal Star* of June 8, 1911, states that the first place in third year medicine at McGill University was taken by Mr. R. H. Malone, late of Antigua; this candidate also gained the Morley Drake prize, which is awarded on the results of the examinations in bacteriology and parasitology, and general pathology. Mr. Malone was once a pupil of the Antigua Grammar School, from which institution he won a Leeward Islands Scholarship, tenable at Harrison College, Barbados; he subsequently held the post of Junior Assistant in the Government Laboratory for the Leeward Islands.

The Agricultural Superintendent of St. Vincent furnishes a report to the effect that an excellent stand of cotton has been obtained in the island, the seed having germinated well throughout. The Agricultural Department has been busily engaged with the selection, testing and disinfection of seed for small growers, and since May 1, 7,507 lb. of cotton seed, or sufficient to plant 1,500 acres, had been sold up to the end of June. The fact that practically the whole of the past season's crop of white Sea Island cotton was sold at 18*d.* per lb., and over, is considered a matter for satisfaction, by growers. The Marie Galante produced has been valued at $9\frac{1}{4}$*d.* per lb.

His Honour the Acting Administrator of St. Vincent has forwarded a copy of the *Report and General Abstract of the Census*, 1911, for that island, prepared by the Compiler of Census, under instructions received from the Governor-in-Council. This shows that in the interval since the taking of the last census in 1891—twenty years—the population of the island has increased from 41,054 to 41,877, which is a gain of 823, or 2 per cent. It is notable that this gain has taken place notwithstanding the visits of two great calamities during the period, namely the hurricane of 1898 and the volcanic eruption of 1902, which caused the loss of nearly 2,000 lives, and much property.

According to *The Board of Trade Journal* for May 25, 1911, p. 430, it appears that after many failures and the expenditure of a considerable amount of capital, the extraction of wax from the candelilla plant (see *Agricultural News*, Vols. IX, pp. 104 and 124; X, p. 203) is about to become a commercial success. There are now four plants for extracting the wax in the Monterrey District of Mexico, two of which, it is stated, are shipping the product to the United Kingdom. The further statement is made that the supply of the plant is practically inexhaustible and the process of extraction inexpensive, while the wax obtained is of excellent quality. It may be mentioned that planting material of the candelilla plant has been distributed for trial among several of the experiment stations, by the Imperial Department.

STUDENTS' CORNER.

JULY.

THIRD PERIOD.

Seasonal Notes.

Describe the steps that may be taken on an estate to supply cane holes which have failed to produce plants. On what circumstances may such failure depend? Where the rainfall has been sufficient, and an inferior stand of cane has been obtained, a useful purpose will be served by digging out the cuttings from the vacant holes and examining them carefully, to find if the failure to sprout has been due to the presence of disease. Describe carefully the precautions that should be taken to prevent cuttings in the ground from being attacked by fungi. In these considerations, what hints are supplied with reference to the selection of material for planting? In supplying dead holes, it is most convenient, from the point of view of harvesting the cane, to employ varieties that mature early. Give examples of such varieties, and indicate their special characteristics. Compare the sprouting of a sugar-cane cutting with the growth of a cutting of a dicotyledonous plant.

In cotton fields, as the plants become firmly established, the time arrives for the making of careful observations, in order to detect the presence of insect and fungus pests. In regard to the latter, much more will have to be done in this way after the appearance of the bolls, as it is at this stage that cotton more usually shows the presence of fungus diseases. Returning to the matter of insect pests, and those which are related, the different kinds of treatment that are required in the several instances, for their control, will be seen to have intimate relation with the life-history and feeding habits of the pest. Follow up this subject, and discuss in relation to it, the treatment that has been proposed for the control of the leaf-blister mite. What special precautions are required in effecting the removal of material that has been attacked by this pest? Discuss the natural control by parasites, of insects attacking cotton.

Explain the process by which soil that is allowed to lie fallow may increase in fertility. State what is meant by the rotation of crops, and give reasons for the adoption of rotation. How are the root systems of the various plants, that are commonly grown, to be considered in relation to the adoption of various methods of rotation? What is the main objection to growing different crops of the same kind in a so-called rotation? Explain the uses of the employment of rotation with reference to insect and fungus pests, and to the economic conditions on the estate. Having regard to these and other considerations, suggest a scheme of rotation under agricultural conditions with which you are familiar.

Opportunity will be taken of the rains that should be received at this time of the year to plant yams, as well as other ground provisions. Give a description of the different kinds of yams with which you are acquainted, pointing out their special characteristics, and making a classification as far as possible. In the planting of yams, why should the soil be deep and easily worked? What information does the method of propagation of the yam give concerning the true botanical nature of the part that is edible? Describe the usual method for the propagation of yams. How should the land be prepared and lined out for the reception of the planting material? Discuss the practicability of raising catch crops of such plants as corn and sweet potatoes, between yams.

Give a careful account of the objections to the dependence of a colony or community on one or two crops. Why is it that such dependence may be more dangerous at the present time than it has been in the past? In relation to these matters, give consideration to the advantages of diversification of crops in agriculture. Having regard to the local conditions with which yon are familiar, make suggestions for such diversification. How is the possession of several crops by a community related to its spending power and its economic prosperity?

While dealing with the ordinary subjects relating to the Students' Corner, it may be well to draw attention to the announcement in connexion with the forthcoming examinations for the Courses af Reading of the Department, which is contained on page 232 of this issue of the *Agricultural News*.

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) Describe suitable rotations including (1) sugar-cane, (2) cotton.

(2) In what ways is the presence of humus in a soil beneficial to plants?

(3) Of what use to a plant is the possession of tendrils? Give an account of the modification of parts of a plant to form tendrils.

INTERMEDIATE QUESTIONS.

(1) To what considerations would you have regard in determining the value of a sample of molasses?

(2) What are the symptoms of the root disease of the sugar-cane?

(3) Give an account, with the aid of a simple sketch map, of the kinds of soil that are found in the island in which you live.

FINAL QUESTIONS.

(1) Write a description of any method of sampling sugars.

(2) Show, with examples, how the properties of soils are related to the plants that may be grown successfully on them.

(3) Give as many examples as you can of the modification of parts of plants for special purposes.

The chemists of Mauritius have formed themselves into a society for the purpose of unifying methods of analysis and of *sucrerie* control in the island. The newly formed society has under consideration a number of important questions, such as whether the density of the first mill juice represents that of the normal juice; methods of calculating the dilution; whether the density of the diluted juice should be taken before or after sulphitation; the best methods of sampling and preserving the different juices; and the adoption of the double polarization of the juice in place of the ordinary direct polarization. The society publishes a quarterly journal styled the *Bulletin de la Société des Chimistes de Maurice*, which has just come to hand, and to which we look in the future for some useful articles. The first two, by Messrs. Giraud and de Sornay, which will be found abstracted in this issue of the journal, promise well. (From the *International Sugar Journal*, May 1911, p. 237.)

FUNGUS NOTES.

THE SEREH DISEASE OF THE SUGAR-CANE.

The disease which forms the subject of the present article has long been known in Java, from which island it was first reported in 1882, though there is reason to believe that it occurred there as early as the year 1875. It has spread steadily and regularly there since the first observation of it, the direction of its progress being from west to east. There is, however, one peculiar limitation that has been observed in connexion with its spread, namely, that it never appears on canes growing at a high elevation, even though such localities are unsuitable to the plants in other respects.

Although much work relating to this disease has been conducted by several well qualified Mycologists, yet its actual cause is still very obscure, and none of the theories put forward on the subject can be said to have been at all definitely established. Moreover, although its symptoms are numerous, it is only in serious cases that all of them appear; often only a few of them are present with certainty. As a consequence of this, there is considerable doubt as to the number of countries in which the disease exists throughout the tropics, and a certain amount of confusion has arisen between this and other diseases. This question, which is of some importance, will be dealt with below.

According to an article by Maublanc, which appears in *L'Agriculture Pratique des Pays Chauds*, No. 91, p. 313, the most characteristic symptom is the shortening of the internodes of the stalk. This results in a very peculiar appearance of the diseased plant: the leaves are crowded together, and the young blades at the top of the stem open sooner than they do on normal plants, and spread out in the shape of a fan, instead of remaining for some time rolled up in a cylinder. The leaf blades are reduced in size and marked with lines of a yellowish green colour. Portions of them die and dry up. In addition to this, there is generally an abnormal development of the buds at the base of the stems, so that the latter become much branched. This is accompanied by a profuse production of roots, causing infected stools to present an appearance that is very different from that of those which are healthy. In fact, the attacked canes closely resemble the grass (*Andropogon Schoenanthus*) yielding lemon grass oil, which is common in Java, and known to the natives as 'sereh'. It is from this resemblance that the disease is said to have taken its name.

Besides the abnormalities which occur in the stem and leaves, sereh is often characterized by the presence of diseased roots on the canes. The tips of these are frequently seen to be dead, while in more serious cases the roots atrophy almost entirely. Another indication of this, as of other diseases of the sugar-cane, is that attacked plants have a marked tendency to arrow.

Although most of these symptoms are present in serious cases of the disease, yet in many instances there is a large variation from the typical appearance. The canes may attain a considerable size, but possess short joints in their upper parts; they are surmounted by a fan-shaped crown of leaves, while below, short branches are produced from the buds. All stages of alteration in appearance may occur—from the stunted and peculiar stools presenting the appearance of sereh grass, to stools having general characters very little different from those of healthy canes.

There are a few other external symptoms that may be present, among which the following may be mentioned. The nodes may be tinted red, and the growing portion of the stalk is often of the same colour; while the leaf sheath and the root origins become vermilion in colour. In some cases, there is no formation of wax on the stem and in some instances the leaf sheaths may stick to the stalk.

When a diseased stem is split open, it is seen that the tissues are considerably disorganized. The vascular bundles are filled with a quantity of gum, which completely blocks the cavities of the vessels. The position of the bundles is marked by a red discolouration which is most easily seen at the nodes, but often extends into the internode in the form of a narrow, red streak. Disorganization of the vascular bundles is also observable in the leaves. No gum is, however, formed in the diseased roots.

There are two theories as to the origin of the disease. According to the first, it is physiological, and due to unfavourable conditions of soil and climate, to want of proper tillage, or to the employment of unsuitable manures. The bulk of the evidence, however, is against this theory, as the disease would appear to be infectious. This is indicated by its method of spread in Java—by the fact that when it first appears in a field it does so in spots, which increase in area from year to year, and from the further fact that diseased cuttings, when planted, either rot or give rise to diseased canes. According to the second theory, it is an infectious disease due to a specific parasite, but opinions vary con- considerably with regard to the nature of the parasite. The disease has been attributed to the attacks of nematode worms on the roots, to the presence of a fungus in the tissues, as well as to the action of bacteria. The eel-worm theory of its origin is not now generally accepted, that having the greatest degree of probability being its attribution to the presence of bacteria.

By way of remedial measures, it is recommended that only thoroughly healthy cuttings should be planted, and that these should be taken from healthy canes grown on soil where the disease has not made its appearance. Much has also been done in Java in this respect in obtaining seedling canes more or less immune to the disease, while attention may again be called to the success which has accompanied the planting of healthy cane cuttings, produced in special nurseries in the mountains.

As will have appeared from the account of the symptoms as given above, this disease may be easily confused with one or two others. That for which it is most frequently mistaken is gummosis—a malady definitely known to be due to a bacterium, *Pseudomonas vascularum*, Cobb. In some respects also, it possesses symptoms resembling those of root disease, as for example, the fan-shaped arrangement of the leaves, the presence of dead roots, and of others dead and discoloured at their tips, as well as the large number of these that are developed. Other points of resemblance are the stunted appearance of infected stools, and the fact that the leaf-sheaths may adhere to the stem. Consequently, great care requires to be exercised in determining this disease in any country where root disease is known to exist, particularly if sereh has not previously made its appearance there.

As was stated above, there is some doubt as to the number of countries in which sereh has actually made its appearance. It has been found in Malacca, Borneo and Bangka, and appears to be more or less indigenous to that part of the world. It has also been reported from Australia, Mauritius and Réunion, but there appears to be reason for doubting its actual occurrence in these localities. Up to the present time, it has never been reported in the West Indies, although there has recently arisen cause for the belief that it may occur in certain places. Dr. Went, whose name is well known in connexion with diseases of the sugar-cane, was unable to find it in Surinam, ten years ago, even after extensive search; nor did he observe it in Trinidad, Barbados, St. Eustatius or St. Martin, though in these islands he did not have the same opportunity of making extensive observations. It would appear, however, that most careful investigations should be undertaken to determine with certainty if the disease is present, and to distinguish it definitely from root disease, so that the necessary measures may promptly be undertaken to control it.

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:—

The beginning of May brought with it a decided improvement in the drug and chemical markets. The advent of really fine and warm weather has resulted in an increased demand for such articles as citric and tartaric acids, lime juice, and products of a nature that enter into the composition of summer, or cooling drinks. There has been a steady sale in most commodities, but nothing in any one of a nature to command note. The condition of the markets in individual products has been as follows: —

GINGER.

At the first spice auction on May 3, 60 barrels and 214 bags of Jamaica were offered, a few only of which sold. Bold fetching 61*s.* and fair washed 56*s.* per cwt. A week later the prices had dropped for all kinds. Ten barrels of fair bright Jamaica were offered and bought in at 65*s.* per cwt. Seventy bags of limed and mouldy Japan were also brought forward and bought in at 40*s* per cwt. Cochin was in large supply, out of 554 bags washed rough offered, 524 were sold, fetching for fair to good bright 35*s.* 6*d.* to 37*s.* 6*d.* per cwt. On the 17th of the month, the prices obtained were 50*s.* to 53*s.* for good common, at which rates 60 bags were disposed of, middling dullish realizing 57*s.* Bold and medium brown rough Calicut, of which 160 packages were offered, were bought in at 51*s.* per cwt. At the last sale in the month, the general tone of the market was very dull. Jamaica was represented by 991 packages, all of which were bought in, though it was afterwards reported that several lots of good washed had been disposed of at from 60*s.* to 63*s.* per cwt : 42*s.* and 37*s.* were the prices at which washed rough Cochin and limed Japanese, respectively, were bought in.

NUTMEGS, MACE AND PIMENTO.

At the first spice auction on the 3rd of the month, West Indian nutmegs were represented by 105 packages, the prices ruling being as follows: 58's, 1*s.* 1*d.*; 63's, 10*d.*; 70's, 8*d.*; 87's, 5½*d.*; and 100's, 5*d.* to 5¼*d.* For the produce of the East, the prices were: 60's, 1*s.*; 65's, 10*d.*; and 70's, 9*d.* A week later, 108 packages West Indian were offered, and disposed of at similar rates, while those from the East were all bought in. On the 17th no West Indian were offered, but on the 24th the West Indies were represented by 234 packages, most of which found buyers, the prices paid being: 64's, 9*d.*; 66's, 8*d.*; 71's to 72's, 6*d.* to 6½*d.*; 85's to 86's, 5½*d.* to 5¾*d.*; 100's, 5¼*d.* Of mace at auction on the 3rd, 42 packages of West Indian sold at 2*s.* 3*d.* to 2*s.* 8*d.* On the 10th, 60 cases West Indian sold at 2*s.* 2*d.* to 2*s.* 4*d.*, while broken fetched 2*s.* to 2*s.* 1*d.* At the last sale of the month, 87 packages West Indian were disposed of at from 2*s.* 1*d.* to 2*s.* 7*d.* There has been but little demand for pimento during the month, the offerings in the early part of the month being all bought in. On the 17th, 30 bags were offered, and sold without reserve, at 2⅛*d.* to 2¼*d.* per lb. At the last sale on the 24th, some 25 bags were offered, and bought in at 2⅜*d.* per lb.

ARROWROOT.

For this article there has been but little demand. At the beginning of the month, some private sales were effected of about 700 barrels of St. Vincent, chiefly at the rate of 2*d.* per lb. This price was paid at the end of the month for a further consignment of 200 barrels.

SARSAPARILLA.

At the first drug auction on the 4th, sarsaparilla was well represented by 22 bales of grey Jamaica, 36 bales of Lima-Jamaica, 32 bales of native Jamaica, and 8 bales of Guatemala character. The whole of the grey Jamaica and Lima-Jamaica were disposed of, the first at 1*s* 9*d.* per lb., and the second at from 1*s.* to 1*s.* 1*d.* per lb. Five bales only of the 32 offered of native Jamaica found buyers, at 8*d.* per lb. for dull reddish; fair red being bought in at 11*d.* A fortnight later, 13 bales of grey Jamaica were brought forward, and disposed of at from 1*s.* 9*d.* to 1*s* 10*d.* per lb. for fair, partly rough. Eight bales of native Jamaica were also offered, but 2 only found buyers, good red fetching 1*s.* 3*d.* and dull red 9*d.* per lb.

KOLA, CASSIA FISTULA, LIME JUICE, LIME OIL, TAMARINDS.

One bag of good dried West Indian kola was brought forward at the beginning of the month and sold at 4¼*d.* per lb. Of Cassia Fistula, the East Indian supply is reported to have quite failed, and as there is also a great deficiency in the West Indian supply the article is much enquired for. In the early part of the month the quotations for West Indian lime juice, ordinary to good raw, was from 1*s.* to 1*s.* 3*d.* per gallon. At the end of the month it was reported that though the supplies were small, the prices quoted were somewhat lower, namely 11*d.* to 1*s* 1*d.* per gallon. For West Indian concentrated lime juice for the same periods, the price has been uniformly, £18 2*s.* 6*d.* to £18 7*s.* 6*d.* West Indian distilled lime oil, early in the month realized 1*s.* 5*d.* per lb, while hand pressed was quoted at 5*s.* 3*d.* At the end of the month 1*s.* 4*d.* was the quoted price for distilled oil, and 5*s.* for hand pressed. At the first auction on the 3rd some 10 casks of ordinary black Calcutta tamarinds were sold at 10*s.* 6*d.*, and for 11 more casks, slightly mouldy, 2*s.* 6*d.* was paid. On the 17th, 8 barrels of pale juicy sold at 14*s.* per cwt, and 15 barrels of dry Antigua were bought in at 10*s.*

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR, July 4, 1911; Messrs. E. A. DE PASS & Co., June 10, 1911.

ARROWROOT—2*d.* to 3¾*d.*
BALATA—Sheet, 3/4; block, 2/6 per lb.
BEESWAX—No quotations.
CACAO—Trinidad, 55/- to 65/- per cwt.; Grenada, 49/6 to 55/6; Jamaica, 48/- to 53/-.
COFFEE—Jamaica, 57/- to 112/-.
COPRA—West Indian, £25 10*s.* per ton.
COTTON—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 15*d.* to 22*d.*
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—50/- to 66/- per cwt.
HONEY—27/- to 37/6.
ISINGLASS—No quotations.
LIME JUICE—Raw, 1/1. to 1/6; concentrated, £18 2*s.* 6*d.* to £18 7*s.* 6*d.*; Otto of limes (hand pressed), 5/-, nominal.
LOGWOOD—No quotations.
MACE—2*s.* to 2*s.* 2*d.*
NUTMEGS—Quiet.
PIMENTO—Common, 2⅜*d.*; fair, 2$\frac{7}{16}$*d.*; good, 2¼*d.* per lb.
RUBBER—Para, fine hard, 4/1½; fine soft, 3/11; fine Peru, 3/10 per lb.
RUM—Jamaica, 1/7 to 5/-.
SUGAR—Crystals, 14/6 to 17/-; Muscovado, 11/3 to 14/-; Syrup, 10/6 to 12/3 per cwt.; Molasses, no quotations.

New York.—Messrs. GILLESPIE BROS. & Co., June 30, 1911.

CACAO—Caracas, 11c. to 12c.; Grenada, 11¼c. to 12½c.; Trinidad, 11½c. to 11¾c. per lb.; Jamaica, 9¼c. to 10½c.
COCOA-NUTS—Jamaica, select, \$28·00; culls, \$16·00 to \$17·00; Trinidad, select, \$28·00; culls, \$16·00 to \$17·00 per M.
COFFEE—Jamaica, 12½c. to 14½c. per lb.
GINGER—10c. to 12c. per lb.
GOAT SKINS—Jamaica, 53c.; Antigua and Barbados, 48c. to 50c.; St. Thomas, St. Croix and St. Kitts, 46c. to 48c. per lb.
GRAPE-FRUIT—Jamaica, no quotations.
LIMES—\$7·25 to \$8·00.
MACE—48c. to 53c. per lb.
NUTMEGS—110's, 10c. per lb.
ORANGES—Jamaica, no quotations.
PIMENTO—4½c. per lb.
SUGAR—Centrifugals, 96°, 3·98c. per lb.; Muscovados, 89°, 3·48c.; Molasses, 89°, 3·23c. per lb., all duty paid.

Trinidad,—Messrs. GORDON, GRANT & Co., July 10, 1911.

CACAO—Venezuelan, \$12·00 per fanega; Trinidad, \$11·00 to \$11·75.
COCOA-NUT OIL—80c. per Imperial gallon.
COFFEE—Venezuelan, 15c. per lb.
COPRA—\$3·50 per 100 lb.
DHAL—\$3·60 to \$3·80.
ONIONS—\$2·00 to \$2·25 per 100 lb.
PEAS, SPLIT—\$5·50 to \$5·60 per bag.
POTATOES—English, \$2·00 to \$2·25 per 100 lb.
RICE—Yellow, \$4·75 to \$4·80; White, \$5·40 to \$5·50 per bag.
SUGAR—American crushed, no quotations.

Barbados,—Messrs. JAMES A. LYNCH & Co., July 14, 1911; Messrs. T. S. GARRAWAY & Co., July 17, 1911; Messrs. LEACOCK & Co., June 23, 1911; Messrs. E. THORNE, Limited, July 18, 1911.

CACAO—\$10·50 to \$11·00 per 100 lb.
COTTON SEED—\$22·40 per ton; meal, \$1·50 per 100 lb.; 2½ per cent. discount.
COTTON SEED OIL (refined)—61c. per gallon.
COTTON SEED OIL (for export)—51c. per gallon (in bond).
HAY—\$1·20 per 100 lb.
MANURES—Nitrate of soda, \$60·00 to \$65·00; Cacao manure, \$42·00 to \$48·00; Sulphate of ammonia, \$75·00 to \$76·00 per ton.
MOLASSES—No quotations.
ONIONS—\$2·00 to \$2·37 per 100 lb.
PEAS, SPLIT—\$5·70 to \$5·75 per bag of 210 lb.; Canada, \$2·75 to \$4·20 per bag of 120 lb.
POTATOES—Nova Scotia, \$4·25 per 160 lb.
RICE—Ballam, \$4·60 to \$4·65 per 100 lb.; Patna, no quotations; Rangoon, no quotations.
SUGAR—No quotations.

British Guiana.—Messrs. WIETING & RICHTER, July 11, 1911; Messrs. SANDBACH, PARKER & Co., June 9, 1911.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	\$9·50 to \$10·00 per 200 lb.	\$10·00 per 200 lb.
BALATA—Venezuela block	No quotation	Prohibited
Demerara sheet	70c. per lb.	65c.
CACAO—Native	11c. per lb.	12c. per lb.
CASSAVA—	\$1·20	No quotation
CASSAVA STARCH—	\$6·50 to \$7·00	No quotation
COCOA-NUTS—	\$12 to \$16 per M	\$10 to \$16 per M., peeled and selected
COFFEE—Creole	16c. per lb.	15c. per lb.
Jamaica and Rio	19c. per lb.	18c. per lb.
Liberian	10½c. per lb.	10c. per lb.
DHAL—	\$3·75 per bag of 168 lb.	\$3·75 per bag of 168 lb.
Green Dhal	\$3·50	——
EDDOES—	\$1·20	——
MOLASSES—Yellow	None	——
ONIONS—Teneriffe	—	——
Madeira	6c.	7¼c.
PEAS—Split	\$5·65 per bag (210 lb.)	\$5·85 per bag (210 lb.)
Marseilles	\$4·00	No quotation
PLANTAINS—	20c. to 40c.	——
POTATOES—Nova Scotia	—	\$4·25
Lisbon	——	No quotation
POTATOES-Sweet, B'bados	96c. per bag	——
RICE—Ballam	No quotation	——
Creole	\$5·25 to \$5·50	\$5·00 to \$5·25
TANNIAS—	\$1·68 per bag	——
YAMS—White	\$3·36	——
Buck	\$3·60	——
SUGAR—Dark crystals	\$2·70 to \$2·75	None
Yellow	\$3·25	\$3·00
White	\$4·00	\$4·00 to \$4·25
Molasses	\$2·10 to \$2·30	None
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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A FORTNIGHTLY REVIEW
OF THE
IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

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CONTENTS.

The Supply of Sulphur to Cultivated Crops.

THE extent to which cultivated plants require nitrogen, phosphate and potash, in order that they may attain a proper development and give an adequate yield, has long been the subject of practical determinations, by agriculturists, in the form of laboratory and field experiments. There has not been by any means the same amount of attention to the similar requirements in regard to sulphur as a plant food; for various circumstances, to be stated later, have led it to be considered that these are small and adequately supplied without the making of any specific attempts to provide sulphur in manures. Recent work* on the part of investigators has, however, made it doubtful if this is a correct view of the case, and the purpose of the following article is to present a simple account of the objects and results of this work.

The investigation was suggested by experiments which had for their object the determination of the amount of sulphur in the feeding material given to sheep for the production of wool. Sheep's wool consists largely of a proteid material rich in sulphur, and this made it appear that the crops on which the sheep were usually fed must contain and provide a larger amount of that element than is commonly understood. The subject was further advanced by the recognition of the fact that the determination of the amount of sulphur in plants, by an examination of the ash, gives results which are generally much too low, as that substance is lost to a greater or less extent during the course of the analyses; the work of several investigators has given support to this view of the case.

In the trials which were undertaken, methods were employed for the determination of the amount of sulphur present (as sulphur trioxide) which would entail as small a loss as possible of sulphur during the work of analysis. Some of the results obtained in this way are interesting. They show that a given quantity of rice grain contains one hundred times as much sulphur trioxide as that which would be indicated by analysis of the ash from that amount

*Research Bulletin No. 14, of the Wisconsin University Agricultural Experiment Station, entitled *Sulphur Requirements of Farm Crops in Relation to the Soil and Air Supply.*

of grain; while in the case of cotton seed and the soy bean, the total sulphur trioxide recovered by the method employed is about ten times as great as that in the ash. The disparity is usually largest in plants like the cabbage and the onion, which contain a fair proportion of volatile sulphur oils.

The matter of practical importance brought forward by these considerations is that cultivated crops probably remove much more sulphur from the soil than has been supposed. Thus, basing the computation on an ash analysis, a crop of corn of 100 bushels per acre would appear to remove about ½-lb. of sulphur trioxide; while the total actual amount consumed by the same crop, employing the method of determination used by the investigators, would be more than 20 lb. These facts are sufficient to show that careful attention is required to the subject of the supply of sulphur from the soil to growing plants.

It is commonly realized that a certain amount of sulphur must be available for the use of plants, particularly in view of the fact that all the proteids which are found in plants contain sulphur. The reason why so little attention has been given to this element in devising schemes of manuring would appear to be that the amount of sulphur required by crops is usually considered to be small, so that little is removed from the soil and the ordinary supply is sufficient for the growth from season to season. There are added to this circumstance the difficulties that arise in estimating the total sulphur in soils; the most reliable methods that have given the best figures are tedious, but are much more accurate than that of ash analysis or extraction with acids because they give results which take account of all the sulphur in the soil, in whatever form it may exist. It may be stated shortly that the effect of the more accurate determinations has been to show that the amount of sulphur in all ordinary soils is comparatively low.

There is not much significance to be attached to this proportionately low sulphur content of soils, if it continues to be maintained that the requirements of plants in this direction are also relatively small. The matter appears in another aspect, however, when it is considered, as a result of the work to which attention is being given, that the amount of sulphur removed by crops from the soil is, in proportion to the supply, quite as large as that of phosphates; while in the case of crops like the cabbage, onions and turnips, it is actually larger.

The work undertaken included the determination of the change in the sulphur content of soils that is caused when plants are being grown continually on them, and for the purpose a number of analyses of cropped, virgin and manured soils were made, the soils of the different kinds being as nearly alike as possible in relation to such matters as drainage and topography. The unmanured soils employed in the investigation had received little or no manure for periods varying between fifty and sixty-three years. The manured soils had been chiefly given applications of stable manure.

It was shown, first of all, that about 40 per cent. of the sulphur trioxide had been lost by the growing of crops on the unmanured soils: in every case they gave a smaller percentage of sulphur trioxide than was found in the virgin soil. The matter of practical importance which may be deduced is that the continuous raising of crops on land, without adequate manuring, causes a large decrease in its sulphur content. With the manured soils, it was demonstrated that their sulphur content was maintained, and even increased to some extent, by liberal applications of stable manure.

The amount of sulphur in the soil and the quantity supplied in manure cannot be considered alone. in in such investigations. Rain-water is responsible for the addition of a certain amount of sulphur to the soil, more particularly in parts of the world where soft coal is burned. It is pointed out in the Bulletin which describes the work under review that it has been found at Rothamsted that the annual rainfall adds about 18½lb. of sulphur trioxide per acre. This quantity naturally varies, from season to season, and with the conditions of the country which may be under consideration. Correlated with this gain of sulphur there is its loss in drainage water. At Rothamsted, Voelcker and Frankland have found that the quantity of sulphur trioxide lost annually from the unmanured and manured plots are respectively 24·7 and 41·0 to 106·1 per million. In discussing such losses, Hall assumes that the mean annual drainage is equal to 10 inches of rainfall and, employing the above figures, each acre of the unmanured land would lose annually about 50 lb. of sulphur trioxide, while the similar loss in the case of manured land would be from 85 to 220 lb. Thus the loss of sulphur trioxide by drainage is large, and, in the case of unmanured lands, it is nearly three times as great as the amount contributed in the rainfall. These figures are not, of course, universal in their application; they will be modified considerably, particularly by matters connected with climate.

These considerations would appear to indicate that it is necessary for the supply of sulphur in cultivated land to be maintained with the aid of manures. This has been done unconsciously for many years, more especially by the application of superphosphate of lime (which contains calcium sulphate), ammonium sulphate, potassium sulphate and pen manure, while gypsum has often been used, with the idea that it was more in the nature of a stimulant than an actual provider of plant food. In this way, the methods are indicated which must be employed if it is considered necessary to supplement the supply of sulphur in the soil. The question has not yet been completely answered, nor is it claimed that this is the case by the authors of the work under consideration, who state on the other hand that they: 'realize the desirability of extreme caution and conservatism in presenting the views outlined.' The importance of the subject from the practical point of view, the small amount of attention that it has received in the past, and the striking results that appear to be obtained when it does receive attention, all point to the necessity for further careful work which will supply definite knowledge as to the requirements of plants for sulphur, and the ability of the soil to supply them with this element.

THE SUGAR INDUSTRY OF THE UNITED STATES, IN 1909.

The following is taken from the *Sugar Beet* for July 1911, p. 214. The original article is a summary, made for that paper, of the results of the cane and beet sugar census in 1909, issued by the United States Census Bureau.

The quantity of cane treated in sugar mills in 1909 was 4,628,200 tons, valued at $17,605,000, an average of $3·80 per ton. The average quantity of cane treated per establishment in Louisiana is 23,660 tons, compared with 26,050 tons for Texas. Of the total quantity of cane treated, 57 per cent. was returned as grown on farms and plantations under the control of the manufacturers, and 13 per cent. was purchased.

Of the value of products, that of sugar constituted 89 per cent. of the total, molasses 9·6 per cent. and syrup 1·4 per cent. The total production of cane sugar was returned as 334,100 tons of 2,000 lb., of which 325,500 tons, valued at $26,017,000, were produced in Louisiana and 8,600 tons, valued at $669,000 in Texas. The distinction made in this investigation between molasses and syrup is that the former includes the liquid product from which sugar has been removed, while the latter includes the product from which no sugar has been removed.

Only 18 establishments were returned as manufacturing brown sugar by the open kettle process, which method was formerly very generally employed. These establishments manufactured 3,700 tons of sugar, valued at $301,000, or slightly more than 4c. per lb.

The total area planted in beets in the United States, in 1909 was 416,000 acres, as compared with 135,300 and 240,800 acres in 1899 and 1904, respectively. From this area, 3,965,300 tons of sugar was made; while the quantities for the above years, in the same order, were 794,600 and 2,175,400 tons.

The quantity of granulated (beet) sugar increased from 57,900 tons in 1899, to 496,800 tons in 1909, and the value from $5,581,000 to $45,646,000. Raw (beet) sugar, sold as such, decreased in quantity, which indicates that the manufacturers are now refining a larger percentage of their sugar output than previously.

Of the total value of beet products, that of granulated and raw sugar constituted 95 per cent., and molasses 2 per cent. Colorado leads the other States in the value of products, its proportion amounting to 29 per cent. of the total, followed by California with 25 per cent., and Michigan with 22 per cent.

The total production of sugar in this country increased from 90,800 tons in 1879 to 835,800 tons in 1909, or 820 per cent.; the increase in the quantity of cane sugar in the 40 years was 274 per cent., and the entire development of the beet-sugar industry is measured by this period.

The imports of sugar into the United States during the period 1879 to 1909 increased from 914,600 tons to 2,887,100 tons, or 216 per cent. In 1909, of the total imports, 32 per cent. came from non-contiguous sections of the United States, and 68 per cent. from other countries. Not taking account of stocks on hand, the supply of sugar for the United States in 1909 was 3,722,900 tons, made up of domestic production amounting to 835,800 tons, and imports to 2,887,100 tons. If the 94,600 tons exported during the year be deducted, the amount retained for consumption is found to be 3,628,300 tons, indicating a per capita consumption of 79 lb., which compares with 59 lb. in 1899, 51 lb. in 1889, and 39 lb. in 1879.

CHANGES IN SUGAR SOLUTIONS AT HIGH TEMPERATURES.

The following are among the conclusions reached in a bulletin on this subject, entitled *The Effect of High Temperatures on Cane-Sugar in Solution* (Bulletin 36 of the United States Department of Agriculture). They are selected and given here on account of their more technical interest:—

The system obtaining in cane juices is a very complex one, consisting of very variable amounts of salts of both strong and weak acids and of free alkali. Hence a temperature which may be safe with one juice may cause serious inversion in another. With the conditions usually prevailing in local factories, juices should suffer a half hour's heating at 120°C. with no detectable loss of sugar. It would be conservative to adopt this temperature as the highest to which cane juices should be subjected during the process of evaporation, though under a careful system of control and observation a temperature of 125° (or even 130° C. for shorter periods) might be permissible.

The sterilization of cane sugar products is possible since it occurs almost instantaneously at 125° C., which is very close to the thermal death point of the most heat-resistant sugar-house bacteria, and since at this temperature in alkaline solution the inversion of cane sugar is very slow.

The effect of high temperatures on clarification is very small; the most that can be hoped for is a juice from which the dirt might be separated with a little more ease.

The use of high temperature evaporation and the preheater system of evaporation, and also the sterilization of all cane sugar house products, is possible under a rational system of control.

FRUITS AND FRUIT TREES.

THE PRODUCTION OF MOCHA COFFEE.

All the Mocha coffee grown in the world comes from the Yemen, a Turkish province in the south-western part of Arabia, and is so called because the entire crop was formerly shipped from Mocha. The trade is now wholly divided between Hodeida and Aden, the bulk of it going from the latter port. Coffee can be grown successfully, probably, in any of the mountainous parts of the Yemen, but its cultivation is, in fact, confined to a few widely scattered districts and the acreage is relatively small. This is due to the fact that the Yemen Arab never uses coffee himself, contrary to general opinion and the reports of some travellers, but cultivates it almost entirely for export. He uses 'Kishar', a beverage he brews from the dried hulls in large quantities, but it is certain that he never would devote much land or labour to the cultivation of the berry for its hulls, because there would be little profit in it. In cultivating coffee for export, the Arab realizes a good profit in money when his trees yield their crop and it is sold. But he must wait four years after planting, during which the cost of labour is heavy, before his trees begin to yield, and the main desideratum with him is not money but food. In a land where the barter of commodities is difficult, through lack of means of communication, money may mean clothing and comforts: but the one necessity is food, and he may not always be where he can buy food with his money. In consequence, the Yemen Arab devotes little of his land to coffee, and very much excellent coffee land to dhurra, a plant resembling Indian corn in appearance but producing a grain like millet. He argues that, however superior the money-getting qualities of land planted with coffee, he gets sixteen crops of dhurra while waiting for one of coffee, and is sure that his family is safe from starvation. According to the American Consul at Aden, the principal coffee regions are in the mountains between Taiz and Ibb, and between Ibb and Yerim, and Yerim and Sanaa on the caravan route from Taiz to Zabeed; between Hayelah and Menakha on the route from Hodeida to Sanaa, and in the wild mountain region north and south of that route; between Beit-el-Fakih and Obal, and between Manakha and Mathan to the north of Bajil. Of all Yemen or Mocha coffee, the best is that known as Mohtari, from the district of Beni Mohtar, lying almost due south of Sanaa. Another nearly, if not quite as good, comes from Yafi, near Taiz. Other kinds that are considered superior are Sharsh, Menakha and Hifash. It is said that all these coffees are the same variety, and that the superior quality of any of the so-called kinds is due wholly to the curing. In Beni Mohtar the coffee lands are held by large and wealthy proprietors, whose means enable them to hold their crop for some months after it is gathered. The berries picked in September are accordingly stored away, and allowed to cure all the winter. The bean thus dries out thoroughly before it is hulled and brought to market. This accounts for the clear, almost translucent yellow colour of the finest berries when they reach the market. The planters in the other districts, however, are compelled to sell their crop quickly, in order to tide over the winter. Hence they pick the fruit before it is properly ripened, and hull the berry before it is properly dried. As a result, the colour is pale and lifeless, the flavour weak and flat, compared with the berry cured within the hull. So little is coffee used by the people, that a few months after the new crop has been gathered, it is impossible for one passing through the country to buy a single pound, except at Hodeida and Sanaa. (The *Journal of the Royal Society of Arts*, May 5, 1911, p. 618.)

EXAMINATION OF THE AGRICULTURAL SCHOOL, DOMINICA.

The following is the report of the Examiner (Mr. F. W. South, B.A.) on the recent half-yearly examination of the Agricultural School in Dominica:—

In consequence of an alteration in the curriculum of the Agricultural School, the half-yearly examination papers were set this year so as to contain questions on the first half of the syllabus laid down for Preliminary Candidates in the Reading Courses examination as outlined by the Imperial Department of Agriculture. The examination was confined to the subject of Agriculture, in which two papers were set, each containing four questions.

Eight boys sat for the examination; the best answers were written by G. Cuffy, who secured 75 per cent. of the marks obtainable. The average percentage of marks obtained by all the pupils was 62·5.

In general the papers were fairly satisfactory, and the standard of knowledge attained was fairly uniform. The answers revealed a very creditable grasp, on the part of the pupils, of the main principles of general agriculture, as contained in the schedule upon which the work had been conducted. Particular points of weakness are referred to in the special reports on each paper. The usual difficulties connected with the correct use of the English language were in evidence.

On the whole, the work done was satisfactory, and reflects creditably on the teaching which the boys have received.

[The details of the marks obtained by pupils are omitted here.]

GENERAL AGRICULTURE. Paper I.—Questions 2 and 3 were well answered by almost all the boys, but the answers to the first and last were not so good. Insufficient attention was paid to the manner in which plants absorb water, and not enough details of the process were given. In the case of the last question only a few of the boys mentioned that budding and grafting are employed for reproducing plants that are not easily grown from seeds or cuttings, while one alone mentioned their use as a preventive of some forms of disease. No one attempted to explain why budded and grafted plants come true to the parent type while seedlings often do not.

Paper II.—This paper was not as well answered as the first. The answers to question 1 were scrappy and very few boys mentioned the value of pen manure in providing humus. In question 2 the substance implied was carbon and some account of carbon assimilation was expected; in most cases it was only referred to very casually and the mistake was made of considering carbon dioxide as a plant food in itself and not as merely a carrier of carbon. Question 3 was usually well answered, but in question 4 the answers showed much confusion; many boys did not mention the presence of the bacteria in the nodules of leguminous plants, though referring to the nodules themselves.

TEPHROSIA CANDIDA AND T. PURPUREA AS GREEN DRESSING CROPS IN ST. LUCIA.

The following interesting notes on *Tephrosia candida* and *T. purpurea* have been prepared by Mr. A. J. Brooks, Assistant Agricultural Superintendent, St. Lucia:—

A small quantity of seed of *Tephrosia candida* was received from the Imperial Commissioner of Agriculture in November last, under the name of Boja Medelloa, this being the common name by which this plant is known in Ceylon (see *Agricultural News*, Vols IX, p. 341; X, p. 91).

The seeds were sown broadcast on November 11, in fairly heavy soil; they germinated well, but the plants grew slowly for the first few weeks; this appears to be a common characteristic of Tephrosias. As the plants advanced in age, the growth greatly increased in rapidity.

At the time of writing—eight months from the date of sowing—the plants are of an average height of 6 feet, with a 4- to 5-foot lateral spread, the main stem being well furnished with lateral branches 2 to 2½ feet long. The root system is of a spreading habit, the tap root being of an average length of only 6 inches. Many of the lateral roots are, however, 3 to 4 feet in length, and bear a few nodules.

The crop is still growing strongly, and has not yet shown signs of flowering. It has thoroughly covered the ground with a mass of light, feathery foliage, and in this particular case has effectually kept down every weed, even Johnson grass (*Sorghum halepense*), which is probably the worst weed known to the agricultural world.

Most authorities state the general height of this plant to be from 3 to 4 feet. The growth of the plants in this trial may, therefore, be regarded as exceptional, but I am inclined to think that this growth would be general in a fairly heavy, but open, soil.

As the amount of seed received was only sufficient to plant a small plot, it is impossible at present to do more than place on record the growth and characters of the crop. As soon as seed is obtained, trials will be made to ascertain the behaviour of the plant in cacao and lime plantations, and its ratooning powers and yields of green and dry humus.

Seeds of *T. purpurea* (see *Agricultural News*, Vols. VIII, p. 405; IX, p. 281, and X, p. 75), known in Ceylon as Kavalai, and Pila, were also received from the Commissioner of Agriculture, for trial. A small quantity of soil in which this Tephrosia had previously been grown was also received, and a little mixed with the seeds when sown in the field in February. Like that of *T. candida*, the seed was slow in germinating, but after the first few weeks the growth became rapid; this, curiously enough, appeared to greatly increase as the plants commenced to flower.

Flowering began three months after sowing; the flowers were purple and white, and very small. At this stage, the plants were from 2 to 2½ feet in height, with a lateral spread of 3 feet. The tap roots in this case were almost twice as long as those of *T. candida*, being of an average length of 1 foot. The root system was much branched, and produced rather fewer nodules than the roots of *T. candida*; this was probably because of the short time taken from germination to the flowering stage, as compared with the similar period of the former.

From various reports from India and Ceylon it would appear that the growth of this crop was normal; the height is given as 1 to 3 feet. It is, however, stated in Vol. VIII, p. 405, of the *Agricultural News*, following an article in *L'Agronomie Tropicale*, that this plant when fully grown is 9 to 11 feet high. It is possible that *T. purpurea* has been confused with *T. candida*.

Seed is being harvested, and in the near future, trials similar to those proposed for *T. candida* will be conducted, and the results published.

From the present results, it is readily seen that both these plants are valuable additions to our green manuring crops in the West Indies.

In forwarding these notes, Mr. J. C. Moore, Agricultural Superintendent, St. Lucia, states that *T. Candida* appears to be the most promising cover crop as a green dressing for cacao and limes that he has yet seen, but that it remains to be put to a practical test, under estate conditions.

Bulletin No. 3 of the Indian Forest Service describes an investigation made for the purpose of ascertaining if there is any difference of strength between naturally grown and plantation timber, in the case of teak. The samples employed were chosen so as to be similar as regards their content of moisture, and the experiments were performed with blocks of each kind having the same dimensions. The results showed that plantation teak is as strong as that naturally grown, except under transverse strain, and even here, the difference is negligible in practice.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date July 17, with reference to the sales of West Indian Sea Island cotton:—

Since our last report, about 150 bales of West Indian Sea Islands have been sold at prices ranging from $15\frac{1}{2}d.$ to $17\frac{1}{2}d.$, and Stains $8\frac{3}{4}d.$ to $9\frac{1}{2}d.$

There is very little doing in Sea Island cotton, but prices are quite steady.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending July 15, is generally as follows:—

There has been no demand again this week, and we can only report the market dull, and repeat last quotations. The unsold stock is still almost entirely held off the market.

SEA ISLAND COTTON IN HAWAII.

One difficulty which has been experienced in growing Sea Island Cotton in Hawaii is that of excessive yield, which results in a too prostrate form of growth. In one locality on the windward side of Oahu, where the rainfall is about 70 inches per year. 2 acres of Sea Island cotton required about 5,000 props in order to keep the branches from lying upon the ground and causing the bolls to rot. In this respect the Caravonica cotton is superior to Sea Island, since it invariably has an upright habit of growth. The difficulty experienced with the prostrate habit of the Sea Island can be appreciated from a consideration of the fact that, in the 2-acre field just mentioned and in another 1-acre field, on the leeward side of Oahu, the average number of bolls per plant was 700, and on one tree 1,200 bolls were counted at one time. This produces a weight under which the slender branches of the Sea Island cannot support themselves in an upright position. An elaborate series of pruning experiments is now under way with the idea of learning a method by which an upright growth can be induced in the Sea Island cotton, at least for the second and subsequent years of the crop. Some promise is already held out by these experiments. A strain of Sea Island, secured from one of the best plantations on James Island, S.C., shows a more upright habit of growth than any other strain of Sea Island which has thus far been secured. (From the *Annual Report of the Hawaii Agricultural Experiment Station*, 1910, p. 13.)

USES FOR COTTON.

A circular has been issued by Messrs. D. F. Pennefather & Co., of Liverpool, which deals with the new uses that have been found for cotton in recent years, and from this the following information is taken.

It is pointed out that there is hardly an industry of importance to-day in which cotton is not used. Among the largest consumers are the railway companies, chiefly for air-brake hose, enamelled ceilings, plush chairs and 'leather' seats. It is believed that the railways and trolley lines in England alone require annually an amount of cotton cloth equivalent to about a quarter of a million bales. Cotton is also largely consumed in the motor car industry, chiefly for the cotton duck basis for tyres, and for the manufacture of 'leather' cushions and seats. For the former purpose, it is estimated that 290,000 bales are required, out of a total of 325,000 bales consumed in the motor car industry.

For the harvesting and marketing of cereal crops, a great amount of cotton is used in making bags, and cotton duck is employed in very large quantities for manufacturing aprons, carriers and elevators for reapers and binders, and other agricultural machinery. In relation to such machinery, it is supposed that the annual output throughout the world is about $1\frac{1}{2}$ million new machines, and this accounts for the consumption of about 50 million yards of cotton duck, at 2 lb. to 3 lb. per yard.

One of the largest uses for cotton is the provision of insulating material for wires in electrical work. This is evident when an attempt is made to consider the increasing extent to which these are being employed.

The armies and navies, too, of various countries account for the consumption of a large amount of cotton, mainly for the provision of khaki cloth and other duck. As far as the navies are concerned, it is a fact that more cotton duck is used in battleships to-day than when the men-of-war were all sailing vessels. Its use for sails has been largely replaced by its employment for making awnings, coverings for launches and for similar purposes.

In the coal-mining industry, cotton is chiefly required in large quantities for the provision of 'brattice cloth' for making ventilating chutes, and in the manufacture of coal bags. For the latter purpose alone, about 15 million yards of cotton duck are required annually.

The increased use of tarpaulins has led to a greater consumption of cotton for making these, and this is the case particularly in South Africa, where the tarpaulin is used instead of the old flax duck cover for vehicles and tents. It is in South Africa, too, that the cotton blanket is now used almost exclusively in the place of the former woollen blanket; the number of cotton blankets imported annually into

South Africa is about 900,000. Again, in relation to clothing, the heavy wool and fur garments that were used in former years, in the Canadian and American North-west have been replaced largely by overcoats of cotton duck with blanket lining; it is supposed that this branch of the trade alone accounts annually for 20 million yards of cotton duck.

In fire-proof buildings, the asbestos covering of the exposed parts of steam and hot-water pipes is supplemented by strips of cotton duck. In houses, wall paper has been replaced to a great extent by cotton cloth, and similarly buckram of cotton cloth has largely taken the place of burlap.

Rough estimates of the more modern ways of cotton consumption are given as follows: cloth signs and advertisements, several million yards; for squeezing water out of clay, in pottery establishments, a very large quantity annually; 4 million yards of cotton duck are required by the British Government for making coin bags; cotton bagging is used by cement companies to the extent of about 8 million yards, every year; the feed bags for horses account for about 2 million yards of cotton duck; enormous quantities of heavy cotton duck are used for driers in wood pulp paper mills and other paper mills; millions of yards of this useful material, as well as of cotton drill are employed for making waggon tops, cushions, waterproof cloaks, 'pantasote', and other articles; millions of yards, also, of a heavy cotton duck, 46 inches wide, are used annually for the purpose of filtering oils.

These do not include all the instances where cotton is used in conjunction with rubber, more especially as the basis of rubber belting and all kinds of rubber hose, the manufacture of which requires 50 million yards, every year. Minor uses in conjunction with rubber are for making gloves, for stiffening gauntlets, leggings, tennis and gymnasium shoes, and shower bath canopies.

Other modes of employment of cotton include its use in the covering of trunks and telescopes, in book-bindiug and in draining mines. All the examples enumerated above do not cover every way in which cotton is utilized. They serve, however, to indicate that its employment exists in many other directions than in the provision of clothing, and the number of uses to which it will be put in the future is likely to increase with the continuation of invention and the devising of new methods of manufacture.

AGRICULTURE IN PORTO RICO IN 1910.

The agriculture of the island, with the exception of food crops raised merely for local consumption, consists in the raising of sugar-cane, coffee and tobacco.

SUGAR. The 1909-10 shipments of sugar aggregated 284,522 tons (an advance of 40,000 tons) and were valued at £4,904,400. The average price per ton was £17 3*s*. The entire production was handled by 43 centrals (factories grinding other cane than their own), 22 lal factories (haciendas) and 65 trapiches or small mills. Indications of the growing crop (1910-11) point to a 400,000-ton yield.

TOBACCO. During the year great improvement was effected in workmanship, factory conditions, selection and scientific cultivation, with the result that the manufactured output now compares favourably with that of any other tobacco-producing country. During the year there were exported 151,724,438 cigars, consumed 92,700,160, total output 244,424,598; an increase over 1908-9 of 19,189,059. During the same period 13,142,000 cigarettes were exported and 393,844,300 consumed, total output 406,986,300; an increase over 1908-9 of 30,816,300. Besides the above, tobacco leaf was exported to the value of £262,149.

FRUITS. The aggregate value of fruit shipped was £340,795. The capital invested in this industry appears to be increasing and more land for the purpose is to be taken up gradually.

ORANGES. Oranges to the value of £121,399 were shipped, of which, however, about half were of what is termed the 'wild orange', that is to say, fruit of already existing island plantations and not the produce of the recent systematic cultivations.

GRAPES. Grapes to the value of £32,902 were exported, more than double the figures of the previous year.

PINE-APPLES. The output of pine-apples (whole) reached £115,634 in value, an increase of £23,383.

The export of canned pine-apples decreased £2,342, owing to the more profitable market presenting itself for whole fruit.

COCOA-NUTS. Shipments of cocoa-nuts, valued at£45,598, showed an increase of £29,942.

Minor fruits, shipped to the value of £2,052, declined about 5 per cent. on the previous year's figure.

COMPANIES. During the year 54 companies—14 for sugar-making, 18 for raising and canning fruit, and 22 for coffee-growing, cattle-raising, and transportation—were registered, with an aggregate capital stock of £10,416,666.

At the end of last year (1908-9) there were 119 domestic and 142 foreign companies doing business, with authorized capital of £62,365,508 and £4,564,910, respectively.

Up-to-date foreign companies are required to submit to the proper authorities two reports annually, but a proposition is about to be considered to decrease this to one only. (From *Diplomatic and Consular Reports*, No. 4657, Annual Series.)

Details of a new transplanting spade are contained in *The Field* for May 20, 1911, p. 976. This consists of a cylinder 5 or 6 inches in diameter, open at the top and bottom, and possessing a keen cutting edge. The cylinder is divided into two semicircular pieces, connected and provided with handles, so that the apparatus may be worked in the same way as a pair of tongs. When in use the spade is opened by pulling apart the handles, placing the spade over the young plant to be removed, closing it and forcing it into the soil. It is then given a half turn and pulled out, together with the plant and its roots with the soil clinging to them, the action being much the same as that of a golf hole maker.

In the *Annual Reports on the Progress of Chemistry*, for 1910, issued by the Chemical Society, a résumé is given of the chief work during the year that has had relation to soil bacteriology. In this, reference is made to the fact that A. Koch has continued experiments which support the results of investigations showing that Azotobacter can accumulate nitrogen in soil to which sugar and other carbohydrates have been added. Other investigators have adduced evidence that the fixation of nitrogen by Azotobacter, under field conditions, is affected to a large degree by the temperature. Further, Koch has demonstrated more completely the connexion between Azotobacter and carbohydrates, by showing that where the latter are added to soils in which the organism does not exist, there is no fixation of nitrogen. These matters are of interest in relation to the subject of molasses and soil fertility (see *Agricultural News*, Vols. VII, p. 227; IX, p. 339; X, p. 179).

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 subject of the editorial of the present issue is The Supply of Sulphur to Cultivated Crops. It gives a general account of investigations that have been undertaken recently in connexion with the sulphur content of soils, and the quantities of this element that are required by plants for their proper growth.

Page 243 contains a note on work in connexion with the changes that are undergone in sugar solutions at high temperatures. The conclusions that are given are useful from a technical point of view, both in the works and the laboratory.

On page 245, there is presented an interesting article which describes experiments that have been carried out recently in St. Lucia with the green manure plants *Tephrosia candida* and *T. purpurea.*

An article on page 246 gives an account of some of the various uses to which cotton is put. It serves to illustrate the fact that the demand for cotton lint will continue to increase largely, in the future.

The Insect Notes of this issue, on page 250, continue the subject of peculiar methods of pollination, which was commenced in the last issue, with an article entitled The Pollination of Yucca Flowers.

The title of the Fungus Notes, on page 254, is Two Banana Diseases of the West Indies. The notes present additional information concerning certain banana diseases that have received attention in these pages already.

Agricultural Training in Dominica.

It is being notified that the Agricultural Department of Dominica is prepared to receive a limited number of pupils for practical training in agriculture. This training will extend over a period of two years, and its object will be the acquirement of practical knowledge concerning methods of plant propagation, nursery work, and the planting and care of staple and provision crops. Instruction and opportunities for practical work will be given in relation to tillage, drainage, weeding, sowing, transplanting, the use and application of manures and mulches; the treatment of insect and fungus pests; pruning, budding, grafting, packing, transporting and placing out young plants; picking, preparing and packing crops for market and export.

In addition to this work, which will be carried out at the Botanic and Experiment Stations, there will be an appropriate amount of class instruction in the principles underlying the subjects in the practical course. Arrangements will also be made for a certain amount of homework to be done, under the direction of the Agricultural Superintendent.

The age of candidates must be at least sixteen years, and they must fulfil other stated requirements in regard to health, general education, adaptability for being taught, and character. They will be granted small increasing allowances, which may be supplemented in the case of pupils who are not within easy access of the Botanic Station.

The general particulars of a similar scheme for St. Lucia were published in the *Agricultural News*, Vol. X, p. 135.

Rubber in Togoland and German East Africa.

The *Kew Bulletin*, 1911 No. 2, gives a translation of a paper on this subject, published in *L'Agronomie Tropicale*, 1910, pp. 190 and 235, which was part of an account presented at the International Congress held at Brussels, last year.

The paper shows that, in Togoland, notable success has been obtained with Ceara rubber (*Manihot Glaziorii*), but that Lagos rubber (*Funtumia elastica*) has been a failure. A small area of Assam (Rambong) rubber (*Ficus elastica*) has been planted, and this is developing favourably.

In German East Africa, by far the greatest part of the rubber cultivation consists of Ceara, and the area is increasing rapidly, since the discovery of a successful method of obtaining and utilizing the latex of the plant. This method, which is known as the Lewa Method, is carried out as follows: 'Portions of the cortex are cleaned by the removal of pieces of bark, and are painted over with dilute acetic, citric, or carbolic acid, or latterly with hydrofluoric acid (purub *), and then, almost point-like incisions are made. From these the latex flows out, and coagulates on the spot as thin tears of rubber. These are collected and worked up into round balls.' Experiments are being conducted in German East Africa with Jequié and Romanso

* See *Agricultural News*, Vol. IX, p. 143.

Maniçoba rubbers (*M. dichotoma* and *M. piauhyensis*), and with San Francisco rubber (*M. heptaphylla*).

Fair amounts of Lagos and Central American rubber have been planted in German East Africa, but there is no great future for these species. The indications are better for Para rubber (*Hevea brasiliensis*), but the conditions are not favourable, on account of the possibility of drought. It has been advised that where irrigation is possible, Hevea may be planted among Manihot.

Other rubber plants with which trials are being made are: *Landolphia Stolzii*, *L. dondeensis*, *Cryptostegia grandiflora*, *Clitandra kilimandjarica*, *Mascarenhasia elastica* and *Ficus Schlechteri*.

The Work of Bacteria in the Soil.

A paper describing investigations in relation to this subject is abstracted in the *Experiment Station Record*, Vol. XXIV, p. 326. In the experiments, it was shown that the repeated cultivation of land on which crops were not allowed to grow caused a material increase of the number of bacteria in the soil, the chief increase being in the summer months. Additions of phosphates and potash did not apparently affect the number of bacteria present, but they hastened the breaking down of organic matter. Organic substances such as straw, sugar and starch, and similar substances containing nitrogen, had the same effect as repeated cultivation, on the number of organisms: while sodium nitrate and ammonium sulphate, like phosphates and potash, did not exert any material influence.

The work was further concerned with investigations in relation to the fixation of nitrogen with the aid of leguminous plants. In this, the important fact was elucidated that such plants use the nitrogen in compounds in the soil, and that in the air, simultaneously: that is to say, there is no large consumption of the nitrogen in the soil by leguminous plants, before they commence to form nodules.

Alcohol for Motive Power.

The *Journal of the Department of Agriculture of Victoria*, for February 1911, contains an article on this subject, in which it is pointed out that, both in Germany and in America, proof has been obtained that alcohol as a motive power, as regards equal bulks, is little inferior to gasolene. Alcohol possesses many advantages over gasolene: it bears higher compression without premature explosion; it is cleaner to use; its combustion gives exhaust gases that are not as objectionable as those from gasolene; it possesses a less inflammable vapour than that of gasolene, except where it is closely confined; and its production is practically unlimited, and is possible to a large extent from what is at present waste matter.

After pointing out the facts on which the production of alcohol from starchy materials depends, reference is made to the circumstance that 80,000,000 gallons of alcohol have been produced from potatoes in Germany, in the course of one year. The types of distilling apparatus employed in that country vary, but they are usually of the continuously working, column form. Brachvogel's *Industrial Alcohol* is recommended as a work to be read by all who are interested in the manufacture of alcohol from agricultural products.

The article concludes by making reference to the many uses of denatured alcohol, and points out that its main employment in future will doubtless depend largely on its successful use as liquid fuel for industrial motors. This, however, awaits the evolution of the type of motor that will make use of alcohol to the best advantage.

Loss and Gain of Nitrogen in Cultivated Soils.

A brief account of the work of A. Koch (an investigator whose name is also mentioned on page 247 of this issue of the *Agricultural News*), with regard to the utilization of certain nitrates by soil bacteria, is contained in the *Experiment Station Record* of the United States Department of Agriculture, Vol. XXIV, p. 140.

As would be expected, it was found that, in very damp soils, free nitrogen is yielded by nitrate of soda, whereas, if the soil is well drained and aerated, the nitrate is used by the bacteria for forming albuminoid nitrogen.

With regard to carbohydrates as a source of energy for the fixation of nitrogen, it was found that cellulose, as well as sugar and starch, is effective in this relation. In the actual experiment to investigate the matter, 100 gm. of earth, mixed with paper as a source of cellulose, and inoculated by means of stable manure, was found to yield 29 mg. of additional nitrogen.

The Formation of Prussic Acid during Germination.

In the *Bulletin of the Bureau of Agricultural Intelligence and of Plant Diseases*, of the International Institute of Agriculture, for November 1910, p. 42, there is presented an abstract of results that have been obtained in an investigation of the formation of prussic (hydrocyanic) acid during the germination of seeds of Guinea corn and of flax (*Linum usitatissimum*), both in the light and in the dark.

The experiment showed that there is such a formation under those conditions, in both cases, and that the amount of acid produced increases as germination continues, up to a certain limit, beyond which there is a decrease. During equal periods of germination in the light and in the dark, the quantity of acid formed is smaller in the latter case.

Further, plants kept in the dark and watered with a 2-per cent. solution of glucose gave a larger proportion of prussic acid than those, kept similarly, which did not receive the glucose. It is thus suggested that an important part is taken by carbohydrates in the formation of prussic acid during germination.

From one point of view, the experiments are of interest in relation to the poisoning effect of unripe sorghum, owing to its containing prussic acid (see *Agricultural News*, Vol. X, p. 123).

INSECT NOTES.

THE POLLINATION OF YUCCA FLOWERS.

In the last number of the *Agricultural News*, p. 234, there appeared a brief account of the manner in which the pollination of the flower of an Aroid plant is accomplished by small beetles, and of the part played by a fungus in aiding the insects to gain an entrance to the interior of the closed floral envelope. The matter of the present article deals with pollination of another kind, by insects, and it is intended to follow this by a third article, treating of a further variation in insect pollination.

In the following notes, the action of a small moth in accomplishing the pollination of a flower of an entirely different structure from that of the Aroids will be explained. The flower referred to in this connexion is that of the Spanish needle or Adam's needle (*Yucca aloifolia*), which occurs throughout the West Indies. The structure of the flower is similar to that of all in the Lily Family, to which the Yuccas belong. The fertilization of the Yucca flower was first studied and described in detail by Professor C. V. Riley, Entomologist to the United States Department of Agriculture, who published in *Insect Life* (Vol. IV, p. 358) an article entitled Some Interrelations of Plants and Insects, which included a most interesting account of this process. Since that time the observations of Professor Riley have been confirmed by other entomologists, and numerous references to these have appeared in entomological literature.

The lily-like flower of the Yucca consists of three sepals, three petals, six stamens and a pistil. The stamens are somewhat recurved, the anthers being thus considerably removed from the stigma, making self-fertilization of the flower difficult, or even impossible. The pistil is composed of three carpels, united in such a manner that the stigmas are situated on the inner surface of a central tube, at the top or outer end of the style.

The pollen produced by the anthers is moist and heavy, and this, taken in connexion with the structure of the stigma and the relative positions of the pistil and stamens, would indicate the necessity for the action of some insect or other agency in accomplishing the transference of the pollen.

The species of Yucca (*Y. aloifolia*) already mentioned depends for the pollination of its flowers upon the voluntary action of a small whitish moth (*Pronuba yuccasella*, Riley), while other species of this genus of plants are dependent on other species of insects of the genus Pronuba.

Pronuba yuccasella is less than ½ inch in length, with a spread of wings of about 1 inch. The fore wings are white, but the hind wings and under parts of the body are dusky. The male and female moths are very much alike in general appearance; the female, however, possesses certain structural peculiarities, not to be found in other moths, which are special developments for the sole purpose of adapting this insect to its relationship to the Yucca plant. These are a piercing ovipositor, by means of which the eggs are inserted into the ovary at the base of the pistil, and a pair of long, hairy processes developed on the modified mouth parts, which are used for collecting and carrying pollen.

The female Pronuba ascends to the summit of a stamen, where, by means of the prehensile organs just mentioned, and her long, slender tongue, she collects a mass of pollen. It is often necessary to visit several anthers before a sufficient quantity of pollen has been gathered. This is shaped with the aid of the front legs, into a small rounded pellet, often two or three times as large as the head of the moth. Having accumulated a satisfactory amount of pollen, the female moth flies with it to the pistil, generally of another flower, on the same plant, than that from which the pollen was gathered, or to the flowers on another plant, and proceeds to insert the pellet into the stigmatic tube. The fertilization of this flower being thus ensured, she makes her way to a position where the ovipositor may be inserted in such a manner that the eggs will be deposited in the ovary near the ovules. The larvae will then be in the best possible situation to begin feeding on the developing seeds.

In the article mentioned above, Riley makes the following statements:—

'The absolute need of Pronuba in the pollination of our dehiscent Yuccas I have proved over and over again in many ways. The plant never produces seed where Pronuba does not exist; it never produces seed when she is excluded artificially, and experiments which I have made with artificial or brush pollination all show that it is much more difficult to ensure complete fructification than would at first appear, and that the act of pollination is rarely performed with a brush or by using the flower's own filaments as successfully as it is done by Pronuba.'

This remarkable action of the female Pronuba would almost seem to be the result of a process of reasoning. The larvae depend for food on the developing seeds, but if the flower were not fertilized no seeds would be developed. When the eggs hatch, the parent moth proceeds to pollinate the flower, and then deposits her eggs almost, or quite, in contact with the ovules.

The relation between Pronuba and the flowers of Yucca is made all the more wonderful from the fact that the adult female derives no benefit by it, since the mouth parts and digestive system are so modified that it is impossible for her to feed at all. The entire operation appears to be a definite provision for the development of the young, without any incentive arising from benefits received by the individual performing the act.

The plant, however, benefits by the action of Pronuba in that it is enabled to produce seeds; the developing larvae do not consume all the seeds formed in the ovary, so that many are left for its propagation.

It is stated in the London *Times* that the regulations issued by the Belgian Government for the prevention and cure of sleeping sickness in the Congo provide heavy penalties for neglect of the prescribed precautions. All employers of native labour must take measures to discover any cases of sleeping sickness among their staff and report them at once to the authorities. Those aiding others to neglect the treatment prescribed will be punished, as well as those who try to pass from infected to uninfected districts or vice versa. It is noted that in order to combat the disease effectively, it is all important to discover those victims who have not yet reached the second stage—somnolence. Such a measure would tend not only to decrease the mortality but also to limit the dissemination of the germs. All suspects, therefore, are to be examined by the heads of training posts or sent for inspection to the nearest doctor, who will carry out a thorough examination. Inspection posts are to be established on the main lines of communication in order to prevent suspects from carrying the disease into provinces which are as yet untouched. Natives from the surrounding countries will only be permitted to enter the unaffected regions of the Belgian colony after undergoing a searching medical examination at Ala or Jakoma. (*Science*, Vol. XXXIII, p. 768.)

TACKINESS IN RUBBER.

An interesting article under this title appears in the *India-Rubber Journal* for May 20, 1911. It describes tackiness, in the mild form, as showing itself as a sticky appearance on the surface of the rubber; in its more serious shape, tackiness may exist to such an extent as to cause the rubber to become a syrupy liquid which can only be used (under the name of heated rubber) as a by-product. The agents responsible for tackiness have been considered to be: (1) bacteria, (2) sunlight, (3) heat, (4) chemical substances.

Attention is drawn to the fact that when observations on tackiness were first made in Ceylon, it was considered to be due almost entirely to growths of bacteria on the surface of the rubber. It was therefore suggested that specimens of rubber showing tackiness should be isolated, and it has been claimed that the adoption of this preventive measure has resulted in a reduction in tackiness. It is admitted that some cases are largely, if not entirely, due to the action of bacteria, in rubbers containing high percentages of proteids. Such rubber is usually the first obtained from old trees, or that from young trees, and it is interesting that these kinds show the greatest tendency to undergo putrefactive changes. Another matter is that tacky rubber, when analysed, is usually found to contain a high proportion of proteids. Support is given to the idea that bacteria play a part in tackiness by the fact that the condition can spread by contact, and that smoked rubber does not frequently become tacky—probably because of the action of antiseptic substances in the smoke. These conditions make it obvious as to what should be done to minimize the chances of rubber becoming tacky through bacterial action.

Tackiness is sometimes found to develop more quickly under the influence of sunlight; although the true explanation of the action is not known. It is very irregular, for samples of rubber have been kept in sunlight for some years without becoming tacky. In any case, there is a greater recognition of the importance of sunlight in the matter, in the fact that many factories are using ruby- or orange-coloured glass, in order to exclude the chemical rays of light.

As regards heat and tackiness, it is well recognized that when rubber is exposed to high temperatures, it becomes soft and sticky; this is why it is usually dried at a maximum temperature of 90° to 100° F. It is the case, however, that heat alone may not produce tackiness, for if putrefaction is prevented, the heated rubber will cool to a product having the ordinary consistency. Heat is most likely to produce tackiness when the rubber is warmed in an atmosphere rich in organic matter.

Chemical agents apparently cause tackiness directly, much in the same way as this is done by sunlight. Bamber states that enzymes may be responsible for the condition; though this view has been given little support, and is questioned by Spence, who has shown that coagulants like sulphuric acid have a strong effect. Similar results have been obtained by Brindejonc, by using weak solutions of acids, for instance acetic acid, which may be produced by bacteria. It is interesting that carbolic acid acts in a similar way, indicating that the action of bacteria is indirect in its nature. Similar results have been obtained by soaking the rubber in salt solution.

A purely hypothetical explanation of tackiness is that of Frank, who attributes it to the presence of imperfectly polymerized portions of the rubber, which are originated through incomplete mixture of the coagulant with the latex. It is seen that all the above matters have to deal with the causes of tackiness. The chemical explanation of its production has not yet been found, and careful work requires to be done before this can be provided adequately.

AGRICULTURE IN SOUTHERN NIGERIA.

AGRICULTURE. In 1907, the value of the exports of cotton, maize and cacao was £184,342, and in 1908, £161,658. In 1909, in spite of the comparative failure of maize, the total increased to £220,927.

CACAO. The area of land under cacao is increasing rapidly, and will probably continue to do so. The shipments under this head have been: 1905, 1,057,987 lb.; 1906, 1,619,987 lb.; 1907, 2,089,225 lb.; 1908, 3,060,609 lb.; and 1909, 5,019,150 lb.

COTTON. In 1908, there were shipped from Southern Nigeria: cotton lint, 2,294,356 lb.; cotton seed, 5,591,979 lb. In 1909, cotton lint, 5 032,916 lb.; cotton seed, 10,756,777 lb.

MAIZE. In 1909, over 5,000 tons less maize were shipped than in 1908.

GROUND NUTS. In spite of the introduction of new seed, and the help given by instructors from the Gambia, the Western Province exports little or no ground nuts, although a good deal is planted, and sold in the markets for home consumption. Such ground nuts as are now exported from Southern Nigeria come from the Central Province and Northern Nigeria.

ECONOMIC GARDENS. A great number of plants, including Para, fibres and fruit, were distributed from the different gardens, as follows: Western Province, 36,000 plants; Central Province, 67,434 plants; Eastern Province, 22,267 plants. In the Western Province, vanilla fruited for the first time.

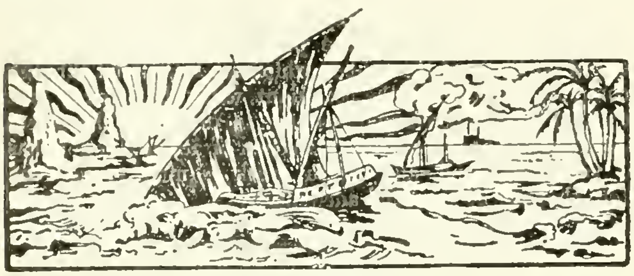
ENTOMOLOGY. The Government Entomologist gave lectures and issued reports, which have been much appreciated by the more intelligent farmers, on the diseases attacking the cacao and maize crops.

COLLECTION OF PLANTS. Eighty-three floral and other specimens were sent to Kew for identification

IMPERIAL INSTITUTE. Many plant specimens of economic value were sent to the Imperial Institute, and full reports of these were published from time to time in the Bulletin of that Institute. (*Colonial Reports*—Annual, No. 665, p. 13, issued February 1911.)

Information has been received from Mr. H. A. Tempany, B.Sc., Superintendent of Agriculture for the Leeward Islands, to the effect that, in the celebrations recently conducted in Antigua in honour of the Coronation of His Majesty King George V, the proceedings included a public tree-planting ceremony, in which part was taken by His Excellency the Governor, Members of Council, Heads of Government Departments, and representatives of the children in the elementary schools.

In all, forty-five mahogany trees were planted to form an avenue along a newly made road, which was declared open by the Governor at the time, and is intended for convenience in leaving the city of St. John, in the direction of English Harbour.



GLEANINGS.

The exports of sugar from Java during January last, which were mostly to India and China, reached the amount of 53,481 tons, as compared with 54,365 tons during 1910.

The exports of balata from Dutch Guiana are increasing, the amount for the past three years being as follows: 1908, 998,800 lb.; 1909, 1,500,400 lb.; 1910, 1,964,600 lb. During last year about 2,500,000 acres were leased as balata concessions. (From the *India-Rubber World*, July 1, 1911.)

The Progress Report on the Peradeniya Experiment Station, Ceylon, from January 12 to March 16, contains the results of an experiment to determine the amount of oil obtainable from Para rubber seeds by expression in a mill. The percentage of oil obtained was 17·75; this left a residue in the form of an oily poonac which would not bind.

A letter appears in *Nature* for June 29, 1911, p. 584, which suggests a new use, in Australia, for Eucalyptus oils that are rejected as not coming up to the requirements of the British Pharmacopoeia. This consists in their employment in mining, for the extraction of the very finely divided particles of minerals in 'tailings'.

A report received from the Curator of the Botanic Station, Montserrat, states that all the plots for experiments are occupied with crops, except that reserved for Egyptian cotton. The details are as follows: ground nuts, 9 plots; sweet potatoes, 10 varieties; yams, 8 varieties; sugar-cane, 17 varieties; a plot for corn breeding, and plots containing six kinds of green dressings.

The New Zealand flax industry of St. Helena suffered a serious set-back during 1910 on account of the shortness of the supply of Phormium leaves. According to *Colonial Reports* Annual, No. 675, it appears that, owing to the poorness of the soil in St. Helena, the plants take a longer time to attain maturity than in New Zealand, and it was this unexpectedly slow growth that has led to an insufficient supply of he plants.

Work has been recently carried out for the purpose of determining the use of the mucilage which is found on various seeds, and an account of this is given in the *Experiment Station Record*, of the United States Department of Agriculture, Vol. XXIV, p. 531. As a result of the investigations, it is claimed that the mucilage, in addition to having any other use, serves as a reserve food for the developing seedling, during germination.

The *Journal of the Royal Horticultural Society* for May 1911, p. 796 (Vol. XXXVI, Part 3), contains a short abstract of a paper in which is considered the possible influence of the scion on the stock in grafting. In this, it would appear that authentic cases exist where the stock has produced shoots showing unmistakable traces of the influence of the scion. Examples are given of new varieties of fruit plants that were produced on stocks after the removal of old scions.

At a meeting of the Legislative Council at St. Vincent, held on February 28, 1911, an Ordinance to provide for the destruction of old cotton plants entitled The Cotton Diseases Prevention Ordinance, 1911, was passed. At a subsequent meeting of the Council, held on March 7, amendments to the Ordinance were made, in consequence of the discovery in it of a few mistakes after its passage. Particulars of the Ordinance are contained in the St. Vincent *Government Gazette* for May 18, 1911.

The *Bulletin of the Bureau of Agricultural Intelligence and of Plant Diseases*, of the International Institute of Agriculture, contains an abstract of a paper by Dr. P. J. Cramer, which deals with the variability of tropical plants in a wild condition, particularly of species of Coffea. With reference to selection, generally, Dr. Cramer recommends the careful examination of all the available wild species of a plant, as the first step, and suggests the founding of a special Institute, directed by a botanist, for plant breeding and selection in the tropics.

A report on a recent teachers' certificate examination held in the Colony is contained in the Trinidad *Royal Gazette* for June 16, 1911. This report indicates that creditable results were obtained in agriculture by most of the candidates, though many of the papers show a lack of power of observation on their part, and there was a want of knowledge concerning the special methods of dispersal of weeds, as well as in other directions. In regard to hygiene, the papers on the whole indicated that the candidates possessed a very creditable grasp of the subject.

According to *Diplomatic and Consular Report* No. 4676—Annual Series, the rice harvest of Corea in 1909 was 37,285,000 bushels, and it is stated that, with the proper use of manure and better irrigation, the crop should reach 50,000,000 bushels. The industry is likely to be assisted by the granting of permission for Corean rice to enter Japan free of duty. It is stated, further, that considerable efforts are being made in Corea to foster the cotton growing industry. An official Cotton Cultivation Association produced about 400,000 lb. of lint from 1,000 acres in 1909, and it is expected that 600,000 acres will be replanted with Upland cotton by 1917.

The St. Lucia *Gazette* for July 8, 1911, contains particulars of an Ordinance called The Turtle and Fish Protection Ordinance, 1911. This provides for a close season for turtle and turtle eggs from May 1 to August 31 inclusive, in every year; though this time may be altered by the Governor, by notice in the *Gazette*. Further, provision is made for the punishment of persons who are in possession of turtles, parts of turtles or the eggs during the close season; of those who are in possession at any time of turtle weighing less than 15 lb.; and for the setting of turtle nets within 100 yards of the shore. In regard to fish, the use of explosives is forbidden in inland waters, and in the sea, within 1 mile of the shore.

STUDENTS' CORNER.

AUGUST.

FIRST PERIOD.

Seasonal Notes.

Where sugar-cane has been reaped, the student should be in possession of a large amount of useful information in regard to the comparative yields from the different varieties that were planted. Where there have been several kinds in cultivation, it will be possible often to correlate the yield of any particular variety with the soil on which it is grown; that is to say, some kinds will be found to flourish on certain soils better than others. The observations will also include the noting of effects arising from the manurial treatment that the land has received. It must be remembered that it is not possible, however, to draw definite conclusions concerning such matters either from one or a few seasons' experiments; the differences in the conditions from season to season, and particularly those in regard to rainfall, bring it about that definite and reliable results can only be obtained after careful observation extending over several years.

On sugar estates where ratoons are being raised, careful note should be made of the kinds of tillage that are employed for these. In some cases, after the banks have been ploughed, all the trash is allowed to remain on alternate banks, while the others are cultivated. It may be possible to determine which of these methods of mulching is most effective in conserving the soil water for the uses of the crop. Careful examination of ratoons should be made from time to time, in order to determine if root disease is present, and if so, to what extent. What are the characteristics of the ordinary root disease of the sugar-cane, and how does the fungus act in causing interference with the life-processes of the plant? Are there any other pests or diseases of the sugar-cane that may produce external symptoms in the plant similar to those caused by root disease?

In cotton-planting, a common fault is to sow too many seeds in each hole—a fault which not only causes seed to be wasted, but also the crowding of the seedlings, which make it difficult to thin them out without disturbing seriously the one which is to remain. In such sowing, the number of seeds to be placed in each hole will be determined to some extent by the state of the weather. The thinning out of the plants should not be left too late; otherwise there will be in each hole a number of plants struggling for existence. This struggle is likely to bring about weakness, later on, and is certain to make it more difficult for the young plants to survive attacks by insect and other pests. A careful watch should be kept for the appearance of angular leaf spot. Where this disease occurs, observations should be made in order to determine if it has any intimate connexion with definite conditions of soil or rainfall. Similar observations should be undertaken in relation to boll-dropping. In those islands where leaf-blister mite is important as a pest of cotton, the plants should be constantly examined in order to find out as soon as possible if and when the pest is present. Where it is found, precautions should be taken immediately in order to prevent its spread, as far as this can be done. What is the nature of these precautions, and what is the proper method for disposing of the material which has been treated? Enumerate the methods of controlling other pests and diseases of cotton, particularly caterpillars, aphis, flower-bud maggot, cut worm, scale insects, anthracnose and angular leaf spot.

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) Distinguish between surface, shallow and deep tillage, and give instances where each is particularly used.

(2) Give examples of stock foods that are rich in carbohydrates, fats and albuminoids (proteids), respectively.

(3) Describe, with examples, the chief methods of cross-pollination in nature.

INTERMEDIATE QUESTIONS.

(1) Mention the chief points that serve to distinguish the moth borer (*Diaprepes abbreviatus*) from the weevil borer (*Sphenophorus sericeus*), particularly in the larval stage.

(2) State what varieties of sweet potatoes are best suited to your neighbourhood, and give information concerning the best months for planting this crop.

(3) Give a general account of the way in which an animal makes use of the carbohydrates, fats and proteids in its food.

FINAL QUESTIONS.

(1) Give a description of the various devices by means of which transpiration from the leaves of plants is checked, and indicate any connexion that these devices may possess in relation to their commercial value.

(2) Prepare an estimate of the cost of erecting a cattle pen of a given size, under conditions with which you are familiar, including particulars as to the number of cattle that it is intended to serve.

(3) Write a short essay on what is generally termed The Balance of Nature, with special reference to the chief circumstauces on which it depends.

Rubber and Gutta-percha in Borneo.—A great awakening took place in 1910 in regard to the value of the native gums of North Borneo, of which there are four—gutta-percha, gutta-jelatong, gutta-jangkar, and rubber. About the beginning of 1909 a British company obtained a concession from the Rajah to control the output of the forests of Sarawak, and a large plant for refining and preparing the gums was erected at the mouth of the Sarawak river, 18 miles from Kutching. It is estimated that not less than 40,000 acres have been brought under rubber cultivation in 1910 in British North Borneo. This has greatly stimulated the demand for coolie labour, which is brought from Java, Singapore, and Hong Kong, through agencies at those places. According to Government reports, there are now employed on the various rubber estates about 15,000 coolies. When the trees now being planted become productive, it is estimated that 50,000 coolies will be required. As this estimate is based on real plantings, there is a bright outlook for large expansion in the general commercial condition of North Borneo. (The *Journal of the Royal Society of Arts*, June 23, 1911.)

FUNGUS NOTES.

TWO BANANA DISEASES OF THE WEST INDIES.

In the *Agricultural News*, Vol. X, p. 110, appeared an article dealing with some diseases of the banana which occur in certain parts of the West Indies and of Central America. Since its issue, two valuable papers have appeared treating of two of the most important diseases at greater length than has been the case in previous publications. These two diseases are somewhat similar in outward appearance, though different in origin. There is a considerable possibility that one or both may occur in some of the islands of the Lesser Antilles and, in consequence, it is thought that a further account of the two diseases may be of interest. The original papers from which the information given below is taken are: A Bacterial Disease of Bananas and Plantains, by Rorer, issued as a publication of the Board of Agriculture, Trinidad, and The Panama Disease, Parts I and II, by E. Essed, B.Sc., published in the *Annals of Botany*, Vol. XXV, p. 343.

THE PANAMA DISEASE. This occurs in Costa Rica, Panama, Surinam, Trinidad and probably in Cuba, while according to report it is also to be found on the Atlantic side of Nicaragua, Honduras and Guatemala. It is of considerable importance in the first two countries, though the damage done there would not appear to be as great as that inflicted on the banana plantations in Surinam. The most susceptible variety of banana is the Gros Michel, though various others, both of bananas and plantains, are also said to be more or less liable to be attacked by the disease. It was thought for some time that the Congo variety was more or less immune, though recently it has been found to be attacked quite frequently, in Surinam.

In the first stage of the disease, according to Essed, the symptoms consist of a peculiar withering of the leaves along the margin, while discoloration may be observed along a mid-dorsal line on the midrib. Sometimes the youngest leaf withers first, and is unable to unfold, while the older leaves are healthy; at other times, the first symptoms appear on the older leaves. In the next stage of the disease development ceases, the leaves droop and the plant looks as though it were suffering from drought. Wrinkles then appear on the sheath and midrib of the leaves; and finally the latter dry up, and the pseudo stem falls over.

On examining the rhizome of an infected plant, it is seen that this is the part principally affected. The healthy whitish colour is replaced by a yellowish hue; while reddish-brown spots and streaks are scattered through the infected parts, and a yellowish or brownish mucilage exudes from the cut ends of the slime canals. The roots are usually free from disease until the tissues at their base become affected, so that it is evident that the fungus does not enter through them. The water-starved appearance of diseased plants is due to the occurrence of masses of mycelium and spores of the causative fungus within the vessels of the vascular bundles, which constitute the water-carrying region. From these the fungus can spread into the cells of the ground tissue, where it causes an almost complete rot.

Essed has given the name *Ustilaginoidella musaeperda* to the causative organism, and has shown, by means of infection experiments, that this fungus, and not any of the bacteria associated with it, is actually responsible for the disease. The fungus itself has many curious reproductive arrangements, but includes among them a simple Fusarium stage (see *Agricultural News*, Vol. IX, p. 175). Such a reproductive form has been found on the fungus associated with a similar disease of bananas in Cuba by Dr. Erwin Smith, and with the Panama disease, as known in Trinidad, by Rorer. The Surinam fungus belongs to the group Hypocreales (see *Agricultural News*, Vol. IX, p. 127), and is distantly related to the genus Nectria. Another closely related species, *Ustilaginoidella oedipigera*, was found by Essed to be responsible for elephantiasis of the banana in Surinam—a disease mentioned in the article in the *Agricultural News* first referred to above. Another closely related species is responsible for a disease of rice, in the same country.

There is nothing that can be done to save plants that have once become affected with the Panama disease, and at present no really successful measures have been discovered for preventing its spread. All that can be undertaken, is to make every attempt to discover a really immune variety, and then to propagate this.

MOKO DISEASE. Under this name, Rorer has described a bacterial disease which attacks particularly the 'moko' fig variety of plantain, much employed in Trinidad as a shade plant for young cacao. It also occurs on the Creole and French varieties of plantain (*Musa paradisiaca*), and on the dwarf or Cavendish banana (*Musa chinensis*). It does not attack the Gros Michel banana or the Manila hemp plant (*Musa textilis*) to any considerable extent.

The disease usually appears first in the lower leaves. The leaf blades droop a little more than usual, and have a slightly yellowish tinge. Then the petiole, or stalk, of one of the leaves breaks just below the leaf blade, and those of the other leaves soon follow. Eventually, the terminal leaf also bends over, and the plant dies and rots down to the ground. When the disease is not severe, or when the plant does not become infected until after it has formed a bunch of fruit, it may remain perfectly healthy in appearance; many of the young fruits, however, do not mature, but eventually become black and rotten. When the pseudo-stem is cut across, it is seen that the vascular bundles are discoloured, the colour varying from pale yellow to dark brown or bluish black. These discoloured bundles run back into the true stem, or rhizome, 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 cavities are formed, which like the vessels, are filled with bacteria. When kept for a short time, transverse sections of the leaves or stem become covered on their cut surface with bacterial drops, which exude from the vascular bundles.

The symptoms of this disease are very similar to those of the Panama disease, but it may be distinguished as follows: Although the vascular bundles of plants attacked by the Panama disease are discoloured and often contain bacteria, yet this bacterium is a gas former, and is not pathogenic. Again, the longitudinal splitting of the leaf sheath, which is a characteristic of the Panama disease, is not found in plants attacked by the moko disease. The Panama disease is due to a fungus which occurs plentifully in the infected bundles. The Gros Michel variety is that principally affected by the Panama disease, while it is practically immune to the moko disease.

The moko disease may be controlled, according to Rorer, by the following sanitary measures: the destruction by burning of all diseased plants when found; the sterilization, by fire, of all tools and implements used in the work; and the planting of healthy suckers.

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 markets, for the month of June:—

The month of June has been remarkable for the holiday element that has prevaded it with much more than usual severity, almost from beginning to end, commencing with Whitsuntide, which was followed soon after by the Coronation festivities, when the produce markets were closed from the Thursday the day of the actual Coronation, until the Monday following. Thus within four days of the close of the half-year and the approach of the season of the general summer holidays, business has been much interrupted. Notwithstanding all this, the general condition of the markets has been satisfactory and quite up to the normal standard. There has been no special interest attaching to, or demand for, any West Indian product, except perhaps lime juice, which during the spell of hot weather at the beginning of the month was in demand at advanced rates, and continued so to the end. Buchu, short broad leaves, continues to command from 4*s.* 6*d.* to 4*s.* 9*d.* per lb.

GINGER.

There has been little or no demand for this article during the month, the offerings for the most part having been bought in. On the 28th, Jamaica was represented by 156 packages and Cochin by 488, practically all of which were bought in.

NUTMEG, MACE, PIMENTO AND ARROWROOT.

At the auction on the 14th, 333 packages of West Indian nutmegs were brought forward and sold at the following rates: 59's, 8½*d.*; 65's, 7*d.*; 69's, 6½*d.*; 74's to 76's, 5½*d.* to 6*d.*; 80's to 85's, 5¼*d.* to 5½*d.*; 98's to 99's, 5*d.* to 5¼. On the 28th, 32 packages of West Indian were offered and sold at similar rates. At the same auctions on the 14th and 28th, 103 packages of West Indian mace were offered at the first, most of which found buyers at prices from 2*s.* 1*d.* to 2*s.* 6*d.*, and 1*s.* 9*d.* for broken. At the second auction prices ruled from 2*s.* 1*d.* to 2*s.* 2*d.* At this auction some 359 bags of Pimento were brought forward, part of which sold at 2½*d.* per lb.; 56 barrels of St. Vincent arrowroot were offered at this auction and small sales made at 3*d.* per lb. for good.

SARSAPARILLA.

The offerings of this drug at auction on June 1, were as follows: grey Jamaica 7 bales, Lima-Jamaica 25 bales, native Jamaica 46 bales. The whole of the two former were disposed of, 1*s.* 9*d.* being readily paid for fair, part roughish grey Jamaica, and 1*s.* 1*d.* per lb. for Lima-Jamaica. Of the 46 bales of native Jamaica, 25 sold at the following rates: 1*s.* 2*d.* to 1*s.* 3*d.* per lb. for good red, 1*s.* 1*d.* for fair red, and 1*s.* for slightly mixed; while ordinary dull fetched 8*d.*, and common dull mixed 6*d.* to 7½*d.* per lb. A fortnight later, the offerings at auction were as follows: Grey Jamaica 26 bales, of which 21 were disposed of; native Jamaica 6 bales and 4 disposed of; and 28 bales of other descriptions. Of the 21 bales sold of the grey Jamaica, the prices realized were from 1*s.* 8*d.* to 1*s.* 9*d.* per lb., 1 bale of a coarser kind fetching only 1*s.* 7*d.* per lb. Of the 4 bales of native Jamaica sold, 1*s.* was paid for ordinary to fair red, and 9*d.* to 10*d.* per lb. for pale yellow. At the last auction on the 29th, 5 bales of grey Jamaica were offered, but none actually disposed of, 1*s.* 6*d.* being the price mentioned and the quality being somewhat coarse. Of 23 bales of native Jamaica offered, 21 found buyers, good red fetching 1*s.* to 1*s.* 1*d.*, fair red 10*d.* to 10½*d.*, and common yellow mixed 8*d.* per lb.

CASSIA FISTULA, KOLA, LIME JUICE, TAMARINDS.

At the first auction in the month, 25 bags of fair Dominica Cassia Fistula pods were brought forward, and held at 40*s.* per cwt. Kola was represented also by 1 bag of West Indian, and disposed of at 4½*d.* per lb. Eight puncheons of fair, bright, raw West Indian lime juice sold at 1*s.* 2*d.* to 1*s.* 3*d.* A week later the quotations were the same for fair raw, while good realized 1*s.* 5*d.*, and towards the end of the month advanced to 1*s.* 6*d.*; at the close 1*s.* 9*d.* per gallon was being asked. Concentrated West Indian was said to be scarce, at from £18 2*s.* 6*d.* to £18 7s. 6*d.* At the last sale on the 28th, 20 barrels of Antigua tamarinds were brought forward, and sold at 8*s.* 3*d.* per cwt.

AGRICULTURE IN JAMAICA, 1909-10.

It is pointed out in *Colonial Reports*—Annual, No. 662, dealing with Jamaica, that a matter which is significant of the need for the improvement of agriculture in the Colony is the extent to which foodstuffs, which might be easily provided in the island, have to be obtained from other countries, and reference is made to the work of the Agricultural Society, which is slowly effecting improvements in this direction. Proceeding to an account of the exports, the report shows that the value of the chief among them for 1908-9 were as follows: bananas, £1,044,820; cigars, £263,850; rum, £186,803; logwood and logwood extract, £160,861, of which the latter accounted for £114,460; coffee, £116,166; cacao, £90,914; sugar, £77,047; grape fruit and oranges, £51,840, of which the latter were valued at £38,474.

Attention is drawn to the fact that the development of the fruit industry of the Colony continues, and that the increased exports of sugar and rum show that these staples have proceeded some little way toward the recovery of their old position. In a table showing the relative importance of the principal staples and the minor products, the order in 1908-9 is seen to be as follows: fruit, 54·9 per cent.; minor products, 13·6; rum, 8·9; pimento, 6·8; coffee, 5·5; cacao, 4·3; sugar, 3·6; and dye-woods, 2·4 per cent.

Other matters of general interest are the facts that the central sugar factories are doing successful work, and that a new factory has been opened in Westmoreland; that, judging from voluntary returns, most of the land is in woods and ruinate, while an area amounting to over three-quarters of the area of such land is tilled, in Guinea grass, or exists as common land; and that in regard to the sale of Crown lands for small holdings, it has been decided to proceed with caution in the matter of selling by instalments, on account of the fact that about one-quarter of the area at present out on credit is now in arrear or taken back.

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR, July 18, 1911; Messrs. E. A. DE PASS & Co., July 8, 1911.

ARROWROOT—2*d.* to 2¾*d.*
BALATA—Sheet, 3/3 to 4/1; block, 2/7 to 3/2 per lb.
BEESWAX—£7 10*s.* per cwt.
CACAO—Trinidad, 56/- to 65/- per cwt.; Grenada, 51/- to 57/6; Jamaica, 49/- to 53/-.
COFFEE—Jamaica, 62/- to 120/-.
COPRA—West Indian, £26 per ton.
COTTON—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 15½*d.* to 17½*d.*
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—49/- to 64/- per cwt.
HONEY—29/6 to 34/-.
ISINGLASS—No quotations.
LIME JUICE—Raw, 1/5 to 1/8; concentrated, £18 5*s.*: Otto of limes (hand pressed), 5/-, nominal.
LOGWOOD—No quotations.
MACE—1/11 to 2/3.
NUTMEGS—Quiet.
PIMENTO—Common, 2 1/16*d.*; fair, 2⅛*d.*; good, 2 3/16*d.* per lb.
RUBBER—Para, fine hard, 4/5; fine soft, 4/3; fine Peru, 4/6 per lb.
RUM—Jamaica, 1/7 to 6/-.
SUGAR—Crystals, 15/- to 17/-; Muscovado, 11/6 to 14/-; Syrup, 10/6 to 13/9 per cwt.; Molasses, no quotations.

New York.—Messrs. GILLESPIE BROS. & Co., June 30, 1911.

CACAO—Caracas, 11c. to 12c.; Grenada, 11¼c. to 12½c.; Trinidad, 11½c. to 11¾c. per lb.; Jamaica, 9¼c. to 10⅛c.
COCOA-NUTS—Jamaica, select, \$28·00; culls, \$16·00 to \$17·00; Trinidad, select, \$28·00; culls, \$16·00 to \$17·00 per M.
COFFEE—Jamaica, 12⅛c. to 14⅛c. per lb.
GINGER—10c. to 12c. per lb.
GOAT SKINS—Jamaica, 53c.; Antigua and Barbados, 48c. to 50c.; St. Thomas, St. Croix and St. Kitts, 46c. to 48c. per lb.
GRAPE-FRUIT—Jamaica, no quotations.
LIMES—\$7·25 to \$8·00.
MACE—48c. to 53c. per lb.
NUTMEGS—110's, 10c. per lb.
ORANGES—Jamaica, no quotations.
PIMENTO—4½c. per lb.
SUGAR—Centrifugals, 96°, 3·98c. per lb.; Muscovados, 89°, 3·48c.; Molasses, 89°, 3·23c. per lb., all duty paid.

Trinidad.—Messrs. GORDON, GRANT & Co., July 21, 1911.

CACAO—Venezuelan, \$12·00 per fanega; Trinidad, \$11·00 to \$12·00.
COCOA-NUT OIL—75c. per Imperial gallon.
COFFEE—Venezuelan, 15½c. per lb.
COPRA—\$3·75 per 100 lb.
DHAL—\$3·60 to \$3·80.
ONIONS—\$2·00 to \$2·25 per 100 lb.
PEAS, SPLIT—\$5·80 to \$5·90 per bag.
POTATOES—English, \$2·60 to \$2·80 per 100 lb.
RICE—Yellow, \$4·60 to \$4·70; White, \$5·40 to \$5·50 per bag.
SUGAR—American crushed, no quotations.

Barbados.—Messrs. JAMES A. LYNCH & Co., July 26, 1911; Messrs. T. S. GARRAWAY & Co., July 17, 1911; Messrs. LEACOCK & Co., July 21, 1911; Messrs. E. THORNE, Limited, July 18, 1911.

CACAO—\$10·50 to \$11·00 per 100 lb.
COTTON SEED—\$22·40 per ton: meal, \$1·50 per 100 lb.; 2½ per cent. discount.
COTTON SEED OIL (refined)—61c. per gallon.
COTTON SEED OIL (for export)—51c. per gallon (in bond).
HAY—\$1·30 per 100 lb.
MANURES—Nitrate of soda, \$60·00 to \$65·00; Cacao manure, \$42·00 to \$48·00; Sulphate of ammonia, \$75·00 to \$76·00 per ton.
MOLASSES—No quotations.
ONIONS—\$1·75 to \$2·37 per 100 lb.
PEAS, SPLIT—\$5·55 to \$5·75 per bag of 210 lb.; Canada, \$2·75 to \$4·20 per bag of 120 lb.
POTATOES—Nova Scotia, \$3·00 to \$3·50 per 160 lb.
RICE—Ballam, \$4·90 per 100 lb.; Patna, no quotations; Rangoon, no quotations.
SUGAR—No quotations.

British Guiana.—Messrs. WIETING & RICHTER, July 22, 1911; Messrs. SANDBACH, PARKER & Co., July 21, 1911.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	\$10·00 per 200 lb.	\$10·00 per 200 lb.
BALATA—Venezuela block	No quotation	Prohibited
Demerara sheet	70c. per lb.	65c.
CACAO—Native	11c. per lb.	12c. per lb.
CASSAVA—	96c.	No quotation
CASSAVA STARCH—	\$6·50 to \$7·00	No quotation
COCOA-NUTS—	\$12 to \$16 per M	\$10 to \$16 per M., peeled and selected
COFFEE—Creole	16c. per lb.	15c. per lb.
Jamaica and Rio	19c. per lb.	19c. per lb.
Liberian	10½c. per lb.	10c. per lb.
DHAL—	\$3·75 per bag of 168 lb.	\$3·75 per bag of 168 lb.
Green Dhal	\$3·50	——
EDDOES—	96c.	——
MOLASSES—Yellow	None	——
ONIONS—Teneriffe	—	4c. to 5c.
Madeira	6c.	5½c.
PEAS—Split	\$5·65 per bag (210 lb.)	\$5·65 per bag (210 lb.)
Marseilles	\$4·00	No quotation
PLANTAINS—	8c. to 20c.	——
POTATOES—Nova Scotia	—	\$3·50
Lisbon	—	No quotation
POTATOES—Sweet, B'bados	96c. per bag	——
RICE—Ballam	No quotation	——
Creole	\$5·25 to \$5·50	\$5·25 to \$5·50
TANNIAS—	96c.	——
YAMS—White	\$3·00	——
Buck	\$3·24	——
SUGAR—Dark crystals	\$3·50	\$2·75 to \$3·00
Yellow	\$3·30 to \$3·50	\$3·25
White	\$4·00	\$4·00 to \$4·25
Molasses	\$2·30 to \$2·50	None
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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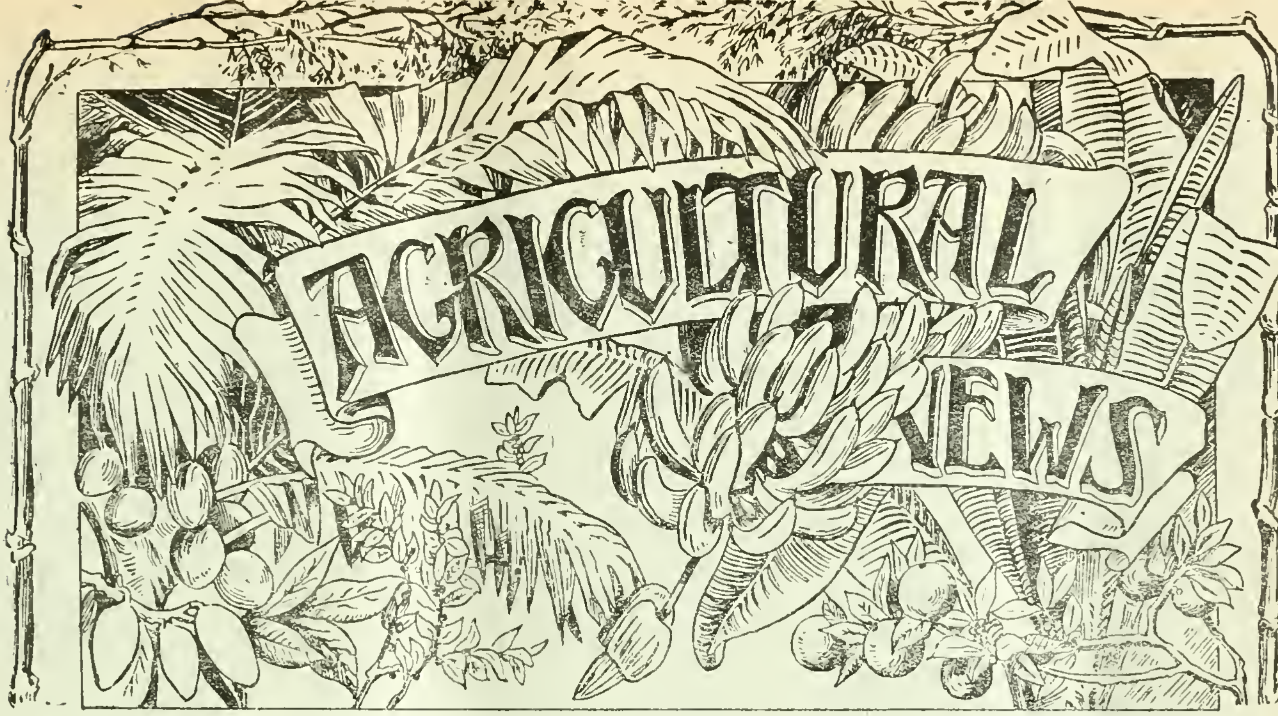

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AGRICULTURAL NEWS.

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

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CONTENTS.

The International Agricultural Institute.

THE INTERNATIONAL AGRICULTURAL INSTITUTE was founded in the year 1905, at Rome, and has received the co-operation of the Governments of most of the principal countries of the world. According to a recent Report of the Work of the International Agricultural Institute*, 'since that time the Institute has been organized on an effective basis, and is doing most useful work, with which agriculturists..... would do well to make themselves acquainted.' At the present time, forty-nine States are represented in the Institute—a number which is much larger than that of the adherents to any other international institute. The latter statement is made on the authority of the President of the Institute, and is contained in the report which is mentioned above. It is sufficient to show the large amount of interest that is being taken in the work of the Institute, and indicates, also, the amount of responsibility which that work entails.

The purpose of the Institute is stated shortly in a phrase of the Rome Convention, namely, 'the Institute shall collect, elaborate, and publish, with as little delay as possible, statistical, technical, and economic information relating to the cultivation of the soil, and to agricultural products.' One of its aims is to afford information to the agricultural world concerning the statistics of production, and the commerce and prices of the principal products, in order that agriculturists may be able to defend themselves from the results of unwarrantable speculation. This aim alone would, however, have only justified the establishment of an International Bureau of Agricultural Statistics, in the place of the International Institute of Agriculture. The wide range of the work of the Institute has necessitated the publication of three Bulletins: a *Bulletin of Statistics*, a *Bulletin of Agricultural Intelligence and of Plant Diseases*, and a *Bulletin of Economic and Social Intelligence*. Extracts and abstracts from the first two, made for the *Agricultural News*, have already brought them to the notice of its readers.

*Issued as a Supplement to the *Journal of the Board of Agriculture*, Vol. XVIII, No. 4, July 1911, from which the following particulars are taken.

The detailed objects of the Institute are best expressed in the words of an appendix to the Report. This shows that, while limiting its action to international questions, it is the duty of the Institute:—

(a) To collect, elaborate, and publish, with as little delay as possible, statistical, technical, or economic information regarding the cultivation of the soil, its production, whether animal or vegetable, the trade in agricultural products, and the prices obtained on the various markets.

(b) To send to interested parties, in as rapid a manner as possible, full information of the nature above mentioned.

(c) To indicate the wages of rural labour.

(d) To notify all new diseases of plants which may appear in any part of the world, indicating the districts affected, the spread of the disease, and, if possible, efficacious means of resistance.

(e) To consider questions relating to agricultural co-operation, insurance, and credit, in all their forms, collecting and publishing information which may be useful in the various countries for the organization of undertakings relating to agricultural co-operation, insurance, and credit.

(f) To present, if expedient, to the Governments, for their approval, measures for the protection of the common interests of agriculturists and for the improvement of their condition after having previously taken every means of obtaining the necessary information, e.g., resolutions passed by International Congresses or other Congresses relating to agriculture or to sciences applied to agriculture, agricultural societies, academies, learned societies, etc.

All questions relating to the economic interests, the legislation and administration of any particular State are to be excluded from the sphere of the Institute.

With relation to the publications of the Institute, the Permanent Committee has insisted that the *Bulletin of Agricultural Intelligence and Plant Diseases* should contain solely new matters that are important and indicative of progress. The claim is made that the Institute probably receives and examines a greater number of agricultural periodicals than any other, and this should serve to indicate the extent and importance of this work alone. The *Bulletin of the Bureau of Economic and Social Intelligence* has commenced by presenting monographs on the position of co-operation, insurance and agricultural credit in several countries, and has been enabled to afford reliable information through the co-operation of the governments concerned. Finally, it is through the *Bulletin of the Bureau of Statistics* that knowledge as to the state of the crops in different parts of the world may be obtained, so that the producer and dealer are not as completely in the hands of speculators as if they were not able to gain possession of such information. At the present time, the Institute publishes the first mentioned Bulletin, containing about 225 pages, in two languages; the second, rather larger in size, in a similar way; and the third in five languages. The regular publications include, in addition to these, a Weekly Bibliographical Bulletin.

The number of registered documents in the library on May 1, 1911 was 38,961, which is nearly four times as many as those in its possession at the end of 1909. In the same way, the reviews and journals that have been filed have increased from 420 to 1,715 for similar dates. A table is given in the report which shows that 1,604 periodicals are received regularly by the library of the Institute, for permanent filing. The importance of these matters is derived from the fact that the publications received are not merely filed, but are, as has been indicated, extracted and abstracted for use in the Bulletins.

The organization of the staff of the Institute has presented difficulties because of the circumstance that those employed must be in possession of sufficient scientific knowledge for the work, and at the same time know several languages. This difficulty has been partly dealt with by the employment of translators, of which there are two classes. One of these performs the work of translating articles which may be required by any particular Bureau, while the other does similar work for matter to be published in the Bulletins.

What has been said serves to indicate in a general way the organization and work of the International Agricultural Institute. It may be useful to conclude by stating where particulars may be found of its early history. This is dealt with in certain of the Parliamentary Publications, namely Cd. 2958, Cd. 4727, and Cd. 5339.

SUGAR INDUSTRY.

SUGAR IN GUADELOUPE.

In a report on the commerce and industries of Guadeloupe, by Consul Robert T. Crane of Basseterre, the following appears in the *Consular Trade Reports* under date of June 22, 1911:—

The year 1910 was the most prosperous in the island of Guadeloupe since the sugar crisis in 1884. Commercial and industrial affairs not only showed an improvement from the preceding year, but also a marked advance over the decade. According to uncorrected customs figures, the total value of the general imports and domestic exports of the Colony during 1910 was $3,243,218 and $4,596,699, against $2,740,845, and $2,174,874 in 1909.

Sugar-cane has always been the chief source of wealth to the Colony. It reached its highest production in 1882, when 64,000 tons of sugar were exported. From that date until 1906 each period of five years showed a decrease of 9 per cent.; but the subsequent four years showed an equal gain, and with the large output of 1910 it is believed that the industry is once more on a paying basis. The islands of Grande Terre and Marie Galante are devoted exclusively to cane-raising, and Guadeloupe proper, to an altitude of about 1,500 feet, is largely planted in cane. On the western slope of the last island, where transportation is difficult over rough country, cane is ground exclusively for rum, of which an excellent quality is produced. The remainder of the territory, containing about 60,000 planted acres, is covered by 17 centrals. The average yields for the five years prior to 1910 were 37,650 tons of sugar, 1,680,000 gallons of rum, and 360,000 gallons of molasses.

The high prices for colonial products in 1910 added to the prosperity of Guadeloupe. Sugar advanced from 2·28 to 2·98c. per lb.; rum, 22 to 29c. per gallon, and vanilla, $1·50 to $2·50 per lb. Coffee and cacao remained nearly stationary at about 17·5 and 13c. per lb, respectively.

The only disturbing factor in 1910 arose in the sugar industry. When the centrals were first established, some thirty years ago, the muscovado produced by the planters of each centre was calculated at percentages varying from 5·5 to 6·5, or 100 to 130 lb. of sugar to the ton of cane. The centrals then contracted to pay for a ton of cane the price which the planter would have obtained for his yield from the ton as estimated on the given percentage for his centre at the market quotations of Pointe à Pitre for sugar testing 70°, the average of the muscovados. This method of calculation has become highly artificial, as muscovado sugars are no longer produced or marketed in the Colony, but the centrals insist on its use. The small planters, holding nearly one-fifth of a total yield of about 450,000 tons of cane, refused to accept the usual contracts offered by the centrals last January, and under their inspiration all of the cane workers, both in the fields and factories, struck for higher pay. Wages were 15c. to 25c. per 10-hour day, but 29c. to 39c. was demanded. A small amount of cane was destroyed during February and March, and the harvest considerably retarded before the centrals yielded. At the same time, the centrals agreed to advance the price of cane about 7 per cent.

No labour difficulties occurred in the western portion of Guadeloupe, where wages run from 29c. to 39c. a day. Of domestics in the Colony, women cooks receive $4·80 to $5·80 per month, maids $2·90 to $3·85, and menservants $7·70 to $8·70, and find themselves. There are 13,000 Hindu coolies in the colony, whose time of service is now up, and whose return to India has been requested by the British Government. If their immediate repatriation is insisted upon, their absence will be seriously felt in the Colony. (The *American Sugar Industry and Beet Sugar Gazette*, July 1911, p. 298.)

A NEW WAY OF FILTERING CANE JUICES.

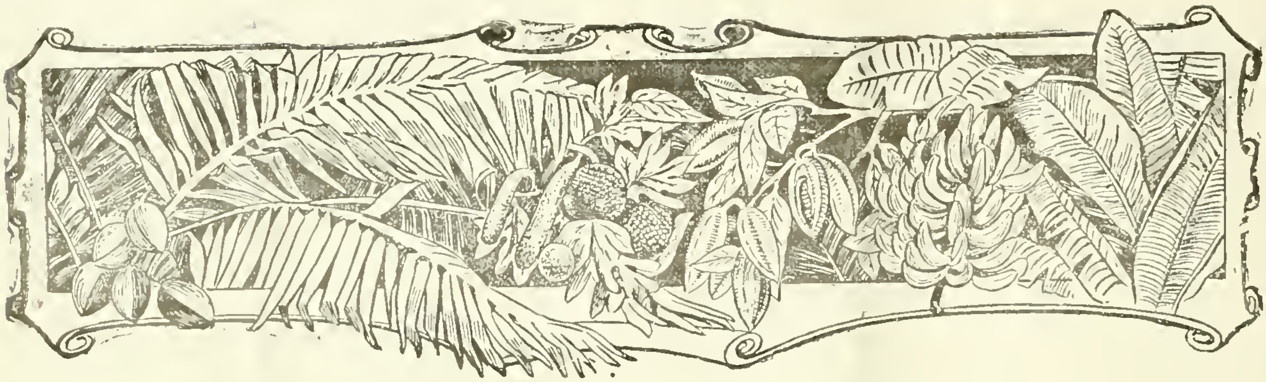
The *Australian Sugar Journal* states that during the last two seasons fine wood shavings, or 'wood wool', have been used at the Pleystowe Mill, Mackay, as a filtering medium for cane juices, with great success. The clarified juices, after coming from the subsiders, are run by gravity through two filters for from ten to twelve hours: the juice is then run into two more filters which have clean shavings in, and the dirty ones are opened up. In these the shavings will be found to be coated with a dirty black slime. This slime is the most serious thing sugar manufacturers have to cope with in their evaporating plants, as it clings to the tubes, and causes a scale which is very hard to get off. During last season, especially, it was noticed that, although the triple effect did 25 per cent. more work than it ever did before, the tubes always kept fairly clean, thus lessening to a great extent the hard labour of Sunday cleaning.

The only attendance required to work 'wood wool' filters is one man for about one and a half to two hours per shift. This is required for changing the shavings, washing them, and putting them back again. The juice goes in by gravity, and a pump to raise the filtered juice to the triple effect supply tank is controlled by a float valve, thus requiring no attendance. The shavings last for a considerable time, being used over and over again. A further advantage is that there is no scoring of the pump brasses, as is the case where sand is used for filtering, the pump working as smoothly at the end of the season as at the beginning. (The *International Sugar Journal*, July 1911, p. 350.)

BARBADOS AND THE CANADIAN NATIONAL EXHIBITION.

The exhibits sent from estates in Barbados to the Canadian National Exhibition, to be held in Toronto from August 26 to September 11, include the following: yellow crystal sugar, dark crystal sugar, syrup sugar, centrifugalled, oscillated and ordinary muscovado sugar, sugar-cane syrup, fancy molasses, crystal sugar molasses, centrifugalled and oscillated muscovado sugar molasses, oscillated sugar muscovado molasses, ordinary muscovado sugar molasses, coloured and uncoloured rum, infusorial earth, Sea Island cotton lint.

Exhibits were also sent by the Permanent Exhibition Committee, various firms and private persons, the Barbados Co-operative Cotton Factory, and the local Department of Agriculture. There were forwarded by these, in addition to some of the materials mentioned above: white crystal sugar, white falernum, wormwood and other bitters, manjak, green tar, Sea Island seed cotton, cotton seed oil, various beans and other seeds, sweet potatoes, yams, tamarinds in syrup, hot sauce and photographs of scenery and industrial life in Barbados.



FRUITS AND FRUIT TREES.

A PERENNIAL RICE FROM SENEGAL.

Toward the end of the year 1909, parts of the rhizomes (underground stems), and of the roots, as well as the fruits, of a perennial rice, were received at the Jardin Colonial from the district of Richard-Toll, in Senegal. Investigations carried out with this material are described in *L'Agriculture Pratique des Pays Chauds* for April 1911, p 265, and it is from this description that the information given below is taken.

An attempt was made to propagate the rice by means of the stalks, and of the pieces of the rhizomes, that had been received. Whether the conditions were unfavourable, or whether the material had become too dry, is not certain; in any case, the attempts to raise the rice in this way were unsuccessful. Several seeds were then sown, and from these were obtained the material upon which some of the observations were made.

After giving reference to instances in botanical literature where perennial rice has been mentioned already, and pointing out that in all these the main attention was given to the flowers and fruits rather than to the rhizomes, the article goes on to describe the last. It appears that the aerial shoots arise most frequently through the adoption of an upright position by the terminal bud of the rhizome, although several lateral branches may be formed. The rhizomes bear scale leaves, provided with axillary buds, which are almost always well developed. The true nature of the underground stems cannot be doubted; they grow in the soil at a depth of at least 2 inches, and are not in the nature of stolons, or runners. Evidence is given to show that the rhizomes, as well as tufts of stems containing no rhizomes, possess a large vitality, which is closely connected with the circumstance, in the case of the former, of their large starch content. It is the presence of such rhizomes which appears to indicate unmistakably that this rice may be cultivated as a permanent crop.

After a detailed description is given of other parts of the plant, an account is presented of the grains, which shows that these vary in shape and possess a reddish surface. This reddish colouration is not only found on the fruit, but also in the interior of the stems, on the young axillary buds, on the young sprouts, on the rhizomes as soon as they reach the light, on the sprouts of cut stems, and also on the young plants. The leaf sheaths are also reddish within, but this characteristic is not confined to the variety under description; it also shows itself in other kinds of rices

Different methods of propagation were tried. In the first, the seedlings from grains sown during August 1910 were pricked out shortly afterwards, and although the conditions were very different from those of the natural habitat of the plant, specimens were obtained which varied in height from 8 inches to 2 feet.

In another method, the stems were cut in order to promote the growth of axillary buds; the latter developed rapidly and produced shoots which replaced the original stem.

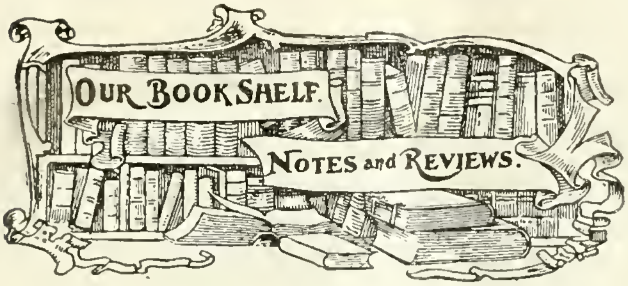
In another way, layering by simple bedding was tried. The plant does not seem to lend itself naturally to this method, and it is necessary to keep the stem in close contact with the soil, when the development of adventitious roots becomes rapid.

The last method of propagation that was attempted was by means of cuttings of the stalks, similar to those employed in sugar-cane cultivation. Each cutting contained three nodes; they were chosen from both the upper and lower part of the stem. Observations made on these showed that, in the case of the cutting taken from the lower part of the stem, the first roots appeared on the third day of the experiment. On the fifth day, these roots were $\frac{1}{3}$-inch in length, while at the same time the first roots from the cutting taken from the upper part of the stem had only just begun to force their way through it. On the seventh day, both cuttings possessed roots, the length of those on the latter being $\frac{1}{25}$-inch, and on the former $\frac{1}{3}$-inch.

On the eighth day an axillary bud developed on the cutting taken from the lower part of the stem, to form a stalk. By the eleventh, both cuttings were sufficiently provided with roots, and each showed a sprout having a reddish colour. The result of the observations is to show that there is a delay that is of little significance in the formation of roots on cuttings obtained from the upper part of the stalk.

It is easy to understand that in its natural surroundings, when cuttings of the plant have formed roots, their further development is easy, even where they are situated in a strong current of water, for the surrounding vegetation would prevent the cuttings from being washed away. It is probable that this method of multiplication is only possible on submerged lands, or during the wet season.

The article concludes with an account of the anatomical characters of a plant which, it appears, should attain eventually an amount of economic significance.



CACAO, ITS CULTIVATION AND CURING. By J. Hinchley Hart, F.L.S. *London, Duckworth & Co.* 7s. 6d. net.

This work, which has received reference and quotation from the *Agricultural News* several times, has appeared already, for the greater part, as a series of articles in the *West India Committee Circular*. Before dealing with the merits of the book itself, it will be well to summarize shortly its contents, which may be stated generally as follows: botany and varieties of cacao, Chapters I and II: planting and growing cacao, Chapters III to VIII; diseases and pests, Chapters IX and X; road-making and draining, Chapter XI; picking and preparation, Chapters XII to XV; special matters in regard to cacao production, Chapters XVI to XX; food value and manufacture, Chapter XXI; transport of cacao plants and seed, Chapter XXII; miscellaneous matters, Chapters XXIII to XXV.

It is hardly necessary to state that the treatment of the whole subject is thorough and authoritative, and this is particularly the case in the parts which will appeal more directly to the practical planter, namely those dealing with the general work of planting and growing the trees, and of harvesting and preparing the product.

The same is true in regard to those portions which have relation to the diseases to which the cacao plant is liable. The special chapter devoted to the subject presents, on the whole, a sound and reliable summary regarding the fungus species known to occur on the cacao plant, particularly in the West Indies, as well as of the position in regard to the knowledge of these at the time of writing the book. It may, however, be pointed out that cacao canker has practically been proved to be caused by *Phytophthora Faberi*, Maublanc, which is the modern name for the fungus formerly known as *P. omnivora*, de Bary; while the present tendency is to regard most of the Nectrias and associated and related fungi as purely saprophytic. Recent work by Coleman has shown that *P. Faberi* is almost always parthenogenetic, and that antheridia very rarely occur, at least as the fungus is known in Ceylon. It is not very clear whether this is the case in Trinidad, or not. Recently acquired knowledge would have enabled the author, also, to write far more definitely on the subject of the identity of the various forms of Diplodia, Botryodiplodia, Lasiodiplodia and Chaetodiplodia, as they are now known to be identical; while Petch advocates the use of the old name *Botryodiplodia theobromae*, Pat., to designate them all, as representing the soundest classification. They are, however, more usually known as *Lasiodiplodia theobromae* (Pat.), Griffon and Maublanc.

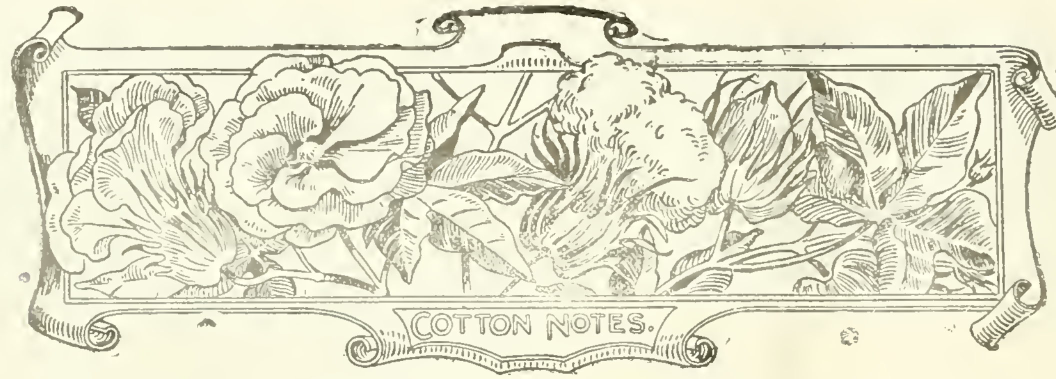
It is somewhat regrettable that the author has dismissed so summarily the question of root disease of cacao; there is much evidence to show that, at any rate one form, having no connexion with *Lasiodiplodia theobromae*, is of common occurrence, and possesses well marked characters, although the causative fungus is unidentified. Again, sympathy cannot be expressed with the author's view as regards the spraying of cacao, as this is put forward on page 89, and reiterated on page 93. The aspect of the question which deals with the protection of young pods, and even of stems, from original infection by means of a coating of Bordeaux mixture, has been entirely overlooked, notwithstanding the recent demonstration of its usefulness, by Rorer, in Trinidad. Further, much of what is said in Chapter XXIII as regards the difficulties of spraying is true, but concurrence with the author cannot be expressed as regards the futility of spraying with fungicides as a preventive for pod diseases: adhesive Bordeaux mixture can be made, and the removal of infected pods may easily be practised in conjunction with spraying. Agreement must, however, be expressed with the author's contention that the application of spraying material should be the work of experienced hands. It is agreed, too, that spraying is of no use as a direct remedial measure against internal parasites; it is, nevertheless, valuable as a preventive, and this aspect is considered in Chapter XXIII. Another matter for remark is that *Hypoxylon rubiginosum* (Pers.), Fr., has been found recently in St. Lucia on a dead cacao branch, and is almost certainly a saprophyte, only.

For the rest, good as is the summary of cacao diseases, it is slightly disfigured by one or two printers' errors, among which may be mentioned *Pellicularia Kaleroga* for *Pellicularia Koleroga*, *Marasmius equicrinus* for *Marasmius equicrinis*, *Corticium lilaco-fuscum* for *Corticium lilacino-fuscum*; the last, however, originated in the source from which the information on the subject is taken. Another matter is that the zoospores of Phytophthora are given as about one two-hundredth of an inch in diameter; this must be a misprint for one two-thousandth.

The review of the mycological part of the work would not be complete without reference to the large amount of interesting information that is given under the head Diplodia. It would appear, however, that the fungus is not responsible directly for as much damage as is considered to be the case by the author. It is a very rapidly growing organism, almost universally present in the air where cacao is planted, and consequently its appearance on material kept in a damp chamber cannot be definitely regarded as a proof that it is the primary cause of any given trouble, unless most careful steps have been taken to make certain that it is not an infection following other forms, subsequently to the cutting of the material. The matter of nomenclature in relation to Diplodia has been treated above.

The forms of animal life found in cacao fields are considered under the head Insects and Mammals, and a table presents in a convenient way the useful facts in regard to these. The account of the insect pests and their treatment is very good, but it would seem that more mention might have been made of the purely beneficial insects such as lady-birds, lace-wing flies, the parasitic and predaceous Hymenoptera, and of the social and solitary wasps; attention should also have been given to the useful work of birds and reptiles, in the same connexion. The chapter entitled Miscellaneous Notes contains sound advice as regards spraying and the natural control of pests, and it is indicated that the value of the latter may vary under differing surrounding conditions. Finally, a few errors appear in the spelling of technical names, but this detracts little from the value of the general treatment, which as has been stated, is good.

It only remains to say that the work is well produced, with good illustrations, and that, notwithstanding the employment of large type—a welcome feature—the book is light in weight and convenient to handle.



WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date July 31, with reference to the sales of West Indian Sea Island cotton :—

About 200 bales of West Indian Sea Islands have been sold since our last report at steady prices. The bulk of the business has been in qualities from 12*d.* to 17*d.*, with some Stains at 8½*d.* to 9½*d.*

P.S. The latest telegrams from Egypt report that the crop, including the new growth, Sakellarides, which was expected to take the place of Georgia and Florida cotton, is being damaged by worms.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending July 29, is generally as follows:—

The sales for the week were 15 bales, portion of [illegible] at 30*c*; otherwise the market has remained dull. Quotations are nominally unchanged.

THE SEA ISLAND COTTON SEASON IN THE UNITED STATES.

A report has been received from Messrs. W. W. Gordon & Co., of Savannah, Georgia, U.S.A., in which is summarized the answers to a series of questions concerning the Sea Island [illegible]ry, sent by this firm on July 6 to various [illegible] Georgia, Florida and South Carolina. The following [illegible] to the information in the report.

[illegible] increase in the area of Sea Island cotton h[illegible] while in others there has been [illegible] of the substitution of Upland [illegible] appears to be unchanged, or [illegible] last year. An increase of [illegible] of manures. [illegible] had been favour[illegible] were show[illegible] the crop was one to two weeks [illegible] that, if the season is normal, cotton [illegible] September 10 or 15.

[illegible] are similar to those in Georgia, [illegible] slight increase in the area plant[illegible] to be more backward than in the [illegible].

[illegible] the Sea Islands [illegible] 25 per cent. [illegible] or no increase [illegible] and while the [illegible] healthy plants, [illegible] of the season. [illegible] little cotton on the Charleston market before the middle of October.

THE BRITISH COTTON GROWING ASSOCIATION.

The Eighty-ninth Meeting of the Council of the British Cotton Growing Association was held at the Offices of the Association, 15, Cross Street, Manchester, on Tuesday, July 4. In the absence of the President (the Right Hon. the Earl of Derby, G.C.V.O.), Mr. J. Arthur Hutton occupied the Chair. The following description of work in connexion with cotton growing in various parts of the Empire is taken from an account of the meeting, furnished by the Association.

WEST AFRICA. It was reported that, as a result of the decision to increase the buying price for cotton at all stations along the Lagos railway, there was now a greatly increased demand for cotton seed for planting purposes, and it is anticipated that there will be a considerable increase in the acreage under cotton this season. The Association have undertaken the distribution of all cotton seed for planting for the current year, on behalf of the local Government.

The total purchases of cotton in Lagos from the beginning of the year amount to 4,981 bales, as compared with 4,901 bales for the same period last year, and 10,620 for 1909.

Attention was called to the remarkable regularity in the price which has been secured for Lagos cotton this season, and which is due to the regularity of the quality, as a result of careful selection of the seed, carried out during the last few years by the Association at the ginneries.

NYASALAND. A letter has been received from the Director of Agriculture, stating that during the past season there has been an exceptionally heavy rainfall and little sunshine, and [illegible] cotton is later than it was last year. There has been very little bacterial [illegible] the crop, but a bad attack of Aphis. The native industry has made considerable progress, and the natives are cultivating in many instances as thoroughly as the white planters, and the appearance of the crop shows that the natives are benefiting considerably from the instructions which have been given them. The export of cotton for the financial year 1910-11 amounted to 4,542 bales of 400 lb. each, as compared with 2,147 bales for 1909-10. It is estimated that there are about 20,000 acres under cotton this year, as against [illegible],752 acres last year; [illegible] under [illegible] at least double what it was last year.

[illegible] A sample of cotton has been received from the Association's plantation at Kat[illegible], and is considered very desirable cotton. The crop [illegible] is a fairly good one, and, on the whole, the prospects are quite favourable.

UGANDA. Cotton is still coming in freely from this Protectorate, and there is every reason to believe that the estimate of a 20,000-bale crop from Uganda this year will be realized.

BRITISH EAST AFRICA. A report has been received from the Provincial Commissioner for the Kavirondo district stating that a further 10 tons of selected seed has been distributed and about 5,000 acres of land has already been cleared and planted, and, if the season continues favourable, a fair output may be looked for from the district, where practically no cotton has been produced hitherto.

INDIA. It was reported that, in accordance with the request of the Association, the Federation of Master Cotton Spinners had appointed a Sub Committee who had decided to recommend that the Federation should appoint one or two of their members to discuss with representatives of the Association the question of the establishment of buying agencies and ginneries in certain districts in India.

COTTON IN THE SUDAN.

The monthly report of the Sudan Central Economic Board, for March 1911, gives the following information concerning cotton-growing in the Sudan in the last few years. The production in the several years 1906-10 has been as follows: 1906, 2,300 tons value £50,000; 1907, 4,400 value £103,000; 1908, 5,400 value £89,000; 1909, 3,900 value £65,000; 1910, 8,700 tons value £235,000.

Information is given further to the effect that excellent reports are being received of the past cotton crop in the Tokar district, Red Sea Province. The export of cotton lint to Liverpool from this district, during March last, amounted to about 115 tons, and this obtained a price of $9\frac{1}{2}d.$ per lb. It is expected that the total Tokar crop will amount to about 6,200 tons of unginned cotton.

The *Board of Trade Journal* for May 25, 1911, from which the above information is taken, states that the recent report by Sir E. Gorst on the affairs of the Sudan for the year 1910 shows that the cotton crop was good and that high prices were realized, so that it is likely that native cultivators will turn their attention to the growing of a higher class product. During last season, 51 per cent. of the Sudan cotton was flood-grown, and about 40 per cent. rain grown: thus about 91 per cent. of the cotton is produced by natives who are not in receipt of European assistance.

A NEW TEST FOR TUBERCULOSIS.

The *Report of the Board of Commissioners of Agriculture and Forestry*, of the Territory of Hawaii, for 1910, gives the following account of a simplified test for tuberculosis in animals. It is known as the intra-dermal tuberculin test:—

This comparatively new method requires only two visits to each dairy (instead of eight); it does away entirely with the thermometer and the taking of temperatures (the work done so far has required the use of more than a gross of thermometers, at \$1·00 apiece); it can be applied to any animal of whatsoever age, class or condition and under any or all circumstances, whether favourable or unfavourable; it is so manifest in its appearance, and so simple in its application that the veriest simpleton can translate it, and, at the same time, it excels the subcutaneous test in that its effectiveness cannot be circumvented for illegal purposes in obscuring thermal reactions by the administration of febrifuges.

The intra-dermal test was first reported on by two French scientists, Moussu and Mantoux, at the Sixth International Congress on Tuberculosis. It consists simply in the injection of a few drops of a special concentrated kind of tuberculin into one of the two folds of skin (sub caudal folds) which are found under the tail when it is lifted. The skin at this place is very thin, soft and pliable, and what is most important, denuded of hair. The authors claim that in animals affected with tuberculosis the injection of a small dose (approximately 3 drops) of strong tuberculin would cause a more or less pronounced swelling of somewhat varying character of the injected fold, while the other one, which is conveniently there for comparison, remains unchanged. This test has, during the months of November and December, been applied to nearly 200 animals, many of which had previously been tested with the subcutaneous test, and consequently were known to be either sound or tuberculous. In every instance the results obtained with the new test proved identically the same as the previous ones, and when supported by post mortem examinations the diagnosis was invariably confirmed.

While this method of testing has been given but scant attention by either official or private veterinarians, I believe this is to be due in a large extent to the fact that a third method, known as the cutaneous test, was introduced about the same time and has been universally declared impractical by those who have published their experiences with it. The two methods resemble each other in several respects, but principally in the fact that the diagnosis does not depend upon a thermal reaction, but upon the local changes which develop in the reacting animals at the place of application or injection. Another fact which may have tended to obscure the intra dermal test is, that the article describing it in the proceedings of the International Congress on Tuberculosis appeared in French only, and it was not until Drs. Baker and Ward of California called attention to it at the meeting of the Veterinary Medical Association in San Francisco in September last that it was decided to give it a trial here. Undoubtedly many other veterinarians have by this time experimented with it, and even though the International Commission on Bovine Tuberculosis discourages the use of any but the subcutaneous method for the present, this is, as stated, probably due to the fact that not enough attention has been given to it and that the immense importance of its superiority as a convenient and economic diagnostic agent for tuberculosis in animals has not been realized. The intradermal method is equally well adapted for diagnosing tuberculosis in hogs, tuberculin in this case being injected in the lower lobe of the ear or just behind and below the ear where the skin is thin. A typical swelling and discoloration of the unpigmented skin takes place, and is generally so well marked that the animal does not need to be confined or restrained for examination.

The *Semi-annual Report* of Messrs. Schimmel & Co., dated April 1911, gives a note on work in which the influence was investigated of certain volatile substances upon the development of germinating grains of corn. It was found that the vapour of thyme, wild thyme, or eucalyptus oil, quickly stopped germination. When the grains were exposed to the vapour of turpentine, rosemary oil, or menthol, the seedlings continued to grow for some time before death. The development was impeded by citronella oil, lavender oil and thymol, but the germs were not destroyed. Camphor, clove and some other oils did not show any effect.

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. X. SATURDAY, AUGUST 19, 1911. No. 243.

NOTES AND COMMENTS.

Contents of Present Issue.

The editorial of this issue gives an account of the International Agricultural Institute. Its object is to indicate in a broad manner the purposes for which this Institute has been formed.

Under the heading Sugar Industry, on page 259, an interesting note is given, which describes shortly a new method that is being employed for filtering cane juices.

Pages 262 and 263 contain an account of a recent meeting of the British Cotton Growing Association.

A test for the existence of tuberculosis in animals, that has been devised comparatively recently, is described on the latter of the above-mentioned pages.

The subject of peculiar methods of pollination, which has received treatment in the last two issues of the *Agricultural News*, is continued under the heading Insect Notes, on page 266. On this occasion, a description is given of the manner of pollination of the Smyrna fig.

Page 267 contains particulars of the awards at the International Rubber Exhibition, to exhibits from the West Indies and British Guiana.

The Fungus Notes will be found on page 270. In this issue, they have for their subject The Bracket Fungi.

Nature Teaching and Hygiene in Elementary Schools, British Guiana.

The report of the Inspector of Schools, British Guiana, for the year 1910-11, shows that Nature Knowledge is an optional class subject in the elementary schools of the Colony, which is taught to pupils of any age. For assistance in teaching, *Blackie's Tropical Readers* and *Nature Teaching* are employed, but are intended only to be used by the teacher, and to indicate in a general way the subjects that must receive attention. Up to the present, the teaching is not quite satisfactory, partly on account of the fact that teachers have not entirely grasped its object, and because of difficulties in holding the examinations. In reporting on the subject, the Inspector of Schools draws attention to the fact that Nature Teaching in schools should have as close a relation as possible to the work that most of the pupils will take up in after life.

In regard to school gardens, the difficulties are mentioned of conducting a fair examination at different times of the year, and of obtaining a proper judgement as to the efficiency of the work. Some doubt is thrown upon the supposed usefulness of keeping notes of school garden work. It is interesting that, in some of the Indian Mission Schools, industrial work is taken up instead of school gardening: in three cases instruction is given to the boys in basket-making, in the making of fans and sieves, and the preparation of the raw material for hammock ropes; while the girls learn cotton-spinning, and the making of hammocks and hammock ropes.

Hygiene is obligatory, and the teacher is allowed a wide range of subjects, although it is intended that he should make the teaching as practical as possible. The report states that there has been a large diffusion of knowledge on the subject during past years, but that little of the teaching is being applied in practice—a circumstance that does not by means apply to British Guiana alone.

The Fibre of Calotropis spp.

The *Journal d'Agriculture Tropicale* for June 1911, p. 190, points out that there has been uncertainty for some time concerning the true nature of the fibre which has been wrongly called 'Coton Akund'. It draws attention to the fact that this fibre is obtained from plants of *Calotropis* spp., which do not belong to the family in which cotton is placed. Nevertheless, it is being imported, together with silk cotton or kapok (from *Eriodendron anfractuosum*), especially in Germany, in connexion with the attempt to incorporate fibres other than cotton in cotton textiles, in order to reduce the European dependence on American supplies of cotton.

The use of the fibre of Calotropis for making textiles is not new, for samples of it, spun with cotton, and alone, were shown at the London Exhibition of 1862. It was designated under its Indian name 'Mudar'; its Javanese name is kapok, and it has been thus confused with the other fibre just mentioned. It is obtained from the plants *Calotropis procera* and *C. gigantea*, the former of which occurs in the West Indies, and is known as French cotton. The fibre is obtained from the stems of these species, and difficulty is caused in its working, on account of the fact that the long fibres show weakness at the parts which were originally situated at the internodes.

It does not seem that there is any marked difference between the two species of Calotropis mentioned; they have much the same habitat. In India the fibre of Calotropis is usually designated as Madar silk.

Rainfall in Antigua, 1910.

The statistics of the rainfall in Antigua for 1910, prepared by the Superintendent of Agriculture for the Leeward Islands, show that the precipitation in that year amounted to 34·77 inches.

The average rainfall in the island for the thirty-seven years, 1874-1910, is 45·03 inches, so that the precipitation for last year was 10·26 inches below the average. This is the lowest rainfall for the last twenty years, with the exception of that in the year 1905, when the average total rainfall recorded was 31·40 inches.

Effect of Nitrate of Soda on the Flow of Ceara Latex.

In the *Agricultural News*, Vol IX, p. 107, reference was made to experiments in connexion with the flow of latex from Ceara rubber trees that are described in Bulletin No. 19 of the Hawaii Agricultural Experiment Station. Attention is also given in this Bulletin to the effects of nitrate of soda on the flow of latex.

In an experiment described, the capacity to yield of a group of trees was tested by means of uniform tapping. Nitrate of soda was then applied to two of the groups of trees, while a third was left as a control. In the case of three trees receiving ½-lb. of nitrate of soda each, the yield of dry rubber was 2·3 oz: from a similar number receiving ¼-lb. of nitrate of soda, it was 1·3 oz.; and from the three control trees, 1·2 oz. The manner of application of the nitrate of soda was to place it in the soil at a depth of 3 or 4 inches, and at some distance around each tree. There was a good rainfall, and it is stated that the effect of the nitrate of soda upon the flow of latex was exhibited within twenty-four hours.

Further experiments have been carried out, and it is concluded from all the trials that the flow of Ceara latex may be temporarily stimulated by applying nitrate of soda.

The *Planters' Chronicle* for April 15, 1911, gives a description of similar experiments carried out on estates in Southern India. In one of these the results were not very conclusive, but it was indicated that the application of nitrate of soda caused an increase in the flow of latex and yield of rubber. In another case, more elaborate trials appeared to show that, under the conditions of the experiments, the best quantity of nitrate of soda to apply is ½-lb. per tree; this increased the yield of wet rubber from 1 oz. 10⅗ drs. to 2 oz. 5⅗ drs. per tree, in eight tappings, and the yield of dry rubber was increased by 5 drs. per tree in the same time. Mr. Rudolph D. Anstead, in reporting these experiments, expresses agreement with the conclusion that further work is required before any decision can be made as to the proper means of manurial treatment with nitrate of soda for Ceara rubber trees.

The Production of Hydrocyanic Acid in Leaves.

The production of hydrocyanic (prussic) acid in parts of plants, such as the germinating seeds, stems and leaves, has received attention in the *Agricultural News* from time to time. In the case of the last, an interesting review is given of recent work, in the *Annual Reports of the Progress of Chemistry*, for 1910, issued by the Chemical Society, p. 214.

The investigations have shown that the action of chloroform and similar anaesthetics on leaves is to produce hydrocyanic acid, the action being most rapid at high temperatures. It was found that, in such experiments, solutions of the substances may be employed instead of the compounds themselves, as water has no influence in causing the production of hydrocyanic acid. An extension of the trials has shown that many other substances than chloroform, such as ammonia, carbon disulphide, various alcohols, benzene and acetic acid, will produce the effect.

It appears that the action arises as a result of the concentration of the contents of the cells of the leaves, and it is suggested that the experiments will eventually provide an explanation of the significance of the possession of ethereal oils and scents by various plants.

Tapping Experiments with Ceara Rubber in Uganda.

The results of two months' (February and March) tapping of twelve Ceara (*Manihot Glaziovii*) trees belonging to the Mabira Forest (Uganda) Co., Ltd., are contained in a Supplement to the Uganda *Official Gazette* for May 15, 1911. The details show that, whereas the trees tapped on the pricking system gave a decrease of 59·51 per cent. in the second month, those which were tapped on the paring system, with no pricking, yielded an increase of 24·23 per cent.

The total amount of dry rubber obtained from six trees by paring was 299·15 gm., which is equivalent to 24·93 gm. per tree per month, or an average of 299·15 gm. per annum; so that assuming a constant yield of this nature, the rubber given by each tree during a year would be 0·66 lb.

Further work will determine if the yield is maintained during the year, and it may be mentioned in this connexion, that February was a very dry month and that the rainfall for March was below the average. The circumstance that is most likely to possess the greatest influence in the matter is the effect on the trees of continuous tapping.

INSECT NOTES.

THE POLLINATION OF THE SMYRNA FIG

The Insect Notes in the last two numbers of the *Agricultural News* described remarkable relationships that exist between certain plants and the insects which act as pollen carriers, and thus ensured the development of the ovary and the fertility of the seeds. These instances were chiefly of interest on account of their biological features and not because of any economic bearing which they possess.

The present article, however, gives the principal facts of a relationship between flower and insect which is quite as remarkable as those already described, and it has an added interest in that a very large fruit growing industry, the cultivation of Smyrna figs, is entirely dependent upon it.

The following notes on the fertilization of the varieties of Smyrna figs by the minute gall-making insect (*Blastophaga grossorum*) are taken from the account given in *Les Insectes*, by Henneguy.

Blastophaga occurs naturally in the inflorescence of the wild fig or Capri fig, as it is called. From time immemorial the people of the Orient have provided for the fertilization of the cultivated fig by placing in the branches of the latter, at the time of flowering, twigs of the Capri fig bearing ripening fruits. It was not, however, until within the past few years that the importance of *Blastophaga grossorum* as a pollen carrier was recognized.

The Capri fig produces three generations of fruits per year. The first of these called Mammee, ripening in April, are developed from flowers of the previous autumn, having remained attached to the tree during the winter. The fruits of the second generation are called Profichi; these ripen in June. Those in the third generation, ripening in August and September, are called Mammoni. At the time when the fruits of one generation are ripening, the flowers of the next are just coming into bloom; for instance, at Naples in April, the Mammee are nearly ripe and the Profichi are in flower at the time that the cultivated figs are in bloom for the first crop of fruits which ripen in June and July. It is at this time that the cultivators remove the wild Mammee fruits, which are nearly ripe, and distribute them through the branches of the cultivated fig.

The inflorescence of the wild fig contains a very large number of male or pollen bearing flowers, while that of the cultivated fig contains almost entirely female flowers. In the former of these there occur immense numbers of a minute Hymenopterous insect the *Blastophaga grossorum* already mentioned. The insect is developed in the minute gall at the base of the flower where the egg has been inserted into the tissues of the inflorescence by the female parent, with the aid of her piercing ovipositor.

On the completion of their life cycle, the female insects, which are winged, leave the inflorescence of the wild fig well covered with the pollen from its male flowers, and proceed to a neighbouring inflorescence. If this latter chances to be one of the cultivated figs, its fertilization is provided for by the pollen adhering to the body of the insect. The object of the visit of the insect to these flowers is, of course, the depositing of eggs to provide for the new generation, and she accordingly introduces her eggs into the ovaries of the flowers. When these eggs are deposited in the tissues of the wild fig, they pass through a normal cycle of growth and another generation of insects is produced; but when this egg-laying occurs in the cultivated or Smyrna fig, the insects do not develop, this perhaps being due to the rapid growth of plant tissue which destroys the egg or the very young larva. In addition to the pollination of the cultivated fig, there seems to be a direct effect on the growth of the inflorescence resulting from the irritation caused by the punctures of the ovipositor of the insect. The combined result of the pollination of the flowers causing the normal seed to develop and of the punctures of the females in egg-laying is to produce a fleshy, sugary fig, which is not to be obtained in any other way.

This process of introducing the wild figs among the branches of the cultivated figs is known as caprification. Some botanists consider caprification as useless, since in some countries, and with many species and varieties of figs, excellent fruits are produced without this operation. It has been well proved, however, that the Smyrna fig, which is the standard of excellence, can only be produced in its best quality by this process.

Dr. L. O. Howard, in the *Year Book* of the United States Department of Agriculture for 1900, presents an article entitled Smyrna Fig Culture in the United States. In this he gives an account of the early attempts, in California, to produce figs of the Smyrna varieties, possessing the same excellent qualities as those grown in Oriental countries. Dr. Howard shows how the usefulness of caprification was discovered, and how the important part played by Blastophaga was thoroughly proved. It was not until the fruit growers of California had succeeded in importing Blastophaga and establishing it on Capri fig trees already growing there, that they were able to produce satisfactory Smyrna figs.

AGRICULTURAL LECTURES IN ANTIGUA.

The following list of lectures in connexion with the Courses of Reading of the Department, which are being delivered in Antigua, has been forwarded by Mr. H. A. Tempany, B.Sc., Superintendent of Agriculture of the Leeward Islands:—

Date.	Subject.	Lecturer.
July 31	Elementary Botany	Mr. T. Jackson
August 7	Some Common Unsoundnesses in Working Stock.	Mr P. T. Saunders, M.R.C.V.S., Veterinary Officer to the Imperial Department of Agriculture
,, 14	Elementary Botany	Mr. T. Jackson
,, 28	Soils and Manures	Mr. V. M. Weil, B.Sc.
Sept. 4	,, ,, ,,	,, ,, ,,
,, 25	Insects and Fungi	Mr H. A. Tempany B.Sc.
October 2	Insecticides and Fungicides (at the Botanic Station)	Mr. T. Jackson
,, 23	Bacteria in relation to Agriculture	Mr. H. A. Tempany B.Sc.

RUBBER INDUSTRY.

AWARDS AT THE INTERNATIONAL RUBBER EXHIBITION.

The following information concerning the awards for exhibits from the West Indies and British Guiana, at the International Rubber Exhibition, is taken from the *West India Committee Circular* of July 18, 1911:—

Mr. J. N. Kelway Bamber, F.I.C., of Ceylon, Mr. Porter, of La Zacualpa Rubber Plantations in Mexico, and Mr. E. Luxmoore Marshall, who kindly undertook to judge the West Indian exhibits at the International Rubber Exhibition, have made the following awards:—

Silver Cup offered by the West India Committee for the finest specimen of Plantation Rubber—Mr. Hodgson, Plantation Noitgedacht, British Guiana.

Silver Cup offered by the West India Committee for the finest specimen of Balata—The Consolidated Rubber and Balata Estates, Ltd.

Silver Cup offered by Messrs. Booker Bros., McConnell & Co., Ltd., of the West India Committee, for the best exhibit by a West Indian Botanic Department—The Department of Agriculture of Trinidad and Tobago.

Silver Cup offered by Mr. W. Middleton Campbell, Chairman of the West India Committee, for the best West Indian comprehensive exhibit—The Permanent Exhibition Committee of Trinidad and Tobago.

Mr. Kelway Bamber submitted the following report regarding the West Indian exhibits:—

I had the honour of being invited to assist in the judging of the West Indian exhibits at the International Rubber and Allied Trades Exhibition and would like to add a few remarks on the various samples of rubber shown.

The [illegible] exhibit of the Castilloa variety was almost [illegible] of thin, [illegible] sheets, containing [illegible] bark, etc. Th[illegible] [ea]sily be improved [illegible] of the latex and [illegible] washed [illegible] tightly stretched [illegible] protected from [illegible] the rate of growth of the trees [illegible], and if the yield of latex and rubber is [illegible] the rubber can be put on the market at a [illegible], there should [illegible] demand for this product.

The [illegible] exhibit of Castilloa showed greater variation and some of the thick biscuits were very strong, and of good [illegible]. In one case the rubber had a strong medicinal smell [illegible] possible, the addition of chemicals should [illegible] of the Para [illegible] this Colony were [illegible], showing faulty methods of preparation, [illegible] being due to [illegible] development in the [illegible] coagulation, with the [illegible] of bubbles of [illegible] burst on rolling. Every precaution should be made to ensure absolute cleanliness, of all utensils, etc., used in the manufacture, the same as in a dairy. A little formalin in the washing water is advantageous, and Condy's fluid can be sprayed over the floor daily. Formalin as purchased contains 40 per cent., and one part of this solution in forty parts of pure water gives a 1-per cent. solution, sufficiently strong for all practical purposes.

Some excellent Castilloa was shown in the Trinidad and Tobago section, including sheets formed by the new separator method, and several good specimens of block. Some of the latter were too thick, manufacturers requiring block not more than 1 inch thick, as this can be placed in their machinery without cutting, and impurities can be more easily detected.

In the British Guiana section some excellent Para biscuits were shown, quite equal to any from the East; also good specimens of balata. The *Sapium Jenmani* rubber could probably be improved in the manufacture, as it was a little irregular. The whole exhibit in this section was very comprehensive, and well illustrated the possibilities of the Colony. The same may be said for the Dominica and Trinidad and Tobago exhibits, the latter being exceptionally good and complete. The numerous photographs and well illustrated pamphlets give one an excellent idea of the condition of growth of the various rubbers shown, and the possibilities of extension in the rubber industry.

THE EXTENSION OF THE RUBBER INDUSTRY IN PARA.

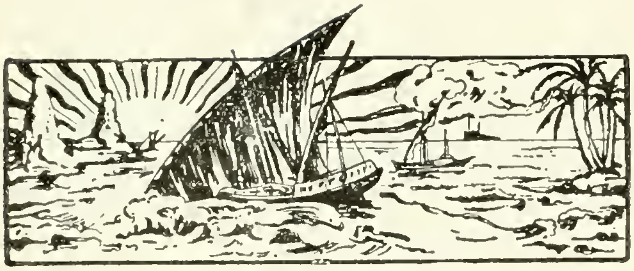
H. M. Consul at Para reports that three Laws (Nos. 1,179, 1,180 and 1,181), of date May 17, have been enacted in the State of Para, for the protection and extension of the rubber industry and trade, and of agriculture generally. The first Law authorizes the Government to grant favours, including exemption from taxes except those on exports, for a period not exceeding fifteen years, to persons undertaking to establish, in the town of Para, factories for the refining of rubber, or agreeing by new and improved methods to wash, rectify and purify india-rubber, so as to permit of the export of one grade only, of the finest quality.

The second Law authorizes the Government to enter into agreement with the Government of Amazonas, and the Federal Government, for the contraction of a foreign loan, of ten years' duration, not exceeding £6,000,000, at a maximum interest of 5 per cent., upon the responsibilities of the two States, and the endorsement of the Federal Government; this loan is to be used to protect the production of rubber. To provide for the interest and amortisation of the loan, an additional tax of 400 reis per kilog. (about 3*d.* per lb.) of rubber exported is established. The Government of Para is also authorized to enter into agreement with the Government of Matto Grosso, with a view to the establishment of this additional tax upon the product of that State also.

Should it not be found possible to raise the loan abovementioned, the State Government is authorized to contract one up to £3,000,000, with interest at 5 per cent., upon the responsibility of the State, and guaranteed by the additional export tax.

The third Law authorizes the Government of the State to guarantee a maximum rate of annual interest of 6 per cent. upon a capital of £3,000,000, to be emitted in series during thirty years, to an agricultural mortgage bank, to be founded in the town of Para.

H. M. Consul points out that, whether the security of the Federal Government has been or will be accorded in connexion with the proposed loan of £6,000,000, is not yet known. (*The Board of Trade Journal*, June 22, 1911.)



GLEANINGS.

The exports of rubber from Ceylon during March 1911 were 5,393 cwt., as compared with 2,065 cwt., in 1910. For the nine months ending March 1911, they were 37,511 cwt.; whereas during the similar period in 1909-10, they amounted to 16,498 cwt.

The *Bulletin of Agricultural Statistics* of the International Institute of Agriculture, Rome, Vol. II, p. 59, gives revised figures of cotton-planting and production in India for the season 1910-11. The area planted was 22,364,143 acres, and the production 4,102,000 bales of 400 lb. each.

In the St. Vincent *Government Gazette* for May 11, 1911, the particulars are given of an Ordinance to amend the Land Settlement Ordinance, 1899, No. 7 of 1911. This Ordinance passed the Legislative Council on April 25, 1911, and may be cited as the Land Settlement (Amending) Ordinance, 1911.

The quantity of desiccated cocoa-nuts exported from Ceylon in 1910 was 28 million pounds. In the previous year the exportation was 27 million pounds. The average exportation for the last ten years is 18,500,000 lb., so that the shipments for 1910 were more than half as great again as this.

A report furnished by the Agricultural Instructor, Tortola, states that a much increased area of cotton was planted in the Virgin Islands during last month, and that there is still a demand for seed. An increasing interest is being taken in regard to lime-growing, and the same is true of sugar production.

It is estimated that, at the end of last year there were in East Sumatra thirty-six British companies raising plantation rubber, and it is supposed that these represent a capital of about £4,000,000. Estimates for the area of land leased to these companies give this as about 445,000 acres; nearly one-ninth of this has been planted in rubber.

In the Grenada *Government Gazette* for July 13, 1911, there is published an Ordinance to amend the Agricultural Products Protection Ordinances, 1906 and 1909; this passed the Legislative Council on June 16, 1911. Its purpose is to regulate the sale and possession of cotton, and it may be cited as the Agricultural Products Protection Ordinance, 1911.

The distribution from the Antigua Botanic Station during July included the following plants and seeds: cocoa-nuts 70, mahogany 55, miscellaneous 122, cotton seed 43 lb., sweet potato cuttings 700. In the nursery, seeds of Eucalyptus, Casuarina and other plants were sown, and plants of *Manihot dichotoma*, as well as of other economic kinds, were potted.

Among the exports from the Philippine Islands, hemp takes the largest place, and the amount shipped in 1910 was worth £1,432,358. This is a decline from the export of last year, which was valued at £1,520,000. The decrease has taken place notwithstanding the fact that the average price for the product has practically maintained the same value during the two years.

It is reported from Nevis that, to the end of last month, about 500 acres of cotton had been planted. The dry weather has, however, interfered seriously with the establishment of the crop, up to the present, so that it is doubtful that the expected increase of the area in cotton-growing in Nevis will take place in the present season. It is estimated that the output of lint for last season is at least 335,000 lb.

H. M. Minister at Panama reports the publication of a Law No. 5 of 1911, ordering the National and Mortgage and Loan Bank to set apart \$100,000 (about £20,500) of its capital for loans that will increase the sugar industry in the Republic. Another Law, No. 42 of 1911, authorizes the Government to enter into contracts calculated to stimulate the sugar industry. (*The Board of Trade Journal*, June 22, 1911.)

According to the St. Croix *Avis* for July 5, 1911, an Ordinance for St. Croix, prescribing measures against diseases of the cotton plant, was passed unanimously by the Colonial Council at an Ordinary Meeting held on May 15, 1911. The draft of the Ordinance, which was sent to the Government for approval, provides among other matters, for the pulling up and burning of old cotton plants by a certain date, to be fixed in each year.

Teysmannia, Vol. XXI, p. 47, contains an account of an experiment in which teosinte (*Euchlaena mexicana*) was crossed with maize, in Java, for the purpose of obtaining a hybrid which would show greater fertility and resistance to chlorosis, the latter being a disease commonly attacking maize in Java. The experiment was a failure, as, although hybrids were obtained from it, these did not give any greater yields, and possessed no increased resistance to chlorosis.

The Egyptian cotton worm campaign is now in progress, and will last until the end of August, the official date of the closure. If by that time the plague is not definitely destroyed in certain provinces, the mudirs and governors will advise the Ministry of the Interior, and the campaign will be continued until September 30. Four European Inspectors have been engaged from the staff of the Khedivial Agricultural Society, to aid in the surveillance of the work against the cotton worm. (The *Textile Mercury*, July 8, 1911.)

The Eighth International Congress of Applied Chemistry will be held at Washington and New York in September 1912, from the 4th to the 13th of the month. In selecting papers for reading and discussion, preference will be given to those which are mainly of international interest; all papers must reach the Secretary not later than July 1, 1912. Information concerning the Congress may be obtained from the Honorary Secretary to the British Organising Committee for the International Congress of Applied Chemistry, Society of Chemical Industry, Palace Chambers, Westminster, S.W.

STUDENTS' CORNER.

AUGUST.

Second Period.

Seasonal Notes.

During the present quarter, favourable weather will see the planting of limes. In this work, state what precautions should be observed with reference to the preparation of holes for the reception of the plants, the lifting and removal of plants from the nursery, and in regard to the packing and transportation of plants, in order that they may suffer as small a loss as possible. Past experience has shown that the planting out of limes should entail a loss of less than 2 per cent. of the plants; where this is greater, it is indicated that the work is not being properly carried out, in one or more particulars. Discuss the treatment that should be given to the unoccupied land between the plants, and state the advantages of the employment of green dressings for growing on such lands. The green scale and black blight are especially likely to attack young plants which have been planted out recently, but have not yet become completely established. In order to deal with such attacks, the plants should be sprayed. What mixtures would you suggest as being most useful for the purpose? It is easy to understand that natural enemies cannot be relied upon to keep these pests in check, under the unnatural conditions that obtain through the introduction of a large number of plants of the same kind, regularly planted in the same area. As the plants grow, the conditions will gradually approximate to those which obtain in nature, although they necessarily remain artificial, to a certain extent, under the surroundings that are required in the case of cultivated plants. In an established plantation, the pests and their parasites have already obtained a natural footing, and their incidence has regular relation to the season and the extent to which each form of life is being parasitized by its enemies. It is evident, on the other hand, that in plantations that have just been made no such regular balancing of the extent to which each form of life exists can obtain; these forms have not yet been sufficiently introduced, and time will be required for them to be brought in and to exert their natural influence upon one another.

Where it is intended to plant crops on undeveloped land, the character of the wild vegetation growing on such land will often serve as a useful indication of the kind of cultivation to which it is best suited. This cannot, however, be taken as an unfailing index of the fact. In a recent number of the *Agricultural News* (Vol. X, p. 193), the effect of the soil in the distribution of plants was considered editorially. It was shown that this distribution, in nature, is not so much a matter of the establishment of plants in those surroundings which they find congenial, as of the effects of competition, whereby a plant may be found in a particular habitat because it is capable of ousting nearly all other plants from that position, or because it has been forced to take that place, as being the only one left to it, if it is to flourish at all. In obtaining information as to the suitable crops for a given area, much more dependence is to be placed on the character of the soil, and of the rocks on which it rests, the depth of the former, the slope of the land, and to climatic conditions, including the amount of rainfall and the prevalence of winds. As is evident, in regard to the last-mentioned, the conditions may be modified by the provision of wind-breaks, which are often employed for the purpose of increasing the agricultural utility of areas of land.

In relation to the kinds of plants found in definite areas, it does not require much observation to show that the character of vegetation varies considerably, even within small areas, where differences exist in regard to such matters as the depth of the soil, the water-supply and the slope of the land. On exposed hillsides, the plants that are most usually found possess devices for preventing transpiration from becoming too rapid. Among these are the reduction of the leaves to spines, as in the prickly pear; the provision of a thick epidermis with few stomata, as in the Agaves; and the bearing of thick, fleshy leaves or of small leaves covered with downy hairs. In sheltered valleys, on the other hand, the plants are most likely to possess large, thin leaves, presenting a great area for transpiration; an example of such a plant is cacao.

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) Give a description of, and name as far as you can, the plants growing (a) in a moist, shady ravine; (b) on a dry, wind-swept hillside.

(2) Describe carefully methods for the cross-pollination of flowers.

(3) Write an account of the structure of a bulb, such as an onion, illustrating your account by means of sketches.

INTERMEDIATE QUESTIONS.

(1) Describe a way in which a pasture may be rendered free from ticks.

(2) Explain exactly how you would distinguish between a rhizome, a true stem, and a true root.

(3) Give an account of the distribution of the plants in an area of 'bush', or forest land, on which you have made observations.

FINAL QUESTIONS.

(1) Describe broadly what happens to an ovule, after fertilization has taken place.

(2) Write an account of the differences in the conditions in a plantation newly planted, and one in which the trees have attained maturity, illustrating your answer by means of a permanent crop with which you are familiar.

Economic Conditions in Hayti.—In Hayti the entire population is agricultural, there being no mines or industrial undertakings of any importance. Agriculture, as practised in Hayti, consists of the collection of coffee berries from trees which grow wild, and the cultivation, with the aid of a sort of bill-hook, of small plots of ground for the sustenance of the peasant owner and his family. A certain amount of sugar-cane is grown, from which raw sugar is made, but the quantity produced does not suffice for the needs of the population, and the greater part of the sugar used is imported, although in the time of the French the export amounted to some 170,000,000 lb. The Government estimates the population at 2,500,000, but this is a mere guess, as no census has ever been taken. The wage for unskilled labour may be put at 1 gourde a day, the value of which depends on the rate of exchange. In 1910 a gourde was worth about 10*d.* Public health in 1910 was as good as can be expected from the way people live in Hayti, in open defiance of all laws of sanitation and hygiene. The number of British subjects in Hayti is probably about 1,200, of whom about 500 are at Port-au-Prince. With but two or three exceptions they are natives of the West Indies, and in poor circumstances. (*Diplomatic and Consular Reports*, No. 4638, Annual Series.)

FUNGUS NOTES.

THE BRACKET FUNGI.

This group of fungi belongs to the big division known as the Basidiomycetes, charcterized by the production of two or four spores on a specialized hypha known as a basidium (see *Agricultural News*, Vol. IX, pp. 94 and 158); the group is called the Polyporaceae. The family belongs to the Order of the Hymenomycetes, in which a definite fructification is produced having a special reproductive portion, or hymenium, made up of basidia closely crowded together. In the family in question the hymenium lines the cavity of numerous circular or polygonal tubes or shallow depressions in the substance of sporophores varying much in colour, size, shape and consistency, but all characterized by the occurrence of the tubes lined with the hymenium. The Polyporaceae are closely connected with the Agaricaceae or toadstool family, in which the hymenium is produced on special gills running radially across the under surface of the sporophore. In the Polyporaceae, the sporophore, or fructification, may be umbrella-shaped like a toadstool and have a central stalk; or it may possess a stalk attached to one side of the cap; or again the whole sporophore may be stalkless and project at right angles from the substratum like a bracket; or, finally, it may lie flat on the substratum with the hymenium turned upwards. In the first three cases, the hymenium is always borne on the under surface of the sporophore. As has been stated already, these sporophores may vary also in consistency: they may be fleshy, coriaceous or woody, while many of them live for many years and periodically produce a new layer of tubes over the surface of the older layers. The tubes themselves vary largely in width and depth, and the spores they contain may differ in colour. It is by means of these and similar differences that the genera and species are separated from one another.

The family is an important one for two reasons. In the first place, the majority of the species live as saprophytes on wood, and, in consequence, are often responsible for a dry rot of timber. In the second, some of them, notably members of the genera Polyporus and Fomes, are wound parasites on many different kinds of trees. In the genus Polyporus, the fructification may have a central or lateral stalk, or may occur as a bracket; it is, however, always more or less fleshy when fresh, though it becomes hard when dry. In the genus Fomes, it may have a lateral stalk, or may be in the form of a bracket or hoof, but it is always of a woody consistency from the first.

In order to illustrate what has been said, one or two species may be considered in somewhat greater detail. One very common bracket fungus, both in temperate and tropical countries, is *Fomes lucidus* (Leys.), Fr. The sporophore possesses a lateral stalk, which may be as much as 4 inches long, or may be reduced to a broad basal tubercle, so that the fructification appears as a bracket. When the stalk is present it is usually more or less erect, irregularly cylindrical in shape, polished, and varying in colour from bright chestnut to almost black. The apex of the stalk is at first white and conical, but later it grows out into a broad cap or pileus, whose upper surface is yellowish-red, reddish-chestnut, deep red or almost black; it is polished like the stalk, and usually marked with concentric furrows. When the sporophore is immature the margin is swollen, white and fibrous, and is not polished: while the varnished portion immediately behind it is then yellow, and the colour slowly deepens into that of the main part of the cap. The lower surface is white, and contains the tubes bearing the brown spores, which are ejected as a dust of the same colour. The substance of the sporophore is brown and fibrous. Several caps may fuse together during growth, and their outline then becomes irregular. Single caps are usually circular, or kidney-shaped, when stalked, and semicircular when the stalk is reduced; they vary in size from a diameter of 2 or 3 inches and a thickness of ½-inch, to a diameter of 20 or more inches and a thickness of 4 inches.

This fungus occurs on several trees in temperate countries, and has been regarded as a wound parasite on oaks. In Ceylon, it causes root disease of the cocoa-nut palm and grows on other palms, while it is associated, as well, with bamboos. It is also known to be parasitic on the roots of the mango and on those of the flamboyante (*Poinciana regia*), while it is saprophytic on dead stumps of many other trees. (See Petch. *Circulars and Agricultural Journal of the Royal Botanic Gardens*, Ceylon, Vol. IV, No 24.) In India, it has been considered as probably parasitic in several instances on forest trees, while it is recorded by Butler as the probable cause of a root disease of the areca palm (*Areca Catechu*). In the West Indies it has been recorded on dead wood, from Trinidad, while Stockdale found it on dead lime trees in Dominica. Recently, it has been observed in large quantities on dead and dying lime trees, in Montserrat and Antigua, the fructifications being at a height of 6 inches to 3 feet above the ground. The evidence at least suggests that it may have been responsible for the death of the trees. It was also found in the former island on a dead trunk of the hog plum (*Spondias lutea*), lying among the lime trees.

Other species of Fomes known to be parasitic in the tropics are *F. semitostus*, Berk., which causes the well-known root disease of Para rubber in Ceylon and Malaya, and *F. australis* which has been known to cause the death of *Acacia decurrens*, in Ceylon. All these species are root parasites, and probably commence their attack by spreading from old tree stumps.

Another fungus, *Poria hypolateritia*, Berk., causes a root disease of tea in Ceylon. This fungus has a fructification which is red when mature, and is spread out as a thin crust on the substratum, with the hymenium upwards. It may occur on the surface of the soil near a dead tea bush, or closely adpressed to the dead stem, or partly on both. (See Petch. Root Diseases of Tea, *Circulars and Agricultural Journal of the Royal Botanic Gardens*, Ceylon, Vol. V, No. 11.) Like the species of Fomes, it commences its attack from dead stumps.

Members of the family Polyporaceae appear to be very common in the West Indies. As has been indicated, they vary much in colour, size, shape and consistency, but may all be recognized as belonging to the family by means of the characters given above. Several occur in connexion with dead or dying trees in such a way that there is at least a suspicion that they are responsible for the damage observed. A further knowledge of their numbers and identity would possibly give rise to results of considerable economic importance.

DEPARTMENT NEWS.

Mr. F. W. South, B.A., Mycologist on the Staff of the Imperial Department of Agriculture, returned to Barbados by the R.M.S. 'Atrato', on the 9th instant, from the Northern Islands, where he had been making investigations into the fungus diseases of various crops.

GERMAN ASSISTANCE TO RUBBER GROWERS.

In the *India-Rubber Journal* for May 20, 1911, there is an account of the first Annual Report of the Kautschuk-Centralstelle, which was inaugurated on April 1, 1910.

The account shows that the Kautschuk-Centralstelle has for its object the assistance of rubber-producing Colonies, through the medium of scientific investigations for the solving of problems with which these are confronted from time to time. In pursuance of this, investigations have been carried out in regard to coagulation, the effect of soils, the thinning out of trees, tapping methods, and the chemical and technical examination of raw products, which are also manufactured into various goods in order to find out the purpose for which they are most suitable. In reference to the last part of the work, it has been proposed to create standard brands for rubber and to draw up the necessary regulations in connexion with these.

Among the work during the year have been investigations into the distillation products of the Urucuri nut (*Attalea excelsa*) which is burned to provide the smoke employed in the curing of Para rubber. Experiments are also being carried out with Masseranduba wood (*Mimusops elata*), and there has been an enquiry into the chemical composition of Funtumia latex and of the serum which is yielded by this.

It is recommended that latex sieves should always be of hair, or if metal sieves are used they should be well tinned and of very fine mesh. Material is being sent for examination in connexion with the rubber that is contained in the unripe fruit of Castilloa. Several enquiries have been received concerning the possible use of the banana plant for giving rubber, and the reply was made that this matter did not include any question of the collection of rubber.

New designs of tapping knives for Funtumia and Hevea have been made, and it is thought that the instruments constructed according to these may, with modifications, be used for the Manihots. It is interesting that the booming of several so-called artificial rubbers, particularly of a substance obtained from soy bean oil, was emphatically denounced by the Centralstelle.

The physical work has been connected mainly with the testing of the viscosity of rubber. In the article from which this information is taken, details of the scope of the work on samples of rubber are given. Among the results of more general interest that have been obtained are the following: the use of Purub for coagulating Ceara latex has not shown superiority to that of acetic acid; herring-bone tapping was found best, in Togo, for Ceara rubber; in regard to this rubber again, samples containing a high proportion of albuminous substances were found to vulcanize very quickly; rubbers can be obtained from Funtumia, in German plantations, which compare in value to first class Para and Congo; Purub did not show any superiority to guiacol as a coagulant for rubbers received from West Africa; with boiled latex, the addition of hydrochloric acid before heating gave the best results, while those from tanning used in the same way were the worst; coagulation of Hevea latex with acetic acid was found to be better than that with Purub; many coagulants that are being recommended from various sources were examined, and the caution is given that care should be used as regards the indiscriminate employment of such substances, where there is no knowledge of their composition; lastly, trials were made for the improvement of inferior rubbers, compensation for the loss of material being obtained from the higher price of the final product.

THE SHOEING OF HORSES.

A series of leaflets is being issued by the Animals' Friend Society, York House, Portugal Street, Kingsway, London. The first of these, among the Farmyard Series, deals with errors in the shoeing of horses, and has been prepared by the editor of *Farm and Home.*

It is pointed out, first of all, that there is no economy in the use of heavy shoes, with the idea that they will last a long time, chiefly because their weight causes inconvenience to the animal, and a certain output of nonproductive energy, which has to be supplied in the food. The general rule is given: 'that no horse should be fitted with a shoe that will last more than a month or five weeks, and that the shoes should be replaced, as nearly as possible, every month.'

Attention is drawn to the fact that the foot of the horse is a living structure which is continually growing, and shedding the worn-out parts which are replaced with new material. The horn of the horse's foot is in the nature of a toe-nail. It is kept in a pliable condition, and prevented from cracking, by the moisture which it contains. In order to prevent this moisture from escaping, the foot is provided with a kind of varnish. The paring and rasping that are often done by the smith in shoeing remove this varnish, so that the horn of the foot dries up and such conditions as sand-crack are produced. As a matter of fact, there is no need for paring and scraping, because the horny fibres break off after they have been growing for a time, to make room for the constantly new supply by which this part of the foot is preserved in a moist and supple condition.

The leaflet conclndes with a description of errors that are made in the treatment of the frog, and in the fitting on of hot shoes.

Cotton and Sugar in China.—The amount of raw cotton annually imported from India varies with the rate of exchange between silver and gold and with the price of American cotton. The Chinese cotton is much whiter and freer from seed and leaf than the Indian, but Indian cotton is imported for the mills in China, when exchange is sufficiently favourable, in order to get a better length of staple. Indian cotton is also imported to make up for scarcity of Chinese cotton when, on account of high prices of American cotton, more Chinese cotton than usual is shipped to Japan. It is to the latter cause that the increase of 18,000 cwt. in the import of cotton in 1909 compared to 1908 is to be attributed. The export of raw cotton increased by 24,000 cwt.

The import of foreign sugar is to some extent an index of prosperity, and from this point of view the increase in 1909 is encouraging. To judge from the returns of Newchwang, the only port of Manchuria of which the statistics are as yet to hand, the increased import is, as might be expected, especially noteworthy in the Manchurian provinces, whose natural resources are being developed more rapidly than those of any other part of the Empire. Ninety per cent. of the actually foreign sugar imported in Newchwang in 1909 was Hong Kong refined sugar, the balance being Japanese. The production of beet sugar in North Manchuria has not yet affected the market. (From *Diplomatic and Consular Reports*, No. 4556 Annual Series, pp. 12 and 15.)

MARKET REPORTS.

London.—The West India Committee Circular, August 1, 1911; Messrs. E. A. De Pass & Co., July 21, 1911.

Arrowroot—2*d*.
Balata—Sheet, 3/4 ; block, 2/7½ per lb.
Beeswax—£7 10*s*. to £8 10*s*. per cwt.
Cacao—Trinidad, 50/6 to 63/- per cwt. ; Grenada, 51/- to 57/6; Jamaica, 49/- to 56/-.
Coffee—Jamaica, 62/- to 120/-.
Copra—West Indian, £25 5*s*. per ton.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 12*d*. to 17*d*.
Fruit—No quotations.
Fustic—No quotations.
Ginger—49/- to 64/- per cwt.
Honey—28/- to 38/-.
Isinglass—No quotations.
Lime Juice—Raw, 1/3 to 1/9; concentrated, £18 5*s*.: Otto of limes (hand pressed), quiet.
Logwood—No quotations.
Mace—Quiet.
Nutmegs—Quiet.
Pimento—Common, $2\frac{1}{16}$*d*.; fair, 2⅛*d*.; good, $2\frac{3}{16}$*d*. per lb.
Rubber—Para, fine hard, 4/8½; fine soft, 4/4½; fine Peru, 4/4 per lb.
Rum—Jamaica, 1/6 to 5/-.
Sugar—Crystals, 15/6 to 18/-; Muscovado, 11/6 to 14/6: Syrup, 11/- to 14/6 per cwt.; Molasses, no quotations.

New York.—Messrs. Gillespie Bros. & Co., July 28, 1911.

Cacao—Caracas. 11½c. to 12c.; Grenada, 11⅝c. to 12⅛c ; Trinidad, 11⅝c. to 12c. per lb.; Jamaica, 10c. to 11c.
Cocoa-nuts—Jamaica, select, \$29·00 to \$30·00; culls, \$17·00; Trinidad, select, \$29·00 to \$30·00; culls, \$17·00 per M.
Coffee—Jamaica, 13½c. to 14¼c. per lb.
Ginger—9½c. to 12c. per lb.
Goat Skins—Jamaica, 53c.; Antigua and Barbados, 48c. to 50c.; St. Thomas, St. Croix and St. Kitts, 46c. to 48c. per lb.
Grape-Fruit—Jamaica, no quotations.
Limes—No quotations.
Mace—45c. to 52c. per lb.
Nutmegs—110's, 9¾c. per lb.
Oranges—Jamaica, no quotations.
Pimento—4½c. per lb.
Sugar—Centrifugals, 96°, 4·36c. per lb.; Muscovados, 89°, 3·86c.; Molasses, 89°, 3·61c. per lb., all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., August 7, 1911.

Cacao—Venezuelan, \$12·00 to \$12·25 per fanega; Trinidad, \$11·60 to \$12·10.
Cocoa-nut Oil—75c. per Imperial gallon.
Coffee—Venezuelan, 15½c. per lb.
Copra—\$3·75 per 100 lb.
Dhal—\$3·90.
Onions—\$2·50 to \$2·75 per 100 lb.
Peas, Split—\$5·80 to \$5·90 per bag.
Potatoes—English, \$3·25 to \$3·50 per 100 lb.
Rice—Yellow, \$4·70 to \$4·75; White, \$5·30 to \$5·40 per bag.
Sugar—American crushed, no quotations.

Barbados.—Messrs. James A. Lynch & Co., August 9, 1911; Messrs. T. S. Garraway & Co., August 14, 1911; Messrs. Leacock & Co., August 4, 1911; Messrs. E. Thorne, Limited, August 14, 1911.

Cacao—\$10·50 to \$11·50 per 100 lb.
Cotton Seed—\$22·40 per ton; meal, \$1·50 per 100 lb.; 2½ per cent. discount.
Cotton Seed Oil (refined)—47c. per gallon.
Cotton Seed Oil (for export)—51c. per gallon (in bond).
Hay—\$1·30 to \$1·40 per 100 lb.
Manures—Nitrate of soda, \$60·00 to \$65·00; Cacao manure, \$42·00 to \$48·00; Sulphate of ammonia, \$75·00 to \$76·00 per ton.
Molasses—No quotations.
Onions—\$1·75 to \$2·37 per 100 lb.
Peas, Split—\$5·65 to \$5·75 per bag of 210 lb.; Canada, \$2·75 to \$4·25 per bag of 120 lb.
Potatoes—Nova Scotia, \$2·50 to \$4·50 per 160 lb.
Rice—Ballam, \$4·85 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
Sugar—No quotations.

British Guiana.—Messrs. Wieting & Richter, August 5, 1911; Messrs. Sandbach, Parker & Co., July 21, 1911.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	\$10·00 to \$10·25 per 200 lb.	\$10·00 per 200 lb.
Balata—Venezuela block	No quotation	Prohibited
Demerara sheet	70c. per lb.	65c.
Cacao—Native	11c. per lb.	12c. per lb.
Cassava—	96c.	No quotation
Cassava Starch—	\$6·50 to \$7·00	No quotation
Cocoa-nuts—	\$12 to \$16 per M	\$10 to \$16 per M., peeled and selected
Coffee—Creole	16c. per lb.	15c. per lb.
Jamaica and Rio	19c. per lb.	19c. per lb.
Liberian	10½c. per lb.	10c. per lb.
Dhal—	\$3·65 per bag of 168 lb.	\$3·75 per bag of 168 lb.
Green Dhal	\$3·50	——
Eddoes—	96c.	——
Molasses—Yellow	None	——
Onions—Teneriffe	——	4c. to 5c.
Madeira	5c.	5½c.
Peas—Split	\$5·65 per bag (210 lb.)	\$5·65 per bag (210 lb.)
Marseilles	\$3·90	No quotation
Plantains—	8c. to 20c.	——
Potatoes—Nova Scotia	——	\$3·50
Lisbon	——	No quotation
Potatoes-Sweet, B'bados	96c. per bag	——
Rice—Ballam	No quotation	——
Creole	\$5·00 to \$5·25	\$5·25 to \$5·50
Tannias—	96c.	——
Yams—White	\$3·00	——
Buck	\$3·24	——
Sugar—Dark crystals	\$3·25	\$2·75 to \$3·00
Yellow	\$3·75 to \$3·80	\$3·25
White	——	\$4·00 to \$4·25
Molasses	——	None
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.

Light and the Growth of Trees.

TREES, like all other green plants, require light, in order that they may produce material for the new growth without which they cannot remain alive. This makes it evident that, where a large number of trees are existing together, the extent to which their requirements are satisfied in the matter of light determines the number that are standing on a unit of area, as well as the manner of growth in those which continue to live. The importance of the proper supply of light to trees has been recognized first, in an organized, practical manner, in forestry, and it will be well to give short attention to a recent publication* which presents particulars of the latest considerations and results belonging to the subject.

In this Bulletin, reference is first made to the ways in which plants are affected by light. They are influenced by this in the building up of food materials, and it is also responsible for the structure, form and colour of the leaves, and the form of the stem and of the crown of the tree. In collections of trees, as in forests, the growth in height, the rate of thinning out and of natural pruning, the character of the smaller plants growing under the trees, and the vigour of the younger trees, are all matters that are determined by the supply of light. It is the recognition of this fact that has stimulated enquiry into the subject, in order that those responsible for forest work may be in possession of accurate information concerning the light required by trees, when growing together.

It must be remembered that plants are subjected to two kinds of light—direct and diffused, and that the proportion of the former is increased as the equator is approached, while they both decrease in amount with increase of latitude. Height above sea-level also affects the ratio of these two kinds of light: the greater the altitude the less is the amount of diffused light, and the larger the quantity of that which is direct. As far as a plant in any given position is concerned, this is illuminated by light which reaches it in different ways, the kinds being overhead light, which is the strongest, side light, light

*Bulletin 92 of the Forest Service of the United States Department of Agriculture, entitled *Light in Relation to Tree Growth*.

reflected from surrounding surfaces, and that reflected from the ground. The first of these influences the arrangement of the leaves on the branches, their position, and the manner in which the branches are developed. The side light stimulates the growth of the buds that are borne on lateral branches; its effect is often seen in the development of the branches on the side of an opening in a wood or forest. All these must be considered in relation to the illumination of any individual plant, and attention must be given to the fact, as well, that trees rarely receive the total daylight, for this is lessened in amount by the shading caused by the foliage of the plant itself and by neighbouring trees.

In dealing with the behaviour of different kinds of trees, under varying conditions, regard is had to their tolerance of shade, or as it is often termed merely, their tolerance. Trees which endure shade well are said to be tolerant, while those needing full light are termed intolerant. Most trees, even in the tropics, will thrive in full light, particularly if they have grown under this condition from the time of planting out. Different plants, in the open, do not however employ the same amount of light: they are enabled to use the quantity that suits them best by placing their leaves in such a position, relative to the source of light, as to regulate the amount falling upon them; or the density of their crowns may be increased so as to produce a deeper shade for the lower and inner branches: or the structure of the leaves may be altered, even, in order to lessen their power of assimilation. Tolerance, nevertheless, is not a fixed quality, in regard to any one kind of tree, since plants may change some of their characters in relation to their environment; while the latter cannot have any effect upon the amount of light which is required inherently.

After treating of these matters, the Bulletin mentioned makes short reference to the work of Lubimenko and of Grafe, which has shown that the amount of assimilation carried on by the leaf is influenced directly by its anatomical structure and by the properties of the specialized portions of the protoplasm (chloroplasts) containing chlorophyll, in their cells. This work has also led to other interesting conclusions, among which are the fact that the regulation of assimilation takes place, in medium diffused light, mainly through the influence of the first mentioned cause, while the properties of the chloroplasts have their greatest effect in light at great and small intensities; and that the latter cause determines the stage at which the most useful amount of assimilation takes place.

Consideration is given to experiments that have been carried out for the purpose of ascertaining the most usual cause of the death, or poor development, of undergrowth in forests and woods. These have shown that the state is not caused by insufficient light alone, but by the competition of the roots of the large trees: the effect of the latter is to lower the water content of the soil to such a degree that the smaller plants are prevented from flourishing. This serves to explain the effects of thinning, in closely growing plantations, whereby the lessened competition for water among the roots permits of increased growth on the part of the plants that remain.

As regards the intensity of light needed at different stages of growth, it is a general fact that most trees exhibit tolerance when they are young, and that as they become older they require more light, while the differences between various species in this respect become more marked. The demand for light also changes with the season; more is wanted for flowering and fruiting than at other times. These matters are such as might be expected, when it is considered that an increase in the rate of formation of tissue entails an enhanced rate of assimilation, and thus a greater degree of illumination.

There are several methods of comparing the amount of tolerance exhibited by trees of different species. Among these are observation of the density of the crowns, of the rate of natural pruning and thinning under similar conditions, of the rapidity of growth, of the ability of seedlings to flourish in the shade, and the determination of the ratio between the height of a tree and its diameter. One of the most useful of these methods is the second, namely observation of the rapidity with which self-pruning of the lower branches takes place. As regards the last, the ratio is usually termed the relative height of the tree; its usefulness depends on the fact that the greater the tolerance of a tree, the less is it likely to increase in height in a manner disproportionate to the rate of growth of its diameter. Thus in the case of trees that have died under shade, the relative height is represented by a comparatively large number.

It will be well to mention the effects of shading on the leaves of plants, as they are given in the work under consideration. In the first place, it causes well-marked changes in the anatomical structure: secondly, as is well known, it prevents the leaves from assuming their natural green colour. Further, shaded leaves show a smaller tendency to the production of a crumpled surface, and of hairs, than those in bright light, while the veins of the former are less strongly developed. Lastly, shaded leaves are usually thin and limp, and do not possess the dense structure of those that have received a normal supply of light.

Enough has been said to show that the supply of light to plants is of much importance in relation to their life-history, and that this is the case to such an extent as to influence them in the direction of making changes in their structure in order that they may adapt themselves to the particular circumstances of the illumination in which they have to grow. This importance is being recognized for forest plants, and there is no reason why it should receive less attention in relation to plants, such as cacao and limes, raised in orchard cultivation, and to the proper provision of shade trees for plants growing under artificial conditions.

SUGAR INDUSTRY.

SUGAR IN CUBA IN 1910.

The crop of the 1909-10 season amounted to 1,800,000 tons or 100,000 tons in excess of the estimates. A comparative table of the crops for the last two years is appended :—

Year.	Mills operating.	Cane ground, tons.	Sugar, per cent.	Sugar, tons.	Molasses, gallons.
1909	170	13,951,998	10·90	1,521,818	60,331,307
1910	175	16,173,378	11·23	1,817,544	74,011,482

Trustworthy estimates of the production of sugar for the 1910-11 season set the figure at 12,241,000 bags (about 1,750,000 tons). The accuracy of these figures, based on the working of 170 mills now in operation, depends on the continuance of favourable weather during the cutting season, which extends from December until June. It is not anticipated, however, that the price will reach the high figure of the past season, the shrinkage in value being estimated at £4,000,000.

The estimated amount of sugar grown for home consumption for the past three years is: 1908, 62,827 tons: 1909, 69,706 tons; 1910, 71,185 tons.

Of the remainder, almost the entire amount is exported to the United States, and, indeed, the sugar industry of Cuba is slowly passing into foreign, principally United States, hands.

The trade with the United States is fostered by the Reciprocity Treaty between the two countries, by which Cuban sugar imported into the United States receives preferential treatment. The American Sugar Trust controls a number of important plantations in the island.

A certain number of refineries has been established and that branch of the industry is now practically in a position to supply local requirements, as is revealed by the statistics of the importation of refined sugar, which shows a decrease in imports from 8,227 cwt. in 1905 to 425 cwt. in 1910.

The average retail prices in Cuba for the year 1910 were for white granulated sugar $3\frac{1}{4}d.$ per lb., and for second quality sugar $2d.$ per lb. The average price for molasses at the mill during the same period was $1·70d.$ per gallon. The average wholesale price of sugar of the standard grade of 96° test, warehoused for export, for the past three years, has been: 1908, 11*s.* 6*d.* per cwt.; 1909, 10*s.* 6*d.* per cwt.; 1910, 11*s.* $4\frac{1}{2}d.$ per cwt.

The exportation to the United Kingdom has increased from none in 1908 to no less than 119,418 cwt. from the 1909-10 crop. This was probably due to the shortage in the European beet sugar crop, and a corresponding increase is not anticipated in the exportation of the present year.

Canada is making a bid for Cuban sugar, and the Legislature of that country has made a provision allowing Canadian refineries to import Cuban sugar up to 20 per cent. of their total output on the same terms as sugar from the British West Indies

During the month of March, in order to bring the country into line with the requirements of the Brussels Sugar Convention of 1902, the Cuban Government reduced the import duties on raw sugar to $1·00 per 100 kilos., and on refined sugar to 75c. per 100 kilos. The question was one of vital importance to the Cuban sugar industry, which, although chiefly dependent on the United States market, is able to deal, as long as the European market is open, at the price fixed in that market.

The industry is in a thoroughly thriving condition. The soil is of such fertility that the canes will continue productive without renewal for a period unknown in other countries, and the industry is consequently of such a profitable nature that foreign capital is very readily attracted to it.

The prosperity produced by the recent crops has caused large purchases of modern machinery, which lead to great economies in production, and consequently increased profits. As there are still profitable openings in this industry for British labour and capital—at present there are only five or six British plantations in the whole island—a short account of it may not be out of place.

The average production per acre is 12 bags, or 3,900 lb. The usual course with planters is to arrange with a mill to take their cane, receiving in return 55 to 60 per cent. of the value of the sugar produced therefrom. This averages £10 to £12 per acre. The remainder, together with the second grade sugar and the molasses, goes to the mill. Sugar is a sure crop, it is little affected by the cyclones, requires but little skill or attention, and the mills are ready to assist small planters with advances, implements, etc. The ploughing for spring sowing is done in January, February and March, and the planting in April and May, and the autumn planting in August or September. Satisfactory sugar land may still be bought at £4 to £10 per acre. (*Diplomatic and Consular Reports*, No. 4695, Annual Series.)

The report of the Royal Commission appointed to enquire into the question of the erection of additional central sugar factories in Queensland contains the recommendation that two such factories shall be erected, having a capacity of 10,000 tons and of 5,000 tons, for the season of 1913. It is also recommended that, under certain conditions, a third factory shall be built, having a capacity equal to the latter of the two just mentioned, and further that for the season 1914, another factory, with a capacity of 8,000 tons shall be built. The question of the future erection of sugar factories is to be left to the State Treasurer.

FRUITS AND FRUIT TREES.

PINE-APPLE GROWING AND MANGANESE SOILS.

This subject has received much attention of late, particularly in Hawaii, and an opportunity is given to present further information concerning it by the publication, in the *Hawaiian Forester and Agriculturist* for June 1911, of an article dealing with the matter, in relation to the soils of Wahiawa in the Hawaiian Islands. It is stated that pine-apple plants growing in this soil are stunted, likely to be attacked by pests and diseases, possess a sickly appearance, and are wanting in the healthy green colour that attends a normal content of chlorophyll in the leaves. The admission is made that these conditions may be due to circumstances other than the presence of an excess of manganese in the soil, among these being lack of drainage, root rot, and deleterious substances in liquid manure; but it is agreed that the manifestation of untoward conditions in this case is due to the effect of the manganese compounds in the soil.

Reference is made to the fact that manganese is widely distributed in soils, but always exists as compounds. The subject is complicated by the considerations that manganese dioxide can lose oxygen and give rise to manganous salts, and that it can combine with such substances as lime to form compounds, call manganites, which decompose somewhat easily under ordinary conditions.

Attention is called to the circumstance that citric acid has been found capable of dissolving considerable amounts of manganous hydroxide, and that acids, generally, can dissolve the oxides of manganese. Further, various water plants have been shown to be able to absorb combined manganese from water containing compounds of that element, manganese dioxide being deposited in the epidermis of the leaves. Other work, carried out more especially in Japan, has demonstrated that plants other than pine-apples exhibit a toxic condition when they are subjected to the action of manganese salts in large amounts. The results of these investigations are applied to pine-apples growing in Wahiawa soils, particularly in view of the large acidity of the plant, although it is doubtful if manganese dioxide could be deposited in the pine-apple in a way similar to that in the case of water plants, in view of the high citric acid content of the former.

Trials have shown that sugar-cane can be grown successfully on manganese-containing soils which could hardly support pine-apples, and this fact suggests that there must be some considerable difference between these two crops, in relation to their absorption of substances from the soil. The matter receives elucidation when the ash of each of these plants is analyzed, for it is seen that the pine-apple takes up much more manganese than the sugar-cane, while at the same time, the proportion of ash to the total weight of the plant is much greater in the case of the former. The circumstance may be due to the greater acidity of the plant, but the important matter is that, where manganese is present in the soil, this will naturally be absorbed to a much greater extent in the case of pine-apples than in that of sugar-cane.

As has been indicated, the formation of manganites from manganese dioxide, with basic substances such as lime, requires due consideration. Several such bodies are formed, with lime, and they are all very poisonous to plant life. An interesting illustration is given, in which a heavy dose of quicklime was applied to a field of soil possessing a high manganese content, where pine-apples were growing, when the plants practically ceased to grow, lost nearly all their chlorophyll, and had to be removed. The circumstance would point to the formation of some highly poisonous compound, through interaction between the lime and the manganese compounds in the soil, and provides an example in which the application of lime was not beneficial, as is usually taken to be the case, but quite otherwise.

The article concludes with the suggestion that, with present knowledge, it may be assumed, at any rate temporarily, that the poisonous effect observed with pine apples growing in the manganese soils of Wahiawa is due primarily to the action of calcium manganite, and secondarily to that of other salts and acids upon this body.

CASSAVA FROM REUNION.

In *L' Agriculture Pratique des Pays Chauds* for July 1911, particulars are given of an analysis of 'manioc en cossettes' exported from Réunion, which was made at the Jardin Colonial. This is a product obtained by drying the cassava and exporting it in the form of small 'cakes'. The figures are as follows:—

	Per cent.
Water	11·70
Starch	84·15
Nitrogenous matter	1·31
Ash	1·70

The cassava was stated to be well prepared and free from large fibrous bundles, and to be considered as a product of very good quality.

GREEN DRESSING TRIALS IN DOMINICA.

The following article comprises an account of recent trials with green dressings made at the Agricultural School, Dominica, which has been prepared by the Assistant Curator of the Botanic Station. In forwarding the account, the Curator states that the first-mentioned, namely *Tephrosia candida*, is the most promising of all the green dressings that have come under the observation of the Dominica Agricultural Department.

TEPHROSIA CANDIDA. Seeds of this green dressing were received from the Commissioner of Agriculture in October 1910. On November 2, they were sown in drills 3 feet apart, on a light open soil, the previous crop having been yams. No soil was received for inoculation, and the plot was not in any way specially prepared. Germination was good and even. Growth at first was somewhat slow. The plot was weeded on three occasions—early in December, late in January and early in March. After the last date, further weeding was unnecessary, the ground being covered over. The plants continued to grow in height for several months, and it was not until the first week in August that flowers appeared, on a few of them; the average height at this date was slightly over 6 feet. The ground under them was perfectly clean from weeds, being covered by a light layer of decayed leaves.

This is one of the most promising of green dressings, especially for rubber cultivations; and if experiments show that it can survive topping at about 3 feet from the ground, for cacao and limes, as well The saving in the weeding expenses resulting from its use would be very considerable. Once this green dressing has become established, it keeps the soil clean for many months.

It is hoped that it will seed plentifully, and that supplies of seeds will be available for planters.

TEPHROSIA PURPUREA. Seeds of this green dressing were received from the Commissioner of Agriculture during February of this year. Together with the seeds was sent a bag containing a small quantity of soil in which the plant had been successfully grown in the East, with the object of supplying the special variety of the nodule organism that lives in symbiosis with *T. purpurea*.

Both the seeds and the soil were sown together, on February 17; a few seeds, however, were put in without the soil, as a control. Unfortunately, only seven holes germinated, and six of the seven were in the part of the plot which had been inoculated.

The growth of leafage was at first very sparse, and continued so until the first flowering took place, which was early in May—eleven weeks from the date of sowing. The plants continued to spread, bearing flowers and seeds nearly all the time. At present (August) they are covered with flowers, have a spread of about 3 feet, and are between 2 and 3 feet high. The seeds that have already matured have been sown, and further experiments will be carried out with this green dressing.

As far as one is able to judge at present, *T. purpurea* is not nearly as valuable as a green dressing as the last-mentioned species of Tephrosia. namely, *T. candida*.

JERUSALEM PEA (*Phaseolus trinervis*). A small quantity of seed of this green dressing was received from the Commissioner of Agriculture early in February of this year. It was sown on February 10, in drills 3 feet apart, in a fairly loose soil, the previous crop having been soy beans. The soil was not in any way specially prepared. Germination was somewhat uneven. The plot was twice weeded—on March 28 and May 12; no further weeding was required. *Phaseolus trinervis* has a very marked creeping habit of growth, and any unevenness which appeared at first was soon concealed by the growing plants. It is a vigorous grower, under conditions in Dominica, and when last examined in the middle of August, showed no signs of flowering. The growth is very thick, and, on an average, 2 feet high; the plant is very effective in keeping down weeds, and has already occupied the ground six months.

As a cover crop, it is a valuable addition to the few really good plants available for this purpose. Its twining habit, however, is somewhat unfavourable when it is growing among young limes and cacao, unless care is taken to keep the vines away from the trees themselves.

In the middle of the plot, the leaves of a few of the plants were attacked by a minute red spider, which does considerable harm to the plants. Those attacked have been removed and destroyed, with the hope, in this way, to prevent the spread of the pest to other parts of the plot.

CHICK PEA (*Cicer arietinum*). Seeds of this green dressing were obtained from Ceylon, by the Commissioner of Agriculture, and a small quantity forwarded in May for trial in Dominica.

The seeds were sown in drills 3 feet apart, on May 30; the previous crop was the Bambarra ground nut (*Voandzeia subterranea*).

The seeds germinated fairly evenly, but failed to grow more than a few inches, when the roots were badly attacked by a fungus, followed by mealy-bugs. The plants made an attempt to produce seeds, flowering during the first week in July five weeks from the date of sowing. Later, the leaves, flowers and young pods (containing one or two seeds) were attacked by a green caterpillar.

It is quite evident that *Cicer arietinum* requires conditions very different from those obtaining in Dominica, for its successful cultivation.

CYAMOPSIS PSORALIOIDES. Seeds were received at the same time as those of the last-mentioned plant, but though carefully sown in well prepared land, they unfortunately failed to germinate.

With reference to the two plants dealt with first, above (*Tephrosia candida* and *T. purpurea*), it may be mentioned that accounts of the results of similar trials, made in St. Lucia, are given on page 245 of the current volume of the *Agricultural News*, and on page 284 of this number.

The *Proceedings of the Agricultural Society of Trinidad and Tobago* shows that the amount of cacao shipped from Trinidad during June last was 5,215,414 ℔., and that the quantity exported during the present year was 35,100,913 ℔. In 1910, the exports, up to the end of June, were 39,277,699 ℔.

WEST INDIAN COTTON.

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

No business has been reported in West Indian Sea Islands during the past fortnight, spinners being quite indifferent about adding to their stocks, until there is some demand for yarn.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending August 12, states that there has been no change since the last report.

COTTON IN ALGERIA.

The *Journal d'Agriculture Tropicale* for May 1911, p. 133, contains an article by M. C. Rivière, Director of the Experiment Station of Algiers, in which the author criticises the conclusions reached concerning the cultivation of cotton in Algeria, in a recent report issued by l'Association Cotonnière Coloniale.

M. Rivière states that for some time he has considered that the climate and labour conditions in Algeria do not lend themselves to the obtaining of satisfactory yields from the cotton plant, and that this opinion is the result of observations extending over forty-three years. Since 1853, the growing of cotton in the country has been encouraged by the French Government, and it appears to be a fact that any development of cotton-growing in Algeria has been due to the stimulus and artificial support given by means of bounties, prizes and official encouragement of every kind. It is considered that, when these large subsidies and favours are withdrawn, the growing of the plant will cease immediately and completely.

Cotton can probably be cultivated successfully in a few restricted localities, and on certain irrigated lands, but it is well known that the area in the country which can be irrigated during summer is very limited. On the other hand, any success with the crop in dry lands is always doubtful.

There are other influences unfavourable to the cultivation of cotton in Algeria; among these are spring frosts, rain and hail toward the end of the year, and the advent of unexpected dry seasons. Further, during the long, rainless summer, the development of the plant ceases, unless it can be watered regularly. With respect to this, irrigation in summer and autumn is not always possible, for want of water; or if it can be carried out, it is available only for small areas of land. Even irrigation itself is unfavourable in certain districts, on account of the saltness of the water that has to be used. As regards labour for the harvest, this is very difficult to obtain, and this fact has always interfered with cotton growing in the country. Lastly, under the special conditions, sufficient manure is never produced on the farm to keep the soil in proper condition for growing cotton.

Figures are given to show that the production and value of the cotton grown have steadily decreased since 1907, and the conclusion is reached that if this annual culture, which does not offer any practical difficulties under proper circumstances, has remained in a stationary condition, if not one of decrease, there is something to show that good causes exist for this state of affairs, which should be considered in assessing the value of the cotton plant to the country.

CARAVONICA COTTON.

In the *Agricultural Journal of India*, Vol. V, p. 248, there appears an article by G. A. Gammie, F.L.S., Imperial Cotton Specialist for India. This reviews the results of trials with Caravonica cotton in various parts of the world, and attention is first given to experiments in the Sudan, which it was decided to discontinue, because the plants did not make satisfactory growth, and the yield was inferior to that from Egyptian cotton. Further, the writer gleans information from articles concerning the subject, that have appeared in the *Indian Trade Journal* and the *Tropical Agriculturist*. The former shows that attempts to grow the cotton were made by several small growers in the vicinity of Cairns (Queensland). Three varieties were tried, and it was demonstrated that these are not constant in their characters, and that all are liable to insect attacks when the plants are young.

Dealing with the second reference, it is shown that this is in the nature of an account of a long interview with Dr. Thomatis, the originator of the cotton, in which it is claimed that the hybrids had required only five years to become established. Criticism is given of several of the statements that were made during the interview, and it is shown that, although good results are alleged to have been obtained in Australia, Caravonica cotton has continually proved a failure in India; while even in the former country, the only claim that could be made at the time of writing was that the cotton is being grown (as has been stated) by several small holders near Cairns. The article concludes with the following statements:—

The tree cotton which will succeed as a field crop has still to be discovered, and until it is really found and certified to be a success by responsible and disinterested men, the public in general will be well advised to withhold their financial support from well-meant, perhaps, but visionary schemes of amassing rapid fortunes from tree cotton cultivation

RUBBER INDUSTRY.

COAGULATION OF RUBBER LATEX WITH ACETIC ACID.

An interesting article in the *India-Rubber Journal*, for May 27, 1911, by Mr. W. Crossley, F.I.C., draws attention to the fact that much has yet to be learned concerning the process of coagulation of rubber latex, in spite of the good work that has been done so far in connexion with the matter.

The article goes on to consider various circumstances relating to such coagulation by means of acetic acid, and shows that research into the literature of the subject indicates a large variation in the quantity of acid that has been considered by different authorities to be necessary for the purpose. After giving examples in illustration, it presents the results of recent experiments that have been performed with latex from Sumatra. This, unfortunately, had been diluted to a considerable extent, but was normal in other respects. The experiments show that, ignoring the coagulating effect of the acids present naturally in the latex, 1 part by weight of acetic acid coagulated 1,176 parts by volume of latex. Allowing for the acid already present, it was found, further, that the true coagulating power of 1 part by weight of the total acid was 575 parts by volume of latex. These results are not of general application, for as has been indicated, the latex used in the trial had been diluted to an unknown extent. The point of interest is that the action of the naturally occurring acid probably explains the large discrepancy in the amounts of acetic acid that are recommended by different authorities for coagulation. The dilution of latex to different degrees, and the extent of time during which this has been kept, between collection and examination, form sufficient causes for the obtaining of results that are not in agreement.

The article mentions the well-known fact that, if the amount of acetic acid is either too large or too small, imperfect coagulation results, and attention is further drawn to work, by Parkin, which led to the following conclusion: 'the percentage of acid necessary is proportional only to the original volume of latex present, and is independent of its dilution with water.' Experiments carried out by the writer of the article support this statement, and the latter is shown by him to hold good through a very long range of values. In the work, the assumption is made that the coagulating powers of the naturally occurring acids and of the acetic acid are equal. Further investigations are required to determine if this is true.

In regard to the maximum quantity of acid that is required for the purpose of producing satisfactory coagulation, details and figures are given of a test in which this was found to be 10·4 times the minimum amount, and an experiment is described further, which demonstrates that the factor obtained by dividing the maximum amount of acid by the minimum is not a constant, 'for with the same volume of latex, and a fixed maximum amount of acid, the maximum amount of acid allowable increases with the dilution.' The matter also explains why addition can be made of a large excess of acid over the minimum required (as far as complete coagulation is concerned), if the latex has been diluted; on the contrary, it is less safe to add a large amount of acid when the work is being done with normal, undiluted latex.

Concerning to the adsorption of acetic acid when it is used to coagulate Hevea latex, the writer does not find evidence that this takes place to any great extent, and details of trials are given which support this view of the matter. If there is any chemical action while coagulation is taking place, it must be constituted in the combination of the acid with one or more substances in the latex, to form compounds having an acid reaction. As far as adsorption is concerned, the writer prefers to consider this as referring to such acid as can only be removed from the precipitated colloid with great difficulty, and an experiment is given to show that a small amount of the acid is actually precipitated in this way.

The article concludes by a consideration of the effect of the quantity of acid employed for coagulation on the protein content of the finished rubber. It was found that the larger the amount of acid, the greater the quantity of protein found in the rubber, and this shows that, under present conditions, it is preferable to use the minimum quantity of acid that will produce complete coagulation. The subject is pursued by the performance of an experiment in which Hevea latex was repeatedly shaken up with fresh quantities of water, when it was found that the proteid content could be reduced to a certain degree, and that rubber was obtained which possessed an exceptionally light colour. No further evidence is required to demonstrate the fact, at least, that the colour of rubber is largely influenced by the way in which it is prepared.

THE SUPPLY OF RUBBER TO THE UNITED KINGDOM.

The following table shows the imports of rubber to the United Kingdom in 1909 and 1910:—

	1909.		1910.	
Origin.	Cwt.	£	Cwt.	£
Gambia	221	3,379	103	2,268
Sierre Leone ...	866	13,607	1,076	26,385
Gold Coast	23,276	272,370	28,730	482,328
Southern Nigeria ...	8,112	94,044	20,351	316,655
Northern Nigeria	—	—	50	905
Natal	1,021	1,661	808	1,622
Zanzibar	725	12,845	528	13,339
East African Protectorate	1,733	47,005	2,989	94,600
India	3,690	23,292	6,164	84,286
Straits Settlements	53,855	1,412,241	81,451	3,039,523
Federated Malay States	11,198	385,798	34,110	1,504,403
Ceylon	11,117	348,183	20,796	880,575
British Borneo ...	5	81	1,681	43,528
British West Indies	37	603	105	1,977
Other British Possessions	2,193	9,454	3,688	24,851
Total, British Possessions	118,049	2,624,563	202,630	6,517,245
Total, Foreign Countries	582,013	11,513,641	674,339	19,579,544
	700,062	14,138,204	876,969	26,096,789

(From the Supplement to *The Chamber of Commerce Journal*, July 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.

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NOTES AND COMMENTS.

Contents of Present Issue.

In this number the editorial deals with Light and the Growth of Trees. This is a subject that is possibly of more importance in temperate climates than in the tropics, on account of the smaller intensity of illumination in those latitudes. It deserves study, nevertheless, in the tropics, because of its importance in relation to the growing of trees collectively, in plantations, and to the provision of shade plants and trees.

Under the heading Sugar Industry, on page 275, information is given concerning the production of sugar in Cuba, in 1910.

An account of interesting trials of green dressings that have been made recently in Dominica is presented on page 277. Similar experiments, undertaken in St. Lucia, receive attention in this number of the *Agricultural News*, on page 284, and more particularly in number 242 of the present volume.

On page 279 there appears an abstract of a useful article, concerning the coagulation of rubber latex with acetic acid.

The Insect Notes, in this issue, present an illustrated article on the mango weevil (*Cryptorhynchus mangiferae*).

An article entitled Manuring and Meat Production is given on page 283. This presents the conclusions of work, in relation to the subject, that has been conducted continuously, through a long period of years.

The West Indies in Canada, 1911.

As was stated in a former issue of the *Agricultural News* (No. 235), the illustrated booklet entitled 'The West Indies in Canada, 1911', has been published for the Canadian National Exhibition that is being held in Toronto at the present time.

The booklet presents the same features as those of the last edition, and the statistical details have undergone the necessary revision. The illustrated portion was printed on calendered paper, as in that edition, on account of the improvement that has been effected by the use of superior paper for the half-tone illustrations.

Periodicity in Yield of Plantation Crops.

Observations made for the purpose of regulating the times and extent of tapping, on rubber estates, have drawn attention to the expected fact that the yields of such crops do not remain constant throughout the year, but vary in relation to different conditions. In the *India-Rubber Journal*, Vol. XLI, No. 12, p. 16, the subject is considered at some length, in an article, where it is pointed out, firstly, that while in most parts of Malaya, where the climatic conditions remain virtually the same throughout the year, the monthly returns from the trees are fairly constant, the matter is very different in the case of those parts of Ceylon where Hevea is grown, and where there is a marked dry period from January to April. In the latter case, during this period, the yield of latex, as well as that of dry rubber, is smaller, per tapping. The figures that are available show that this is not the case in regard to the second, smaller dry season; this is probably because of the increase in age of the trees, and in that of the number which is being tapped.

Interesting figures relating to rubber production in Ceylon are given, which support the contention that the advent of the dry season causes a reduction in output from the trees. The conclusions from these are complicated by the fact that heavy rains interfere with tapping operations to such an extent as to decrease the output during the time that these are being received.

It is pointed out that, even in Malaya where, as has been said, the variations in the climate during the year are smaller than in Ceylon, there is a decrease in the amount of tapping during February and March because it is believed that the trees, while losing their old leaves and producing new foliage, give a smaller yield of latex and receive benefit from a rest. This is probably true, on account of the decreased turgidity of the cells, owing to the lessened transpiration through the loss of the old leaves. A further cause of irregularity is the rapid increase in transpiration on account of the appearance of the young leaves.

The matters considered in the article give rise to the conclusion that, when the Hevea trees growing in the East have reached maturity there will always be a decline in the rubber exports from that part of the world during February and March, and this notwithstanding the custom of regular tapping which has been adopted on the majority of the estates.

The Effects of Compression on the Growth of Stems.

In recent years, interest has been taken in the effect of stresses, in various directions, on the manner in which plants grow. With reference to such work, an investigation is described in the *Botanical Gazette* for 1910, p. 257, in which experiments were made with woody and herbaceous plants for the purpose of ascertaining the effect of causing compression, along the length, of upright stems. It might be thought that such compression would result in an increase in the strength of the stem and in the tissues mainly responsible for that strength, owing to the stimulus that may be caused by the stress. There was, however, no indication that this is the case, as far as the woody stems are concerned; while in the young herbaceous stems the increase of strength during growth was actually smaller than the normal.

It was found that there was no effect in the direction of causing differences in the shape of any of the elements of the stem, except where the compression was very large, and out of all proportion to the strength of these elements.

The Trade and Commerce of British Guiana, 1910-11.

During this period the total trade of this Colony with the United Kingdom was 43·75 per cent. of the whole trade; that with Canada was next, with 20·16 per cent. The proportion of commerce with parts within the British Empire was 48 per cent. Among foreign countries, the United States had the largest trade with the Colony, the amount being 19·16 per cent. of the whole.

According to the *Annual Report of the Comptroller of Customs*, of British Guiana, for 1910-11, from which these figures are taken, the import trade with the United Kingdom increased by 2 per cent., namely to $4,001,095, the increase being chiefly due to larger importations of milk and machinery, and linens, cottons and wollens.

The returns for the trade with Canada show that the Dominion enjoys 8·23 per cent. of the whole import trade of the Colony, the actual amount being $689,178. The import trade with Canada is increasing, chiefly on account of larger receipts of flour and potatoes. As regards exports to the Dominion, these were $389,300 less in value than in 1909-10, sugar being responsible for the decrease, as the exportation fell by 5,735 tons.

There was also a decrease in the value of the exports to the United Kingdom; it was $802,258 less than that for the previous year, the decrease being in gold, cacao, diamonds, cattle food, citrate of lime, rum and sugar. As regards balata, copra, hides, kola nuts, crabwood, lumber and greenheart timber, there were increases. The value of the exports to the United States suffered an increase, being greater by $287,525 than that for 1909-10, cocoa-nuts, citrate of lime, crabwood, lumber, sugar and timber being chiefly responsible.

The Use of Calcium Cyanamide as a Manure.

Recent experiments with this manure appear to indicate that care should be exercised in its application to crops and trees in cases where little or no information exists at present in regard to its possible effect on their growth. The *Bulletin of the Bureau of Agricultural Intelligence and Plant Diseases* of the International Institute of Agriculture, for November 1910, p. 87, gives an account of trials that were made with calcium cyanamide on young and old olive trees, the quantities employed being from about 1 lb. to 6½ lb. per tree. The manure was employed in two ways, namely, by scattering it on the surface of the soil to an extent corresponding to the spread of the branches, and by burying it in a furrow around the trees at a distance of 16 to 20 inches. In the result, the plants which had received more than 1 lb. of the manure showed early signs of withering; this commenced in the leaves at the top, and continued until the trees were leafless, weakening the plants to such an extent that no fruit was borne in the following year.

It would appear that the quantities of calcium cyanamide that were applied were excessive, particularly in relation to the kind of soil in which the trees were growing; this was a poor, sandy soil, containing little humus.

The Use of Non-proteid Bodies by Animals.

It has long been the custom to state in a general way that the only nitrogenous food bodies that are of use to animals, in building up their tissues and producing energy, are those of a proteid nature. For some time, also, work has been undertaken by various investigators for the purpose of determining the value of nitrogen compounds that are not of a proteid nature in the nutrition of animals. A review of such work, in which the experiments were made with ruminant animals, is given in the *Annual Reports on the Progress of Chemistry*, for 1910, issued by the Chemical Society.

The method of investigation adopted was to feed lambs in such a way that their requirements in regard to nitrogen were supplied by asparagine and ammonium acetate—bodies which are of a proteid nature in no respect. It was shown, as a result, that these substances could be changed by the bacteria of the intestines into protein, in such a way that they can take the place of part of the protein required for maintenance. It was not demonstrated, however, that there was any production of flesh from these non-proteins, but that they are capable of increasing the formation of flesh, when fed with protein, by taking the place of a proportion of the latter that would be used for maintenance.

The results are supported by other experiments, made with milch cows, which have shown moreover, that proteids formed by bacterial action from non-proteid bodies may be utilized for the production of milk.

The general effect of such work has thus been to show that proteids may be formed in the intestines from non-proteid bodies, and that they are capable of assisting in maintenance and milk formation.

INSECT NOTES.

THE MANGO WEEVIL.

The Bureau of Entomology of the United States Department of Agriculture, has recently issued a Circular (No. 141, June 20, 1911) giving an account of the mango weevil (*Cryptorhynchus mangiferae*) and the injuries that it causes to mangoes. There is great danger that this insect may be introduced wherever mango seeds are imported for planting, and though mangoes are not grown from imported seeds to any extent, if at all, in the West Indies, the very serious results likely to follow the introduction of the mango weevil into these islands render it desirable that all readers of the *Agricultural News* should be in possession of the known facts regarding it. Consequently, the circular mentioned above is partly reproduced herewith.

It may be of interest to mention that the mango weevil belongs to the same genus as the Jacobs or Scarabee of the sweet potato (*C. batatae*). Another insect of this genus is common in St. Vincent as a borer in cultivated crotons (*Codiaeum* spp.), and still another was reported some years ago as a similar pest in orange trees (Fig. 13) in Grenada (see *Agricultural News*, Vol. I, p. 280). A brief account of the mango weevil in Hawaii has already been given in the *Agricultural News* (see Vol. V, p. 90).

FIG. 13. ORANGE BARK WEEVIL.

Beetle, about natural size. Grub, one-half natural size.

The most serious insect pest of the mango in oriental countries is the mango weevil (*Cryptorhynchus mangiferae*, Fabr.) This weevil is related to the boll weevil, and this, aside from its well-known destructive work on the mangoes, is sufficient indication of its undesirability. It is probably of Indian or at least of oriental origin, and has already obtained foothold in most of the important mango-growing countries, being carried readily with seed for planting. It now inhabits all the mango regions bordering on the Indian Ocean and adjacent islands, and occurs throughout the East Indies, including the Philippines and other groups of South Pacific islands. It has gained foothold similarly in South Africa and Madagascar and numerous other points. Fortunately, this country [the United States] is so far free from this pest, and if it can be kept out, the mango industry which it is hoped to develop in Florida and perhaps in the other warmer parts of this country can be given a very great advantage over other mango-producing regions of the world.

As has been indicated already, this mango pest belongs to the weevil family. The egg is deposited in the fleshy part of the fruit, and the young grub burrows at once into the seed pod and develops in the seed to a pupa, and finally to the adult weevil or beetle. The green mango soon heals up over the egg slit, and there is very little, if any, exterior indication of infestation. The weevil or beetle is about $\frac{1}{4}$-inch long, and dark brown in colour. It remains in the seed for some time, and may thus be easily distributed with seed for planting, or with the ripened fruit.

Protected as it is within the seed pod, and, in fact, within the seed itself within the pod, it is not possible to destroy it by fumigation with any certainty. The only means of determining infestation is in opening the seed pod and removing the paper-like covering of the seed itself, when normally the gnawing and excrement and discoloration due to the work of the larvae and weevil can be noted. Therefore, all seeds introduced for planting in this country, in regions where mangoes are grown, should be opened in this manner, and all that indicate infestation should be burned. As a matter of further security, all the apparently sound seeds should be germinated in a box under a wire screen, so that any weevils which may occur in seeds which show no visible sign of infestation may be retained and destroyed. The danger is particularly great where, as is now the case, mango seeds are being imported for planting in regions in Florida where fruiting mango trees occur. Where there are no mango trees, or trees of fruiting age, the danger is perhaps negligible, as no other food plant is known for the mango weevil. Still, if large numbers of these weevils should be introduced and liberated, they are long-lived, and might easily be carried on railway trains to regions where they might find lodgment. It is, therefore, desirable in any case to observe all the precautions indicated.

It has already been stated that this mango weevil is the principal enemy of the mango practically wherever this fruit is grown. In the Hawaiian Islands, Mr. D. L. Van Dine, formerly Entomologist of the Hawaii Agricultural Experiment Station, reports that, during the first year of his examination, he found 60 per cent. of the mangoes infested, and the following year from 80 to 90 per cent., in some instances as many as four larvae being found in a single seed. While the mango weevil destroys, primarily, the seed of this fruit, it is also believed by growers to hasten the maturity of infested fruit, and thus to increase the percentage of fallen mangoes.

Inasmuch as this insect passes its entire development within the seed, it is beyond the reach of insecticides and fumigation, and the only remedy which the bureau is able to advise to prevent it from becoming a pest in the United States is to collect and destroy all the fallen or supposedly infested mangoes.

It is most urgently important now, however, for Florida to keep this weevil out. Mango seeds are now probably being imported into Florida by various growers, and the danger of such importation should be thoroughly understood, and whatever authority the State may have to prevent or control such importations should be put in operation.

MANURING AND MEAT PRODUCTION.

A note on work relating to this subject, carried out by Professor Somerville was given in the *Agricultural News*, Vol. VIII, p. 361. More lately, the results of fourteen years of this work have been issued as a supplement to the *Journal of the Board of Agriculture*, Vol. XVII, No. 10, and it is from this that the following conclusions are taken:—

1. Cake of various sorts was fed to sheep on pasture at eleven centres, and in no instance was the outlay on the cake recovered in the increased mutton produced by the sheep in the season when the cake was consumed.

2. In the latter part of the grazing season sheep getting liberal allowances of cake did not increase in weight to a greater extent than those getting no cake, but which were grazing pasture improved by liberal dressings of basic slag.

3. The residual values of cake were occasionally higher than is usually estimated, but, in comparison with basic slag, cake residues had a poor ameliorative effect on the pasture.

4. Even when both direct and indirect effects of cake are taken into account, the original outlay was not recovered at two of the three main stations. This result was confirmed at such of the minor stations as were concerned with this problem.

5. It would appear to be bad practice to feed cake on pasture containing much clover, as the nitrogen in the cake residues has a tendency to repress the clovers by stimulating the non-leguminous plants.

6. Common burned lime, used alone at the rate of 4 tons per acre, has proved very ineffective; but smaller dressings of ground lime, when added to a phosphatic dressing, have sometimes been justified.

7. Basic slag, applied as a single dressing at the rate of ½-ton per acre, has generally proved a most effective agent in improving the feeding value of pasture, and its effects are not nearly exhausted at the end of nine years.

8. It has proved much more profitable to apply a heavy dose of basic slag as a single dressing, than to divide it into two equal portions and apply these with a three years interval.

9. A repeated dressing of basic slag has, however, had a marked effect in some cases, and the productiveness of slagged pastures that are showing signs of exhaustion can be rapidly improved in this way. The action of a repeated dressing appears to be more rapid in many cases than the action of the first dose.

10. Basic slag put on in the middle of June had much more effect than the same quantity applied in winter. Whether this result is of general application can only be determined by further experiments.

11. Where a direct comparison has been made between the effects of equal quantities of phosphoric acid derived from basic slag and superphosphate respectively, the former manure has always produced the greater amount of live-weight increase. When the cost of the manure is taken into account, the profits from the use of basic slag have always been much greater than those from superphosphate.

12. Potash added to a phosphatic dressing generally resulted in the production of more live weight increase, but this increase was not a profitable one. The expediency of using potash on pastures—as contrasted with meadows—therefore, receives no support from these experiments.

13. The addition of moderate dressings of sulphate of ammonia or nitrate of soda to land already treated with phosphate has increased the yield of herbage, but has, as a rule, reduced the yield of mutton. The use of nitrogenous manures on pasture would, therefore, appear to be bad practice.

14. Dissolved bones compare badly with basic slag and superphosphate. This is doubtless due to two reasons: (a) the slower action of part of their phosphates, and (b) the presence of nitrogen. But the nitrogen of dissolved bones, being less active than that of sulphate of ammonia, the general effect on the sheep of the dissolved bones, has been better than that of a mixture of superphosphate and sulphate of ammonia. The use, however, of dissolved bones on pasture would seldom appear to be justified, and especially so as their phosphoric acid costs more than the same substance in basic slag.

SISAL FIBRE-CLEANING IN FIJI.

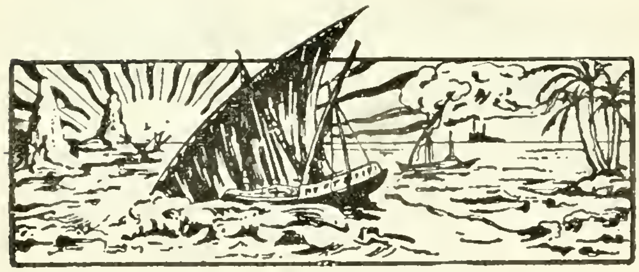
The machines used at the stations are made by Death & Ellwood of Leicester, England. That such machines clean the fibre very well will be seen from reports upon the fibre prepared in Suva by one of them. They are said by the makers to turn out 6-10 cwt. of fibre in a day, requiring 3-4 h.p.

They are provided with rollers which grip the leaves and crush them before they come under the action of the beater-knives. The direction of motion of these rollers may be reversed by pressing a conveniently placed foot-lever. To clean leaves, this lever is pressed and two leaves are fed in, butt ends first. When half cleaned they are withdrawn and the point ends are then presented to the rollers, the fibre of the cleaned half being held by the operator.

In common with all hand-fed machines, much in the way of output, depends upon the operator. With these machines an increase in the speed does not mean an increase in the output in exact proportion, because the time taken to reverse the leaves and to feed in fresh ones remains the same, whatever the speed.

It is important that the butt ends are cleaned first, for some of the fibre does not reach to the tip of the leaf and it would be drawn through during the second part of the cleaning, if the point ends were treated first. For the same reason, care should be taken that not more than one half of the leaf is cleaned during the first part of the process. A careless operator in this respect can cause the loss of much fibre.

Machines are usually adjustable for different fibres, and should be set so as to clean the fibre perfectly but without damaging it. Of course with less perfect cleaning, the apparent yield of fibre will be greater, but the value will be considerably reduced. (From *Sisal Hemp in Fiji*, Bulletin No. 1 of the Department of Agriculture, Fiji.)



GLEANINGS.

A report received from the Curator of the Botanic Station, Dominica, shows that, during July, flowers were setting favourably for the cacao crop. The lime crop was normal, and there had been heavy shipments of the green fruit during the month.

It is reported by the Imperial Trade Correspondent at Durban, that an estimate by the Natal Sugar Planters' Association gives the production of sugar in the Colony for the year ending May 1912 as 95,000 tons. The total for the year 1910-11 is reckoned at 75,000 tons.

In the *British Medical Journal* for 1910, p. 1145, a paper is given in which the experience of the author is described in relation to the use of bananas for feeding infants. This has led to the recommendation that the fruit should be used for the purpose in the form of the flour, made into gruel or a decoction.

According to the *Trinidad Mirror* for August 22, 1911, *L'Entente Républicane* of Martinique states that machinery has arrived recently in that island, which is being obtained for the purpose of extracting the juice and essential oil from limes. This points to the commencement of a new industry in Martinique.

The number of bales of cotton imported into the United Kingdom during the twenty-six weeks ended June 29 was 1,999,461. Of these 7,466 bales were British West Indian, 4,049 British West African, 15,835 British East African, and 45 bales foreign East African. (From *The Board of Trade Journal*, July 6, 1911.)

It is stated by the Agricultural Superintendent of St. Kitts, that the young cotton in the island is generally healthy and vigorous. There is about the same area in this crop as was the case last year. On two estates, cotton is being picked from the early planted fields, and one bale has already been shipped.

With reference to the article on page 215 of the last issue but one of the *Agricultural News*, dealing with *Tephrosia candida* and *T. purpurea* as green manures, information has been received, from the Superintendent of Agriculture, St. Lucia, that the plants of the first mentioned species, under trial at the Experiment Station, have attained a height of 8 feet, and that they are flowering, the flowers being 1 inch in diameter, and of a pure white colour.

The crop of sugar produced in Madeira was larger in 1910 than in any previous year, being estimated at 68,000 tons, with a value of about £245,000. More attention is being given on the part of growers to the employment of artificial manures in sugar production, and the imports of these are steadily increasing.

Notice is being given that the Dominica Agricultural Department is offering for sale to planters, for cultivation in the island, 6,000 seedlings of the Para rubber plant (*Hevea brasiliensis*) at the rate of 2*d*. per plant. Applications for these were to have been received by the Curator of the Botanic Station by the 1st inst., and the plants will be ready for distribution early in next month.

According to an abstract in the *Bulletin of the Bureau of Agricultural Intelligence and of Plant Diseases*, of the International Institute of Agriculture, the area of cotton in Greece in 1908 was 223 acres. From this a crop of 210,058 lb. was obtained; while the yield rose to 219,538 lb. in 1909 notwithstanding the fact that the area in cotton was reduced to 200 acres. During last year, there was upwards of 608 acres under cotton, in Greece.

The export of rubber from Ashanti, in 1910, was 1,257 tons, valued at £293,320. This is a decrease by 62 tons from the quantity shipped in 1909, but the value has largely increased. The fall in the exports of rubber is entirely due to the lowering of prices toward the end of the year, and very large quantities came in, early in 1911. The exports of cacao amounted to 1,914 tons, valued at £80,388, compared with 1,790 tons in 1909.

The *Zeitschrift für Angewandte Chemie*, Vol. XXIII, p. 2279, gives a paper which shows that calcium cyanamide containing free lime decomposes on treatment with water, and that the consequent rise in temperature causes a loss of nitrogen: the same effect results from the presence of calcium chloride. The suggestion is made that the addition of fatty matters which would absorb heat on melting will prevent this decomposition and the consequent loss of nitrogen. Another advantage that arises from the admixture of calcium cyanamide with such bodies is that it may be more conveniently used as a manure, on account of the fact that it is not so easily blown about by the wind.

The *Experiment Station Record* of the United States Department of Agriculture, for May 1911, presents an abstract describing work which has had for its object the finding of means to keep pollen alive until it is wanted for experimentation. The principle of the method described is the enclosing of the pollen in air-tight glass vessels containing water-free calcium chloride. In detail, the pollen is placed in a glass vessel about 2 inches long and ½-inch wide. This is plugged with wadding and placed in a larger vessel about 5½ inches deep and 3 inches wide, containing a layer of water-free calcium chloride just over 1 inch deep and covered with a layer of wadding about ⅓-inch thick. When in use, the larger vessel is tightly closed and should only be kept open during the short intervals when it is desired to introduce or remove tubes containing pollen.

STUDENTS' CORNER.

SEPTEMBER.

First Period.

Seasonal Notes.

Discuss the ways in which soils are formed from rocks, and make observations on the soils and the underlying rocks in a district with which you are familiar. A useful manner of obtaining knowledge of the subject, at first hand, is to examine areas of soil in different situations, and to compare the soil in each case with the rock on which it is lying. If this is done in a district where the rock beneath the soil shows distinct variations in character, or where the ground is sloping or hilly it will often be made evident that the soil is not always derived from the rock underlying it, but that it has been carried from the places where it was formed originally, or that it has been made from material that has been transported in a similar manner. Give an account of the ways in which soils and soil-making materials are carried from one place to another. It sometimes happens that such removal of materials causes a soil to be formed from rocks of more than one kind. Of what advantage may this circumstance be to the plants growing in a soil having an origin of this sort? How do you account for the fact that soils may be found which contain stones of a fairly large size?

Make a review of the ways in which the pollination of flowers takes place. Distinguish carefully between pollination and fertilization, and mention any ways in which steps are taken to increase the amount of natural fertilization, in relation to a given crop, in order that a greater number of fruits may be obtained eventually. State, in general terms, what happens to a pollen grain when it reaches the stigma of a flower of the same kind as that from which it originated, under conditions favourable to the accomplishment of the purpose for which it was intended. Describe carefully an experiment by which it may be shown that pollination is necessary for the formation of fruit, with seeds. Mention any direct commercial uses to which flowers are put.

The most obvious directing influence that has effect in deciding what kinds of plants may grow in a district or country is that of climate. Illustrate, in a general way, the manner in which climate decides what type of vegetation shall flourish in the different regions of the earth. What is meant by the acclimatization of plants, and in what ways is this most usually effected? Of what use is such acclimatization to the agriculturist? A certain district, or country, is noted on account of its ability to produce some special agricultural product in a superior form. Discuss the economic effect of the successful introduction on a large scale, into another country, of the plant from which this product is obtained, and state the nature of the observations and precautions that will have to be made and taken, in the country of its adoption. In dealing with questions of this kind, it must be remembered that the increased production of a given article leads to the lowering of its market price and to the finding of a larger number of uses for it, and that the cultivation of a plant on an increased scale, through its introduction into new countries, often necessitates the greatest care for the prevention of its destruction by pests and diseases, in those countries.

From year to year, to the agriculturist in any given district, the changes of season are a more important matter than the circumstances of the general climate. In the tropics, differences in the amount of rainfall at the various periods of the year form the most powerful cause operating in regard to the changes undergone by plant life during its course. Under continental conditions—that is in the case of countries surrounded by, or situated on the borders of, large areas of land—the changes in the course of the different years usually take place with more or less regularity, and this is often true of islands, particularly where there are high hills. In other circumstances, however, the rainfall varies greatly in different years and in different seasons; that is to say, the agriculturist faced by such circumstances is never sure as to the adequacy of the rainfall for the coming year, or of the way in which this will be distributed throughout that period. Instances of such conditions may be derived from experience in the West Indies, and it will be useful to discuss the matter from the point of view of the diversification of agriculture, of the use of manures, and of the rotation of crops.

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) Give, with diagrams, an account of the structure of any flower that is pollinated by insects.

(2) How are plants enabled to make use of the water which falls upon the soil and passes into it?

(3) Distinguish between climate, season and weather.

INTERMEDIATE QUESTIONS.

(1) Write an account of the changes in the life-history of any given plant throughout the year.

(2) Compare the floral organs of maize with those of the cocoa-nut palm.

(3) State in what ways a soil may derive its properties from the rock from which it was formed.

FINAL QUESTIONS.

(1) Show how the agricultural operations throughout the year, in your district, are related to the changes of season.

(2) Give a method of classifying soils, and state the name, in the case of each different kind, of one plant or group of plants at least that is particularly suited to it.

(3) What are the methods most commonly in use for obtaining new markets for an agricultural product, and increasing its consumption?

A New Fibre Plant.—*Der Pflanzer* for April 1911 gives a note on a new fibre plant which has been found in German East Africa. This bears a fruit composed of two elongated follicles, like that of Funtumia, but shorter and thicker, and containing seeds with fine, silky hairs. The plant bearing the fruit is a liane, and is determined as *Chlorocodon Whitei*. Samples of the seed-hairs were sent for examination to the Aktien-Spinnerei, at Chemnitz, and at the same time seeds were sown for the purpose of obtaining information as to the rate of growth and yield of the plant. It has since been reported from Chemnitz that the fibre is very valuable, and that a larger sample of it was required.

It remains to be ascertained if the plant can be cultivated profitably. Seeds sown at Amani, German East Africa, for trial, have germinated successfully, and it is recommended that experiments with the plant should be made in other places.

FUNGUS NOTES.

THE DIE-BACK FUNGUS OF PARA RUBBER AND OF CACAO.

In an article in the *Agricultural News*, Vol. X, p. 78, attention was called to a few of the fungi which are parasitic both on cacao and on rubber plants. Among these was included *Lasiodiplodia theobromae*—the die-back fungus well known as a cacao parasite in the West Indies. Recently, important investigations on the life-history of this fungus and on its parasitism have been conducted by Mr. C. K. Bancroft, Mycologist on the Staff of the Department of Agriculture of the Federated Malay States. The results of these investigations have been published in Bulletin No. 9 of that Department, entitled The Die-back Fungus of Para Rubber and of Cacao. These are of considerable importance, as they not only do much to clear up the confusion in the nomenclature of this fungus, but throw considerable light on its method of attacking its host and on the factors governing the extent of the damage caused. A short summary of this work is given below.

The die-back fungus is distributed throughout practically the whole of the tropical zone. It occurs in the West Indies, tropical America, San Thomé, tropical Africa, Ceylon, the Malay Peninsula, the East Indies, the Philippines and Samoa. It is found on a very large number of host plants, though it is of greatest importance as a parasite on cacao and Para rubber, since on many of the others it would appear to be mostly only saprophytic. Bancroft records it on dead shoots of coffee, cocoa-nut, camphor, *Castilloa elastica*, and on dead stems and roots of tapioca, or cassava.

The symptoms of the disease on Para rubber are those usually associated with die-back, though it is worthy of note that in early stages it is rarely found that more than one or two shoots are affected simultaneously. Infection usually takes place first on a branch at a point varying in distance from its apex. The terminal portion dies first, owing to the stoppage of its food supplies, and the disease then spreads downwards towards the base of the branch. When the trunk is reached, the fungus may continue to extend to the roots. Frequently, however, if the tree is healthy, the spread of the fungus in the branch is checked before it reaches the trunk, and growth is continued by a healthy shoot arising below the dead portion of the branch. The disease may also be arrested in its course, upon reaching the trunk of the tree. When it spreads down the trunk, all the branches above the point of entry die from want of food, and eventually the tree is killed.

The wood is the part in which the spread of the fungus principally takes place. This is turned to a uniform grey colour, owing to its presence, while in the parts less affected the change of colour takes place in the medullary rays, which are turned brown. After the wood is dead, the outer tissues still yield some latex, but these die eventually; the bark becomes greyish in colour and peels off, while the cambium layer is reduced to a black mass. In cases where the growth of the fungus is slow, and where infection has occurred on an older part, a cankered appearance may be produced. It is worthy of note that the line of demarcation between healthy and dead tissue in the wood is often fairly definite, but that the hyphae of the fungus actually extend for a distance of 4 or 5 inches below the point where the wood can be seen by the naked eye to be infected.

The ordinary fructifications of *Lasiodiplodia theobromae* are well known and need not be described here; they are illustrated in the *Agricultural News*, Vol. IX, p. 174. Bancroft has, however, found two other forms of spores that are produced by this fungus. One is the ascospore, of which eight are formed in a definite sac or ascus, the asci being contained in black perithecia: the other is a small colourless spore, produced like the Lasiodiplodia spores, in a black pycnidium; this form belongs to the genus Cytospora. The discovery of the ascospore form was recorded in the number of the *Agricultural News* to which reference is made at the beginning of this article, and it was mentioned there that the name *Thyridaria tarda*, given to it by Bancroft, is that by which the fungus in all its forms must now be known. This is so because the ascomycetous stage is regarded as the most highly developed form of the fungus.

The perithecia containing the asci were produced on specimens of diseased cacao branches, sent to Kew from West Africa. They were borne on the same stromata as the Lasiodiplodia form, and contained asci in which eight, 3-septate dark-coloured spores were produced.

On the other hand, the pycnidia belonging to the Cytospora stage were produced on dead branches of Hevea, in the Federated Malay States. They also arose on stromata which had previously carried the Lasiodiplodia form. As has been stated already, they produced numerous elliptical-oblong, small, hyaline spores borne on the ends of sterigmata.

Inoculation experiments with the Lasiodiplodia spores on Hevea plants gave rise to interesting results. In the first place, it was found that no infection could be produced at an uninjured surface, either of the leaf or the stem; and that even very young leaves were not attacked, although Ridley has claimed to have infected them directly. (See *Agricultural News*, Vol. IX, p. 382.) Further, it was observed that infection did not occur at small wounds or on well tapped surfaces. This was the case, as long as the wound was not deep enough to expose the wood and did not penetrate to the inner bark, or to the cambium. The bark tissues possess the power of rapidly forming a corky layer, which excludes the fungus; while the wood, when exposed, presents a dead surface. on which the organism can grow vigorously. Infection resulted in every case from inoculating wounds that were deep enough to expose the wood, though the death of the plant when it was in a healthy state did not always follow.

Inoculations on Hevea plants, with the ascospores formed on cacao, produced the usual symptoms of die-back on the Hevea, in each case, and eventually pycnidia of Lasiodiplodia were formed on the dead portions of the rubber plant; these were identical in appearance with those on cacao. This places the identity of the fungus on cacao and rubber beyond dispute. No inoculation experiments with the Cytospora spores have yet been recorded, though further work on this form is being undertaken by Bancroft. Finally, it may be stated that the presence of *Gloeosporium alborubrum*, said by Petch to be frequently responsible for the initial stages of this disease in Ceylon, has never been recorded in the Malay States.

In regard to remedial measures, Bancroft emphasizes the need for thorough sanitation, good cultivation and careful pruning on rubber estates, in order to check the spread of the disease—measures long advocated by this Department for the same purpose in regard to cacao. He also states that the attacks of other fungi, as well as the presence of wounds and ill-health due to physical causes, may predispose a tree to disease; consequently, it is extremely likely that the die-back fungus is not always the primary cause of the trouble, and that by no means all the effects that have been attributed to it are really due to this fungus. This is an opinion which receives the support of this Department.

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:—

The conditions of the markets in drugs and spices during the month of July, though perhaps, not brisk, have been quite of a satisfactory character, more especially when the season of the year is taken into account, July being one of the months when it is usual to think, if not believe, that London is empty, and the requirements of those that remain, are more for cooling drinks than for drugs. The continued prevalence of very hot and dry weather, even up to the time of writing, has to some extent verified this. The following are the details of West Indian products which have been offered at the fortnightly and weekly auctions during the month:—

GINGER.

Throughout the month this article has been slow of sale. At the first auction on the 5th, some 700 packages of Cochin were offered and bought in; 21 bags of bold selected Calicut were sold without reserve at 84*s.* to 85*s.* per cwt. On the 19th, the offerings amounted to 127 packages of Cochin, all of which was bought in at 80*s.* per cwt. for medium cut. No Jamaica has been offered.

NUTMEG, MACE, AND PIMENTO.

For nutmegs there has been a steady demand. At auction on the 5th, 72 packages of West Indian were brought forward and sold, 78's fetching $5\frac{3}{4}d.$, 80's to 88's, $5\frac{1}{2}d.$, 102's 5*d.* to $5\frac{1}{4}d.$, and 111's to 117's, 5*d.* Thirteen cases of Penang were also sold without reserve, 65's fetching 11*d.* per lb. and 80's $6\frac{1}{2}d.$ to 7*d.* On the 19th there was again a good demand; practically the whole consignment of nearly 700 packages of West Indian was disposed of at the following rates—53's 1*s.*, 57's 8*d.* to 1*s.*, 60's to 61's 9*d.* to 11*d.*, 70's to 80's $5\frac{3}{4}d.$ to $6\frac{1}{2}d.$, 108's to 112's $3\frac{3}{4}d.$ to $5\frac{1}{2}d.$ Mace was also in steady demand during the month. At auction on the 5th, 11 packages of West Indian were offered and disposed of at 2*s.* 1*d.* to 2*s.* 2*d.* per lb. for good fair reddish, and 1*s.* 10*d.* to 2*s.* for ordinary to fair. On the 19th, 160 packages of West Indian were brought forward and sold, good fetching 2*s.* 3*d.* to 2*s.* 4*d.*, ordinary to fair 2*s.* to 2*s.* 2*d.*, and broken 1*s.* 8*d.* to 1*s.* 10*d.* per lb. Pimento was represented at auction on the 19th by 75 bags, which met with a ready sale at $2\frac{1}{8}d.$ per lb. for fair.

SARSAPARILLA.

At the drug auction on the 13th, the offerings were as follows: grey Jamaica 7 bales, Lima-Jamaica 14 bales, native Jamaica 12 bales, and Honduras 2 bales. The whole of the grey Jamaica and Lima-Jamaica were disposed of, also 11 bales out of the 12 of native Jamaica. The Honduras found no buyers; 1*s.* 7*d.* per lb. was paid for the grey Jamaica, which was an advance of 1*d.* per lb. on previous rates, notwithstanding the quality was slightly coarse. Part of the Lima-Jamaica was quoted at 1*s.* 3*d.* per lb. for good, and 1*s.* per lb. for ordinary coarse. Of the native Jamaica, 11*d.* per lb. was paid for dullish red, and 7*d.* to 8*d.* for common dull and grey mixed. At the last sale on the 27th, grey Jamaica was represented by 15 bales, which were sold at 1*s.* 8*d.* per lb. for good fibrous, and 1*s.* 7*d.* for coarse. Seven bales of native Jamaica were also offered, and 4 sold, 1*s.* per lb. being paid for fair red, 10*d.* for mixed, and 9*d.* to $9\frac{1}{2}d.$ for common mixed.

LIME JUICE, KOLA, TAMARINDS.

It was reported at the beginning of the month that the supply of good quality was limited; a few packages of fair have been sold at 1*s.* 5*d.* Later on, 4 barrels of what was described as 'common brown Barbados' were offered, and bought in at 1*s.* 3*d.* per gallon, but they were afterwards disposed of at this rate. Towards the end of the month there were many enquiries for good raw West Indian, for which 1*s.* 9*d.* has been paid, and as much as 2*s.* for refined. For kola there has been a good demand throughout the month, with scanty supplies. At the last auction, good dried West Indian was held at 6*d.* per lb., an offer of $5\frac{1}{2}d.$ being refused. On the 12th of the month, 10 packages of dry Antigua tamarinds were sold at 9*s.* per cwt., and at the end of the month 8 casks of mouldy East Indian were sold without reserve at 5*s.* per cwt.

ST. VINCENT AND THE VIRGIN ISLANDS AT THE CANADIAN NATIONAL EXHIBITION.

Information has been received from the Honorary Secretary of the Permanent Exhibition Committee, St. Vincent, which shows that the exhibits sent by that Committee to the Canadian National Exhibition, opened on August 26, 1911, were comprised in the following classes: sugar, nine exhibits; cacao, twelve; rum, twelve; fancy molasses, five; arrowroot, forty-seven; cassava starch, six; cassava meal, two; arrowroot meal, one; sweet potato starch and yam starch, one each; coffee, two; pigeon peas, one; honey, one; ornamental seeds, four; Sea Island cotton, seven; and Sea Island seed-cotton, three exhibits; making a total of 114. The exhibits were provided chiefly by the owners of estates; they were also supplied by private firms and by the Agricultural Department.

With reference to the Virgin Islands, the Agricultural Instructor reports that in this, the sixth year of representation of that Presidency at the Canadian National Exhibition, the following samples were forwarded: cacao, coffee, sugar, arrowroot starch, concentrated lime juice, preserved limes, and rum, four exhibits each; cassava bread, one exhibit of eighteen cakes; cotton, eight bags; and fancy work, twenty exhibits.

A note in the *Bulletin Agricole* of Mauritius, which is published under the patronage of the Chamber of Agriculture of that island, states in its issue for May last that the plantings of Sea Island cotton in the Colony were generally showing good resistance to the drought that was then prevailing; the fields were green and the plants healthy. The statement is made, further, to the effect that there is little room for doubting the power of this cotton to survive untoward circumstances in the climate of Mauritius, especially as it has, since its introduction, survived three cyclones and a drought, almost without showing any tendency to fail.

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR, August 15, 1911; Messrs. E. A. DE PASS & Co., July 21, 1911.

ARROWROOT—2*d.*
BALATA—Sheet, 3/4; block, 2/6½ per lb.
BEESWAX—£7 10*s.* to £8 10*s.* per cwt.
CACAO—Trinidad, 50/6 to 65/- per cwt.; Grenada, 51/- to 57/6; Jamaica, 49/- to 56/-.
COFFEE—Jamaica, 62/- to 120/-.
COPRA—West Indian, £25 15*s.* per ton.
COTTON—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, no quotatiens.
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—49/- to 64/- per cwt.
HONEY—28/- to 38/-.
ISINGLASS—No quotations.
LIME JUICE—Raw, 1/3 to 2/-; concentrated, £18 5*s.*; Otto of limes (hand pressed), 5/3.
LOGWOOD—No quotations.
MACE—Quiet.
NUTMEGS—Quiet.
PIMENTO—Common, 2$\frac{1}{16}$*d.*; fair, 2⅛*d.*; good, 2$\frac{3}{16}$*d.* per lb.
RUBBER—Para, fine hard, 4/7; fine soft, 4/5; fine Peru, 4/4 per lb.
RUM—Jamaica, 1/6 to 5/-.
SUGAR—Crystals, 15/6 to 18/-; Muscovado, 11/6 to 14/6; Syrup, 12/6 to 14/- per cwt.; Molasses, no quotations.

New York.—Messrs. GILLESPIE BROS. & Co., August 11, 1911.

CACAO—Caracas, 11⅜c. to 12¼c.; Grenada, 12c. to 12¼c.; Trinidad, 11⅞c. to 12c. per lb.; Jamaica, 10¾c. to 11c.
COCOA-NUTS—Jamaica, select, $30·00 to $32·00; culls, $19·00 to $20·00; Trinidad, select, $30·00 to $32·00; culls, $19·00 to $20·00 per M.
COFFEE—Jamaica, 13c. to 14¼c. per lb.
GINGER—9½c. to 12c. per lb.
GOAT SKINS—Jamaica, 53c.; Antigua and Barbados, 48c. to 50c.; St. Thomas, St. Croix and St. Kitts, 46c. to 48c. per lb.
GRAPE-FRUIT—Jamaica, no quotations.
LIMES—No quotations.
MACE—45c. to 52c. per lb.
NUTMEGS—110's, 11½c. per lb.
ORANGES—Jamaica, no quotations.
PIMENTO—4½c. per lb.
SUGAR—Centrifugals, 96°, 4·61c. per lb.; Muscovados, 89°, 4·11c.; Molasses, 89°, 3·86c. per lb., all duty paid.

Trinidad.—Messrs. GORDON, GRANT & Co., August 21, 1911.

CACAO—Venezuelan, $13·00 per fanega; Trinidad, $11·90 to $12·50.
COCOA-NUT OIL—82c. per Imperial gallon.
COFFEE—Venezuelan, 15½c. per lb.
COPRA—$3·90 per 100 lb.
DHAL—$3·90.
ONIONS—$2·50 to $2·75 per 100 lb.
PEAS, SPLIT—$5·80 to $5·90 per bag.
POTATOES—English, $2·00 to $2·25 per 100 lb.
RICE—Yellow, $4·80 to $4·85; White, $5·25 to $5·30 per bag.
SUGAR—American crushed, no quotations.

Barbados.—Messrs. JAMES A. LYNCH & Co., August 26, 1911; Messrs. T. S. GARRAWAY & Co., August 28, 1911; Messrs. LEACOCK & Co., August 18, 1911; Messrs. E. THORNE, Limited, August 14, 1911.

CACAO—$10·50 to $11·50 per 100 lb.
COTTON SEED—$22·40 per ton; meal, $1·50 per 100 lb.; 2½ per cent. discount.
COTTON SEED OIL (refined)—47c. per gallon.
COTTON SEED OIL (for export)—51c. per gallon (in bond).
HAY—$1·30 to $1·40 per 100 lb.
MANURES—Nitrate of soda, $60·00 to $65·00; Cacao manure, $42·00 to $48·00; Sulphate of ammonia, $75·00 to $76·00 per ton.
MOLASSES—No quotations.
ONIONS—$1·83 to $2·50 per 100 lb.
PEAS, SPLIT—$5·65 to $5·80 per bag of 210 lb.; Canada, $2·75 to $4·40 per bag of 120 lb.
POTATOES—Nova Scotia, $2·50 to $4·40 per 160 lb.
RICE—Ballam, $4·85 to $5·25 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
SUGAR—No quotations.

British Guiana.—Messrs. WIETING & RICHTER, August 19, 1911; Messrs. SANDBACH, PARKER & Co., August 18, 1911.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	$10·00 to $10·25 per 200 lb.	$10·50 per 200 lb.
BALATA—Venezuela block	No quotation	Prohibited
Demerara sheet	70c. per lb.	70c.
CACAO—Native	11c. per lb.	11c. per lb.
CASSAVA—	96c.	No quotation
CASSAVA STARCH—	$6·50 to $7·00	No quotation
COCOA-NUTS—	$12 to $16 per M	$10 to $16 per M., peeled and selected
COFFEE—Creole	16c. per lb.	19c. per lb.
Jamaica and Rio	19c. per lb.	19½c. per lb.
Liberian	10½c. per lb.	12c. per lb.
DHAL—	$3·60 per bag of 168 lb.	$3·70 per bag of 168 lb.
Green Dhal	$3·50	——
EDDOES—	96c.	——
MOLASSES—Yellow	None	——
ONIONS—Teneriffe	——	4c. to 5c.
Madeira	5c.	5½c.
PEAS—Split	$5·75 per bag (210 lb.)	$5·75 per bag (210 lb.)
Marseilles	$3·90	No quotation
PLANTAINS—	8c. to 20c.	——
POTATOES—Nova Scotia	——	$3·50
Lisbon	——	No quotation
POTATOES—Sweet, B'bados	96c. per bag	——
RICE—Ballam	No quotation	——
Creole	$5·00 to $5·25	$5·00 to $5·50
TANNIAS—	96c.	——
YAMS—White	$3·00	——
Buck	$3·24	——
SUGAR—Dark crystals	$3·60	$3·60
Yellow	——	$3·75 to $4·00
White	——	$4·25
Molasses	——	None
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 Health of Plants as Related to Insects.

In a short article, which appeared in the *Journal of Economic Entomology*, for April 1911 (see Vol. 4, p. 269), Mr. J. B. S. Norton, of the Maryland State Agricultural Experiment Station, discusses the topic indicated by the heading appearing above.

Mr. Norton finds examples for the illustration of his points in certain well-known conditions with reference to insect pests in the United States. A perusal of this article has suggested the desirability of a discussion of the subject along similar lines, using as examples insects which are known to readers of the *Agricultural News*.

In considering the relation of insects to plants, the author places the health of the plant as the basis of argument. In ordinary practical work, this feature although important is largely lost sight of in dealing with the question of profit and loss. Insects injure plants, and as a result the crop is smaller or of an inferior quality, and consequently profits are reduced, or in extreme cases the crop is ruined and becomes a total loss. It may thus be of interest to note the ways in which insects affect the health of plants, but it must be borne in mind that everything influencing the plant adversely has also an unfavourable effect on the net results to the planter or farmer.

The effect of insects on the health of plants may be of two kinds, direct and indirect. Direct injury results when the insect actually removes portions of the plant which are essential to growth and reproduction, or when the actual food material of the plant is removed, or when the action of the insect interferes with the physiological functions of the several parts. Indirect injury takes place when disease-producing organisms are either actually conveyed from plant to plant, or are provided with easy means of entering into the tissues of the plant.

Direct injury to plants is of great importance and often very obvious. The feeding of myriads of cotton worms in a field of cotton destroys large numbers of leaves, which are essential for the elaboration of raw food material, from which the structure of the plant must be built up, and which goes also to the formation of seed and lint. Plants have great powers of recuperation, and the loss of a portion of the leaves may be quickly remedied by the development of others—a circumstance which, nevertheless, lowers the vitality of the plant and makes it less able to endure further untoward conditions. Insects that deposit their eggs in the twigs of trees, which they girdle so that the egg may be carried to the ground embedded in the tissue which shall furnish food for the larva and at the same time protect it from its enemies, are also to be considered under this head.

The kind of loss to the plant occasioned by the feeding of scale insects, leaf-hoppers, plant lice, cotton stainers and similar insects, is likewise of great importance when these insects are numerous, but it is often not readily discovered on account of the minute size of the insect. The observer also often fails to realize the drain placed upon the resources of the plant because of the abstraction of food by the enormous numbers of small insects which can be accommodated on a very small area of its surface.

The loss of raw and elaborated food material deprives growing tissues of their nourishment, and often results in checking growth and producing deformities. Discoloured and shrunken leaves often indicate an attack of this nature, and long continued exhaustion of the kind produces weak, under-sized plants, and often even results in their death. The red maggot lives near the delicate cambium and bast tissues of cotton stems, feeding on the rich supply of elaborated food, and at the same time causing the death of the adjacent tissues. The long-horned beetles, whose larvae live as bark borers in the trunks of trees, exist under like conditions, and exert a similar effect on the plants they attack.

Injury of a direct nature to plants, from the weakening of the supporting tissues, is often very serious. Trees affected by borers, cotton plants which have suffered from severe attacks of red maggot, and plants which have lost their roots from the action of insects, are rendered less able to resist the force of the wind. They are broken off or blown over, either losing a portion or all of their foliage-bearing structure, or being uprooted.

The power to reproduce possessed by plants is often greatly lessened by the attacks of insects. The flower-bud maggot, by its attacks on the developing buds of cotton plants, causes them to drop, thus preventing the formation of flowers and seeds. The boll worm and the corn ear worm tunnel into the bolls of cotton and the ears of corn, destroying the developing seed; and, in the case of corn, these insects further interfere with the reproductive processes by devouring the silk of the ear, thus preventing pollination.

Grain weevils and grain moths attack Indian corn and Guinea corn, feeding on the embryo, and rendering subsequent growth impossible; or devouring the reserve food, and in this way weakening the seedling which develops from the planted seed.

Direct injury to plants also results from the destruction of their organs by insects, so that the ordinary physiological functions are prevented from being performed. The feeding of the root borer destroys the roots of the cane; this prevents the absorption of water and mineral food constituents from the soil, and the plant is injured, and may even die. Borers in the stem cause injury to the woody tissue, stopping the ascent of raw liquid food material, and to the soft bark tissues, preventing the proper distribution of elaborated food from the leaves to the growing cells.

The leaf-blister mite causes deformities of the leaves of cotton, which reduce in amount the elaboration of the raw food material, and other blister-forming and gall-forming insects produce deformities which interfere with normal plant processes. Leaf miners, which live in minute tunnels under the epidermis of leaves, reduce the extent of the action of sunlight on the underlying tissues. When, as a result of great increase in the amount of epidermis separated from the subjacent green tissue, an air space is formed, and foreign matter, composed of insect excrement and dust accumulates, the function of the leaf is greatly impaired, and it often dies prematurely.

The principal form of indirect injury to plants by insects is to be found in the invasion of fungoid or bacterial diseases, which take advantage of the punctures made by sucking insects and the tunnels which are excavated by boring insects, in gaining entrance to the inner tissues. Plants are, in general, protected by an epidermal covering, which varies in thickness and quality according to the species and to the part of the plant on which it occurs. When the epidermis is punctured, the soft tissue is exposed, and there can be no doubt that an easy opportunity is offered for the entrance of disease-producing organisms. The moth borer, the shot borer and the weevil borer of the sugar-cane perforate the epidermis of the cane stalk, and it has been held that the occurrence of these insects in enormous numbers accounted for the unusual prevalence of sugar-cane diseases a few years ago. Butterflies and moths sometimes puncture ripening fruits for the purpose of feeding, and the punctures provide easy access for spores and germs of disease and decay. Lastly, certain insects carry, mechanically attached to the hairs of legs or body, disease-producing germs or spores, which are likely to find suitable lodgment on the plants visited by them.

Proof, based on experimental evidence, is not available for many instances of the relation of insects to the spread of the diseases of plants, in the West Indies. It seems likely, however, to take an example, that in the case of thrips on cacao there may be a very definite connexion between the spread of certain diseases and an abundance of the insect. The abrasions made by the feeding of enormous numbers of these minute insects would offer, so it would seem, very good opportunities for the lodgment of spores and the entrance of disease.

SUGAR INDUSTRY.

THE COMPOSITION OF SUGAR-CANE SEED.

An investigation is being carried out, at the Sugar Experiment Station, New Orleans, Louisiana, for the purpose of obtaining information concerning the composition of sugar-cane seed. An account of this is given in the *International Sugar Journal* for July 1911, p. 362, and this is employed as the source of the following particulars.

Attention is first drawn to the large importance which the seed of the sugar-cane has gained in recent years, in relation to the production of new varieties: it is this variation in the plants that can be raised from such seed that has rendered it possible to obtain the large number of varieties of sugar cane that are now at the disposal of the experimenter and the planter. When such seeds are analyzed, variation is seen to be a quality of its composition as well as of its power to produce plants. This fact may be illustrated from the following table taken from the article in question, in which the results of the analysis of cane seed from different sources are given:—

	Antigua.	T.105.	Lahaina.	Hawaii 29.	B.306.
Protein	6·23	8·38	7·44	8·64	6·13
Fat	1·98	1·99	1·64	1·95	1·72
Pentosans	25·72	29·75	23·00	25·10	24·34
Soluble carbohydrates	1·23	1·03	0·61	0·66	1·41
Lignin	12·71	12·78	21·57	16·04	22·09
Fibre	27·16	28·87	27·17	25·73	25·55
Ash	14·22	6·20	7·01	10·58	7·48
Water	10·75	11·00	11·53	11·30	11·28

The seeds used for analysis included both the husks and the kernels, as well as the covering of hairs; it was found impossible to separate the former owing to the small size of the seed. In considering the analysis, one of the most striking matters is the variation in the ash content and in that of the lignin and of the soluble carbohydrates. In the case of the last-mentioned, it is likely that the differences can be accounted for by the fact that the seeds employed in the investigation were of different ages.

The amount of water-soluble carbohydrates is seen to be about 1 per cent. These were found to contain reducing sugars, including glucose, but no sucrose was found, in spite of the making of careful tests. It may be that the absence of sucrose was due to its disappearance in the time that elapsed before the seed could be analyzed. Another body whose presence could not be discovered was methyl pentosan. It was shown that the cellulose in the seed was ordinary glucocellulose.

All the kinds of cane seed examined were found to contain lignin, but this substance was not present in the hairs covering the seed. It is intended to pursue further the investigation, particularly in regard to an examination of the non-carbohydrate bodies in the seed.

MOLASSES AND MILK PRODUCTION.

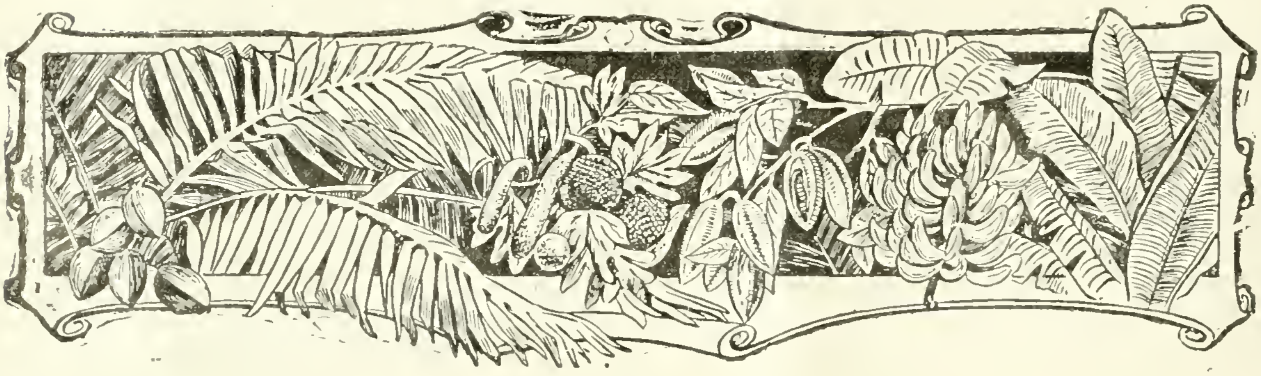
The use of molasses as a food for stock has received attention several times in the *Agricultural News*. Further interesting work relating to the matter is described in the *Journal of the Board of Agriculture*, Vol. XVIII, p. 146 (May 1911), which presents an abstract of investigations carried out at the Hohenheim Agricultural Experiment Station, Germany.

The molasses was used more especially as a condiment, and the way in which the investigations were made was to compare the milk production, when unappetizing food mixtures were employed, with that when the same mixtures were used, but with the addition of molasses. At the same time parallel experiments were carried out with foods rich in condimentary stuffs other than molasses.

The result of the trials was to show that the effect of the addition of molasses, as a condiment, to unappetizing food mixtures was to increase the milk production by 50 per cent., and to make it equal to that obtained when condimentary food mixtures were employed. This leads to the suggestion that molasses may form a useful purpose in its addition to tasteless or unsavoury food, with the object of making this more readily acceptible to animals. The matter is particularly important as regards milk production, especially in view of the further interesting conclusion that the more a ration is lacking in sweet-tasting or sweet-smelling constituents, the greater is the effect of adding molasses.

DEPARTMENT NEWS.

Mr. F. W. South, B.A., Mycologist on the Staff of the Imperial Department of Agriculture left Barbados on September 10, by the S.S. 'Korona' for Dominica, for the purpose of making investigations into the fungus diseases of various plants. Mr. South will probably return to Barbados on the 20th instant.



FRUITS AND FRUIT TREES.

THE DATE PALM.

The date palm, to be successfully grown, needs intense heat, excessive dryness of the air and absence of rain for months at a time, especially during the growing season. Hot and dry winds are advantages rather than drawbacks to the date palm. This palm has the power of resisting large amounts of alkali in the soil, hence does not mind the ordinary brak and sandy soils so frequently met with in the dry regions. The best commercial variety is the Deglet Noor. The Rhars is a good early date for cool climates; the plant is vigorous, bears while young, and the fruit is extremely sweet and tender-skinned. The Teddala is also a good sort for a cool climate. The fruit of this variety is larger than that of the Rhars. It attains a size up to 3 inches long, is a vigorous grower and prolific bearer. Some varieties of the date require practically no curing, but dry on the bunch quite fit for use.

The proportion of male palms in commercial groves should be one to a hundred; it is, however, advisable to have one to fifty.

The blooms in spring should produce six to twenty flower clusters; each flower cluster on a female palm produces fruit. A bunch bears from 10 to 40 lb. of dates. Vigorous trees are allowed to carry eight to twelve bunches.

Seedlings are not the best means for propagation, offshoots are preferable, as they withstand more alkali in the soil than seedlings. Also, the date does not always reproduce true to type from seed.

Offshoots should be set out where they are from three to six years old, not earlier. These should be planted in the early summer when the soil is warm, and be kept moist continually during their first season.

In soils where a considerable quantity of alkali is present and rises to the surface, young palms do not thrive well. Assistance may be given them by enclosing the spot where each one is planted with a wall of sand; into this the fresh water should be put, and the surface covered a foot deep with grass or straw, so as to prevent evaporation and rise of alkali.

Plants should be set out 26 to 33 feet apart, giving sixty trees to the acre. The land between the young trees may be cultivated, and crops taken from it, during the first ten years of the trees' life.

Offshoots, under proper conditions, usually produce fruit in their fourth year, and should be in full bearing in their eighth or tenth year. Palms continue bearing up to 100 or more years of age. A good tree will produce from 60 to 200 lb. of fruit per annum.

For pollination, one twig of male blossoms extracted from a cluster should be inserted into a bunch of female flowers and tied thereto; this will be sufficient to pollinate the whole bunch. Pollen may be preserved in a cool, dry place, and it will remain active for fully twelve months. (From the *Agricultural Journal of the Union of South Africa*, Vol. 1, p. 678.)

REPORT ON LIMES FROM ST. LUCIA.

The following report on a case of limes sent to England from Choc estate, St. Lucia, has been kindly furnished by Mr. A. E. Aspinall, Secretary of the West India Committee, at the special request of the St. Lucia Agricultural Department, on the behalf of which it has been forwarded by Mr. A. J. Brooks, Assistant Agricultural Superintendent.

These limes show a marked improvement on any from St. Lucia which I have yet seen, and though it would be too much to say that they are collectively as fine as any shipped from the neighbouring lime-producing colony, many of the individual limes are fully equal in appearance to the finest shipped from Dominica.

The case was unsatisfactory, being made of slats of uneven thickness, and the box had suffered somewhat in transit.

The trial shipment is particularly interesting in view of the fact that the fruit arrived here during a spell of tropical weather, the thermometer ranging from 76° to 88° in the shade, and owing to the delay in the arrival of the Mail, was for some reason or other not delivered with the usual rapidity from Southampton, the case not being opened in consequence until four days after the arrival of the Mail. In spite of this, many of the limes are still green, which indicates that they might have been kept even longer before shipment. The public here do not understand green limes, although West Indians know that they are preferable to yellow ones, which are in greatest demand on the London market.

There was some inequality in the size of the fruit, and consequently the limes were not packed sufficiently closely together, but the average size was larger than that of recent shipments from Dominica. There was not a bad fruit in the whole case. The brown paper used in packing left nothing to be desired.

The fruit is full of juice, but the aroma is not so strong as that of Dominica limes. I notice, however, that the aroma of the yellow limes is stronger than that of the green.

I would advise the packing of this fruit in square boxes, size one foot square, to hold approximately 220 limes, or in double cases, with a division in the middle, which could easily be sawn in two. Such cases in reasonable quantities should have a steady sale in London at prices ranging from 3*s.* to 4*s.* 6*d.*, delivered at Nine Elms Station, London. The London market is very uncertain, and would require very careful watching until limes are as well known by the English public as they are in America.

TRIALS WITH GREEN DRESSINGS IN ST. KITTS.

On pages 245 and 284 of this volume of the *Agricultural News,* information was given concerning trials that have been conducted recently in St. Lucia with certain green dressing plants. The last number of the *Agricultural News* (p. 277) presented an account of similar experiments made in Dominica. Since this was received, a report on green dressing experiments of a like nature has been supplied by Mr F. R. Shepherd, Agricultural Superintendent, St. Kitts-Nevis. In forwarding this, Mr. Shepherd states that the results obtained in St. Kitts, at the La Guérite Experiment Station, are almost identical with those reported from St. Lucia. The details of the report are as follows:—

TEPHROSIA CANDIDA. This was planted on November 14, at distances 2 feet square, and at first grew slowly, but later on the plants developed into fine, large bushes, covering the land thoroughly and keeping down all grass and weeds. At the present time the plants are from 5 to 6 feet high, with laterals from 3 to 4 feet, and as yet show no signs of flowering. On examination, a few nodules were found on the lateral roots.

These plants have been growing during the last few months under very dry conditions, and do not appear to be suffering in any way. I was surprised to find, only a few weeks ago, that the plant is growing wild here, as I found in a garden quite near the Station, a number of specimens growing most luxuriantly; I am informed that it also grows on the mountain lands.

As soon as seed is obtainable, further trials will be made with this plant, as from what can be gathered from this experiment, it should prove a valuable crop for green dressings.

TEPHROSIA PURPUREA. A small quantity of seed was received from the Commissioner of Agriculture, for trial, and also a little soil in which the plant had previously grown. This was mixed with the seed, and sown in a plot, in March.

Germination was very slow and irregular; but later on most of the seed sprouted, and in about three months the plants began to flower, when about 2 feet high. They are now bearing seed, which is being collected for further trial. As a green dressing, they are not to be compared for foliage, etc., with *Tephrosia candida.*

CYAMOPSIS PSORALOIDES. Seeds of this plant were received from the Commissioner of Agriculture in April, and sown at the Experiment Station on May 11. They germinated well, and have produced plants from 2 feet to 3 feet high, with distinct characters; some have bushy laterals about 2 feet long and others are erect, without any laterals. They are at present covered with seed, which is produced in small, straight pods growing in clusters from the stem.

The plants are very succulent and should be useful as a green dressing. No nodules have so far been observed on the roots. Further trials on a larger scale will be made with this plant.

One of the matters of chief interest in relation to the experiments in the three islands named is that *Tephrosia candida* has shown itself likely in every case to constitute a valuable plant when employed as a green dressing.

THE CONSTITUTION OF YOUNG CASTILLOA PLANTS.

Interesting experiments have been undertaken recently, in Malaya, for the purpose of ascertaining the manurial requirements of Para rubber plants. These have been followed at the Jardin Colonial, Nogent-sur-Marne, by similar experiments in relation to *Castilloa elastica.* The results of the latter work are presented in *L'Agriculture Pratique des Pays Chauds* for June 1911, from which the following information is taken.

The work was done with plants of *Castilloa elastica* one year old, and the method employed was to determine their mineral composition in order to obtain some indication as to a rational course of manuring for such plants. It is pointed out that the composition of the young plant is probably not identical with that of the matured tree; nevertheless the analysis of it is likely to give indications of the composition of the ash of the adult plant. Again, it should be useful to know what is to be found in the ash of young plants, in order that they may receive adequate manuring for the purpose of accelerating their growth and giving them the vigour by which they may be able to withstand the attacks of pests and diseases.

The following information concerning the composition of young Castilloa trees is taken from a table given in the article. The selected details are, in percentages :—

	Ash.	Dry Material.	Green Material.
Water	0·00	0·00	82·67
Nitrogen	0·00	2·57	0·445
Ash	100·00	13·65	2·365
Sulphuric Acid	6·07	30·8	0·114
Phosphoric Acid	3·84	0·52	0·09
Lime	23·21	3·11	0·539
Potash	8·84	1·21	0·210
Soda	8·30	1·13	0·196

A scheme of manuring based on this table is drawn up, and attention is directed to the fact that the chief bodies that appear to be required by the plant are nitrogen, lime and potash.

It is intended to conduct manurial experiments, based on information of this nature, at the Jardin Colonial, and the suggestion is made that similar trials should be made on estates.

It is stated, for general information, that Mr. C. R. Kennaway, of La Perle estate, St. Lucia, has for sale a purebred Jersey bull, born (from imported Jersey stock) in 1906, and imported into St. Lucia, from England, in 1907.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date August 28, with reference to the sales of West Indian Sea Island cotton :—

Owing to the labour troubles in Lancashire, no business has been reported in West Indian Sea Island cotton during the last fortnight.

Sea Island crop accounts from America are generally favourable.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending August 19, is as follows:—

Another week has passed without any demand, and the unsold stock is still practically held off the market. We renew our last quotations which are nominal.

We quote, viz :

Fully Fine at 28c. = $15\frac{3}{4}d.$ c.i.f. & 5 per cent.
Fine 26c. = $14\frac{3}{4}d.$,, ,, ,, ,,
Stains and Off Grades 20c. to 24c. = $11\frac{1}{2}d.$ to $13\frac{1}{2}d.$ c.i.f. & 5 per cent.

TRIALS OF COTTON VARIETIES IN INDIA.

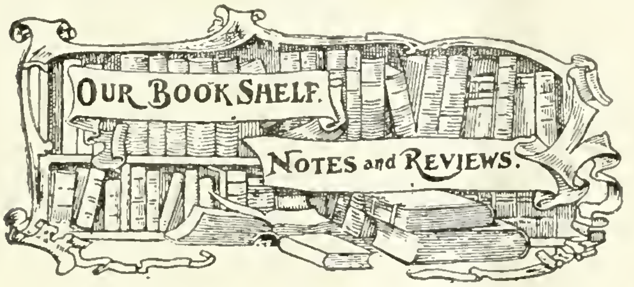
The *Report on the Progress of Agriculture in India* for 1909-10 shows that trials of exotic varieties of cotton have been continued in that country, on Government Farms and in the fields of cultivators. In regard to Egyptian cotton, cultivation is being encouraged by the Government of Bombay, by the regular supply of irrigation water at the time of sowing, and by the granting of a rebate of one rupee of land revenue on every acre planted in this cotton. It is stated that the success of attempts to grow Egyptian cotton in India will depend upon proper cultivation and the sowing of the seed of the right kind; the avoidance of barren ground and if possible the making of a rotation with bersim (*Trifolium alexandrinum*); and the provision for the proper preparation and disposal of cotton lint.

Fairly extensive experiments have shown that the production is possible, under ordinary circumstances, of a good class of American cotton, in Sind; this is because it possesses a shorter growing period than the native cotton (Sindhi) and can therefore be sown on inundation canals; thus opening a very large area on which it can be grown. Recent experimental trials have given yields of 825 to 900 lb. per acre of seed-cotton, and the reports on the lint from Liverpool were favourable. It is recognized, however, that the provision of buying agencies is necessary to its successful introduction.

A large adaptability to varying conditions in India has been shown by a form of Upland Georgian received from Cochin-China and described generally under the name Cambodia. This can be used for spinning higher counts of yarn than any of the native Madras cottons, and it also gives very heavy yields, under suitable cultivation. At Dharwar, two years' trials have afforded a yield of about 500 lb. of seed-cotton per acre, showing the high ginning percentage of 39; good results have been obtained under a rainfall of only about 25 inches. Another type of Upland Georgian is described under the name of Buri; this is more particularly suited to districts of heavy rainfall, and has been raised very successfully. In the Punjab, Dharwar American is being largely sown but is not continuing to oust the Deshi variety, as the latter proved profitable in 1909. In Burmah, trials are being made for the purpose of introducing a suitable cotton, and there have been numerous private demands for Sea Island cotton seed.

The experience with tree cottons in India has been in accordance with what was stated in an article having reference to the subject, in the last number of the *Agricultural News* (page 278), and the position is summed up shortly in the Report by saying that experiments with tree cottons have resulted in failure. Efforts to introduce the Bourbon cotton into the Bombay and Madras Presidencies were disappointing, though in one district, in Burmah, recent trials are indicating success with Pernambuco tree cotton. As in the case of the Bourbon cotton, trials with Brazilian, Rough Peruvian and a few others have failed completely. Finally, in regard to this matter, the chief objection to the introduction of tree cottons as field crops, as mentioned by Mr. Gammie, Imperial Cotton Specialist, are quoted, namely: (1) the urgent water requirements of such cottons, in their early stages; (2) the great probability of no yield in the first year; (3) the risk of damage by wounds; (4) the increased danger from insect pests, as these are harboured and carried over from year to year; (5) the imperfect opening of the boll, which is usually accompanied by damaged cotton; and (6) the inferior yield throughout, as compared with that of native varieties, or a fairly large return in the first year, followed by steadily diminishing annual yields.

A report shows that, owing to heavy rainfall during last month, a certain amount of damage was done in St. Vincent to cotton cultivations in different parts of the island, and planters have found it difficult to keep the fields clear of weeds.



THE PHYSIOLOGY AND DISEASES OF HEVEA BRASILIENSIS, by T. Petch,. B.Sc., B.A., Mycologist to the Government of Ceylon. *London, Dulau and Co., Ltd.*, 7*s.* 6*d.* net.

This book must be regarded as a most valuable addition to the literature dealing with the Para rubber tree (*Hevea brasiliensis*). It is evident from the simple though scientifically accurate method in which the subject matter is treated that it is primarily intended for the planter, but the careful descriptions of the diseases, accompanied as they are throughout by the scientific diagnoses of the fungi causing them, are of no less value to the plant pathologist. The sections treating of the fundamental facts of plant anatomy and physiology which underly all systems of tapping, and that part dealing with the effect of different systems on the tree may well receive the careful attention of all owners of estates, whether private individuals or directors of companies. Finally, the careful critical method followed by the author in considering all the experiments which he quotes to illustrate his points, as well as the principles contained in the chapter entitled The Art of Experiment, should serve as a guide to all engaged in the conduct of agricultural research experiments in the tropics.

The style of the book is simple, lucid and definite; the treatment of the subject matter is excellent. There is a marked freedom from any casual or inaccurate employment of scientific terms, while a clear-sighted and critical attitude is maintained throughout, which leads to the rejection and overthrow of many prevalent but inaccurate beliefs, having no sound basis in scientific observation, often contrary to all known botanical facts and, generally, belonging to the category of popular natural history. Such beliefs are not merely passed over summarily, the reasons for their dismissal are given, and this treatment of them serves as a good model of the way in which published scientific statements should be criticized by the reader; a further illustration of this is provided by the author's discussion of the experiments considered in the text.

The book is really constructed in two parts. The first deals with the general structure and physiology of the plant and outlines their significance in the consideration of problems relating to tapping and to the general health of the tree. This matter is contained in seven chapters whose titles are as follows: I, The Structure of Hevea; II, Latex and Rubber; III, The Strength of Plantation Rubber; IV, Physiological Considerations; V, Tapping Systems and their Effect on the the Tree; VI, Tapping Experiments and Their Teachings; VII, The Art of Experiment.

The subject matter in these chapters is interesting throughout. The description given in Chapter I, though clear and easily understood, might perhaps have been illustrated by a few simple diagrams. The phenomenon, usually known as 'wound response', is frequently attributed to a vital stimulus of irritation produced by wounding. The author, however, after drawing attention to the lower percentage of rubber contained in the latex obtained at such consecutive tappings, puts forward another view. According to this, the phenomenon is due to the combined effects of gravity and the infiltration of water into the latex tubes. The removal of the latex on the first day permits of the infiltration of water into the tubes. This water lessens the viscosity of the latex, and the flow obtained on the second day is consequently greater, while the percentage of rubber obtained from it is lowered. Thus the phenomenon is controlled by the factors to which the increased flow of latex in wet weather must also be attributed.

Many other practical points of interest are discussed in this portion of the book, such as the amount of damage inflicted upon trees by various tapping systems, the effects of different instruments for tapping on the nature of the renewed bark, and many others, but, unfortunately, space does not permit of their consideration here.

The second half of the book deals with specific diseases and malformations. It is divided as follows: General Sanitation, Leaf Diseases, Root Diseases, Stem Diseases, Abnormalities in Hevea, Prepared Rubber, Other Fungi on Hevea

In considering the question of protective belts, under the heading General Sanitation, the author points out the difficulty of obtaining any suitable crop for their formation, and thinks that, in consequence, they must consist of useless forest trees. But it seems that certain useful timber trees might be employed for the purpose, especially in districts with good means of communication. The final conclusion reached does, however, seem true, namely, that the employment of such belts of forest is only practicable when a district is being opened up, and that protective belts are out of the question in most countries. Several other important points receive attention in this chapter, such as the Removal of Stumps, Pruning, Planting Distances and Cover Crops. Finally, the evidence on the matter of the internal application of fungicides is summarized, and the conclusion is reached that at present such treatment cannot be recommended.

The leaf diseases mentioned are none of them considered to be of any great importance, and only the principal ones are given in Chapter IX; the other fungi found on the leaves of this plant are recorded in Chapter XIV. The root diseases are three in number. The first is due to *Fomes semitostus*, Berk.; this is a well known disease, but the author points out that the name of the fungus should probably be *Fomes Auberianus*. The second is the brown root disease due to *Hymenochaete noxia*, Berk., and the third is caused by *Sphaerostilbe repens*, B. and Br. All of them commence their attacks, in the majority of instances, from decaying jungle stumps.

The stem diseases are canker, due to *Phytophthora Faberi*, Maubl., which also causes canker of cacao; pink disease due to *Corticiums salmonicolor*, B. and Br., formerly known as *Corticium javanicum*, Zimm.; die-back, due to the combined action of *Gloeosporium alborubrum*, Petch, and *Botryodiplodia theobromae*, Pat., which latter is the same as *Thyridaria tarda*, Bancroft (see *Agricultural News*, Vol. X, p. 286); a disease due to *Fusicladium* sp. in Java; a disease of stumps due to *Botryodiplodia theobromae*; a new stem canker not previously described, caused by *Coniothyrium* sp.; and a stem disease of seedlings due to *Pestalozzia palmarum*, Cooke.

The whole of this section is very thorough and brings the information covering the diseases up to date, with the exception of the work very recently published by Bancroft and referred to above. All that is necessary to complete the literature dealing with the pathology of *Hevea brasiliensis* is a similar work treating of its insect pests.

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 of this issue treats of The Health of Plants as Related to Insects. It reviews various ways in which insects damage plants, both directly and indirectly, and points out that the extent of the loss from this damage is not adequately realized.

Page 291 contains an abstract of an interesting article that has appeared recently on the composition of sugar-cane seed. It also presents an article dealing with molasses in connexion with milk production.

Attention is drawn to the report, furnished in England, on a consignment of limes from St. Lucia, which is given on page 292.

An account of trials with green dressings, carried out in St. Kitts, appears on page 293. The reports of similar experiments in other islands have been given in recent numbers of the *Agricultural News.*

The Insect Notes, on page 298, present information concerning an insect recently found to have been introduced into the West Indies.

The Fungus Notes are presented on page 302. They have for their subject some of the latest work of investigation that has been conducted with Bordeaux mixture. This tends to show that when plants are sprayed with this mixture, the secretions of the fungi actually dissolve copper compounds, which are absorbed, and cause the death of the former.

The Influence of Leaves on the Development of Fruit.

Work conducted for the purpose of ascertaining the nature and extent of the influence of leaves on the development of fruit is described in the *Journal de la Société Nationale d'Horticulture de France,* for November 1910, in which the development of fruit on branches of the pear tree deprived of their leaves was compared with the normal growth. Investigation was also made of the constitution of the fruit obtained under the different conditions.

It was found that an effect of depriving the fruiting shoots of leaves was to cause the fruit borne on them to be lighter than ordinary fruit. In regard to the constitution of the former, it was shown that these contain less sugar than fruits on shoots bearing leaves. In addition to this, the juice of the fruit of the former kind contained a higher percentage of acid than that from normal fruit.

British Imperial Council of Commerce.

The Board of Trade Journal for July 6, 1911, contains an account of an inaugural meeting of the British Imperial Council of Commerce, which was held on July 5 at Salters' Hall, St. Swithin's Lane, London, E.C., under the Presidency of Mr. Charles Charleton, Vice-president of the London Chamber of Commerce.

After giving a list of the bodies which were represented at the meeting, the account states that the following resolutions were adopted unanimously:—

(1) That this meeting, representative of the Chambers of Commerce, Boards of Trade, and similar organizations in the British Empire, and of British Chambers of Commerce throughout the world, approves of the formation of an organization, to be known as the 'British Imperial Council of Commerce', on the lines of the scheme contained in a report adopted by the Associated Chambers of Commerce of the United Kingdom in March 1911.

(2) That the existing Congress Organizing Committee, together with its officers, be confirmed under the new title of the 'British Imperial Council of Commerce', and that there be added thereto (a) certain members to be appointed by this meeting, and (b) such further members as the said Council may hereafter determine to co-opt, due regard being had to the adequate representation of the Chambers of Commerce associated with the movement.

(3) That this meeting hereby invites each British Chamber within the Empire and throughout the world to appoint an additional member on the Council.

(4) That this meeting requests the British Imperial Council of Commerce to take such steps to complete its organization as may be necessary, and to appoint committees or to make regulations for its future working, such regulations not being inconsistent with the report adopted by the Associated Chambers of Commerce of the United Kingdom in March, 1911.

St. Kitts and the Canadian National Exhibition.

Information has been received from the Agricultural Superintendent, St. Kitts, that exhibits for the the forthcoming Canadian National Exhibition were forwarded by the S.S. 'Rhodesian', of the Pickford and Black line of steamers, on August 5.

The number of exhibits sent was eighty-two, put up in glass exhibition jars of suitable sizes. They comprised sugars, molasses, rum, cotton and its by-products, meals and starches, and preserves. In addition, there were forwarded bunches of cocoa-nuts, and sugar-cane and palm branches, to be employed for the purposes of decoration.

The Importance of Calcium Cyanamide as a Manure.

Information that has been issued recently, in connexion with calcium cyanamide, or nitrolim, serves to show the growing importance which is possessed by this artificial manure. As is well known, it is quickly becoming more widely used by agricultural companies, planters and farmers.

The increased degree to which nitrolim is being produced furnishes a guide as to the growth of its use by agriculturists. In connexion with this, it is of interest that the manufacture of this useful manure is being carried out to the following extent in the countries named: Norway, France, Switzerland, Canada, Japan and Austria, by one company each; Italy and Germany, by three companies each; making a total of twelve companies, which are individually capable of producing from 3,000 to 12,000 tons per annum.

Besides these existing works, others are in construction for the manufacture of nitrolim in Dalmatia (Austria), and in Bavaria (Germany). The annual output of these will be 4,000 and 12,500 tons, respectively.

Trade and Agriculture of St. Vincent, 1910.

A report on the trade and agriculture of St. Vincent for the year 1910 is given in the *Government Gazette* for July 27, 1911. This commences by showing that the total value of the imports and exports during that year were £97,737 and £101,180, so that the total trade of the Colony for the year was £198,917. In regard to the last, this is a total increase of £22,409 on the total trade of 1909, made up as follows: imports £9,927, exports £12,482.

The exports from St. Vincent in 1910 comprised live animals, food supplies, etc., £50,063; raw material £43,060; manufactured articles £8,057. The similar figures for 1909 were £52,212, £24,760 and £11,725. There have thus been slight decreases under the first and last classes, and a large increase in the value of raw materials exported.

The values of the principal articles of export in 1910 were: Sea Island cotton, £37,237; arrowroot, £30,089; sugar, syrup and molasses, £5,883; live stock, £5,424; cacao, £4,131; cotton seed, £3,684; cotton other than Sea Island, £1,171.

It is interesting to compare the above cotton industry exports with those of 1909, the values of which were as follows: Sea Island cotton £20,684, cotton seed £1,893, cotton other than Sea Island £642.

The imports into St. Vincent from the United Kingdom during the year amounted in value to £43,254; this is greater, by £13,021 than that for 1909. The value of the imports from other British Colonies was £31,688; this is a decrease from that of the previous year by £11,338.

Imports from foreign countries show an increase of £8,243, being actually £22,784 in value; of this increase, £5,165 is accounted for by a larger importation from the United States.

Agriculture and Hygiene in St. Lucia Elementary Schools.

The Annual Report of the Inspector of Schools, St. Lucia, for 1910, contains a report by the Agricultural Superintendent on the teaching of agriculture in the Elementary Schools of that island, during the year. The examination, which is the third to be held, was carried out, under the direction of that Officer, by the Schoolmaster of the Agricultural School, the number of schools dealt with being eighteen.

The number of pupils examined was 441, including fifteen girls. In 1909 the total number was 454, but the average per school for 1910 was greater, being 24·5, as compared with 22·7 for 1909.

In comparison with the results of 1909, nine of the schools have shown improvement, six retained their former position, and three have gained lower marks. The detailed account of the condition of the school gardens, furnished by the examiner, shows that this is generally satisfactory, though there is room for improvement at some of the schools. At present, it appears that amendment is required in the following directions: (1) the employment of the gardens throughout the year; (2) greater attention to the growing of native plants; (3) the giving of larger prominence to the aspect of the work having relation to nature study. Notwithstanding these matters, the efforts of the past three years have given encouraging results, and at the present time each school possesses a useful outfit of garden tools, chosen under the recommendation of the Agricultural Superintendent.

The same account contains a special report by the Inspector of Schools on the teaching of hygiene in these schools during the year. This shows that the subject has been taught during 1910 in every school, from Standard II upwards, in the Colony. Success is being obtained, and attention is drawn to the fact that for this to continue the subject matter must be confined to the general rules of tropical hygiene, with as much explanation as is required to make the learning of them intelligent, and to create a healthy interest in them.

INSECT NOTES.

AN INSECT NEW TO THE WEST INDIES.

According to information contained in a paper entitled A Report on a Recent Addition to the Insect Fauna of the West Indies, by Dr. A. Fredholm, which appeared in the *Proceedings of the Agricultural Society of Trinidad and Tobago*, an insect has been discovered in St. Croix and in Trinidad which may prove to be a troublesome pest, if it becomes established and spreads to other islands.

The insect referred to is *Bartocera rubus*, Linn., and the account of its occurrence given herewith is taken from the paper referred to above.

Bartocera rubus is a large beetle of the Longicorn group, commonly called the long-horned borers. It varies in size, the body being from 29-55 mm. (1¼ to 2⅓ inches) in length, and about one-third as wide as long. The antennae are slender, and much longer than the body, and the legs also are long and slender.

In colour, this insect is dark-brown on the dorsal surface, marked with reddish or yellowish spots, the scutellum being white. The under surface is covered with a fine, greyish-yellowish pubescence, with a wide, white stripe on each side.

The insect is a native of Asia and Eastern Africa, where, with other species of the genus, it is of fairly common occurrence. There are, of course, many long-horned borers which are native to the West Indies and other parts of tropical countries, but this genus is not a native, and occurs only as an introduced form.

The specimens from St. Croix were forwarded by the Secretary of the Agricultural and Commercial Society of Trinidad and Tobago, to Washington, where the identification was made by experts of the Bureau of Entomology.

Mr. August Busck, an agent of the Bureau of Entomology of the United States Department of Agriculture, who visited the West Indies in 1906, obtained two specimens of *Bartocera rubus*, but as all the recorded species were at that time known from Oriental regions, the data supplied to Mr. Busck were doubted at Washington.

Bartocera rubus has apparently existed in St. Croix for some three years, but the manner of its introduction is unknown. The larva is a borer in the wood of living trees. In the East it is known to attack trees of several natural orders, generally those the wood of which is rather soft.

Mr Petersen, who found this insect in St. Croix, states that he knows it to attack avocado pear, mango, and rubber (*Ficus elastica*) trees, and also a tree from which fishermen make floats for their seines. In Trinidad this tree is known as 'bois flot', and the botanical name given for it is *Ochroma Lagopus*, Sw.; in other parts of the West Indies, it is called 'bombast mahoe', or 'down tree'.

In Ceylon, the insect was in 1870, a very serious pest of cocoa nuts, killing large numbers of young trees. Other trees which would probably suffer if Bartocera should become established in the West Indies are the silk cotton tree, trumpet tree (*Cecropia peltata*), many species of Ficus, the hog plum (*Spondias lutea*) and related species, the bread-fruit, and jack-fruit, and the Central American rubber (*Castilloa elastica*).

Introduced pests are almost certain to become more serious in their effects in new localities than in those where they have been long established, since their natural enemies are not generally introduced with them, and those of similar insects do not at once recognize the new forms as their prey.

In view of these facts, planters throughout the West Indies should keep a careful look-out for large grubs boring in the trunks of trees, either those which are living or those recently dead, and when such grubs are found, steps should be taken to rear the adult insect in order that it may be identified, and in the event of *Bartocera rubus* being found, energetic measures should be adopted for its eradication.

FORESTRY IN HAWAII.

A note on the forest policy that is being adopted in Hawaii was given in the *Agricultural News*, Vol. IX, p. 87. The following additional information in regard to the same matter is taken from the Report of the Superintendent of Forestry, Hawaii, for 1910:—

Forestry in Hawaii is a matter which concerns both private interests and the Government. Each manager of a corporation owning or controlling land should look to it that his forests are well cared for, and that waste or other land, that cannot be utilized more intensively, is planted with trees. And the people, as a whole, through their representatives in the Legislature, should make adequate provision for the proper care and development of the forest areas belonging to them, but managed for them by the officers of their government—the forests on government land.

Specifically, as regards the government forests of Hawaii, provision should be made by adequate appropriations for five main branches of forest work:—

(1) For the proper maintenance and protection of the existing native forests—through the fencing of forest reserve boundaries, the care of the forests and their protection from trespass by forest rangers, and a special fund, to be used only in case of need, for fighting forest fires.

(2) For the planting of open places in forest reserves, and of other government lands, where the growing of a forest is the best use to which the land can be put.

(3) For the extension and better equipment of the system of sub-nurseries and local distributing points for the giving away of trees.

(4) For the introduction and experimental planting of economically desirable trees and shrubs new to the territory.

(5) For the general administrative and routine expenses of the Division of Forestry in carrying out these several branches of work, and in its more strictly technical investigations, such as the work being done in connexion with the herbarium; it being understood that the allotment for this last section should be sufficient to include provision for the publication of results.

A report received from the Agricultural Superintendent, St. Lucia, show that the planting of limes is continuing in the island, and that there are indications that the cultivation will be taken up by peasant holders as soon as they are certain of being able to dispose of their crops to the larger producers.

MATERIALS FOR PAPER-MAKING.

The following is adapted from the conclusions reached in an article entitled The Utilization of Crop Plants in Paper-making, which appears in the *Yearbook* of the United States Department of Agriculture for 1910:—

There are numerous crop materials now going to waste that deserve utilization for the making of paper. Hitherto, the price of wood has been so low that they could not enter into competition with it. This condition appears to be changing, and a point may soon be reached where crop by-products can be made into pulp and paper at a profit to both the farmer and the manufacturer. There does not seem to be any reasonable hope at the present time of producing paper stock from crop wastes that will be cheap enough to use for printing newspapers. This is due chiefly to two causes—the low cost at which such paper can be produced from ground wood, and the striking adaptability of ground wood pulp to the newspaper-printing industry.

Not only is the grinding process the cheapest method of obtaining print paper of any character, but it also produces the highest proportion of pulp to raw material. While the chief chemical processes produce on an average only about 1,000 lb. of pulp per cord of wood, the yield of ground wood pulp per cord is considerably over 2,000 lb. Although lacking in durability, ground wood fibre, with the addition of a small proportion of stronger and better chemical fibres, answers its intended purpose admirably. It is light, reducing freight cost on the unprinted paper and postage on the printed. It is opaque, printing readily on both sides of moderately thin sheets, and, finally, it has excellent ink-absorbing qualities, fitting it unusually well for use on the high-speed presses of the present day.

Wood will probably be used for making news paper long after other materials have acquired importance in many branches of the chemical pulp industry. It should be added that chemical pulp papers, such as books and magazines are printed upon, consume over 1,000,000 cords more wood each year than that consumed by the ground-wood industry.

There is some scepticism as to the failure of the pulp-wood supplies, but this is certainly poorly grounded. During 1909 the quantity of spruce used in the United States was less by 40,000 cords than in 1907, but the cost was $2,000,000 greater. Present efforts in connexion with the reafforestation of spruce and poplar are not extensive enough to produce any noteworthy effect upon the available supply within a generation. At the present rate of increase in consumption, it will require between 15,000,000 and 20,000,000 cords of wood to satisfy the demand for pulp and paper fibre in 1950. It will certainly be impossible to furnish this from the forests. If every acre cut over each year were reafforested it would be twenty-five or thirty years, or possibly even longer, before the trees could attain sufficient size to warrant cutting. The forests cannot recover from the overdrafts continually being made upon them; hence it is only a question of a limited number of years until paper fibre must be grown as a crop, as are practically all other plant materials entering into the economy of man. While the conservation of only a few of the by-products of the farms yielding paper fibre can be accomplished profitably in the near future and only a few plants promise to be money-makers immediately if grown solely for paper production, it seems very probable that raw products now scarcely considered may in a few years play an important part in the paper and pulp industry.

THE TONKIN RUBBER TREE.

This rubber-producing plant, which is of special interest because its natural habitat is between the tropical and temperate zones, has received attention in the *Agricultural News*, Vols. VIII, p. 377; and IX, p. 165. Further information concerning it is available in the *India-Rubber World* for August 1, 1911, which presents an abstract of an article in the *Bulletin Economique* of the Government of Indo-China.

In regard to the coagulation of the latex from the Tonkin rubber tree (*Bleekrodea tonkinensis*), sulphuric acid has given the best results so far, being better for the purpose than acetic acid, which appears to act on the globules of the rubber in such a way as to prevent their cohesion, while hydrochloric acid is not suitable owing to its reduction of the elasticity of the rubber obtained.

Samples of the rubber have been submitted to commercial experts for valuation. One, which had been treated with ether and freed from all foreign substances, was valued at 72 to 75c. per lb. The other sample was of native origin, the latex having been gathered without care and coagulated without using acid, so that the rubber contained a large quantity of impurities; this was valued at 49½c. per lb. Both of these valuations were made at the time when Para was quoted at less than $1·00.

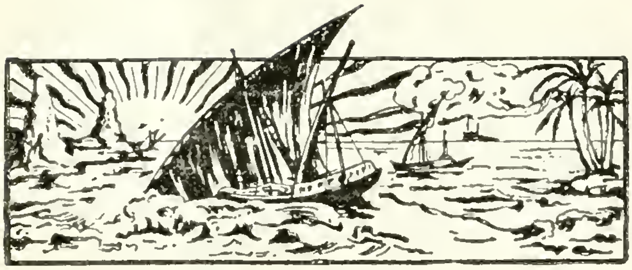
An estimate of the value of the rubber well treated and well prepared, with Para at about $2·25 per lb. (the price current at the time when the article was written), gives this at $1·62 to $1·80 per lb.

TRADE AND COMMERCE OF THE CANARY ISLANDS, 1910.

Diplomatic and Consular Reports, No. 4658 Annual Series, shows that the export of bananas from the Canaries during 1910 was 2,700,352 crates, as compared with 2,782,299 in the previous year. Of the other agricultural exports, the amounts in the case of tomatoes and potatoes were 1,013,806 bundles and 384,703 boxes; in 1909, the similar figures were 739,174 and 399,203, respectively.

In commenting on these matters, the report states that the scarcity and resulting dearness of other fruits have had the effect of increasing the demand for bananas in Italy, France and Germany, so that a regular trade has been established and is likely to grow in importance. The rapid increase in this demand has caused the competition among the buyers in the islands to become very keen, and contracts for fruit have been made at relatively high prices. Growers have also been able to dispose of their produce at advanced rates because of the shortage during the early part of the winter, which caused sellers to find difficulty in executing their contracts and thus compelled them to give high prices. The industry has been most successful for growers and proprietors, and enhanced prices are being obtained for land.

The matter is different in the case of tomatoes, and up to May, in 1910, most of the shippers suffered severe losses; this was also the case at the beginning of the season 1909-10, but later prospects are more hopeful. Among the causes of the untoward conditions have been the poor quality of the fruit and the lack of demand in England and on the continent. In the latter case, the inquiry is increasing on the whole, but the considerable fluctuations in price make shippers chary of sending large or regular quantities. As regards the potato-growing industry, the trade is becoming less important year by year.



GLEANINGS.

The Board of Trade Journal for July 20, 1911, states that the Monthly Report of the Sudan Central Economic Board gives the total export of cotton up to the end of May from Tokar (Red Sea Province) as about 6,680 tons. At the time of reporting there remained about 90 tons to come in.

It is reported by H.M. Minister at La Paz, Bolivia, that the production of rubber in that State, in 1910, amounted to 3,061 tons. The greater part of this rubber was shipped by way of the Amazon River. The statistics show that, of the amount exported, the United Kingdom took 1,274 tons, Brazil 810 tons and Germany 565 tons.

It is stated that trials are being made by the Bombay Department of Agriculture, on the Dharwar Farm, of a new method of harvesting ground nuts. In this, the stalks of the plants are first cut, and the nuts are then removed from the soil with a heavy harrow. This should reduce the expense of harvesting the nuts, and in consequence, cause the cultivation to be taken up on a larger scale.

A preliminary statement issued by the Chamber of Agriculture of Mauritius shows that the production of sugar in this island in 1910-11 was 218,786 tons, as compared with 229,631 tons in 1909-10, and 192,401 tons in 1908-9. The total weight of cane bought by factories, or ground for different planters, during the last crop, was 813,384 tons, as compared with 897,425 tons in that of 1909-10.

The principal agricultural articles for export from French West Africa in 1909 were as follows: ground nuts, 228,000 tons value £1,772,240; rubber, 4,318 tons value £1,273,480; palm nuts, 43,369 tons value £410,560; palm oil, 21,437 tons value £373,760; gum arabic, 3,459 tons value £68,240; maize, 9,335 tons value £28,000; gum copal, 150 tons value £11,960. The exports also included 152 tons of cotton worth £5,800.

Reference has been made from time to time in the *Agricultural News* to the occurrence of prussic acid in sorghum (*Agricultural News*, Vols. I, p. 70; IX, p. 275; X, p. 123). Work carried on in recent years at the Nebraska Agricultural Experiment Station has confirmed the existence of prussic acid in the stalks of sorghum. In another, similar investigation with corn, no trace of prussic acid was found, no matter at what stage the plants were examined.

At a meeting of the British Cotton Growing Association, held on August 1, 1911, it was reported that the total purchases of cotton in Lagos, from the beginning of the present year, amount to 5,129 bales as compared with 5,228 bales and 11,166 bales for the same period in 1910 and 1909, respectively. It is estimated by Sir Walter Egerton, the Governor of Southern Nigeria, that the Lagos cotton crop during the coming season may amount to 15,000 bales.

An abstract in the *Bulletin of the Bureau of Agricultural Intelligence and of Plant Diseases* for January 1911 states that good rubber has been obtained from *Euphorbia Tirucalli*—a plant mentioned in the *Agricultural News*, Vol. IX, p. 232. It is stated that a pound of rubber may be obtained from $3\frac{1}{2}$ pints of the latex, and that a plant six years old will yield over 5 lb. In East Africa, the plant exists in thickets, near the rivers, containing 300 to 400 trees.

The production of cotton is the most important industry of the State of Texas, from 20 to 30 per cent. of the entire cotton crop of the United States being grown in that State. There were only four cotton mills in Texas in 1899; there are now seventeen, of which number fifteen are in active operation. These fifteen mills have an aggregate capitalization of £464,375, are equipped with 2,508 looms, and 112,336 spindles, and consume an average of 40,000 bales of cotton a year. (The *Textile Mercury*, July 29, 1911.)

The *Journal of the Royal Society of Arts* for July 28, 1911. draws attention to the scarcity of cinnamon in Ceylon, which is being brought about by the substitution of rubber or cocoa-nuts for the plant. The deficiency is being made good in the European market by the offer of Cassia bark, from China, in its place. It is stated that this bark possesses a stronger and somewhat coarser flavour than cinnamon, and is gaining appreciation. It is estimated roughly that the area of cinnamon cultivated in Ceylon is 45,000 acres.

Information received concerning agricultural conditions in St. Kitts during August 1911, shows that the reaping of the old cane crop was still being carried on, in the case of a few estates. Both the new cane and the cotton in the northern districts of the island were healthy, and making good progress, but in the Valley District, near Basseterre, these crops were being affected by the prolonged drought. As has been indicated before, the picking of early planted cotton has been carried on for some time, and fair returns are being obtained.

In the *West Indian Bulletin*, Vol. XI, p. 207, an abstract is given of a paper describing the sugar industry of Negros in the Philippine Islands, in which it was shown that at the time of writing, the methods of sugar production were antiquated throughout the island. In connexion with this it is of further interest that, according to the *Louisiana Planter* for July 22, 1911, a large central factory, having a mill with a daily capacity of 1,000 tons, is being put up at San Carlos, in the middle of the sugar country of that island. It was intended at first to introduce a 600-ton mill, but the number of contracts signed for the provision and grinding of cane necessitated the acquisition of the larger one.

STUDENTS' CORNER.

SEPTEMBER.

SECOND PERIOD.

Seasonal Notes.

The gathering of the lime crop affords an opportunity for making observations on the relation between the yields that have been obtained and the manures used. For purposes of comparison, the conducting of these should only be done in relation to plants which are similarly situated and in a state of good health. It is probable that, while such work is being carried out, indications will be obtained as to the effects of different kinds of manure in relation to insect attacks, particularly invasions of scale insects. The results of all such observations should be employed for the purpose of outlining a scheme for manurial experimentation for the coming season.

Those who work on lime estates should ascertain the acidity of the raw lime juice, in grains per ounce, and in ounces per gallon; the way in which this is to be done may be explained by the Agricultural Officers. Note that the acidity of concentrated lime juice is always expressed in ounces per gallon. The best concentration is considered to correspond with 95 to 105 ounces per gallon. Why is the concentration not carried much further? In preparing the best qualities of such juice, it is filtered after concentration, and this is done most successfully and quickly while it is still warm.

In connexion with the attacks of scale insects on limes, careful observations should be made for the purpose of discovering, and gaining a knowledge of, the fungus parasites which assist in keeping these in check. Where the attacks of the insect are serious, branches containing parasitized scales are often placed in the affected tree, and the process has been been unfortunately referred to as 'inoculation'. Discuss the advisability of the employment or otherwise of this word in the special connexion.

In cotton fields, a careful lookout should be kept for pests, particularly for the leaf-blister mite, whose initial attacks may be easily overlooked, so that time is given for a serious spread before its discovery. What treatment should be adopted when the presence of leaf-blister mite is ascertained in the fields? In what way does this pest interfere with the life-activities of the plant, and how is it spread?

Where onions are grown, careful observation should be made on the way in which the seed is planted and the young plants are transplanted into the field. A useful investigation is to make an experiment to find if there is any advantage in transplanting instead of sowing directly in the fields. What precautions may be taken in order to prevent the seed from being carried away by ants, and why should the soil in the seed boxes or nursery beds be as free as possible from the seeds of weeds? Give an account of the procedure in connexion with the growing of a crop of onions and the preparation and packing of the produce for export.

Discuss the respective merits of such plants as you have seen grown for the provision of green dressings, including in the discussion the time taken by the plants to reach maturity, the insect pests by which each kind is attacked, and the best means for controlling these pests. It is a useful matter to consult the reports of trials with green dressing plants in other islands, with a view to the introduction of such among them as may appear to be best suited to the conditions under which they are required to grow. Under what circumstances is the application of green dressings to soil likely to be most successful, and in what cases may actual damage result from such application?

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) Give a brief account of the life-history of three plants that are raised from cuttings.

(2) In what ways does the provision of good drainage benefit the soil?

(3) Why are plants propagated by grafting?

INTERMEDIATE QUESTIONS.

(1) What is the nature of the losses sustained by soil through the removal of water by drainage?

(2) Describe, with the aid of drawings, the development of any plant that you have raised from a cutting.

(3) What special care would you give to a newly grafted plant?

FINAL QUESTIONS.

(1) Describe those parts of a stem of a plant that are of the greatest importance in enabling it to be raised by vegetative means.

(2) Of what advantage is uniformity in estate produce, and in what ways may such uniformity be obtained, under conditions with which you are familiar?

(3) Describe a system of draining the land, for any crop with which you have had experience.

EXPERIMENTS IN THE EXTRACTION OF MANIHOT GLAZIOVII LATEX.

Two experiments of this kind have been made recently at Kalamu, near Boma, in the Lower Congo, with trees, in the first case, growing in a sandy hollow. The results, which are given in the *Bulletin Agricole du Congo Belge*, for June 1911, p. 359, show that in the first experiment made in the dry season, employing 129 trees, the yield of latex was 12·9 gallons, equivalent to 32·7 ℔. of dry rubber; the renewals of the tapping were made during twenty-nine days. It was noticed that, during this trial, the latex was much thicker and richer in rubber than in the one to be described. A circumstance rarely observed in regard to Manihot was noticed, namely a decided increase in the yield of latex after the first four renewals of the tapping; toward the end of the trial a gradual diminution occurred in the quantity collected daily. A former experiment, made on the same trees during the rainy season, gave a yield of 14·6 gallons of latex, or 28·3 ℔. of dry rubber.

The second trial was made in the dry season, employing 242 trees, situated on a plateau possessing a clay soil with pebbles. The tapping, repeated for ten days, gave 27·6 ℔. of dry rubber.

In the two experiments, the latex was coagulated to form sheet rubber by the employment of 3 per cent. of its volume of 'formol'. The rubber was kept for a quarter of an hour in water at 80° C., then passed through the press and well washed with water. The report of the experts to which the samples were submitted showed that the rubber had exactly the same appearance as that shown by Hevea rubber from the Far East. It was valued at 2*s.* 5*d.* per ℔., with Para at 5*s.* 10*d.*

The wounds from tapping healed normally in the case of most of the trees. With some, however, the bark dried up, and cracks were produced in it, the wounds thus formed being attacked by insects.

FUNGUS NOTES.

RECENT WORK ON BORDEAUX MIXTURE.

In considering the poisonous action of copper salts on plant organisms when they are used in the form of sprays, it must be borne in mind that no substance in the solid form is capable of penetrating the walls by which the living protoplasm of practically all plants is protected, and that, consequently, in order to bring about the death of the organism, the copper salt must be soluble in water. Such a soluble salt is copper sulphate, or blue stone, and it might at first seem that the application of a solution of this substance to diseased plants would be all that is required to kill the fungi causing the disease. This course has several drawbacks. In the first place, it is often found that such a solution, when strong enough to kill the fungi, damages the host plant as well; secondly, it is easily washed off by rain.

In order, therefore, to diminish its harmful effect on the host plant, and at the same time to increase its adhesiveness, it is mixed, in the preparation of Bordeaux mixture, with lime-water, or water containing slaked lime partly in solution and partly in suspension. As a result of this mixing, an insoluble compound of copper is formed, which may often be mixed with excess of lime. The Bordeaux mixture must contain no copper in the form of the soluble sulphate, if injury to the leaves of the sprayed plant is to be avoided. Consequently, enough lime is always added to turn all the copper into the solid form. The liquid containing the insoluble copper precipitate suspended in the form of fine particles is then sprayed on the plant, and covers the parts to be protected with a fine film of insoluble copper compounds. The question now naturally arises as to how this insoluble substance is again rendered soluble, as it must be, if it is to bring about the death of germinating fungus spores, which would otherwise infect the sprayed plant.

There are three theories which have been put forward to account for the manner in which the insoluble copper compounds are rendered soluble; these are: (1) that the copper is brought into solution by the action of the atmosphere, more especially owing to the presence of the carbon dioxide in it; (2) that the insoluble compounds are dissolved by some substance or substances secreted by the sprayed leaves; (3) that the copper is rendered soluble by some substance secreted by the fungus itself, which consequently brings about its own destruction.

The first of these theories was supported by Pickering (see *Eleventh Report on the Woburn Experimental Fruit Farm*, 1910); but recently, further work carried out by Gimingham, and by Barker and Gimingham, discredits this theory and lends support to the last, namely that of the action of the fungus itself. (*Journal of Agricultural Science*, Vol. IV, pp. 69 and 76.)

Pickering found that the insoluble substances containing copper formed in the preparation of Bordeaux mixture were partly dissolved in water containing a large amount of carbon dioxide and that copper sulphate was formed in the solution. This naturally led to the idea that the fungicidal action of the mixture was due to the effect of atmospheric carbon dioxide on the insoluble copper precipitate. Furthermore, he observed that when the mixture contained excess of lime, no copper appeared in the solution until all the lime had been converted into chalk by the action of the carbon dioxide. Consequently, he recommended that care should be taken to prepare Bordeaux mixture without excess of lime, since this substance would only delay the action of the mixture as a fungicide.

Gimingham, however, found that if the excess of carbon dioxide was removed from the liquid, the copper was again precipitated in an insoluble form; while as the result of several experiments he finally concluded that it was unlikely that the copper was rendered soluble by the action of the atmosphere.

The possibility that the copper is rendered soluble by secretions from the sprayed leaves was examined by Barker and Gimingham. They found that a certain amount of soluble copper sulphate was produced by the substances secreted through minute punctures or abrasions on the surfaces of the leaves. This quantity, however, was not sufficient to account for the fungicidal action of the Bordeaux mixture; on the other hand, it was enough to cause scorching of the leaves in spots, and explains why older leaves which have been longer subject to possible damage are more liable to scorching than younger foliage, since undamaged leaves do not appear to secrete the necessary substances.

The same workers then turned their attention to the possibility that the copper is rendered soluble by substances secreted by the spores or germ tubes of the fungi themselves. They found that spores possessing thin walls, and also the tips of young germ tubes, do actually appear to secrete small quantities of such substances sufficient in amount to dissolve enough copper to cause their death. The amount of copper dissolved depended, however, on the distance of the spore or germ tube from the particle of copper compound nearest to it; while the fungicidal action of the particle only took place when this distance was very small. Another point determined was that there was no secretion from spores provided with a special, thick protective wall, and that these could only be killed after the formation of a germ tube. This makes it still more improbable that the epidermal cells of the sprayed leaves can give rise to the necessary secretion, as these also are furnished with a special thick cuticle in almost all cases.

These results have an important practical bearing on the application of Bordeaux mixture. In the first place, they indicate that the mixture is of more service as a preventive than as a remedy; this is supported by actual results. In cases where fungi have already gained a hold on the leaves before spraying, the hyphae in the plant tissues will not come into intimate contact with the particles of copper compound on the sprayed surfaces, and will, therefore, not be affected.

In the second place, the film of copper compounds deposited must be even and universal, for, if small untreated areas are left, fungus spores will be able to germinate on them unharmed, and the resulting hyphae will penetrate the internal tissues underlying the fungicidal film, without coming into close contact with this, and, therefore, without receiving any check. It is because of the advantage gained by uniformity in the film deposited that a second spraying is particularly beneficial. Excess of lime in the mixture would appear to have but little effect on its action, except in so far as it increases the distances between individual particles of the copper compounds in the film.

A final point not considered by these workers is of importance in the tropics. Frequently, extra adhesives must be added to Bordeaux mixture when it is used in places where the rainfall is high. The choice of such adhesives requires care, since they might conceivably form a film over the particles of copper compounds, such as would prevent the secretions of the fungi from exerting their solvent action on those particles.

CASTOR OIL SEED FROM UGANDA.

The *Uganda Official Gazette* for April 15, 1911, contains a supplement which presents the results of an examination of castor oil seed from Uganda, made at the Imperial Institute.

Figures are given to show that, in the nine samples examined, the yield of oil obtained by extraction with ether varied from 47·6 to 50·8 per cent. As regards the commercial valuation, it is stated that consignments similar to the samples would obtain a ready sale in Europe at a value near that of Bombay castor oil seed, which at the time of reporting (February 1911) was about £12 5*s.* per ton, in the United Kingdom.

Useful information is given in the report concerning the properties which most directly affect the value of castor oil seed. Among these, the most important is the amount of oil contained by it; if this is satisfactory, the size and colour of the seeds do not appear to influence their value in commerce, provided that they are in good condition.

It is suggested that, in view of the large demand for castor oil seed and the desire of manufacturers in the United Kingdom to obtain supplies from new sources, the cultivation of the plant in Uganda should be encouraged, if the price quoted is likely to be remunerative.

REGISTRATION AND IMPORTATION OF STOCK IN ST. VINCENT.

The St. Vincent *Government Gazette* for July 27, 1911, contains rules which were passed by the Governor-in-Council on July 18 last for regulating the registration and certification of stock in that Colony; also regulations, with respect to the importation into the Colony of cattle and other animals, made by the Governor-in-Council under the authority of the Cattle Diseases Prevention Act, 1869.

The rules regulating the registration of stock provide for the keeping of a stock register or registers, by the Government Veterinary Surgeon, and for the entry therein, by that officer, of full details of animals passed for registration by a Committee to be appointed by the Administrator; the issue of registration certificates for horses and cattle on payment of a fee of 2*s.* for a horse, and 1*s.* per head for cattle. The horses eligible for registration are divided into four classes, namely thoroughbred, seven-eighth bred, three-quarter bred and half-bred, but power is reserved to the Committee to exclude any horse from registration which possesses any defect likely to impair its breeding qualities. The class of cattle eligible for registration is limited to that known as purebred, similar power being reserved to the Committee as in the case of the registration of horses. Further, provision is made for supplying the owners of registered stallions and bulls with service forms, and the owners of mares and cows with birth forms.

The regulations with respect to the importation of cattle and other animals into the Colony, including Bequia and Mustique, provide for the examination, at the port of Kingstown, by the Government Veterinary Surgeon, of all animals intended for importation, 'animal' being interpreted to mean 'any horse, mare, gelding, foal, colt, mule, ass, bull, ox, cow, steer, heifer, calf, sheep, ram, lamb, goat, kid, hog and pig.' Animals which, in the opinion of the Government Veterinary Surgeon, are suffering from any infectious or contagious disease, which he may deem dangerous to the health of animals in the Colony, are prohibited from being imported; but in the event of the Government Veterinary Surgeon being in doubt as to whether the animal is suffering from disease, he may permit it to be landed and impounded, at the cost of the importer, in such place, under such conditions and for such reasonable time as may be necessary for him to satisfy himself that the animal is not suffering from disease, or has ceased to be a source of infection or contagion. If in the opinion of the Veterinary Surgeon, an animal so landed and impounded is suffering from an infectious or contagious disease dangerous to the health of animals in the Colony, then he may direct such animal to be re-exported by the owner, or to be destroyed and its carcass disposed of in such manner as he may deem expedient. The fees payable by importers of animals for the remuneration of the Government Veterinary Surgeon are 1s. per head for horses, horned cattle, mules and asses, and 6*d.* per head for goats, sheep and pigs.

SUGAR FROM SHREDDED CANE.

The *Journal d'Agriculture Tropicale* for May 1911, gives an account of a sample of what was apparently shredded cane prepared by the McMullen process, which was shown at an exhibition held in Havana during last February.

The material in the bale exhibited is stated to have been made up of finely pulverized sugar-cane and to have had the appearance of sawdust. It was accompanied by the figures of an analysis which showed the composition of the shredded cane to be as follows:—

	Per cent.
Moisture	6·10
Sucrose	50 35
Glucose	3·42
Cellulose	35·02
Non-sugars	5·10

As is pointed out, this analysis shows that the quantity of contained sugar amounts to 50 per cent. of the weight of the bale. This formed part of the exhibits sent by the Department of Forests and Mines, which was one of the sections included in the Exhibition of the Cuba Department of Agriculture, to which reference has been made already.

THE FIBRE OF CALOTROPIS.

The last number but one of the *Agricultural News* contained a note on the production of fibre from *Calotropis procera* and *C. gigantea*. In regard to the latter, further information is presented in the *Indian Textile Journal* for November 1910. This states that *C. gigantea* is found in India at heights up to 3,000 feet. The plant is very hardy, and withstands drought very successfully; it yields a fibre which is utilized by villagers for making very strong ropes, and by fishermen on the Indus for the production of lines and nets. As has been indicated already, the frequency with which the stem branches causes the extraction of the fibre to be a matter of difficulty, and this is probably the reason why no machine has been devised, so far, for the purpose.

In order to surmount this difficulty, caused by the possession by the plant of many branches, the interesting suggestion is made, based on experience with ramie (*Boehmeria nivea*), that Calotropis should be planted closely, with the hope of obtaining the suppression of lateral branches, and the production of long, straight stems. If this method of growing the plant is successful, it might be useful for adoption, even without the existence of machinery for extracting the fibre; for the last could be obtained by the peasants from the plants grown in this way much more easily than from the naturally grown plants exploited at present.

MARKET REPORTS.

London.—The West India Committee Circular, August 29, 1911; Messrs. E. A. De Pass & Co., August 18, 1911.

Arrowroot—$2\frac{1}{4}d$.
Balata—Sheet, 3/4; block, 2/6 per lb.
Beeswax—£7 10s. per cwt.
Cacao—Trinidad, 53/- to 65/- per cwt.; Grenada, no quotations; Jamaica, 51/- to 57/-.
Coffee—Jamaica, 63/6.
Copra—West Indian, £26 15s. 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 63/- per cwt.
Isinglass—No quotations.
Honey—No quotations.
Lime Juice—Raw, 2/-; concentrated, £18 7s. 6d; Otto of limes (hand pressed), 5/-.
Logwood—No quotations.
Mace—2/- to 2/7.
Nutmegs—Quiet.
Pimento—Common, $2\frac{3}{16}d$.; fair, $2\frac{1}{4}d$.; good, $2\frac{5}{16}d$. per lb.
Rubber—Para, fine hard, 4/9½; fine soft, 4/5; fine Peru, 4/5 per lb.
Rum—Jamaica, 1/6 to 5/-.
Sugar—Crystals, 16/9 to 19/-; Muscovado, 12/9 to 15/-; Syrup, 11/6 to 14/3 per cwt.; Molasses, no quotations.

New York.—Messrs. Gillespie Bros. & Co., August 25, 1911.

Cacao—Caracas, 11¾c. to 12½c.; Grenada, 12¼c. to 12⅝c.; Trinidad, 11⅝c. to 12½c. per lb.; Jamaica, 10¾c. to 11c.
Cocoa-nuts—Jamaica, select, $30·00 to $32·00; culls, $17·00 to $18·00; Trinidad, select, $30·00 to $32·00; culls, $17·00 to $18·00 per M.
Coffee—Jamaica, 13¾c. to 14c. per lb.
Ginger—9c. to 12c. per lb.
Goat Skins—Jamaica, 53c.; Antigua and Barbados, 48c. to 50c.; St. Thomas, St. Croix and St. Kitts, 46c. to 48c. per lb.
Grape-Fruit—Jamaica, no quotations.
Limes—$5·00 to $6·00.
Mace—45c. to 52c. per lb.
Nutmegs—110's, 9¾c. per lb.
Oranges—Jamaica, no quotations.
Pimento—4½c. per lb.
Sugar—Centrifugals, 96°, 5c. per lb.; Muscovados, 89°, 4·50c.; Molasses, 89°, 4·25c. per lb., all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., September 4, 1911.

Cacao—Venezuelan, $13·50 per fanega; Trinidad, $12·50 to $13·00.
Cocoa-nut Oil—86c. per Imperial gallon.
Coffee—Venezuelan, 15½c. per lb.
Copra—$4·00 per 100 lb.
Dhal—$3·90.
Onions—$2·50 to $2·75 per 100 lb.
Peas, Split—$5·80 to $5·90 per bag.
Potatoes—English, $2·00 to $2·25 per 100 lb.
Rice—Yellow, $4·80 to $5·00; White, $5·30 to $5·40 per bag.
Sugar—American crushed, no quotations.

Barbados.—Messrs. James A. Lynch & Co., September 9, 1911; Messrs. T.S. Garraway & Co., September 12, 1911; Messrs. Leacock & Co., September 1, 1911; Messrs. E. Thorne, Limited, August 14, 1911.

Cacao—$10·50 to $11·50 per 100 lb.
Cotton Seed—$22·40 per ton; meal, $1·50 per 100 lb.; 2½ per cent. discount.
Cotton Seed Oil (refined)—47c. per gallon.
Cotton Seed Oil (for export)—51c. per gallon (in bond).
Hay—$1·30 to $1·40 per 100 lb.
Manures—Nitrate of soda, $60·00 to $65·00; Cacao manure, $42·00 to $48·00; Sulphate of ammonia, $75·00 to $76·00 per ton.
Molasses—No quotations.
Onions—$1·83 to $3·00 per 100 lb.
Peas, Split—$5·65 to $5·90 per bag of 210 lb.; Canada, $2·75 to $4·50 per bag of 120 lb.
Potatoes—Nova Scotia, $2·66 to $4·00 per 160 lb.
Rice—Ballam, $5·00 to $5·25 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
Sugar—No quotations.

British Guiana.—Messrs. Wieting & Richter, September 2, 1911; Messrs. Sandbach, Parker & Co., August 18, 1911.

Articles.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	$10·25 per 200 lb.	$10·50 per 200 lb.
Balata—Venezuela block	No quotation	Prohibited
Demerara sheet	70c. per lb.	70c.
Cacao—Native	11c per lb.	11c. per lb.
Cassava—	96c.	No quotation
Cassava Starch—	$6·50 to $7·00	No quotation
Cocoa-nuts—	$12 to $16 per M	$10 to $16 per M., peeled and selected
Coffee—Creole	16c. per lb.	19c. per lb.
Jamaica and Rio	19c. per lb.	19½c. per lb.
Liberian	10½c. per lb.	12c. per lb.
Dhal—	$3·50 per bag of 168 lb.	$3·70 per bag of 168 lb.
Green Dhal	$3·50	——
Eddoes—	96c.	——
Molasses—Yellow	None	——
Onions—Teneriffe		4c. to 5c.
Madeira	5c.	5½c.
Peas—Split	$5·75 per bag (210 lb.)	$5·75 per bag (210 lb.)
Marseilles	$3·90	No quotation
Plantains—	8c. to 20c.	——
Potatoes—Nova Scotia	——	$3·50
Lisbon	1c. to 1¼c. per lb.	No quotation
Potatoes-Sweet, B'bados	96c. per bag	——
Rice—Ballam	No quotation	——
Creole	$4·90 to $5·00	$5·00 to $5·50
Tannias—	96c.	——
Yams—White	$3·00	——
Buck	$3·24	——
Sugar—Dark crystals	$3·60 to $3·65	$3·60
Yellow	$4·10	$3·75 to $4·00
White	——	$4·25
Molasses	$3·25	None
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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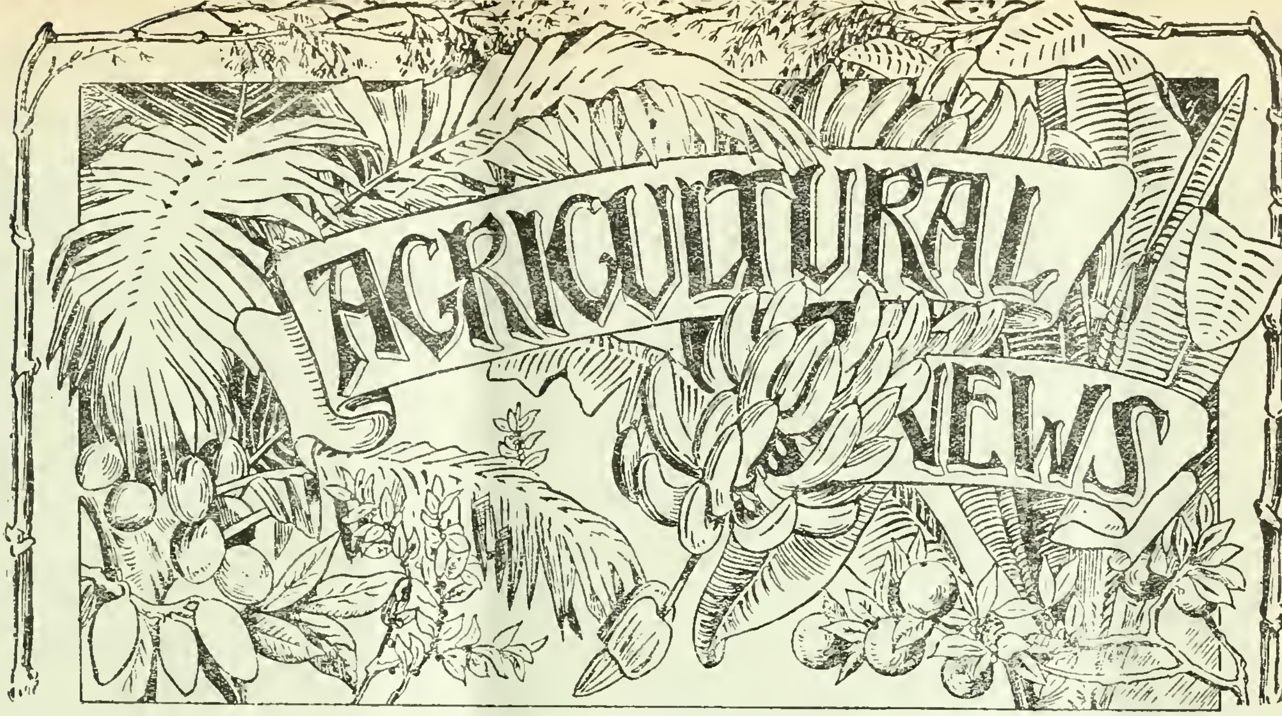

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CONTENTS

The St. Vincent Land Settlement Scheme.

THERE has been issued recently, as *Colonial Reports*—Miscellaneous, No. 77, under the title Report on the Administration of the Roads and Land Settlement Fund, St. Vincent, an account of the St. Vincent Land Settlement Scheme, prepared by Mr. M. Tatham, Private Secretary to the Hon. C. Gideon Murray, Administrator of St. Vincent. It will be useful at the present time to give a review of this, with special attention to the details that are of more general interest

Reference is first made to the critical condition of the native population of the island, which existed at the time of the visit of the West India Royal Commission, in 1897. Attempts had already been made to effect settlements of the Crown lands in the interior, but had not met with success. The main cause of the prevailing distress was the decline of the sugar industry, and it was increased by a disastrous hurricane in September 1898. To express the matter shortly, the outcome of the visit of the Royal Commission was the granting of a sum of £15,000 as Imperial aid to the Colony, in 1898, and the passing of the Land Settlement Ordinance in the following year.

The most important features of the Ordinance, as they are given in the Report, are as follows:—

(1) Land acquired by the Government for allotment in small holdings to be surveyed before allotment is made.

(2) Certain reserves to be made, such as land necessary for townships, roads, public buildings, forest and stream conservation, etc.

(3) All remaining land to be divided into allotments of as nearly as possible five acres each, no allotment to exceed ten acres without the approval of the Governor-in-Council.

(4) In selecting applicants for allotments, priority to be given to those prepared to pay 25 per cent. of the value of the lot: the remainder of the purchase money to be paid off, after an

interval of five years, in twelve equal annual instalments, together with interest on the balance of purchase money then outstanding, calculated at 3 per cent. per annum from the date of conditional permit to occupy.

(5) Other applicants, if considered eligible, to pay at the end of the first year one-sixteenth part of the purchase money together with interest at 3 per cent. per annum on the amount of such purchase money then outstanding.

(6) Land reserved for a township to be laid out in house spots not exceeding 50 by 100 feet, every allottee on an estate being entitled to purchase a house spot on the adjacent township. (House spots may also be sold or leased to persons not allottees on the estate on special terms approved in each case by the Governor-in-Council.)

(7) Every purchaser for 16 years to reside on his allotment or house spot.

(8) Every purchaser for 16 years to carry out all instructions as to clearing of land, area of cultivation, nature of products to be planted and their handling for market, etc., given by the Officers of the Imperial Agricultural Department for the West Indies.

(9) On failure to comply with conditions laid down, the Governor-in-Council to have the power to forfeit without any appeal, any allotment or house spot or house erected thereon by the Government, and all crops and instalments already paid.

The work under the Ordinance commenced in February 1899, at which time a Land Commissioner was appointed. By the end of this year 4,380 acres of land was acquired, situated in the Cumberland and Linley valleys on the leeward coast, at Richmond Hill above Kingstown, and at New Adelphi and Park Hill on the windward side of the island. Of these areas part was restored later to its proprietor on account of difficulties in coming to a satisfactory agreement. In 1900, the work of dividing up the land was commenced in the Linley Valley and also in the Cumberland Valley and at Richmond Hill. It was at the first mentioned of these places that the most promising results were obtained at the beginning; the same success was not met with in the Cumberland Valley and in the less accessible parts of the acquired land because of the lack of competition and the existence of a belief that the payment of annual instalments was preferable to the making of an initial deposit of the purchase money. Generally, in the first year, progress was disappointing, because of lack of enthusiasm on the part of the peasantry. The results were more satisfactory, however, during the next year, and it was considered that the scheme was now established in working order. Among the efforts made in 1900 was the free distribution from the Botanic Station, of 5,660 plants, of which 3,735 were cacao plants: the planting of wind-breaks, the construction of streets, and the erection of rest houses for those engaged directly on the scheme. It must be remembered that during the whole time in which the scheme has been in existence, there has been some misapprehension on the part of the peasantry in certain quarters as to its true purpose and intended results.

The year 1901 saw the completion of the division of the estates, acquired so far, into rural and township lots. Toward the end of this year, purchase was made of the estates Clare Valley, Questelles and Coopers Bay. Since this time no new land has been acquired in the island itself for the purposes of the scheme.

The Land Settlement suffered no financial loss from the eruption of the Soufrière in 1902, and notwithstanding the time that had to be given by Government Officers to special duties connected with the eruption, the ordinary work of the scheme made good progress. This was retarded, however, to a certain degree, on account of the suspicious attitude mentioned above, the calamity of the eruption, and a demoralizing effect of the liberal grants made, both in the Colony and in Great Britain, to sufferers by it. At this time, Sir Daniel Morris, K.C.M.G., the late Commissioner of Agriculture, drew special attention to the urgent necessity for a careful revision of the scheme, from the point of view of agriculture, to lessen the tendency of settlers to regard their holdings as provision grounds rather than lands to be planted in permanent crops. It was also stated by Mr. Powell, the Curator of the Botanic Station, that the critical time for success or failure had now arrived, and that particular attention should be given to the cultural matters connected with the scheme. As a result, it was decided that the Agricultural Instructor should give all his time to the teaching of correct agricultural practice among the peasantry.

By the end of 1904, the mileage of roads made available for riding through the allotments was fifty-six, and there were constructed in addition nineteen culverts, with other accompanying works. During 1905-6, the distribution of plants amounted to 11,770, and included 9,895 cacao plants and 1,406 nutmegs. The Agricultural Superintendent furnished a report in 1907, in which the fact was emphasized that cacao was the chief crop planted by allottees. As a result of the distribution of cacao plants from the Botanic Station, the Georgetown Experiment Station and the Linley and Cumberland Valleys, the total number growing, inclusive of those raised by the allottees, was at least 60,000. Plants other than cacao in permanent cultivation were coffee, nutmegs, cocoa-nuts and cinnamon: in addition, sugar-cane, arrowroot, cassava, cotton, ground nuts, and provision crops were grown on considerable areas. At this time, prizes were awarded from the Land Settlement Fund in order to promote competition.

In June 1910, Union Island, some forty miles to the south of St. Vincent, was purchased, subsequent to a petition from its inhabitants for inclusion under the Land Settlement Scheme, and the progress since that time has led to the hope that the new departure will meet with success. Other further matters are connected with the fact that negotiations are proceeding, at the present time, for the acquisition of the Fairhall estate in order to provide agricultural settlements for the peasantry living in and near the town of Calliaqua.

At this stage the Report ends its review of the annual progress of the work and gives attention to the agricultural side of the scheme, using the information supplied in a recent paper by Mr. W. N. Sands, Agricultural Superintendent, dealing with the matter, which appeared in the *West Indian Bulletin*, Vol. XI, p. 194. It is here that reference is made to the importance of the introduction of the Sea Island cotton industry into St. Vincent. This section concludes with the following statement: 'It would be difficult to overestimate the progress which has been made through the efforts of the Agricultural Department. The officers of this Department have not only dealt with questions concerning the best method of growing and handling different crops, but also with those of maintaining the fertility of the lands of the small holdings. Instruction has been freely given in the making of drains to prevent washing: the formation of compost heaps and manure pens: the growing of leguminous and other plants for green-dressing purposes; the utilization of grass and bush as mulch for permanent crops and arrrowroot; the rotation of crops and pasture fallowing. The advice that has been received in these and other matters is producing a class of small holders which is a valuable asset to the agricultural progress of the Colony.'

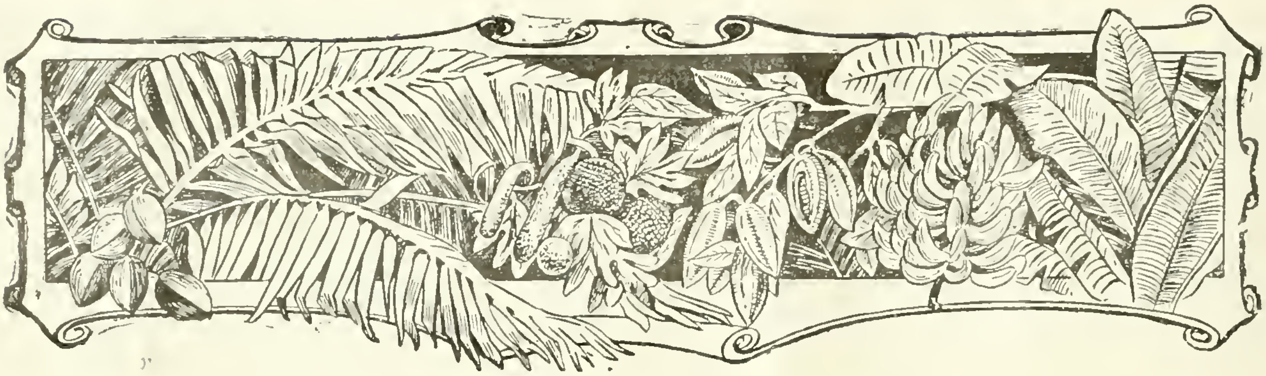
The opinion is finally reached in the Report that the results of the scheme are justifying its adoption, and that misapprehension as to its purpose has to a large extent disappeared. It is pointed out, however, that success is not as yet complete, and attention is drawn to the circumstance that the most urgent requirement for such success is co-operation among the peasantry. This exists to a certain extent in the interests connected with the Government cotton factory, and in the formation of an agricultural credit bank in one of the districts, and there is little doubt that the success which is being obtained with these will lead to the taking of further measures for closer union among the allottees under the Scheme.

SUGAR IN PORTO RICO, 1910.

Of the $37,960,219 of exports during the fiscal year 1910, sugar and molasses totalled $24,145,046. Since the earliest times, Porto Rico has been noted for the quality of her sugar-cane. The strip of level land bordering her sea-coasts has been mainly devoted to this crop. Since the American occupation, this industry has had a phenomenal growth, brought about by favourable trade relations with the United States, the installation of modern equipment in both the cultivation and the grinding of the cane, and in modern methods of culture. Although the cane acreage has been increased, the greater gain has resulted from a better preparation and cultivation of the soil, and the application of fertilizers. The greatest increase in the future production of sugar on the island will be brought about by more intensive cultivation, augmented to some extent by a larger acreage planted in cane.

Owing to the profit of cane-growing under present conditions in Porto Rico, the planter endeavours to continue this crop on the land without rotation. This is contrary to the best practice in agriculture, and, to succeed, the grower must apply an unusual skill, or disaster will overtake him. The first endeavour among progressive planters has been the changing of varieties, especially the introduction of the new productions obtained from the seed The experiment station has for several years been engaged in breeding new canes, and importing those of other stations in the West and East Indies. The aim in this work is to secure a cane of larger tonnage, greater sweetness, and resistance to disease.

The sugar planters, realizing the importance of scientific research in the improvement of their industry, have organized their own station for the study of the questions directly affecting sugar production. A tract of land has been purchased and a staff selected. The various phases and factors influencing sugar production will be studied. This station, working in harmony with the Federal Station, will greatly profit the industry in Porto Rico. It will also relieve to some extent the latter station, which is endeavouring to cover many lines of work in the large and important field of tropical agriculture. (*Annual Report of the Porto Rico Agricultural Experiment Station* for 1910, p. 8.)



FRUITS AND FRUIT TREES.

CACAO-SPRAYING EXPERIMENTS IN GRENADA.

The following particulars of the scheme for cacao-spraying experiments in Grenada, which has received the approval of the Imperial Commissioner of Agriculture and the Agricultural Board, is taken from a letter addressed to the Grenada Agricultural and Commercial Society by the Superintendent of Agriculture, Mr. G. G. Auchinleck, B.Sc.: this appears in the Minutes of the Proceedings of that Society, 1911, p. 75.

These experiments are laid down upon two lines:

(1) Spraying with copper sulphate solution to destroy mosses growing on cacao trees.

(2) Spraying with Bordeaux mixture as a preventative and cure for pod and stem diseases.

Both lines of work have been tried before, with satisfactory results.

EXTENT OF EXPERIMENTS. Six stations to be chosen in the island, each station to contain 600 trees, to be treated as follows:—

Plot A. 300 trees to be left unsprayed: yield to be weighed for one year, diseased pods being weighed separately.

Plot B. 300 trees adjacent to Plot A: tilled and manured similarly to Plot A: to be sprayed with Bordeaux mixture or copper sulphate: yield to be weighed for one year, diseased pods being weighed separately.

OBJECTS OF EXPERIMENTS. (1) To determine whether increase of yield will justify the expense of spraying twice in one year with Bordeaux mixture. (2) To ascertain whether there is an appreciable lessening of fungoid diseases on pods and trees following on such spraying. (3) To note whether epiphytic growths such as mosses and pines are destroyed effectively by Bordeaux mixture.

ESTIMATED COST. Total of £10 authorized by Agricultural Board. Lorer, as a result of his experiments, finds that ½-gallon per tree is effective. This gives the following figures per station: 300 trees need 150 gallons at 60c. per gallon—8*s.*; labour, say 4*s.* per 300 trees; total per station—12*s.* Allowing a maximum of 16*s.* instead of 12*s.* for one spraying of 300 trees, each station being sprayed twice would cost 30*s.* per annum.

PERIOD OF YEAR FOR SPRAYING. First spraying, as soon as pods are beginning to form. Second spraying, about two months after the first spraying.

SILK COTTON OR KAPOK.

Information concerning the silk cotton tree, and the fibre and its uses has been given recently in the *Agricultural News*, Vols. VIII, pp. 130, 279, 393, and IX, pp. 60, 93, 239. The following further particulars are taken from the *Bulletin of the Imperial Institute*, Vol. IX (1911), p. 121.

Kapok is a fine fibrous material, somewhat resembling cotton, but weaker and more lustrous, derived from the tree known as *Eriodendron anfractuosum* which occurs in the Dutch East Indies, India, Ceylon, tropical Africa the West Indies, Mexico and Central America. The fibres arise from the inner wall of the capsule and surround the seeds.

The kapok tree grows at the sea-level and up to an altitude of 3,000 or even 4,000 feet, but gives the best yield and quality of fibre when situated at less than 1,000 feet above the sea. It is said to flourish best on a porous, sandy-clay soil, in a climate with a dry east monsoon, and to be capable of withstanding heavy rains and resisting long periods of drought.

The propagation of the tree can be easily effected by means of either cuttings or seed. In the latter case the seed is sown in nurseries, and is only lightly covered with earth. If the soil is poor, it is recommended that stable manure should be applied about ten days before sowing. The seed should be planted in rows at a distance of 10 to 12 inches. When the young plants are about 5 or 6 inches high they should be no longer shaded but exposed to the sun. If the plants do not obtain plenty of sunshine, they grow thin and lanky. The seedlings are planted out when from eight to twelve months old. In Java, kapok trees are commonly planted about 12 to 15 feet apart along the roads in the coffee and cacao plantations. When the trees are grown in special plantations, they should be placed about 18 feet apart (about 144 trees to the acre), for if planted more closely they soon interfere with one another. The trees commonly attain a height of 30 feet, but sometimes grow to 50 feet or even more.

Before transplanting, it is advisable to strip off all the leaves and to cut the stem down to a height of 1½ to 2 feet, and also to cut the chief roots so as to make stumps of them. If the top is not cut it will usually die down to the ground. The trees subsequently require very little attention, but the soil must be kept free from weeds.

During the early years of growth other plants can be cultivated between the young trees. In Java it is a common practice to grow pepper in this way, but it should not be planted before the kapok trees are three or four years old.

The trees begin to bear in the third or fourth year, but sometimes not till later. The crop is never very large until the sixth year. A large tree brings 1,000 to 1,500 fruits to maturity per annum, each of which contains about 0·7 to 1·2 grammes of dry fibre. Hence, on an average a well-developed tree may be expected to give an annual yield of $\frac{3}{4}$ to $1\frac{1}{4}$ kilogrammes (or about $1\frac{1}{2}$ to $2\frac{3}{4}$ ℔.) of clean fibre.

The tree flowers in April or May, and the fruits mature at the end of October or in November. As the fruit ripens it becomes yellowish-brown and then begins to open. As soon as this point is reached, the fruits are gathered by means of long bamboo poles bearing small hooks at the upper ends. They are then left on a clean floor, preferably of cement, and exposed to the sun in order that they may ripen completely and open fully. The fibre and seeds are picked out of the capsules by women and children and dried in the sun for some days.

The seeds are usually removed from the fibre by beating with sticks, or by means of a simple machine. A special form of gin, resembling a cotton gin, has been recommended for the purpose, but it must be remembered that in most cases the kapok is only a subsidiary product, and produced in small quantities, so that the provision of expensive machinery would not be remunerative.

The kapok is packed in bales by means of hydraulic or hand presses, but must not be compressed too severely, or its resilience will be impaired, and its value consequently diminished. Each bale weighs about 80 ℔. The number of bales exported from Java in recent years is as follows: 1907, 92,874; 1908, 109,852; 1909, 87,685.

The value of the total imports of kapok into the United Kingdom amounted to £23,752 in 1908, and to £27,645 in 1909.

An account of the properties and uses of the fibre has been given in this *Bulletin* (1905, p. 221).

A German firm has recently discovered a method by means of which kapok can be spun either alone or in admixture with cotton (see this *Bulletin*, 1911, p. 70).

The market price of kapok has advanced during the last few months from 7*d.* to about 9*d.* per ℔., and it is therefore possible that the collection and preparation of this fibre for export would prove a remunerative industry in certain British Colonies and Dependencies.

THE WATER REQUIREMENTS OF CROPS.

Volume I, No. 10, of the *Memoirs of the Department of Agriculture in India* has been received. It concludes the account of work that has been done by Mr. J. W. Leather, Ph.D., F.I.C., Imperial Agricultural Chemist for India, in regard to the water requirements of crops in that country. The following facts are taken from the conclusions that are expressed at the end of the account of the investigation.

It was found that the water content of the soil that is necessary for the proper growth of the plant varies largely with the nature of the soil. Under field conditions, the effect of the plant on the water content is to cause this to be lowered throughout a number of feet of the soil in its vicinity. This decrease, in the Pusa soils employed in the experiment, was found to be more or less uniform for about 5 or 6 feet; below this the change is smaller.

Observations were made for the purpose of finding the lowering of the water content in a column of soil of given dimensions. They showed that, allowing for evaporation from the soil, the relation between this and the amount of the crop produced is very nearly the same as that obtained in experiments employing pot culture. It follows from this that the observed decrease of water within the range of the roots of a crop will give an indication of the quantity that is required by it.

After plants growing in soil have reached maturity, the water content is lower than it would have been if the land had been allowed to remain fallow. When such plants no longer occupy the ground, there is a tendency for water to move from below toward the drier soil, but the process is very slow. These and other considerations show that a crop grown during the rainy season causes the amount of water in the upper parts of the soil occupied by the roots to be decreased, while that below this level contains an approximately normal quantity. If a dry weather crop is grown in such soil, the supply of water that is obtainable by the roots will be defective, while it is not possible for the deficiency to be made up by water from the soil below, even though it may be present in very large quantities. The following interesting general conclusion is also expressed: 'The whole of the facts which have been brought out by the experiments detailed in this memoir would be accounted for if the quantity of water which can move through a soil per unit time were dependent on the three factors, concentration, distance and physical character of the soil; temperature also, no doubt, has an important influence.'

The author concludes by suggesting that if a laboratory method could be devised for estimating the capacity of the soil to conduct water, this method would prove of very great value to agriculture.

THE COAGULATION OF FICUS ELASTICA LATEX.

The *Journal d'Agriculture Tropicale* for April 1911 contains details concerning a new method of producing the somewhat difficult coagulation of the latex of *Ficus elastica.* This has been evolved in Java, where the tree is grown for rubber to a large extent, the latex being usually coagulated mechanically, by beating with a wooden spatula. This process requires a long time and a deal of labour, and in consequence much has been done in the direction of finding a way in which it may be hastened.

The principle of the new method is to 'encourage' coagulation by the addition of a coagulum obtained in the following way. On each day, about a pint of the thickest latex is taken, and coagulation started by stirring (not beating) it with a wooden spatula. When this has arrived at its proper stage it is added to the ordinary, thinner latex, when the rubber separates out in about a quarter of an hour, instead of the hours that are required by the method in which beating is employed. It is on account of this action that the added coagulant is said to 'encourage' (amorcer) the coagulation.

The writer of the article draws attention to the fact that the advantage of such a method is that no foreign matter is introduced into the latex, so that the maximum chance is given for the production of rubber possessing its natural characteristics, and concludes with the suggestion that trials of the method might well be made with the latex of *Castilloa elastica.*

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date September 11, with reference to the sales of West Indian Sea Island cotton :—

Since our last report, a moderate business has been done in West Indian Sea Islands, chiefly Barbados and St. Kitts, at prices ranging from 16*d.* to 17*d.*

Prices are firm, but buyers are awaiting further news from America as to the growing crop before purchasing freely.

A serious storm has damaged the Carolina Island cotton, where about 10,000 bales are grown; but we understand that it has not affected Georgia and Florida, where the crop usually amounts to about 90,000 to 100,000 bales.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending September 9, is as follows:—

In consequence of the recent severe storm throughout the Sea Island section, the marketing of the crop will be very much delayed, and it will probably not be before the middle or the end of October that the receipts will be sufficient to admit of any offerings.

The stock of the old crop cotton held over from last year has been temporarily withdrawn from the market, as the Factors are anticipating very full prices for any well-matured sound lots. Under these circumstances, no bright cotton of the old crop is offered under 40c., equals 22*d.*

CONTAMINATION IN EGYPTIAN COTTON.

Work that is being done in connexion with the introduction of the growing of Egyptian cotton into the United States has led to the consideration of the fact that this is likely to be contaminated by the inclusion of an undesirable type of cotton, possessing a short, weak fibre, and called Hindi cotton. The matter is dealt with in Bulletin No. 210 of the Bureau of Plant Industry of the United States Department of Agriculture, entitled *Hindi Cotton in Egypt*. It is pointed out in this publication that the presence of Hindi cotton plants in fields, in Egypt, causes the production of hybrids, and the consequent obtaining of a cotton mixed in character. In that country, the possession of skilled and cheap labour has rendered possible the careful sorting of the cotton by hand, before baling, so that Egyptian cotton possesses a high reputation for uniformity. In the United States the circumstances are different, and the lack of cheap skilled labour makes it necessary to give careful consideration to the existence of Hindi cotton in Egyptian varieties, when it is desired to introduce this cotton into that country.

In pursuance of the matter, the conclusions reached in the bulletin to which reference is made state that the prospects of introducing the growing of Egyptian varieties into the United States are dependent upon the possibility of obtaining a uniform crop, and at the same time avoiding the necessity of sorting the lint after picking. Notwithstanding the care that is employed in Egypt in regard to the removal of Hindi plants from the field at the time of thinning, there is rarely any complete elimination of the undesirable plants. This is partly because many of the hybrids, when young, do not possess visibly the hybrid characteristics, though later they exhibit these by possessing white flowers, bolls pale-green in colour, or a scant yield of inferior lint, or a relative or complete sterility. It is supposed that the Hindi contamination of Egyptian cotton has increased in recent years, and this would cause a decrease in the yield and quality of the crop, independently of any of the other causes that have been alleged as being responsible for the lessened production in that country. This supposed increase may be due to the fact that Hindi cotton possesses naked seeds, which consequently germinate more readily than those provided with fuzz, and give plants which are thus reckoned as the most hardy when the time comes for thinning out. There is the additional possibility that the characters of this cotton are prepotent over those of the Egyptian, as is the case in regard to the later generations of Egyptian-Upland hybrids.

The means suggested for adoption in the States for producing a uniform Egyptian cotton is that of particular attention to the external characters of all the plants in the field, and the removal of those which are undesirable, before the time of flowering. It is expected that reversion to the Hindi characters may continue to occur in small amounts, even under the most careful selection, just as plants with naked seeds are found to occur in rigidly selected Upland varieties. The experiments that have been made so far indicate, however, that these reversions are not likely to produce any large degree of contamination, in the event of the employment of the proper methods of selection.

Owing to the heavy rainfall in St. Vincent during August, some damage has been done to the cotton cultivation in the island, and difficulty has been found in keeping the fields clear of weeds. The condition of the arrowroot and cacao crops in St. Vincent is fair. The report of the Government Veterinary Surgeon for August shows that among fifty-seven deaths of stock there were no cases of anthrax; in two instances the cause of death was not ascertained, but no suspicion was entertained that anthrax was present.

A METHOD OF TAPPING THE CEARA RUBBER TREE.

The *Agricultural Journal of the Mozambique Company*, Vol. I, p. 49, describes a mode of tapping the Ceara rubber tree (*Manihot Glaziovii*), which is known as the Lewa method, as follows:—

The tree is fit for tapping when the rough and papery outer bark has been removed. If this has not been recently done the surface may contain dirt conveyed up the tree by little ants, so it is therefore advisable for the tapper to carry a stiff scrubbing brush, for the purpose of cleaning the surface. The portion of the tree to be tapped is then painted over with a weak acid solution—acetic, citric, carbolic or fluoric acid. The juice of citrus fruits, such as limes, lemons or oranges, or seeds of the baobab tree soaked in water, will also serve the purpose; but clean solutions only should be employed, and absolute cleanliness practised throughout. In the portion to be tapped, almost point-like incisions should be made, and the latex oozes out and flows down, and coagulates in thin ribbons on the bark. These incisions should be made 4 inches apart, as each incision drains the latex from 1 inch to 2 inches in every direction from the wound. An ordinary pruning knife is suitable, but every care must be taken that the incisions do not reach the cambium layer; a very narrow chisel, or a flattened bradawl, will also serve the purpose; but it is better to use a knife with a guard, to prevent the incisions from being made too deep. If the latex does not coagulate quickly, the acid solution is not strong enough. In damp weather the acid will be required to be stronger than in cold weather. The requisite strength will soon be found from experience.

Formerly, when the system was first started in German East Africa, the rubber was rolled off the tree into round balls. It followed, of course, that particles of bark and dirt became mixed with the rubber, and the product was consequently of poor quality. Latterly, however, this method has been improved upon, and instead of the rubber being rolled into a ball, it is now rolled off from the tree on to a small wooden roller in such a way as to form a sheet when cut from the roller lengthways. The latter method is a great advance on the method of collecting in the form of balls, as the tapper can from time to time dip the roller into a pail of water and wash off particles of bark and dirt, and subsequently put the sheet through a washer.

The tapper should be provided with a rough scrubbing brush, acid and a small hand whitewash brush, for applying the acid, a wooden roller, about 6 inches long by 2½ inches in diameter, and a pail or calabash of clean water. In addition to the tapper it is advisable to have a second boy to follow him to collect the rubber, for if too many trees are tapped at a time the rubber from the first trees will not be so easy to roll off. When rolling the ribbons off they should be distributed over the roller as evenly as possible. It is desirable that the sheets should not be too thick, so the rubber should be removed at intervals according to the desired thickness. The size of the sheets would vary, of course, according to the size of the roller used. It is desirable that the sheets should be of uniform thickness and size, so the rollers should be all the same size. The rubber should not be exposed to light more than is possible, so whenever the roller is not in use it should be kept in a pail of water, and the sheets that have been collected should also be kept in water and brought in from the plantation twice a day, after the morning and evening tapping.

It is stated that further experimentation is necessary before a definite opinion as to the merits of this method can be expressed.

AGRICULTURAL TRAINING IN ANTIGUA.

The following note on the scheme of agricultural training, for work on estates, has been supplied by Mr. H. A. Tempany, B.Sc., Superintendent of Agriculture for the Leeward Islands:—

At a meeting of the Antigua Agricultural and Commercial Society, held on September 8, 1911, Mr. H. A. Tempany, B.Sc., Superintendent of Agriculture for the Leeward Islands, briefly reviewed the work that had been accomplished in Antigua in connexion with the Examinations in Practical Agriculture, of the Imperial Department of Agriculture, and at the same time gave a short account of the system of cadetships and junior assistants in training under the Agricultural Department, now in practice in the Presidency.

In the course of his remarks, Mr. Tempany pointed out that, in view of the approach of the time for again holding the agricultural examinations, the present formed a good opportunity for reviewing the work that had been accomplished since the inception of the scheme three years ago. After recapitulating the history and the objects of the scheme, Mr. Tempany pointed out that three preliminary, two intermediate, and one final examination had been held; in all thirty candidates had been examined, twenty for the preliminary, eight for the intermediate, and two for the final; he emphasized the importance attached to knowledge of practical planting in the intermediate and final examinations, and paid a tribute to the large amount of time and trouble devoted to the examinations by the planter examiners, Messrs. Spooner, Goodwin and Roden.

With regard to the cadetships, Mr. Tempany showed how they had been inaugurated at the instance of Dr. Francis Watts, and the manner in which the work had been extended and systematized. The character of the cadetships, as continuation agricultural scholarships tenable under the Agricultural Department at the Antigua Grammar School and the Botanic Station and Government Laboratory, was explained, and the object of their institution, namely, to give boys further training in agricultural work such as would fit them to follow the planting profession, was pointed out. The cadets were recruited from the agricultural pupils of the Antigua Grammar School. In connexion with the cadetships, two junior appointments were maintained at the Experiment Station, and recruited from holders of cadetships from time to time; the object of these was to provide still further training in agricultural work.

A small salary was paid to holders of these appointments who were, as part of their duties, trained to develop a sense of responsibility and to obtain practice in the handling of labour; at the same time their knowledge of scientific agriculture was increased, and the training character of the appointments was never forgotten. The appointments were only tenable for a limited term of years, so that a continuous system of training was thus maintained. In conclusion, Mr. Tempany pointed out that the time and energy expended on the organization and carrying out of these branches of departmental activity would be amply justified if they resulted in the provision of men properly equipped and qualified to carry on the profession of planting in future years.

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 number, the editorial gives a review of a recent Report on the St. Vincent Land Settlement Scheme. The general matters in the report alone receive treatment; reference is made to the original for many interesting details.

On page 308 will be found a short account of a scheme for cacao-spraying experiments in Grenada.

A summary of a recent investigation in regard to the water requirements of crops is presented on page 309.

On the same page, an abstract of an account is given of a method that has been devised recently for hastening the coagulation of the latex of *Ficus elastica*. In the original article, the suggestion is made that the method might be tried for Castilloa latex.

An article on page 312 consists of an abstract of a recent paper detailing investigations of much importance that have been carried out recently, in relation to the quality of plantation rubber.

The Insect Notes in this issue, on page 314, present information concerning ticks, and include a note on a new sugar-cane pest that has been discovered recently in Mauritius.

The Fungus Notes will be found on page 318. They deal chiefly with the disease known as the black rot of Natal citrus fruits.

Publications of the Imperial Department of Agriculture.

The Pamphlet Series of the Department is about to receive additions by the publication of Numbers 69 and 70, which are shortly to be issued respectively under the titles *Hints to Settlers in St. Lucia* and *Coco-nut Cultivation in the West Indies.*

The former of these has been prepared by His Honour Edward J. Cameron, C.M.G., Administrator of St. Lucia, with assistance from the Officers of the Local Department of Agriculture. It contains twenty-seven pages of letter press, affording concise information concerning the island, and is made attractive by the inclusion of useful illustrations Pamphlet 70 is also illustrated.

These will both be shortly obtainable from the agents for the publications of the Department, price 6*d*., post free 7½*d*.

The Increasing Use for Lace.

A note of some interest in relation to cotton production appears in the *Drapers' Record* for September 9, 1911. This states that the vogue for lace is returning to favour, and : 'there is no longer any doubt that lace will play a very important part in the fashions of the immediate future.' This is to a large extent due to the example that has been set by Queen Mary, who, as is well known, possesses an admiration for the best kinds of lace. The demand is also increasing on the European Continent, and lace is coming into use to a constantly greater extent for the adorning of afternoon and evening gowns. The information is all the more welcome to those in the cotton and lace industries, as some time has passed since lace has been in fashion to the extent desired by the producers.

It is stated that there is every indication that a return is to be made, with the modifications natural in such a matter, to the fashions of 1850-60—'fashions which lend themselves admirably to the dexterous use of lace.' At the present time there is considerable ingenuity in forming unique combinations of laces, particularly for flounces, blouses, and restaurant coats.

The note concludes with the following statement: 'Those in the know confidently predict a lace season in 1912, and with the coming of spring, lace will undoubtedly have arrived, and will assert itself upon garments of every sort and kind with remarkable pertinacity.'

The Quality of Plantation Rubber.

Attention is given in the *India-Rubber Journal* for July 22, 1911, to the circumstance that, at the recent Conference held during the International Rubber Exhibition, doubts were cast by one authority on the quality of the Para rubber seed that was obtained by Mr. H. A. Wickham for planting in the East, the contention being made that in the district from which the seeds were collected the trees are all yielders of what is called weak rubber. It will be understood that this suggestion is serious in nature, as it would infer that the large area of land in the Mid East which has been acquired for rubber planting at the expenditure of very large sums of money has been planted with trees that can only yield a low grade rubber.

It is evident that, since thirty-five years have elapsed since these seeds were collected, there has been sufficient time for the better trees in the district to have been destroyed by the careless methods of tapping that were employed up to a few years ago; while the inferior trees that are left are only now receiving attention for collecting. There is the further matter of the assertion by Mr. Wickham that the seeds were obtained by him from trees yielding rubber of the best quality.

The circumstances were sufficiently important for it to be decided that tests should be made, at the Exhibition, of rubber from the two sources: and to state the results shortly, it was found that a sample of plantation rubber sent as an exhibit from the Botanic Gardens, Singapore, and coagulated on a revolving stick by means of smoke, gave almost identical results, on being suitably tested, as those obtained from a sample of fine Para. The differences, as a matter of fact, were so slight that they would probably disappear, for all practical purposes, under a large number of tests. The statement is made that it may be concluded, 'as the result of these most interesting experiments, that when Malayan plantation rubber is prepared in the same way as Brazilian rubber, the two substances are indistinguishable in quality, and that there is a strong probability that they are the product of one and the same species of Hevea.'

In presenting the results, a warning is given against concluding that the only way to coagulate Para rubber, in order to obtain the best product, is the employment of the method of smoking, and attention is drawn to the fact that a sample of such rubber, obtained with the aid of acetic acid, gave even better tests than those which have just been mentioned.

The Properties of Nitrate of Lime.

The *Journal of the Royal Horticultural Society* for May 1911 gives, as one of the contributions from the Wisley Laboratory, an article on calcium cyanamide and nitrate of lime; part of this has reference to the properties of the latter manure. Attention is drawn to the fact that commercial nitrate of lime is a pale brownish compound, free from smell, and at first finely granular. The amount of calcium nitrate present is 75 to 77 per cent.; the rest is water and a very small amount of other substances. As is well known, nitrate of lime is very soluble in water: not only this, but it possesses in a marked degree the property of absorbing moisture from the air.

In connexion with the last mentioned property, an experiment was devised for the purpose of comparing it in this respect, with calcium cyanamide and nitrate of soda. For the purpose, weighed quantities of each substance were placed in small open dishes standing over water, under bell jars—an arrangement which gave the best chance for water to be absorbed. The dishes and their contents were again weighed after forty-eight and 120 hours of exposure to the moisture-laden atmosphere. At the end of the first period, 100 parts by weight of the calcium cyanamide, the nitrate of soda and the nitrate of lime had increased respectively to 102·7, 105·8 and 115·6; while at the end of 120 hours the similar figures were 158·7, 226·9 and 247.2.

It is thus seen that nitrate of lime absorbs water from the air very readily indeed, the effect being to produce a sticky mass in the place of a granular substance. The possession of this property makes it difficult to apply the manure to the soil unless it is used immediately after the packages are opened. The difficulty appears to have been partly met in some instances by mixing the manure with ashes before spreading it abroad.

A matter to be remembered is that if superphosphate is mixed with nitrate of lime, the mixture should be made use of immediately; for if it is kept, its manurial value decreases owing to the chemical actions that take place.

Manuring and Milk Production.

The *Agricultural News*, Vol. X, p. 283, contained an article which presented the results of experiments that had been carried out for the purpose of ascertaining the effect of certain kinds of manure on the production of mutton. In the *Journal of the Board of Agriculture* for January 1911, attention is given to similar experiments that were made at the Midland Agricultural and Dairy College, with the object of obtaining similar information with respect to the way in which pastures should be manured, under the conditions of the experiment, in order to increase the production of milk. The special manures employed were superphosphate and sulphate of potash.

The soil employed in the trials was of a strong, clayey nature, and, on account of indications of a lack of lime, both the manured and the control plot were given a preliminary treatment in the form of an application of 10 cwt. of ground lime per acre. The manurial treatment consisted in the application of 4 cwt. of superphosphate and 1½ cwt. of sulphate of potash per acre. The procedure followed was to graze two cows on each plot for a fortnight; after this they were changed over, so that those on the manured plot now fed on the unmanured plot, and vice versa. These changes continued for five months; thus each lot of cows visited each plot five times. The yield of milk was only observed during the second week of each fortnight, in order to enable the cows, at every change, to get used to the fresh conditions of pasture.

In the result, the condition of the manured plot was so much better than that of the other, that a third cow was kept on it during the latter part of the experiment, and a gain, due to the use of the manure, was obtained to the value of 13s. per acre. It is held that this gain would have been even greater in practice, as in the experiment, the yield from the cows suffered periodically from their removal to the inferior pasture, so that time was required for this to be made up before the effect of the improved conditions could be shown.

INSECT NOTES.

INFORMATION CONCERNING TICKS.

In the Yearbook of the United States Department of Agriculture for 1910, an article appears which is entitled *Some of the More Important Ticks of the United States*, by W. D. Hunter and F. C. Bishopp.

The cattle tick of the United States, or the North American fever tick as it is commonly called, is *Margaropus* (*Boophilus*) *annulatus*, Say, which is closely related to the common cattle tick of the West Indies, *Margaropus* (*Boophilus*) *australis*; indeed, the latter is classed by some authors as merely a variety of the former. On account of this relationship, the following note, which is copied from the article mentioned above, is given:—

The well-known transmittor of splenetic or Texas fever of cattle, *Margaropus annulatus*, Say, in importance far exceeds any of the other ticks found in this country. It has received attention in various departmental publications, and will consequently be given but brief notice in this paper. It is found throughout the Southern States. The original northern limit of its range in the eastern part of the country corresponded rather closely to Mason and Dixon's line. The work of eradication which has been undertaken recently has reduced the infested area considerably. Closely allied forms occur in other parts of the world, where they transmit diseases of cattle which are very similar to, if not identical with, the splenetic fever which occurs in this country.

This tick causes a direct loss of at least $40,000,000 a year in the United States; indirectly the damage is much greater. Although primarily a factor connected with cattle raising, the importance of this species extends far beyond that industry. It practically inhibits the proper utilization of live stock and thus prevents a rational system of agriculture. In this manner the whole structure of the South is affected and its development held back. A better system of agriculture and rapid development are sure to follow the eradication of the tick.

There are two peculiar features of the life-history of this tick. It is practically restricted to cattle as a host, and it does not fall to the ground for the purpose of moulting. These two peculiarities render the control of the fever tick a comparatively simple matter. Its failure to exist on other hosts renders it practical to free areas of its infestation in a comparatively short time by the simple device of keeping the cattle out. Likewise the dipping or greasing of cattle is a certain and economical method. Both of these means are being practised by the Bureau of Animal Industry of the Department of Agriculture, which has undertaken extensive work which will ultimately relieve the South of a most important obstacle to development.

The cattle ticks of the West Indies do not seem to be very well known, and it would be of advantage if readers of the *Agricultural News* would collect and forward to this Department specimens of any ticks they may come across on cattle, sheep, goats, dogs, fowls, or any other domestic or wild animals, in order that identifications might be obtained. Ticks may be enclosed alive in small card boxes, or preserved in dilute (70 per cent.) spirit, and forwarded through the Agricultural Officers in each island. The ticks from each host should be enclosed separately.

Mr. W. A. Hooker, of the Bureau of Entomology of the United States Department of Agriculture, has published in the *Journal of Economic Entomology* (Vol. II, p. 403) a paper entitled The Geographical Distribution of American Ticks, from which the following list of the West Indian species is largely taken, a few records of the distribution being added from the material of this Department.

The cattle tick (*Margaropus australis*) occurs in St. Kitts, Antigua, Guadeloupe, Dominica, Barbados and Trinidad.

The gold tick, or St. Kitts tick (*Amblyomma variegatum*), is recorded from St. Kitts, Antigua and Guadeloupe.

The fowl tick (*Argas miniatus*) is known to occur in Antigua, Martinique, Barbados and Trinidad.

The brown dog tick (*Rhipicephalus sanguineus*) is recorded from Antigua and Dominica, and in Barbados a tick identified as *Boophilus* sp. has been found on a dog. Another tick. *Amblyomma dissimile*, has a general distribution in the West Indies, being known in Antigua, Barbados and Trinidad.

In addition to the species mentioned above, Hooker's list includes two species, *Amblyomma hirtum* and *Hyalomma aegyptium* from Guadeloupe, and three from Trinidad, *Dermacentor nitens*, *Hyalomma longirostre*, and *Rhipicephalus* sp.

It will be seen that no records are given for the occurrence of ticks in St. Lucia, St. Vincent, Grenada, Montserrat, Nevis and the Virgin Islands. It is not likely that this list represents the distribution of ticks even in those islands from which species are recorded: a little collecting will probably demonstrate the occurrence of most of these species in other islands than those reported: and if planters and others would forward specimens with notes on the host on which they are found, a much more complete and useful list might be prepared.

A NEW SUGAR-CANE PEST IN MAURITIUS.

The *Bulletin Agricole* of Mauritius for July last contains a brief note on the occurrence of an insect pest attacking the roots of sugar-cane plants in Mauritius. The insect is a beetle, the larval stage of which occurs in the ground, where, by feeding on the roots, the larvae inflict very serious injury on the growing canes. It has not been identified, but it is believed to be a recently introduced form, and, as the first attack was observed near the Pamplemousses Gardens, it is inferred that the introduction may have occurred in connexion with imported plants. Collecting the larvae was tried at first as a remedial measure, but as this did not appear to be satisfactory more drastic means of control were employed. The canes were dug, and by the use of kerosene (pétrole) they and the soil were thoroughly burned. This seems a very severe practice, but if it has the effect of completely destroying a serious pest before it becomes widely distributed, it will be well justified.

It is suggested by the editor of the *Bulletin Agricole* that the occurrence of this pest is another argument in favour of legislation to prevent, as far as possible, the importation of insects which are pests to agriculture.

HUMAN AND ANIMAL TUBERCULOSIS.

The Royal Commission appointed to enquire into the relations of human and animal tuberculosis have recently issued their final Report (Cd. 5761, Price 6*d.*) which contains an account of the investigations carried out, and sets forth certain conclusions based on the results of the Commission's researches.

In regard to the question whether tuberculosis in animals and in man is one and the same disease, it is considered that on certain points there is room for difference of opinion, but that whether one prefers to regard bovine tuberculosis and the cases of tuberculosis in man, which are caused by the human type of bacilli, as varieties of the same disease, or as independent diseases, there can be no question that human tuberculosis is in part identical with bovine tuberculosis. The researches of the Commission have proved that, in a considerable proportion of cases of the human disease, the lesions contain, and are caused by, bacilli which are in every respect indistinguishable from the bacilli which are the cause of tuberculosis in cattle. In all such cases the disease, therefore, is the same disease as bovine tuberculosis.

They further conclude that mammals and man can be reciprocally infected with tuberculosis, and that a considerable amount of the tuberculosis of childhood is to be ascribed to infection with bacilli of the bovine type, transmitted to children in cow's milk. The danger to the adult human subject appears to be substantially less.

In the interests therefore of infants and children, and for the reasonable safeguarding of the public health generally, the Commissioners urge that existing regulations and supervision of milk production and meat preparation should not be relaxed, that on the contrary Government should cause to be enforced throughout the kingdom food regulations planned to afford better security against the infection of human beings through the medium of articles of diet derived from tuberculous animals.

More particularly, action in this sense is urged in order to avert or minimize the present danger arising from the consumption of infected milk. And in this connexion it is pointed out that bovine tubercle bacilli are apt to be abundantly present in milk as sold to the public when there is tuberculous disease of the udder of the cow from which it was obtained. This fact is generally recognized though not adequately guarded against. But these bacilli may also be present in the milk of tuberculous cows presenting no evidence whatever of disease of the udder, even when examined post mortem. Further, the milk of tuberculous cows not containing bacilli as it leaves the udder may, and frequently does, become infective by being contaminated with the faeces or uterine discharges of such diseased animal. Measures for securing the prevention of ingestion of living bovine tubercle bacilli with milk would greatly reduce the number of cases of abdominal and cervical tuberculosis in children, and such measures should include the exclusion from the food supply of the milk of the recognisably tuberculous cow, irrespective of the site of the disease, whether in the udder or in the internal organs. (The *Journal of the Board of Agriculture*, Vol. XVIII, p. 405.)

PALAY RUBBER IN MEXICO.

Palay rubber is obtained from the plant *Cryptostegia grandiflora*, which is commonly known in Mexico under the names Clavel Aleman and Clavel de España; it is a native of India, and was introduced into Mexico a few years ago as an ornamental plant.

An interesting article in the *India-Rubber Journal* for May 20, 1911, deals with the plant, and it is from this that most of the following information is taken. The most striking matters in regard to *Cryptostegia grandiflora*, which it may be said has been introduced into several of the West Indian Islands, are the ease with which it is propagated, its rapidity of growth (3 to 6 yards in a year), its power to resist drought, and lastly its ability to grow again even when it has been cut back severely. Anyone who has broken off a leaf or twig of *Cryptostegia grandiflora* has been made aware of the presence of an abundant white latex; this is stated to contain a quantity of rubber which amounts to 2 per cent. on the weight of the fresh plant. It is considered by some authorities that the most economical method of extracting the latex would be to submit the whole plant to pressure; this method is not practicable at present, on account of the fact that the sap of the plant becomes mixed with the latex and prevents the rubber from coagulating. A sample of the stems and leaves from Mexico, examined in California, is reported to have afforded a rubber of the best quality.

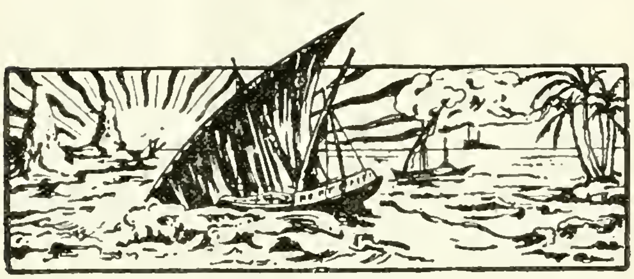
The author of the article quotes Wright as stating that the rubber is of fair quality, containing about 80 per cent. of caoutchouc. He also gives a quotation from Sir George Watts (in *The Dictionary of the Economic Products of India*, p. 561) to the effect that the plant is: 'an extensive climber, fairly common on the western and southern tracts of India, and is stated to have been repeatedly cultivated with a view to the utilization of both its milky sap and beautiful fibre; so long ago as 1893 the rubber prepared from it was reported on in England as "hardly equal to Ceara rubber from Brazil, although its general qualities are very encouraging".'

Particulars are given of three samples of Palay rubber that were examined at the Imperial Institute; these came from Madras, Jalaun and Bombay, and gave the following percentage analyses:—

	Madras.	Jalaun.	Bombay.
Moisture	24·7	5·5	3·6
Caoutchouc	67·4	79·9	64·3
Resin	5·9	8·5	10·1
Insoluble impurity	2·0	6·1	—
Albuminoid matter	—	—	7·9
Insoluble matter (including ash)	—	—	14·1
Ash	—	—	8·2

In regard to plants grown in Mexico, an examination made by the writer showed that the dry leaves contained 3·4 per cent. of caoutchouc and 1·5 per cent. of resins. The percentage of caoutchouc in the dry stems was 4·0, that in the latex 37·0. The crude rubber from the coagulum gave: caoutchouc 85·0 per cent., resins 8·8 per cent. Reference is made to the fact that, besides rubber, the plants yield a strong fibre. It is of interest also that the latex is emetic and the leaves very poisonous, although the special alkaloid is unknown.

In concluding this information it may be mentioned that another Cryptostegia has also been introduced into the West Indies, namely *C. madagascariensis*. This, like the former, possesses a vine-like habit; it is the source of the rubber known as Lombiro.



GLEANINGS.

The distribution of plants from the Dominica Botanic Station during last month amounted to a total of 16,065. This included limes 7,887, vanilla 7,740, cacao 318, grafted mangoes 28, budded citrus 23, and miscellaneous 69.

In connexion with the onion-growing industry of Antigua, St. Kitts and Montserrat, it is of interest that 242½ ℔. of seed has been distributed in these islands from the Antigua Agricultural Department for the planting of the coming crop.

The Board of Trade Journal for August 17, 1911, states that the cotton crop of Turkey for the last season amounted to 32,000 bales. The coming crop is estimated at 35,000 bales. So far, the quality of the cotton from Turkey has shown little variation.

According to the *Journal of the Royal Society of Arts* for August 25, 1911, an industry of recent growth in Italy is the extraction of an oil from tomato seed. This was formerly thrown away, but the oil is now beginning to be in steady demand for soap-making. In its properties, tomato-seed oil resembles somewhat that from cotton seed.

The area planted in sugar-cane in Java in 1910 was 312,000 acres, as compared with 301,134 in 1909 and 289,744 acres in 1908. From these areas there were produced, respectively, 1,280,300, 1,241,726 and 1,241,885 tons of sugar. The number of factories working in each of the three years mentioned was 182, 181 and 177.

A copy of a Special Colonial Hardware, Dairy Machinery, and Agricultural Implements catalogue of the Swedish Chamber of Commerce in London, 5, Lloyds Avenue, E.C., has been received. This contains matters of interest to agriculturists, and will be supplied free to applicants who mention the *Agricultural News* when requesting it to be forwarded.

A note appears in Bulletin No. 208 of the Bureau of Plant Industry of the United States Department of Agriculture, on a sample of Sea Island cotton grown from seed planted in Trujillo, Honduras, in the latter part of August 1909. The plant which produced the seed is stated to have measured 10½ feet in height and to have been bearing 78 bolls and six blossoms.

An account, based on information in the Uganda *Official Gazette*, of tapping experiments with Ceara rubber in Uganda was supplied in the *Agricultural News*, Vol. X, p. 265. Since that time the useful information has been given in the issue of that paper for July 15, 1911, to the effect that the trees with which the trials were made had an average age of two and a half years, and an average girth, 3 feet from the ground, of 13 inches.

A report received from Montserrat shows that cotton is by this time well established throughout the island, although at the time of writing rain was becoming necessary, particularly in the windward and northern districts. The effect of the want of rain is to cause premature ripening of the earlier cotton. Picking of this was commenced at the end of last month. It is of interest that pests are not particularly in evidence, although leaf-blister mite is met with in a few places and cotton stainers are probably more prevalent than usual.

Reference has been made in the *Agricultural News* from time to time to the National Dairy Show at Chicago. Information is now received from the National Dairy Show Association that the United States Agricultural Department intends to make an exhibit at the Show. This will take the form of enlarged photographs, prepared by officers of the Department during their inspection trips in dairy districts, and will include illustrations of the interior and exterior of buildings used in the production and marketing of milk and milk products.

The imports and exports of the Turks and Caicos Islands for 1910 were valued at £24,202 and £24,461, as against £25,262 and £18,936 in 1909, respectively. The exports in salt fell from £15,732 to £14,889, in spite of favourable prices, the small shipments being due to the disastrous floods in November 1909, which did more damage to the industry than the hurricane of the preceding year. The exports of sisal rose in value from £608 to £7,351, while those of sponges increased from £953 to £1,316. (From *Colonial Reports—Annual*, No. 681.)

The *Bulletin of the Imperial Institute* for 1911, p. 105, contains an article dealing with the nuts of the dum palm (*Hyphaene thebaica*) which shows that these have been tried for making buttons, in the place of the vegetable ivory, from *Phytelephas macrocarpa*. The buttons made were of an inferior quality and their manufacture would not appear to be profitable. The suggestion also exists that the nuts may be turned to make small balls, suitable for bagatelle and other games, but their shape and the large cavity in them render them unfit for the purpose.

With reference to the percentage of oil in ground nuts, it is stated in the *Report on the Progress of Agriculture in India* for 1909-10 that investigations have shown that there is no relation between this and the variety. The percentage appears to be determined by the conditions under which a given variety has been grown, rather than by the nature of the variety itself. Further investigations are being made in order to determine if there is any connexion between the oil content of the ground nut and the amount of cultivation that is given to the plant during its growth.

It is reported by the Agricultural Superintendent, St. Lucia, that the alterations made at the station in connexion with the new scheme of agricultural training have been completed. The old office building is now to be used as a class-room for agricultural pupils, while an extension has been made to this to form a new office for the Agricultural Superintendent. These changes, together with improvements that have been carried out in the grounds have added to the picturesqueness of the station and have made it more fitted for the work that is conducted there.

STUDENTS' CORNER.

OCTOBER.

FIRST PERIOD.

Seasonal Notes.

In cocoa-nut plantations, it must be decided during the growing of the plants as to whether the soil between them shall be occupied by green dressings, in order that it may be given proper cultivation and be enriched in nitrogen, or whether the space shall be used for the production of catch crops during such time as elapses while the trees are attaining maturity. In either case, care should be taken not to allow the plants to grow too near to the palms, and in cultivation caution should be exercised in order to prevent any damage to roots by the implements employed. All dead leaves which fall, and are still seen to be infected with pests or diseases, should be carefully buried in the soil, as by this means the spread of pests will be lessened, and the soil benefited by the return of useful plant food. In regard to the space around the trees, this should be kept clear of weeds, and the light cultivation thus given will be all that is required. Where catch crops are raised, those parts of the plants that are not required for consumption, and commercial and similar uses, should be buried in the area in which they are grown; this lessens the amount of soil exhaustion consequent on their being raised.

It should be remembered that if the best returns are to be obtained from a cocoa-nut plantation, manuring should be continued after the plants commence to fruit. The principal manurial bodies required are potash and phosphorus, as the fruits are largely composed of these. Soil exhaustion owing to the production of the nuts may be lessened by burying all such parts of them as are not required. Finally, proper manuring in a cocoa-nut plantation will cause the trees to attain that vigour which is needed for the combating of the enemies, both of a fungus and insect nature, that are likely to attack them.

Discuss the rations that are required by (1) growing cattle, (2) working cattle, and state how these may be supplemented by the employment of by-products on an estate, under conditions with which you are familiar. It should be remembered that animals at work require what is called a wide ration to supply energy, that is to say their food should contain a comparatively large proportion of carbohydrates. Young growing cattle, on the other hand, need a narrow ration; in other words, the food should be fairly rich in nitrogenous bodies. In the feeding of stock of all kinds, special attention is requisite in order to ensure that this is done at the proper time and that the food is supplied in the required amounts. With reference to the provision of water, animals fed on a narrow ration require more of this than those whose food is less rich in nitrogen. A point of importance when consideration is being given to these matters is that water functions chiefly as a carrier of the food bodies employed in the nutrition of the animal, so that an inadequate supply of this results in insufficient nutrition.

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) Give an account of the constituents of the atmosphere that are of the greatest importance to plants.

(2) How is the quantity of nitrogen in the soil maintained by natural means alone?

(3) Give a general description of the way in which water travels through plants?

INTERMEDIATE QUESTIONS.

(1) How would you demonstrate, by means of a simple experiment, that water is absorbed by plants?

(2) On what constituents of the air in the soil are plants most dependent?

(3) What are the most general causes of denitrification in soils?

FINAL QUESTIONS.

(1) Give an account of the measures that are taken, on an estate with which you are familiar, to maintain the nitrogen content of the soil, and supply particulars of any way in which you consider that these measures may be improved.

(2) State broadly how the presence in a soil of the roots of a crop affects the composition of the air contained in the soil.

(3) How would you show that water travels upwards from the roots through the wood of a tree, and not through the region outside of the cambium layer?

FRUIT-GROWING IN QUEENSLAND.

Considerable attention is being given to agricultural education in Queensland, a well-equipped agricultural college with grounds and farm of 1,692 acres having been established some years at Gatton, 60 miles from Brisbane. The climate seems to be particularly suitable for fruit-growing, the orange, pine-apple, and olive all doing well. The Queensland orange, when well developed, is a very fine fruit. The tree is a rapid, vigorous grower and very productive, and when grown under favourable conditions and properly looked after is easily kept free from disease. The sweet orange, ripening as it does from April to September, or at a time when the oranges of the Northern Hemisphere are out of season, is a valuable fruit for export to London, especially as it is a good carrying fruit when gathered at the right stage and properly handled and packed. The Queensland season, being earlier than those of the other colonies, would permit export from one or two months earlier than the season of the southern colonies, and Queensland is able to place her fruit on the home markets at a time when they are practically bare of oranges.

The pine-apple is grown to perfection and produced profitably at a low rate when grown on suitable soils. With the improved methods of over-sea carriage, there is no reason why pines should not be shipped to Europe successfully, and return a fair profit to the shipper. Olives also do well in Queensland, especially on, and to the west of, the Darling and Peak Downs, and though they will thrive near the coast, both the trees and fruit are much more liable to the attacks of insects than when grown further inland. Olives do well in any deep, well-drained soil, especially such as is naturally rich in lime, and when the trees are well established they will stand considerable hardship. Queensland has been pronounced very suitable for the production of the olive on a large scale. (Information received from the London Correspondent of the *North Queensland Herald*, 70a, Basinghall Street, E.C.)

FUNGUS NOTES.

BLACK ROT OF NATAL CITRUS FRUITS.

Some interesting results, arising from an investigation into the cause of a black rot of various citrus fruits in Natal, have recently been published in Science Bulletin No. 4, of the Transvaal Department of Agriculture, entitled On the Structure and Life-History of *Diplodia natalensis*, n. sp., by I. B. Pole Evans, M.A., Plant Pathologist to the Transvaal Department of Agriculture. As this fungus is somewhat similar to the West Indian die-back fungus of cacao, some account of it and of its effects on the fruit may be of interest.

EXTERNAL SYMPTOMS OF DISEASE. The disease first appeared on lemons shipped to the Transvaal from Natal, but subsequent investigations showed that it could occur on all forms of citrus fruits. The account of its symptoms, as given by Pole Evans, is as follows:—

'The first evidence of disease is a translucent or watery appearance of the rind, usually around the stalk end of the fruit. This is quickly followed by a softening, and gradual brown discoloration of the affected tissue. The brown discoloration, when it has once appeared, spreads very rapidly and uniformly over the whole fruit, which then becomes distinctly sticky to handle, while at the same time a greenish-brown liquid exudes from it where it comes into contact with anything on which it is resting. Very soon after this a dark olive-green to black discoloration appears at the stalk end, and from thence encroaches over the whole fruit, until it is converted into a black, mummified mass, with a very wrinkled and shrivelled surface.

'Fruit in this condition, if left exposed to a dry atmosphere, soon dries out, and remains indefinitely a hard body, exceedingly light in weight, but retaining to a considerable extent its original form and shape. The loss of weight in the fruit can be detected almost as soon as the brown discoloration appears. When a dry lemon is cut open, the whole of the pulp has become absorbed, and nothing remains but a dark, fibrous mass of tissue.

'The pips and radiating septa are usually covered with a dull greyish growth. On examining the external black discoloration more closely with the naked eye or with a hand lens, it is seen to be due to the formation of a number of small black patches under the epidermis of the rind. As these dark masses increase in number they run one into another and coalesce, so that the whole surface takes on a homogeneous dark colour.

'If affected fruit is kept under moist conditions, a very different state of affairs occurs. The surface very soon becomes studded with innumerable tufts of hyphae, at first greyish-olive in appearance, but which later on turn darker coloured and then eventually completely invest the fruit with a dark felt-like mycelial growth.'

CAUSE OF THE DISEASE. The disease is due to a species of Diplodia, believed by Pole Evans to be different from any previously described, to which he has given the name *Diplodia natalensis*. The fungus produces scattered pycnidia beneath the rind of infected fruits. The spores are biseptate, dark olive-brown in colour, and very similar to those of the cacao die-back fungus, except that they are marked with bands running along their length. In artificial cultures, under damp conditions, the pycnidia are produced in small hummock-like protuberances covered with a thick felt of dark olive-green hairs; this is similar to the manner in which those of *Thyridaria tarda* are produced under similar conditions. The resemblance between these two fungi is strong, though there are some points of difference.

INFECTION EXPERIMENTS These left no doubt that the fungus *Diplodia natalensis* was the cause of the disease described. They further showed that the fungus was capable of living on apples and peaches, and of producing characteristic pycnidia upon these at the end of ten days, although there was no formation of these organs on infected lemons at the end of fourteen days. In fact on lemons and oranges, pycnidia only occur on the black sclerotial bodies found in the infected fruit after such bodies have passed through a resting period of two months. If after this, the fruits are exposed to the right conditions of temperature and moisture, pycnidia will develop.

Another set of inoculation experiments on lemons gave rise to some points of interest. It was found that infection occurred on placing spores of the fungus upon the stalk scar, both when this was punctured with a sterile needle and when it was left untouched. Furthermore, it was observed that spores placed on a slightly wounded or abraded surface of the rind could cause disease, but that they could not do so when the rind was intact. Another point revealed by the experiments was that in many cases there was an incubation period of from ten to fifteen days between the date of infection and that of the first appearance of the disease. Thus fruit apparently quite sound might be packed in a case and develop the disease in transit.

PREVENTIVE MEASURES. The chief source of infection is the mass of spores formed in the pycnidia arising on mummified fruit left lying about the orchards. The principal means of reducing the prevalence of the disease must, therefore, lie in destroying, by heat, the fungus contained in all such mummified fruits, which must be carefully collected and removed from the orchards for the purpose.

A fungus very similar in appearance and possibly identical with that found in Natal has recently been shown to cause gumming of citrus and peach trees in Florida. An account of the inoculation experiments carried out to determine this was published in *Mycologia*, Vol. III, p. 151, under the title A Gum-Inducing Diplodia of Peach and Orange, by H. S. Fawcett and O. F. Burger. It was shown by cross-inoculation that the fungus on citrus caused gumming on peach trees, and vice versa. The same fungus also occurred on rotting fruits of orange and grape fruit, while inoculations with it caused softening and decay of oranges, lemons and apples, in the space of one to two weeks. In the case of the two former fruits, it was only necessary to place the mycelium on the stalk end to induce decay, while the fungus could subsequently be recovered from the diseased fruit. The authors are of the opinion that the Diplodia causing the gumming may well be the same as *D. natalensis*, though the point is not yet established.

An interesting saprophytic fungus of frequent occurrence in the West Indies is *Hirneola polytricha*, Mont., closely related to the Jew's ear fungus, found on the elder, in temperate countries. The fructifications of the local species are roughly ear-shaped, and are attached to the substratum by a very short stalk. They are of a gelatinous consistency when moist, but become rigid and horny when dry. The upper surface is blue, and possesses a bloom like that of purple grapes. The surface underneath is greyish-brown, and very hairy. The fungus is common on dead cacao, on wooden posts, and on all dead wood. It occurs on Para rubber in Ceylon, and has been seen on Barbados evergreen (*Ficus* sp.) killed by *Eutypa erumpens*, Massee

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:—

August 1911 will be a memorable month in the history of commerce and trade, not only of the Port of London, but also of Liverpool, Manchester and other leading towns, owing to the unsettled state, and subsequent strike, of dock labourers and carmen generally, which was immediately followed by the almost general strike of railway men.

The holiday season had already begun when these troubles arose, so that, taken together, there was almost a deadlock of trade, coupled with the uncertainty of the duration of the strike and the consequent stagnation of business, through the difficulties attending the transit and delivery of goods. Besides all this, the remarkable drought that has prevailed in England all through the months of July and August, and is still being continued at the time of writing, into September, has had a serious effect not only on the usual vegetable crops, but also on those furnishing drugs, both of home growth, as well as those of Germany, Russia and other places in the European Continent, where the drought has also prevailed, and whence supplies are imported into England.

With the labour troubles suspended, or, it is hoped, ended, it is anticipated that the autumn will see a complete revival of trade and commerce

The following details refer to West Indian imports during August:—

GINGER.

This article has been in very slow demand during the month. At the spice auction on the 16th, some 680 packages of Cochin and Calicut were brought forward, only 40 of which were sold, realizing 42*s.* per cwt. for washed rough Cochin. The remainder were bought in at the following prices: good small Calicut 75*s.*, medium cut 85*s.*, and bold brown rought 50*s.* At later auctions the offerings were all bought in. Jamaica has been unrepresented.

NUTMEGS, MACE AND PIMENTO.

At the sale on the 23rd, 115 packages of West Indian nutmegs were sold at the following rates: 83's, 4½*d.*; 89's 4¾*d.* to 5*d.*; 93's to 99's, 4½*d.* to 5*d.*; 100's to 140's, 4½*d.* to 4¾*d.* At the auction on the 30th, 219 packages were offered and sold, 60's to 71's fetching 9*d.* to 10*d.*, 76's to 94's 5*d.* to 6½*d.*, 96's to 114's 4½*d.* to 5½*d.* Mace was represented at the same auctions by 26 packages on the 23rd, which realized 2*s.* to 2*s.* 3*d.* for good, and 1*s.* 10*d.* to 2*s.* 1*d.* for broken. On the 30th, 88 packages were offered and disposed of at 2*s.* 1*d.* to 2*s.* 4*d.*, broken realizing 1*s.* 9*d.* to 1*s.* 11*d.* Pimento has been very quiet, the offerings for the most part being bought in at 2¼*d.* per lb.

ARROWROOT.

At auction on the 23rd, 35 barrels of manufacturing St. Vincent were offered and bought in at 2⅛*d.*; at the same sale 50 cases good Natal fetched 9*d.* per lb.

SARSAPARILLA.

At the drug auction on the 24th, 12 bales of grey Jamaica and 8 bales of native Jamaica were offered and sold, the former fetching 1*s.* 7*d.* per lb. for fair and slightly coarse, and the latter 1*s.* 1*d.* for fair red; while for palish red 1*s.* was paid, for dull red, mixed, 10*d.* to 11*d.*, and for common dull 7*d.* to 8*d.* per lb.

LIME JUICE AND TAMARINDS.

In reference to the scarcity of lime juice on the market, it was reported at the beginning of the month that 91 packages had arrived from Dominica, and that business had been done up to 3*s.* per gallon for refined, and 2*s.* per gallon for raw West Indian, for early delivery in September. Quite at the end of the month it was announced that quantities were coming in more freely from Dominica and Jamaica. Of tamarinds, 12 casks of Nevis were offered at auction on the 23rd, and sold at 10*s.* for ordinary dark juicy.

AGRICULTURE IN THE PHILIPPINE ISLANDS.

The removal, under the United States Tariff Act of August 1909, of the export duties upon Philippine products imported into the United States, has undoubtedly done much to stimulate the cultivation of sugar, cocoa-nuts, tobacco, etc., but it cannot be said that, speaking generally, the agricultural conditions in these islands are very satisfactory. In an address delivered before an agricultural conference held in February, 1910, the Governor-General stated that the great obstacles in the way of agricultural progress were 'rinderpest, locusts, roads and titles'. Rinderpest indeed, which destroyed so many thousands of the water buffaloes (carabao) which are used as draught animals throughout the islands, caused incredible losses to the farmers, and gave agriculture a severe check. The inaccuracy, and often the absence of title deeds, make it difficult for the farmer to raise money to effect necessary improvements, and the badness of the roads in the country districts makes the transportation of his products to market a difficult and expensive matter. Another urgent requisite has been an improved system of irrigation, but important works are now in progress, and this defect will soon be remedied.

A further difficulty is the scarcity and unreliability of native labour. This is, indeed, probably the greatest obstacle in the way of larger investments of American and other capital in agricultural enterprises. A large company in the Island of Mindoro complains that, while it requires labourers by the thousand, it can only obtain a few hundreds.

The re-admission of Chinese has been very strongly urged in many influential quarters, and, from the point of view of the plantation owner, this would be, no doubt, highly desirable. The efficiency of the Chinese labourer, however, as compared with the Filipino of the same class, is such that, were the former to be freely admitted, he would soon practically monopolize the labour market. In addition to this, it is probable that the strong feeling in the United States against the importation of Chinese into the Philippines, particularly with the free importation of Philippine products into the former country, would effectually prevent Congress from sanctioning any such measure. The importation of labour from Java has also been suggested, and it is certain that, unless a proper supply of labour is forthcoming, comparatively little can be done to develop the vast resources of the islands. (*Diplomatic and Consular Reports*, No. 4607 Annual Series, p. 16.)

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR, September 12, 1911; Messrs. E. A. DE PASS & Co., September 1, 1911.

ARROWROOT—2½d.
BALATA—Sheet, 3/4; block, 2/4 per lb.
BEESWAX—£7 10s. per cwt.
CACAO—Trinidad, 59/- to 66/- per cwt.; Grenada, 55/- to 60/6; Jamaica, 54/- to 59/-.
COFFEE—Jamaica, no quotations.
COPRA—West Indian, £28 10s. per ton.
COTTON—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 16d. to 17d.
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—49/- to 63/- per cwt.
ISINGLASS—No quotations.
HONEY—28/6 per brl.
LIME JUICE—Raw, 2/-; concentrated, £18 5s. to £18 10s.; Otto of limes (hand pressed), 5/- to 5/3.
LOGWOOD—No quotations.
MACE—2/- to 2/8.
NUTMEGS—4½d. to 8½d.
PIMENTO—Common, 2 3/16d.; fair, 2¼d.; good, 2 5/16d. per lb.
RUBBER—Para, fine hard, 4/8½; fine soft, 4/6; Castilloa, 4/3 per lb.
RUM—Jamaica, 1/6 to 5/-.
SUGAR—Crystals, 16/6 to 21/9; Muscovado, 12/- to 16/-; Syrup, 12/9 to 16/9 per cwt.; Molasses, no quotations.

New York.—Messrs. GILLESPIE BROS. & Co., September 8, 1911.

CACAO—Caracas, 11¾c. to 12¾c.; Grenada, 12½c. to 12¾c.; Trinidad, 11¾c. to 12¼c. per lb.; Jamaica, 10¾c. to 11c.
COCOA-NUTS—Jamaica, select, $33·00 to $34·00; culls, $20·00 to $21·00; Trinidad, select, $34·00 to $36·00; culls, $20·00 to $21·00 per M.
COFFEE—Jamaica, 13½c. to 15c. per lb.
GINGER—9c. to 11½c. per lb.
GOAT SKINS—Jamaica, 53c.; Antigua and Barbados, 48c. to 50c.; St. Thomas and St. Kitts, 46c. to 48c. per lb.
GRAPE-FRUIT—Jamaica, no quotations.
LIMES—$5·50 to $6·00.
MACE—No quotations.
NUTMEGS—No quotations.
ORANGES—Jamaica, no quotations.
PIMENTO—4½c. per lb.
SUGAR—Centrifugals, 96°, 5·61c. per lb.; Muscovados, 89°, 5·11c.; Molasses, 89°, 4·86c. per lb., all duty paid.

Trinidad,—Messrs. GORDON, GRANT & Co., September 18, 1911.

CACAO—Venezuelan, $13·00 per fanega; Trinidad, $12·50 to $13·00.
COCOA-NUT OIL—87c. per Imperial gallon.
COFFEE—Venezuelan, 15½c. per lb.
COPRA—$4·25 per 100 lb.
DHAL—$3·60 to $3·90.
ONIONS—$1·90 per 100 lb.
PEAS, SPLIT—$5·80 to $5·90 per bag.
POTATOES—English, $2·00 to $2·25 per 100 lb.
RICE—Yellow, $5·20 to $5·25; White, $5·60 to $5·75 per bag.
SUGAR—American crushed, no quotations.

Barbados,—Messrs. JAMES A. LYNCH & Co., September 23, 1911; Messrs. T.S. GARRAWAY & Co., September 25, 1911; Messrs LEACOCK & Co., September 15, 1911; Messrs. E. THORNE, Limited, August 14, 1911.

CACAO—$10·50 to $12·00 per 100 lb.
COTTON SEED—$22·40 per ton; meal, $1·50 per 100 lb.; 2½ per cent. discount.
COTTON SEED OIL (refined)—47c. per gallon.
COTTON SEED OIL (for export)—51c. per gallon (in bond).
HAY—$1·30 to $1·40 per 100 lb.
MANURES—Nitrate of soda, $60·00 to $65·00; Cacao manure, $42·00 to $48·00; Sulphate of ammonia, $75·00 to $76·00 per ton.
MOLASSES—No quotations.
ONIONS—$1·75 to $3·00 per 100 lb.
PEAS, SPLIT—$5·65 to $5·75 per bag of 210 lb.; Canada, $2·75 to $4·65 per bag of 120 lb.
POTATOES—Nova Scotia, $2·50 to $3·25 per 160 lb.
RICE—Ballam, $5·10 to $5·60 per 190 lb.; Patna, no quotations; Rangoon, no quotations; Garden Siam, $4·87 per 164 lb.
SUGAR—American granulated, $5·50 per 100 lb.

British Guiana.—Messrs. WIETING & RICHTER, September 16, 1911; Messrs. SANDBACH, PARKER & Co., August 18, 1911.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	$10·25 per 200 lb.	$10·50 per 200 lb.
BALATA—Venezuela block	No quotation	Prohibited
Demerara sheet	70c. per lb.	70c.
CACAO—Native	11c per lb.	11c. per lb.
CASSAVA—	96c.	No quotation
CASSAVA STARCH—	$6·50 to $7·00	No quotation
COCOA-NUTS—	$12 to $16 per M	$10 to $16 per M., peeled and selected
COFFEE—Creole	16c. per lb.	19c. per lb.
Jamaica and Rio	19c. per lb.	19½c. per lb.
Liberian	10½c. per lb.	12c. per lb.
DHAL—	$3·40 per bag of 168 lb.	$3·70 per bag of 168 lb.
Green Dhal	$3·50	——
EDDOES—	96c.	——
MOLASSES—Yellow	None	——
ONIONS—Teneriffe	——	4c. to 5c.
Madeira	5c.	5½c.
PEAS—Split	$5·75 per bag (210 lb.)	$5·75 per bag (210 lb.)
Marseilles	$3·75	No quotation
PLANTAINS—	8c. to 20c.	——
POTATOES—Nova Scotia	——	$3·50
Lisbon	1c. per lb.	No quotation
POTATOES—Sweet, B'bados	96c. per bag	——
RICE—Ballam	No quotation	——
Creole	$4·60 to $4·75	$5·00 to $5·50
TANNIAS—	96c.	——
YAMS—White	$3·00	——
Buck	$3·24	——
SUGAR—Dark crystals	$4·00	$3·60
Yellow	$4·50 to $4·70	$3·75 to $4·00
White	——	$4·25
Molasses	$3·25 to $3·50	None
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.

VOL. X. No. 247. BARBADOS, OCTOBER 14, 1911. PRICE 1d.

CONTENTS.

The Spirit of Agricultural Investigation.

THOSE who are responsible for agricultural investigation and experimentation at the present time are faced by the fact that the field over which their energies may be expended has largely widened in recent years. Agricultural problems are no longer regarded as being comparatively small in their scope and simple in their nature. They require the assistance of many of the so-called branches of science. The help of the chemist, the botanist, the plant pathologist and physiologist, the entomologist, the geologist and the physicist, large as it is, does not exhaust the amount of aid that is needed by the agricultural investigator.

This circumstance has led to the existence of the worker who specializes in one or two of the many matters that must receive attention for the elucidation of agricultural problems. He does not necessarily go into the field, nor need he be an agriculturist, in the ordinary sense of the term. His work may be purely academic: nevertheless, it is required by the practical experimenter, who has not the time, and probably does not possess the knowledge, to enter into specialized scientific investigations. Further, the attitudes of the two kinds of workers are different: the specialist directs his gaze towards what is waiting to be found out, while the maker of agricultural experiments gives his attention to results already obtained, in order that they may be endowed with a practical value.

While the latter kind of investigator is a user of existing results, it is the purpose of his work, as has been indicated, to employ these for obtaining others that are applicable on a larger scale. He must, therefore, be in possession of a definite scheme of working. It is his duty, also, thoroughly to master the necessary preliminaries before he proceeds to put any scheme into operation. An important matter among such preliminaries is the gaining of an adequate knowledge of what has already been discovered in relation to the subject. It is too often the case that ground is covered by one investigator, in ignorance that it has been traversed already and to an adequate degree, by another, with consequent waste of time, resources and energy. It should hardly be necessary to point out that the provision of a central agricultural organization possessing a wide knowledge of agricultural matters and the power to direct the energies of the officers under its charge forms the most useful means of preventing the loss that arises in this way.

One necessity for the experimenter is the possession of the imaginative faculty. He must be able to take a broad view of the field in which his activities are to be confined, so that he may see plainly where his work is required, and be able to devise the best methods for experimentation. Without such a view, he will be likely to make his research a matter, merely, of attention to inconsiderable details.

He also requires patience. In agriculture, particularly, years of careful observation and many repetitions of experiments are generally needed before any dependable results can be obtained. Attention may be drawn, for illustration, to manurial experiments, particularly with the sugar-cane and cacao, that have been carried out during long periods in the West Indies.

Another requisite is a proper realization of the necessity for the fair and honest presentation of his results. As far as is humanly possible, the direction of the experiments and the presentation of what they appear to demonstrate in fact should be free from bias arising from preconceived theories. There should be no ignoring of indications contrary to existing ideas; nor, on the other hand, should too great a stress be laid on isolated circumstances that appear to give support to some favourite theory. Theories of the latter kind will often have to be discarded, and there should be no hesitation in dismissing them from further consideration, once they have been proved untenable.

The advantage of the fair treatment of results appears in another light. It may lead to the forming of conclusions that are of the greatest use, although totally unexpected. Such conclusions are of all the more value because they have been formulated after ignorance of their existence and in the consequent absence of bias in their favour.

In presenting reports of work, much care should be taken that such presentation is effected with the greatest clearness, and fairness to the evidence that is available. Where this is the case, the clearness of the account is of the largest use to other experimenters, and may even enable them to elucidate useful facts in connexion with their own work. The importance of this indirect use of negative conclusions will be evident.

Where positive results of certain application have been obtained, they have two uses. The first is the obvious matter of their utilization in existing circumstances; the second is their employment to suggest other lines of work. Such results actually have their place in a larger scheme; they comprise a necessary step for its completion. The provision of all the results in the scheme are in the hands of no single investigator. One takes up the work where another leaves it; but the conclusions reached by those who succeed the pioneers could not have been obtained without the existence of the preliminary conscientious investigations.

Lastly, the use of the results of experimentation is not confined to the line of work in which they have their special place: it exists for other, probably quite dissimilar, interests. It was not obvious that the observation of Cavendish, that the oxygen and nitrogen of the air unite in the presence of an electric spark, would be a necessary preliminary to obtaining an artificial manure, using the nitrogen of the atmosphere; the agriculturists of the time did not regard the work with bacteria, of Pasteur, as the commencement of studies which would lead to the devising of proper systems of tillage and agricultural conservation.

The agricultural investigator has before him a large field of work. He cannot enter it alone. He must survey it with an open mind, and decide which part of it to occupy: for this he will most probably require the guidance of those who can more easily see how his work must be correlated with that of others. Lastly, he will find it partly occupied with the results of former activities. These he will employ for the conduct of his researches, in order that he may leave at least something of use to those who will take the place in which he once laboured conscientiously.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture returned to Barbados, from duty leave in England, by the R.M.S. 'Thames', on October 9.

Mr. P. T. Saunders, M.R.C.V.S., Veterinary Officer on the Staff of the Imperial Department of Agriculture, arrived at Barbados from Antigua, on October 4, by the R.M.S. 'Magdalena'.

SUGAR INDUSTRY.

SUCROSE AND POTASH IN CANE JUICE.

The *International Sugar Journal* for August 1911 contains a paper by H. C. Prinsen Geerligs, which is of much interest as it demonstrates the existence of a relation between the sugar in the juice of the cane and its content of potash.

It is first pointed out that the observation has been made several times to the effect that, although the quantity of exhausted molasses obtainable from a given variety of cane varies considerably, yet the composition of the molasses, and especially the amount of potash in it, does not differ much, from sample to sample. Cane juice of a high purity gives exhausted molasses very similar in its composition to that from juice with a very low purity.

Further, analysis makes it evident that the ratio of potash to dry substance in exhausted molasses varies little, although the quantity of molasses obtainable exhibits considerable differences. 'For example, in the case of juice of 75 purity yielding 2½ times the quantity of molasses which is produced by juice of 90 purity, the potash content of the latter is by no means 2½ times that of the former; and this is only what may be expected if both had contained at the outset the same ratio of potash to dry substance content. As, however, this potash content does not differ, we are compelled to admit the fact that, generally, a cane juice of low purity is more charged with potash salts than a juice having a high quotient of purity.' This, combined with the fact that the purity is influenced mainly by the glucose content, leads to the conclusion that the glucose in a ripe cane is accompanied by a fixed proportion of potash salts, so that the latter keep back in the cane juice a quantity of glucose which does not disappear during the ripening of the cane, and thus the quotient of purity is lowered. If the potash salts possess such an action, a ripe sugar-cane with a high potash content must contain a high percentage of glucose. Actual investigations have shown this to be true in the case of the beet.

The matter is complicated by the fact that differences in purity are brought about by the soil conditions, climate, the manures employed and the variety of cane; the degree of maturity of the cane also entails differences which are likely to cause confusion. The work of the author, combined with the results of others, shows that there is no perceptible change in the content of potash in the juice while the cane is ripening. It thus follows that if there is any relation between the proportion of potash and that of glucose, it must be correlated with what is termed the natural glucose in the cane, namely that which depends on the variety and conditions of climate; but not with what is called the accidental glucose, which is present through imperfect maturity or over-ripeness.

In the investigations, analyses were made of juices from estates dealing with canes possessing a juice with a high purity, and similarly with those grinding canes with a low purity. In the same way the experiments were extended to different varieties of cane, choosing for comparison those giving juice of the highest purity and those in which this was very low. In the result, the indication was obtained that, in the case of rich and pure canes, the juices contained little potash; whereas where the purity of the juice was low, large quantities of potash were always found. The same was demonstrated to be true of the varieties chosen to exhibit large differences in purity.

It therefore follows that canes possessing the largest power to absorb potash from the soil gave juice with the lowest purity, and that conversely, the available sugar was largest in amount from canes absorbing the least potash. It is, naturally, not intended that these statements should discourage the employment of potash manures among planters, for these are necessary in order that the plant may have an adequate supply of its essential food bodies in the soil.

It is pointed out that while sugar-cane seedling production and selection have given canes with a larger weight, there has been no increase in the sugar content, but rather a decrease in many instances. The practical import of the investigations is then expressed, namely that more attention should be given in seedling cane production to the sucrose sugar content, and that a useful indication of this is afforded by the determination of the extent to which potash salts are present in the juice.

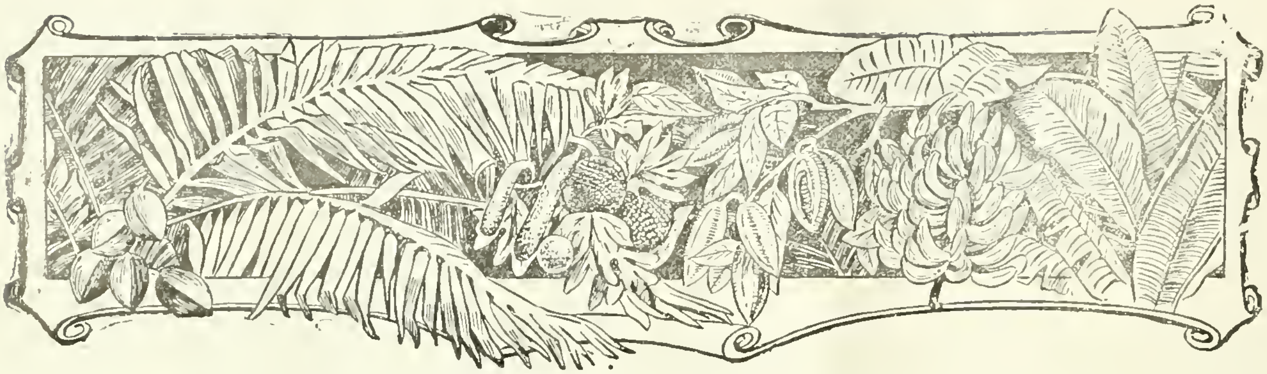
Sugar-cane Seedling D.1135 in New South Wales.—A bright, light purple-coloured cane, introduced by the Colonial Sugar Refining Company, from Fairymead, Queensland.

So far as growing trials of this cane have progressed, D.1135 proves best as a two-year-old plant cane, but is of uncertain sweetness, and somewhat difficult to trash. As a ratoon cropper, it is reported to develop poorly. It is an exceedingly straight grower, carries a dark olive-green leaf of attractive appearance, and has few dead stalks as a two-year-old crop.

On the Richmond River, it is questionable whether this cane is likely to prove the continued success that D.1135 has been found to be in other parts of the State. Here its sugar density appears to be greatly influenced by weather and soil conditions. In this respect it cannot be relied upon, as can the two more largely grown varieties, Malabar and Mahona.

As the true character and value of D.1135 have not as yet been fully demonstrated, this cane should be given a further and more extended trial. (The *Agricultural Gazette of New South Wales*, Vol. XXII, p. 516.)

A report from Montserrat states that ample rains have fallen during September, throughout the island, and that the outlook for the cotton crop has improved considerably. It is thought that this will not be quite up to the average, but as the area in cotton cultivation has increased, the total output will be fairly large. Cotton-picking has commenced at least a month earlier than it did last year. In the districts that have suffered severely from drought, as well as in some others, leaf-blister mite is more prevalent than it has been for many years. The cotton worm has not caused much trouble, while angular leaf spot has not been present to the extent of last year, and the flower bud maggot has not been reported.



FRUITS AND FRUIT TREES.

THE FRUITING OF A 'MALE' NUTMEG TREE.

The following interesting note has been received from Mr. J. C. Moore, Agricultural Superintendent of St. Lucia:—

One of the staminate nutmeg trees at the Botanic Gardens in St Lucia has produced a single fruit. On examination, the fruit appeared to be quite normal in development, the seed being of the usual size and containing an embryo, and surrounded on the outside by the usual scarlet aril, or mace. The tree has never been observed to bear fruit before, and frequent search for flowers showing abnormal structure, and for any indications of a tendency to develop other fruits, has given negative results. The tree is about twenty years old. This is the first instance of a staminate nutmeg tree bearing fruit that has come under my observation, and it would be interesting to know if there is any record of similar observations elsewhere.

TRIALS OF THE COCO-DE-MER IN THE WEST INDIES.

In July 1908, three germinating nuts, in each case, of the double cocoa-nut or coco-de-mer (*Lodoicea sechellarum*) were distributed by the Imperial Department of Agriculture to the Agricultural Departments in St. Lucia, Dominica, St. Vincent, and Grenada. Since that time, reports as to the progress of the trials have been received from the Agricultural Departments in the different islands, and the information available is recorded here as it may be of interest to readers of the *Agricultural News*.

In St. Lucia, the trials resulted in failure, and none of the plants have survived.

The best results have been obtained at the Botanic Gardens in Dominica, where two of the three germinating nuts are reported to be making good growth. In sending the information, the Curator of the Botanic Station states that with care and attention the trial is likely to be successful. At the time of writing, each plant possessed one fully developed leaf and the second leaf was appearing in each case.

The experience in St. Vincent has been similar to that in St Lucia, and no plants have been raised.

In Grenada only one plant has survived, the others having died shortly after being planted out. This specimen is not healthy and only possesses two leaves, while another leaf which has just appeared seems to be somewhat dwarfed. In making the report, the Superintendent of Agriculture gives it as his opinion that the conditions at the Grenada Botanic Gardens are too dry for the plant.

A NEW METHOD OF HANDLING POLLEN.

This is described by a writer in the *American Breeders' Magazine*, Vol. II, p. 52, and is as follows:—

In the spring of 1908, having large numbers of apple, peach, plum and other blossoms to cross and self-pollinate, I was greatly hindered and suffered many losses by the failure to have sufficient pollen at hand at the critical period. The usual method of collecting a fresh supply at each operation was very slow and clumsy. After trying every possible way of collecting and preserving pollen I accidentally found a very simple method, which during three seasons has proved almost ideal.

Empty quinine capsules seem to meet the requirements, under almost all circumstances, for gathering and storing pollen, and they are convenient to use. These capsules can be obtained at all drug stores at a very slight cost. In most cases the smaller sizes will do. Anthers of the desired female parent are selected as near the bursting point as possible, and scarped or cut into a capsule. The capsule can then be lettered or numbered with Indian ink, or a small slip of paper may be inserted with a note as a record. These capsules can be thrown loosely into a small box, or arranged to suit personal taste. In a few hours the anthers in the capsule will burst, and a shake will scatter the pollen, which will adhere uniformly over the gelatine walls inside the capsule, where it can be transferred to the stigma with the usual brush or thin-bladed knife. I have found a knife the better tool, as an abundance of pollen can be gathered on its point for transference, and it is instantly cleaned. Pollen can thus be very quickly applied to flowers having pistils of a suitable size, such as peach, plum, etc.

Pollen in these capsules is available at a moment's notice, regardless of outside conditions. A large supply is on hand, and in compact shape. A capsule once filled will often last the entire season. The length of time that pollen will retain its vitality when so enclosed is surprising. These capsules are small and light, and can be mailed without trouble. Thus the plant breeder can extend his field of operations by using pollen gathered, for instance, in California, and mailed across the continent.

Pollen from almost every flower with which I have worked can be stored and successfully used from these capsules, with the exception, perhaps, of that from some of the Cucurbitaceae. Some pollen from this family seems to be so very moist and sticky that it does not readily separate from the anthers when they are cut before bursting, and it does not adhere satisfactorily to the capsule walls.

FIG. 14. FRUITING BRANCHES OF THE LITCHI (DOMINICA).

THE LITCHI IN DOMINICA.

The illustration on this page is a reproduction of a photograph taken by Mr. J. Jones, Curator of the Botanic Station, Dominica, of clusters of fruits of the Litchi (*Nephelium Litchi*), grown at that Station. The tree on which the fruits were borne was presented to the Dominica Botanic Gardens some years ago by Mr. Justice Pemberton.

In forwarding the photograph, Mr. Jones draws attention to the fact that the litchi is a native of South China, and that the fruit is much esteemed by the Chinese. The fruits when ripe are bright-red in colour, and their appearance at the time of ripening, together with that of the dark-green pinnate leaves of the plant, makes the tree very attractive. Mr. Jones states further that, though the plant grows well in the West Indies, and maintains a healthy appearance, it is evident that the climatic conditions are not entirely suitable, for fruits are produced once only in a period of six or seven years.

The litchi is closely related to the akee (*Blighia sapida*). The fruit is a nut containing one seed surrounded by a fleshy aril, which is the part eaten; while in the akee the edible portion is the swollen aril and stalk of the seeds.

THE PRODUCTION AND CONSUMPTION OF CACAO, IN 1910.

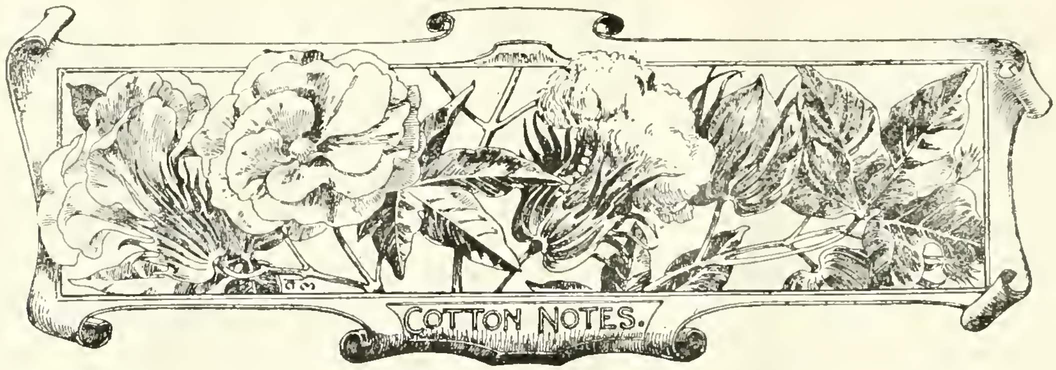
The following figures of the production and consumption of cacao during last year, and in the two preceding years, are taken from the *Journal d'Agriculture Tropicale* for July 1911, p. 223, which reproduces them from *Gordian*, where they are given provisionally. The quantities are in metric tons (2,205 lb.).

The world's production of cacao was:—

	1908.	1909.	1910.
Ecuador	32,120	31,560	34,480
St. Thomas	28,730	30,260	36,580
Brazil	32,960	33,820	28,230
Trinidad	21,740	23,390	26,140
British West Africa	14,260	22,470	25,090
Venezuela	16,300	16,850	17,530
Dominican Republic	19,010	14,820	16,620
Grenada	5,160	5,440	5,250
German Colonies	2,740	3,870	4,800
Ceylon	2,840	4,070	3,570
Java	2,380	2,470	2,500
Hayti	2,710	2,120	2,200
Fernando Po	3,000	2,730	2,110
Surinam	1,700	1,900	2,040
Jamaica	2,690	3,210	1,760
French Colonies	1,420	1,370	1,500
Cuba	830	1,940	1,250
Belgian Congo	610	770	850
St. Lucia	610	700	650
Dominica	490	600	550
Costa Rica	340	230	300
Other countries	1,000	1,000	1,200
Totals	193,620	205,250	219,200

The world's consumption of cacao was:—

	1908.	1909.	1910.
United States	42,620	53,380	50,310
Germany	34,350	40,720	43,940
France	20,440	23,250	25,070
England	21,050	24,260	24,080
Holland	15,820	19,390	19,190
Switzerland	5,820	6,680	9,090
Spain	6,580	5,980	5,520
Austria-Hungary	3,710	4,250	4,960
Belgium	4,550	5,010	4,790
Russia	2,590	2,930	3,700
Italy	1,430	1,620	1,890
Denmark	1,200	1,520	1,600
Canada	1,080	1,170	1,520
Sweden	970	1,140	1,000
Norway	470	740	850
Australia	700	750	770
Portugal	170	210	200
Finland	90	90	110
Other countries	1,500	1,800	2,000
	165,140	194,870	200,590



WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date September 25, with reference to the sales of West Indian Sea Island cotton :—

Since our last report, West Indian Sea Islands have been in good request and the sales amount to about 330 bales, including St. Kitts 16½*d.* to 19*d.*, Nevis 17*d.*, Montserrat 16½*d.* to 18*d.*, St. Eustatius 17*d.* to 18*d.*, Anguilla 16*d.*, Barbados 16*d.* to 17*d.*, St. Croix 16*d.*, and St. Vincent 15*d.* to 18*d.*; also stains at 8½*d.* to 9¼*d.*

Spinners are purchasing the better qualities, owing to the reported damage to the Carolina crop, for which the market has not yet opened in Charleston. Meanwhile, the best Floridas and Georgias do not seem to have been affected, as they are offering freely at 13*d.* to 14*d.* for the New Crop.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending September 9, is as follows:—

In consequence of the recent severe storm throughout the Sea Island section, the marketing of the crop will be very much delayed, and it will probably not be before the middle or the end of October that the receipts will be sufficient to admit of any offerings.

The stock of the old crop cotton held over from last year has been temporarily withdrawn from the market, as the Factors are anticipating very full prices for any well matured sound lots. Under these circumstances, no bright cotton of the old crop is offered under 40c., equals 22*d.*

THE INTRODUCTION OF COTTON-GROWING INTO NYASALAND.

There has been received recently, Bulletin No. 1 of 1911, of the Department of Agriculture of the Nyasaland Protectorate, which deals with some problems connected with the introduction and cultivation of exotic cottons in Nyasaland. This pays attention to the problems that have required solution in connexion with cotton-growing in that country, rather than to the statistics of production.

It is pointed out, first of all, that cotton cultivation in Africa cannot be compared with that in such countries as America. In the case of Africa, the grower is uncivilized, and trammelled by tradition and primitive methods; so much so, that it is hard to make him understand why he should grow a crop that does not directly provide food for him. The fact that the women are desirous of obtaining the bright cloths which have so great an attraction for them serves as one of the chief inducements for the men to grow cotton, in order to obtain the money necessary for the purchase of such materials. It is to be considered that the effects of the extension of cotton-growing in Africa are to increase the supply of raw material for Europe, and at the same time to enhance the demand for manufactured cloth from Europe.

In regard to the climatic conditions in Nyasaland for cotton-growing, it has been found that Egyptian cotton should not be grown at elevations greater than 2,000 feet, while American is suited to districts lying at an altitude between 2,000 and 4,000 feet. In dealing with these matters, a fact is stated that should be more generally realized by cotton growers, namely, that no one making experiments in a new country, or where cotton is being newly introduced, should expect to obtain large yields in the first years of the trials. It should be considered satisfactory if a gradual increase is gained.

Conditions of transport in Nyasaland make it possible to grow cotton profitably within 40 miles of the railway; outside of this distance there is little profit unless the seed-cotton can be ginned where it is grown, in order to lessen the cost of porterage. It is natural that the native does not wish to carry his cotton a great distance in order to sell it. He usually conveys it in crates each containing about 70 lb. of seed-cotton, and receives ¾*d.* to 1*d.* per lb., the price being dependent on locality; such a quantity of cotton will usually give about 20 lb. of lint for export. The first requirement for a large extension of cotton-growing in Nyasaland is the provision of more railways, to supplant the slower and more expensive native porterage.

As in the West Indies, experience in Nyasaland has shown that the only method of discovering the most suitable seeds for planting is by making careful experiments; the success or failure of the industry depends on the suitability of the seed. Both Uganda and Nyasaland suffered at the time of the introduction of cotton growing by the importation of several different kinds of seed by private individuals. The result was much confusion and a lively appreciation of the fact that the question must be considered thoroughly, both from the point of view of climate and of commerce. It is hardly necessary to mention that the untoward state of affairs would not have existed if the countries under discussion had possessed agricultural officers capable of giving good advice and provided with suitable experiment stations.

Attention is drawn to the fact that careful consideration of the conditions in the American cotton belt have led to the conclusion that the United States will be able to supply the demand for most of the short staple cotton for many years, but that there will eventually be a shortage from this source in regard to long staple Upland. It is the latter fact that affords some of the greatest encouragement for cotton growing in Nyasaland and Uganda. It is pointed out that Nyasaland already possesses an excellent long stapled cotton, described in Manchester as Nyasaland Upland. In 1909 samples from the crop of this were valued by the Chairman of the British Cotton Growing Association at 2*d.* to 2½*d.* per lb. on the price of Middling American.

In treating of the control of insect pests and diseases, the Bulletin points out that the existence of an agricultural department with power to regulate the importation of planting material into the country would probably have prevented the introduction of certain insects and fungi which have now to be controlled. In regard to the organization of a native cotton industry, great importance is attached to the employment of cotton inspectors and native overseers to travel constantly among the villages in order to give information concerning the proper growing and preparation of the crop that it has been decided to establish.

It is considered that the prospects of cotton-growing in Africa are very good, and that there is little chance of a set-back if the American cotton boll weevil can be kept out of the Continent. In token of the progress that has been made in Nyasaland alone, the following values of the exports for the years mentioned are given, in conclusion: 1903 £3, 1904-5 £5,914, 1907-8 £13,999, 1908-9 £28,355, and for the first eleven months of 1910-11 £52,853.

THE CONDITIONS BEST SUITED TO EUCALYPTUS TREES.

The native home of the valuable eucalypts is in the warmer portion of Australia and a few of the adjoining islands. The question of hardiness to frost is of paramount importance to the growing of Eucalyptus in the continental United States, because the range of the tree is there determined by its ability to endure cold. In Hawaii, however, the question of frost hardiness is not of great consequence because, outside of the summits of the three highest mountains in the islands, the temperature everywhere in the territory is sufficiently high for the growing of Eucalyptus.

Several species of eucalypts have been planted within the last three years on the west slope of Haleakala, on the island of Maui, at an elevation of between 6,000 and 6,500 feet, and a number of them are doing very well, notably the peppermint gum (*E. amygdalina*), the blue gum (*E. globulus*), the mountain ash (*E. siberiana*), and the broad-leaved ironbark (*E. siderophloia*). Here the temperature is almost never lower than 35°F. How much higher than 6,500 feet these trees would grow it is difficult to state, but there is no reason to believe that the temperature would be too low for a proper growth of the eucalypts at elevations as high as 7,000 or 8,500 feet, since the thermometer rarely drops below 32° F.

The temperature and moisture conditions most favourable to the growth of Eucalyptus in Hawaii are an abundant rainfall, say between 50 and 100 inches per year, and a rainy season alternating with plenty of strong, warm sunshine. Prolonged rain suddenly followed by intense sunshine and heat is injurious, especially to seedlings.

The eucalypts are intolerant of shade, and require plenty of light for their proper development. When given too much light, however, the eucalypts will branch out immoderately and will then not be of much value as a timber tree. The trees in their seedling stage can endure more shade than the older trees, and the very young seedlings require a certain amount of shade for their growth. When all are planted at the same time, the eucalypts can grow in dense stands, and the trees will then form straight, cylindrical trunks. They will not grow, however, planted in the shade of other trees.

Most of the eucalypts have well developed root systems, and as a rule are not easily thrown down by ordinary winds, but the foliage of many of the gums is affected by strong winds, and few species can therefore thrive in windy situations. The trees seem to suffer more by constant than by unusually strong winds, and the ordinary trade wind in an exposed situation will be more harmful than an occasional kona storm. The foliage of blue gum (*E. globulus*) and of red gum (*E. rostrata*) is particularly sensitive to strong winds. Sugar gum (*E. corynocalyx*) and peppermint gum (*E. amygdalina*) can stand much wind, though the trees will often lean to leeward and are then unfit for straight timber. The swamp mahogany (*E. robusta*) is generally considered sensitive to strong winds in California, but in Hawaii it is found to grow straight and of good form even in the most exposed situations.

The eucalypts, as a rule, prefer a very moist soil and respond readily to irrigation in dry situations. Swampy land, however, is not favourable to good growth, especially if the roots of the trees are constantly flooded. The red gum (*E. rostrata*) is probably the least exacting in this respect, and will thrive in wet swamps. Swamp mahogany (*E. robusta*), blue gum (*E. globulus*), and the bastard mahogany (*E. botryoides*), will also endure excessive moisture. The sugar gum (*E. corynocalyx*), on the other hand, is the most intolerant in this respect.

Unlike agricultural crops, trees are not fastidious as to the quality of the soil on which they grow. There is hardly a soil so poor as not to be able to support some tree growth. The chemical composition of the soil is of little importance, provided its physical composition is favourable. The physical composition of the soil is important because it determines to a large extent the amount of available soil moisture. A deep, loose, moderately fine-grained, sandy loam, is the best for most species of eucalypts, as it is for almost all other forest trees.

The following trees require good soil for their proper growth: blackbutt (*E. pilularis*), red gum (*E. rostrata*), manna gum (*E. viminalis*).

The trees which are least fastidious as to their soil requirements are peppermint gum (*E. amygdalina*), yate (*E. cornuta*), red mahogany (*E. resinifera*), swamp mahogany (*E. robusta*), and red ironbark (*E. sideroxylon*). (From Bulletin No. 1 of the Hawaii Division of Forestry, entitled *Eucalyptus Culture in Hawaii*, p. 5.)

Indian Mango Juice.—We have received from the Oriental Cannery Co., Honovar, India, a sample tin of this preparation of which we have formed a very favourable opinion. It is of semi-solid consistency, and the colour and taste that of the best ripe mangoes. It is excellent served as a sauce with blanc-mange, etc., and could also be used to make ices, or simply mixed with milk to form 'mango fool', or used alone, in place of mango fruits for dessert.

According to the report on it from the *Lancet*, it is stated to be practically free from sugar, and to possess antiscorbutic properties, while the *British Medical Journal* states that it is free from preservatives, and the material appears to consist of nothing but the pure pulp with its natural juice.

It can therefore be confidently recommended as a very satisfactory means of enjoying the mango fruit at any time or place. (The *Tropical Agriculturist*, Vol. XXXVII, p. 38.)

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 the present issue deals with the subject of The Spirit of Agricultural Investigation. Its purpose is to show in a broad way how such investigation should be undertaken, and the manner in which the results should be presented and interpreted.

Page 323 contains an abstract of an interesting article that has appeared recently, dealing with the relation between the content of sucrose and that of potash in cane juice.

The matter on page 324 includes information concerning the recent fruiting of a 'male' nutmeg tree in St. Lucia, and in connexion with trials of the coco-de-mer, or double cocoa-nut, that have been made in some of the islands of the West Indies.

Among other matters, page 325 gives an illustrated note on the Litchi in Dominica.

The Insect Notes, on page 330, include articles dealing respectively with the House-Fly and Man, and the Locomotion of Young Scale Insects.

Page 331 contains an article which deals with the present position as regards the employment of fermented milk in certain complaints and diseases.

On page 334, there appears the first of two articles on Wounds in Plants and Their Treatment. In the next number of the *Agricultural News*, remarks will be made on some other forms of wounds and their treatment, and a few points having a general connexion with the subject will also be considered.

Studies of Soil Bacteria.

Work that has been undertaken during the last two years in connexion with the study of soils and soil bacteria receives attention in the *Bulletin of the Bureau of Agricultural Intelligence and of Plant Diseases* for January 1911, p. 48. One of the conclusions that have been reached is that certain soil bacteria favour the formation of nodules on the roots of leguminous plants such as serradella (*Ornithopus sativus*). The action of the bacteria is to cause the enlargement of the nodules, whereby a greater quantity of nitrogen is produced than if the effect had been that of the nodule organisms alone.

Further work has been connected with the decomposition of rocks to form soil, and it is now demonstrated that leguminous plants can extract a much larger amount of plant food from unweathered rocks than can plants belonging to the Grass Family.

Lime and Magnesia in Soils.

The *Rural Californian*, Vol. XXXIV, p. 358, contains a report of observations made for the purpose of determining the causes of a certain type of malnutrition in orange and lemon trees. One of the signs of this malnutrition is the existence of what is termed mottled leaf, in such plants. The conclusion was that the condition was due to the presence of large amounts of magnesium in the soil, in proportion to the lime.

Analyses were made both of healthy and unhealthy leaves, when the former were found to contain an excess of potash and phosphoric acid, while they were deficient in lime. Analyses of the soil in which the plants were growing correlated the condition of unhealthiness with the presence of the excess of magnesia over lime.

The reason for the excess of potash in the leaves appeared to be connected with the circumstance that the plants were not obtaining sufficient lime from the soil for their needs, so that they absorbed abnormal amounts of potash for the purposes of the neutralization of the acids in them.

Calcium Cyanamide and Nitrate of Lime.

The *Journal of the Royal Horticultural Society* for May 1911 (to which reference was made in the last number of the *Agricultural News*, p. 313) contains an account of experiments in which the above mentioned manures were compared with nitrate of soda and sulphate of ammonia. In the experiments, the land received a dressing of superphosphate and kainit; the quantity of nitrate of soda applied per acre was 4 cwt., while the amounts of the other manures yielding nitrogen were at such a rate that each plot was in receipt of the same weight of that element. The crop employed was turnips, and the results showed that there was little to choose between the different manures as sources of nitrogen.

Notes on trials of these manures have been given several times in the *Agricultural News*. In the present volume, they are to be found on pages 57, 168 and 232.

Lime and Nitrification in Wet Soils.

Bulletin No. 37 of the Experiment Station of the Hawaiian Sugar Planters' Association contains an account, among other matters, of work undertaken for the purpose of ascertaining the effect of various forms of lime on nitrification, in a rich, acid soil, in a wet district. It was found that nitrification was increased, and larger amounts of lime and potash soluble in water were recovered in the drainage water, when calcium was added as the oxide, carbonate or sulphate. Of these the last was most effective in all three directions.

A further result of interest had reference to the connexion between the acidity of the soil and nitrification. The investigations showed that the calcium compounds dissolved in the water of the soil seem to exercise a greater control than acidity, as regards nitrification.

The nitrification of ammonium sulphate was increased in rate by the use of soluble phosphoric acid and sulphate of potash, as manures.

In the same connexion, another interesting result was that, when the rate of nitrification was increased, there was usually also an increase in the amount of lime contained in the drainage water.

Agriculture in British Honduras, 1909.

Colonial Reports—Annual, No. 667, dealing with conditions in British Honduras during 1909 has been issued recently. It shows, first of all, that the amount of mahogany shipped was 10,673,881 feet, of which 6,860,549 feet was the produce of the Colony. During 1908 and 1909, the export of cedar increased considerably. There was a decrease in the number of bananas shipped, but on account of the increasing demand in the United States for plantains, the number of this fruit exported increased from 939,000 in 1908 to 2,238,500 during the year under review. The latter circumstance is welcomed by planters, who prefer to grow plantains rather than bananas, because the former are hardier, and less likely to be rejected for shipment.

A record was made in the number of cocoa-nuts shipped. With rubber, on the contrary, the exports were the lowest since 1897. The quantity of chicle (for chewing gum) exported was greater than in the previous year; of the total amount a little over 33 per cent. was produced in the Colony. There was a decrease in the exports of sarsaparilla, and a slight improvement in that of tortoiseshell. The amount of logwood taken by the United Kingdom, France, Germany and the United States was 6,134 tons, the largest customer being the United Kingdom, with 3,786 tons.

The exports of cacao increased from 29,174 lb. to 39,868 lb. Sugar was made by fifty mills, of which fourteen were worked by steam, two by oil engines, and the rest by cattle; with the exception of 36 tons, all the sugar made was consumed in the Colony. During the year three saw mills were in operation. In regard to marine products, the sponge fishery produced 4,322 lb.

Sheds for Curing Tobacco.

In *The Journal of the Department of Agriculture of Victoria* for August 1911, an account is given of sheds that are suitable for curing tobacco. This commences by pointing out that such sheds should be built in positions where advantage may be taken of the prevailing winds; while at the same time it is not desirable that the site should be very exposed. The soil beneath should be dry and well drained.

For the production of bright leaf, the shed should be small, and under the conditions, a square shed measuring 16 feet × 16 feet, four floors high, has been found convenient: in the circumstances described this holds an acre of tobacco. The lowest floor should be 9 feet from the ground, and this as well as the others should be provided with poles 4 inches in diameter running from end to end: the use of the poles is to carry the sticks on which the tobacco is hung. The second floor should be 3 feet 6 inches above the first, and the third the same distance above the second. In the space below the roof two rows of tobacco may be hung.

For heavy tobaccos larger sheds are required, and if the leaf is to be partly air-cured, arrangements should be made so that the shed can be widely opened or tightly closed. Such a shed is described which, under the conditions, will hold about 1 acre of tobacco.

The Grenada Land Settlement Scheme.

The Superintendent of Agriculture of Grenada has forwarded an account of a meeting which was held under the Grenada Land Settlement Scheme, at the Experiment Plot established in connexion with this at Morne Rouge South. The Superintendent of Agriculture, the Secretary of the Agricultural and Commercial Society, Mr. A. E. Steele, and the Land Officer, Mr. H. H. Walwyn, were present.

The purposes of the meeting were to give the peasants information concerning the growing of ordinary crops and green dressings, and to explain to them the use of the Experiment Plot. Such work is particularly necessary on account of the errors made by them in regard to agricultural operations, notably the mistake of burning bush on their allotments each year before planting, and thus quickly exhausting the soil.

At the meeting, an address was given by the Superintendent of Agriculture, chiefly with reference to the use of green dressings, and practical demonstration was made of the existence of the nodules on the roots of leguminous plants. The information was employed to show how and when such plants should be buried, and why they are preferable as green dressings to ordinary crops.

An examination was made of one of the allotments, after the meeting, and the crops were found to be in good condition, particularly maize, which had reached a height of about 9 feet and was bearing well.

INSECT NOTES.

THE HOUSE-FLY AND MAN.

In previous numbers of the *Agricultural News* (see Vols. VII, p. 26; VIII, p. 238; IX, p. 298) articles have appeared dealing with the house-fly (*Musca domestica*, Linn.). A Farmer's Bulletin (No. 459) issued recently by the United States Department of Agriculture entitled House Flies, by L. O. Howard, Chief of the Bureau of Entomology, gives an excellent account of the house-fly, and describes several other similar insects which are often found in houses.

The house-fly breeds in manure and decaying organic matter, where the eggs are deposited and the larval and pupal stages are passed. The adult insect often flies directly from its filthy breeding place into houses, where it settles on or in food materials. Other flies which occur in houses have similar habits, breeding in the same or similar situations, and are also carriers of filth.

The greatest importance attaches to the house-fly on account of its ability to carry disease germs. The name typhoid fly has been given to this insect, and is now commonly in use in the United States, in order that the people generally may constantly be reminded of the dangerous character of this familiar insect.

According to Dr. Howard, flies are not only a factor in the distribution of typhoid and other intestinal diseases, such as Asiatic cholera, dysentery and infantile diarrhoea, but they are believed to aid in the dissemination of tuberculosis, anthrax, yaws, ophthalmia, small pox, tropical sore and parasitic worms. In the case of certain of these diseases, actual laboratory proof exists as to the agency of the insects, and in other cases the circumstantial evidence leads almost to certainty.

In discussing remedies and preventives, Dr. Howard gives the results of experiments in the control of flies. One of the most satisfactory methods employed consists in enclosing manure from the stables in a tight vault each day and scattering over the surface a shovelful of chloride of lime. The manure is removed from the vault about once a week.

In agricultural districts the problem of fly control is more difficult, but cleanliness and the use of chloride of lime and kerosene will do much to reduce the numbers.

In applying measures for fly control to the conditions in West Indian towns and villages, the greatest possible degree of cleanliness would be of first importance. The satisfactory disposal of all garbage in such a manner as to prevent the breeding of flies is a necessity. This might be accomplished by burning, burying, or by treating with lime or chloride of lime.

The greatest care is necessary in disposing of manure and all excrementitious matter, especially in the case of human excrement during the occurrence of typhoid fever in any locality. On estates, much could probably be accomplished by carefully cleaning up all garbage and rubbish and adding these to the manure pile, which might be thoroughly covered with mould once each week. Kerosene as a contact insecticide is fatal to the larvae and pupae of flies, and has a distinct value in treating privy vaults where these are not cleaned out frequently.

On estates where flies are abundant and the treatment of their breeding places is found to be difficult, dwellings, or at least kitchens and dining-rooms should be made inaccessible to flies by means of screens at doors and windows, in order to protect food from these pests. If everyone would remember that flies live, grow and reach maturity in filth, and that where opportunity offers the winged adults make their way directly from their filthy breeding places to food which they contaminate always with uncleanness and often with disease, the necessity for fly control might be more thoroughly realized. This realization should be assisted by the knowledge that flies also visit all sorts of loathsome sores, and frequently carry the causative organism to healthy individuals.

LOCOMOTION OF YOUNG SCALE INSECTS.

In an article bearing the heading given above, which appeared in a recent number of the *Journal of Economic Entomology* (Vol. IV, p. 301) Mr. H. J. Quayle, of the Agricultural Experiment Station, Berkeley, California, gives the results of experiments on the powers of locomotion of the young of the black scale (*Saissetia oleae*, Bern.), the red or orange scale (*Chrysomphalus aurantii*, Mask.), and the purple scale (*Lepidosaphes beckii*, Newm.), which represent the most serious insect enemies of citrus trees in southern California.

The experiments showed that the wind is not likely to dislodge the active young of scale insects and thus greatly aid in their distribution, nor are these tender animals able by their own powers of locomotion to travel over the surface of the soil, under ordinary conditions, in sufficient numbers to account for serious and rapid spread throughout an orchard.

The means of spread of scale insects are described in the following paragraphs taken from the article referred to above:—

'The distribution of scale insects over long distances is effected mainly through the interchange of nursery stock, and over the same general community by birds and active insects, chiefly, together with the agency of man in his usual cultural operations, while in the spread from tree to tree or to nearby trees, aside from the above factors, the power of the insects to transport themselves must be taken into consideration. The wind is another factor which may aid certain insects in distributing themselves, either by blowing them directly or with a leaf or light twig upon which they may be resting. Such insects as winged plant lice and the males of scale insects have frequently been observed to be wafted by a gentle breeze or aided in their flight through its influence. Experiments with a foot bellows showed that young black scales are not very readily dislodged from a twig, but once dislodged might be carried a short distance as they fell. Twigs having numerous active young scales had to be brought to within about six inches of the mouth of the bellows before any of the insects were dislodged. It thus requires a stronger wind than usually blows to have any effect on the scales on the tree, but once dislodged the wind might carry them to an adjoining tree, if the foliage of the different trees were in close proximity......

'The experiments recorded here represent but a few of the total number made, but they will serve to show how they average. In the case of the black scale, it was shown that about 4 feet of ordinary orchard soil is about the limit that will be traversed by the active young. Under favourable conditions they might, therefore, through their own powers of locomotion, make their way from one citrus tree to another, or to a second or third tree away. But the number thus travelling would be exceedingly small, as compared with the total. These records were made on soil with an ordinary mulch. Tests were made on their powers of travelling over compact soil, and they invariably showed very much greater progress. A compacted irrigation furrow enabled even the young red scale to travel two or three feet, while in a loose mulch this scale makes practically no progress. The young red scale, in attempting to ascend a small particle of earth, falls back again, and this is repeated time after time. The same is almost as true for the young purple scale. Where there is a fine mulch, therefore, the chance of the young red or purple scale reaching an adjoining tree is practically negligible.'

FERMENTED MILK.

There has recently been much interest in the use of various forms of fermented milk in certain diseases, and even for the alleged purpose of retarding the changes that take place in the human system on the approach of old age. This interest has led to a consideration of the whole matter by the Bureau of Animal Industry of the United States Department of Agriculture, and the consequent issue of Circular 171 of this Bureau, from which the following abstract has been made.

Fermented milks are formed by an acid fermentation in which lactic acid is produced from the sugar in the milk, the process being brought about by bacteria, or when alcohol is formed as well, by bacteria and yeasts together. The preparations of fermented milk are usually introduced from Southern Russia, Turkey and neighbouring countries, and are sold as specially prepared milk, or in the form of tablets or powders in capsules; the latter may be either taken directly, or added to milk, in order to produce the required fermentation.

When dealing with the claims made for fermented milks, it should be remembered, first of all, that they possess a high food value, though this is sometimes reduced below that of ordinary milk by the partial or complete removal of the fat. As is well known, Metchnikoff has put forward the opinion that the lactic acid in such milk is capable of controlling putrefactive changes in the intestines, and thus prolonging life by the prevention of the action on the body of the deleterious substances that are produced by such changes. In support of this, attention is drawn to the fact that those peoples using fermented milk are generally long-lived. Their longevity may, however, be due to the fact that such races usually follow a healthy outdoor life, and employ a simple diet. These healthy conditions are themselves sufficient to reduce the amount of auto-intoxication, or self-poisoning, that is the result of the undue accumulation of poisonous substances arising from putrefactive changes in the intestines. The evidence of the production and absorption of such substances often consists in an uncomfortable feeling of indigestion and headache; the so called ptomaine poisoning may even be caused.

In considering the facts, it must be realized that, while the digestive tract of human beings is normally free from bacteria at birth, these soon gain access and under ordinary conditions remain harmless and probably in some cases aid digestion. It is of interest that the bacteria producing auto-intoxication are anaerobic, that is to say they cannot grow in the presence of air; while the harmless kinds can live either with or without air. The theory of the action of fermented milk as a remedy for auto-intoxication is that the introduction of lactic acid bacteria causes conditions to arise in which the poison-producing bacteria can no longer exist. There is no doubt that an improved state of health often follows the exhibition of fermented milk, and cases of this are on record. The action may be due to the power of the lactic acid in the milk to reduce the activities of the putrefactive bacteria, or it may arise from the growth in the intestines of bacteria that are capable directly or indirectly of suppressing the other forms. As far as the first of these suggestions is concerned, it is well known that many bacteria cannot grow in an acid medium. It must be remembered, however, that the normal condition of the intestinal contents is alkaline, and that any large increase of the acidity would interfere seriously with the digestion. As a matter of fact, it does not appear to be probable that the acidity of any kind of fermented milk is sufficient to inhibit bacterial activity. With reference to the second suggestion, namely the introduction of acid-forming bacteria which multiply at a great rate in the intestines, the evidence that such a condition can be made to arise is by no means conclusive It is in relation to this that the claims for the possession of large acid-forming qualities is made for the micro-organism that has come to be known as the Metchnikoff bacillus, the bacillus of Massol, or *Bacillus bulgaricus*. Investigations in connexion with this organism have given conflicting results and, in the words of the Circular: 'It must be admitted that up to the present time the investigations have not conclusively demonstrated that it is possible to establish the lactic acid bacteria in the intestines with any permanency.' In regard to other observations, indications have been received that fermented milks may possibly contain substances possessing an antiseptic action in regard to certain bacteria, so that the ingestion of these controls the development of the latter.

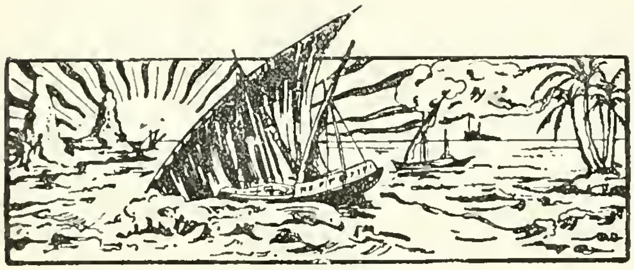
In concluding the discussion of the claims made for fermented milks, it is stated that, although exaggerated claims have been made for such milk, there is no doubt that their use has been followed in many cases by an improvement in health. It is probable that this improvement results from the change in diet which their employment entails, and in any case, before it is decided to consume large quantities of such milk, the opinion of a medical man should be taken as to whether this is advisable under the given circumstances.

The following information concerning the various forms of fermented milk is abstracted from the Circular:—

CULTURES IN TABLET AND CAPSULE FORM. These are sold in addition to the fresh forms of fermented milk, and are claimed to be pure and active cultures of *Bacillus bulgaricus*. The examination of several preparations has shown that this claim is by no means always justified. An easy method of testing the purity and activity of such dried cultures is to keep about half a pint of milk in a bottle closed with cotton wool, at or near the boiling point, for at least an hour, to let this cool, and then to add two or three of the tablets. The milk is then kept at a temperature near blood heat for a night, when if *Bacillus bulgaricus* is present, it will have curdled, with a sharp acid taste and the formation of whey.

BUTTER-MILK. This is obtained by churning milk or cream for butter-making; it is often, however, simply sour skimmed milk in which the curd has been broken up by churning or stirring. Directions are given in the Circular for various preparations of butter-milk.

OTHER FORMS. These are Kefir (from the Caucasus), Kumiss (from European Russia and Central and South Western Asia), and Yoghurt (from the countries bordering on the eastern Mediterranean). For interesting details concerning these, reference is made to the Circular.



GLEANINGS.

Information received from the Agricultural Superintendent, St. Lucia, shows that the cacao crop of the island promises to be good, but will probably be somewhat late in the Soufrière District. It has reached its best development in the district of Fond St. Jacques.

It is reported from H. M. Legation at Buenos Aires that the first export of raw cotton, amounting to 200 tons, from the Argentine Republic, recently took place. Statistics show that at present about 4,340 acres of land is in experimental cotton cultivation, in the Argentine.

According to *Diplomatic and Consular Report*, No. 4639 Annual Series, the total production of sugar in Réunion for 1910 was 39,000 tons, as compared with one of 39,500 tons in 1909. The amount of vanilla exported last year was 42 tons; in 1909, 1908 and 1907, it was 39½, 70, and 48½ tons, respectively.

Among the agricultural exports from Mexico during the year 1909-10, the following had the values stated: henequen (sisal hemp), £2,255,657; coffee, £817,364; timber, £254,428; raw tobacco, £67,602; dyewoods, £43,626. These are all decreases on the values for the previous year, except in the case of timber and dyewoods.

It is satisfactory to be able to report that good rains fell in Nevis toward the end of last month, and that the prospects for the coming season are probably better than those recently formulated. The cotton crop had not yet been established at the end of September, but many hundred acres had been planted, chiefly during the last week of the month.

In the *Agricultural News*, Vol. X, p. 247, a description was given of a transplanting spade, based on information contained in the issue of *The Field* for May 20, 1911. Since this, *The Field*, in the number dated July 1, 1911, states further that the address of the inventor and supplier of the implement, the price of which is about 25*s*., is Förster Dostal, Köllein, Oesterr-Mahren, Austria.

The year 1910-11 was one of general prosperity for Burma. Some depression resulted from unsuccessful speculations in rice and in investments, but it need not be anticipated that this will have an enduring or widespread effect. The rice crop, always a ruling factor in the trade of Burma, was a good one, and remunerative prices were obtained. Well established industries, such as the oil, timber and hide trades, continued to flourish, and newer enterprises, notably mining and rubber-planting, have made a sound beginning, which augurs well for the future development of the country. (*The Board of Trade Journal*, August 3, 1911.)

In St. Kitts during September, the cane crop in the Valley District was still suffering from drought, though in the Northern District conditions were more favourable. Useful rains had been received, but much more was needed for the proper growth of the canes. Cotton was making good progress generally, though a certain amount of loss had resulted from attacks of the cotton worm.

The distribution from the Botanic Station, Antigua, during last month included 4,413 limes, 86 mahogany plants and 194 miscellaneous plants. The work included the supplying of numerous shrubs and trees to take the place of those in the Station as well as of some that had been planted on Arbor Day, which had perished from the effects of the recent drought. Advantage has been taken of the improved weather conditions in Antigua to plant cotton, sweet potatoes and other crops.

A bulletin of the condition of crops in Egypt on September 1, received from the Department of Agriculture, shows that in regard to cotton there has been an increase of parasites, but that the strenuous Government operations have resulted in making the third brood of cotton worms small and distributed in widely scattered batches. The attacked plants have now made a good recovery but the crop is at least ten days late, and a continuance of warm weather was desired for the control of the boll worm. Small patches infected with plant lice have been reported.

The *Experiment Station Record* of the United States Department of Agriculture for June 1911, p. 609, contains a reference to a method which has been devised by N. Caro for determining the nitrogen in combination as cyanamide and dicyandiamide. The method is based on the fact that cyanamide may be precipitated as a compound of silver from an ammoniacal solution; while dicyandiamide is also precipitated from the filtrate as a silver compound, by the addition of potassium hydroxide. In both cases the determination of the nitrogen in the precipitates is made by means of the Kjeldahl method.

At the recent meeting of the British Association, Sir Daniel Morris, K.C.M.G., brought to the notice of the Botanical Section a branch of the Japanese Euonymus (*Euonymus japonica*) which was attacked by the disease Oidium. This disease has been spreading steadily in England, and Sir Daniel expressed it as his opinion that, unless precautionary measures are taken, the plant will cease to exist as an ornamental shrub in the South of England. He also made reference to the measures for the control of diseases of imported plants that exist in the West Indies, pointing out that similar measures might well be adopted by the British Government.

The *Report on the Progress of Agriculture in India* for 1909-10, p. 42, refers to the fact that the cultivation of sugar-cane in Malabar is practically unknown and that this, as well as the details of making jaggery, have had to be taught to the people from the beginning. New varieties of cane have been introduced, and attention is drawn to the fact that the increased profits to the cultivators through the employment of new canes are larger than the whole cost of the local department of agriculture. Among the new canes reference is made to the introduction of one of the Barbados seedlings, which is stated to possess a very high sugar content and to be a most valuable acquisition to India.

STUDENTS' CORNER.

OCTOBER.

Second Period.

Seasonal Notes.

During the time of the lime crop, which will probably continue until the end of December, measures should be taken for the suitable protection of drains in the cultivations, as well as of neighbouring streams, in order to prevent the fruits from being washed away at the time of heavy rains. In going through the plantations, note should be made of trees that are producing excessively heavy crops, and these should be carefully observed, in order to determine the effects on the plants of a large production of fruit. Such a condition is likely to weaken the trees, and interfere with their power to bear an adequate crop during the next season. It will be well to apply to each of such plants a dressing of 8 oz. of sulphate of ammonia. Where this treatment has been adopted observations should be made in order to determine the exact effect, if any, of the manure. Why is it that some lime trees produce more fruit than others, even when they are all of the same age? How are attacks of scale insects related to the production of fruit, and the power of the tree to resist adverse circumstances?

Fruits which have ripened and dropped to the ground should be collected as soon as possible. Before they are used for making lime juice, that is to say, previous to placing them in the mill carrier, they should be washed, in order to remove small stones and grit. What are the chief objections to the presence of such foreign bodies?

In regard to the concentration of lime juice, careful notes should be made with reference to all parts of the process. These will include information in relation to such matters as the kind of fuel used, the amount required and the citric acid content of the juice.

The present is the time for sowing lime seeds, in order to obtain plants for setting out during next season. It should be noted that lime plants usually come true to seed. If it were otherwise, the adoption of such a method of planting would be dangerous, and it would be necessary to employ some method of propagation by vegetative means. Discuss the matter in relation to such a crop as cacao or cotton.

The grafting of cacao should commence at the present time, and the work will be done as far as possible in sheltered spots in order to give the best chance for the raising of successful plants from the grafted material. Where a cacao drier is used, it should be examined in order to make sure that it will be ready for use, and in an efficient condition when it is required. The fermenting boxes should also be overhauled. During this part of the season the strictest outlook is needed for cacao diseases. Obtain as much information concerning these as possible, not only from descriptions, but what is more important, in the plantations themselves, and note what measures are taken for their prevention and control.

In the Students' Corner on page 301 of this volume of the *Agricultural News*, paragraph 2, last line but two, it should be stated that lime juice may be filtered after coming from the still, instead of after concentration; in the latter case filtering would be a difficult matter, and inadvisable for other reasons. The usual course is to permit the juice to settle while it is yet hot from the still.

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) What is meant by the rotation of crops, and what are its chief advantages?

(2) Mention the precautions that should be taken in pruning plants.

(3) State what classes of insects are broadly recognized by the agriculturist, in relation to their power to damage crops.

INTERMEDIATE QUESTIONS.

(1) State the differences between rotation crops and catch crops.

(2) For what purposes are plants pruned?

(3) Give an account of the measures to be adopted for the control of any two insect pests of different kinds.

FINAL QUESTIONS.

(1) Discuss a suitable rotation of crops in a district with which you are acquainted.

(2) Compare the results of frequent light, and occasional heavy, pruning for cacao. Discuss the advisability of pruning limes.

(3) State exactly how you would deal with an outbreak of any insect pest upon which you have made observations.

THE PRESERVATION OF PEN MANURE.

The chief methods adopted for the storage of manure may be designated as the box, pit and heap systems, and this classification covers in a broad sense all the methods generally adopted. In the box system, the animals are placed in a loose box, with a thick bed of litter, to which the waste fodder is added daily. The dung of the animals is trampled into and intimately mixed with the litter, which also absorbs the urine. In course of time the whole is trampled into a compacted mass, and by thus excluding excess of air, the fermentation is kept within bounds. In the pit system, the animals are placed on a hard floor, and the dung, urine and waste litter is daily thrown into a pit dug in the soil of the yard, and made as water-tight as possible. Dry earth is sometimes thrown on at intervals, in order to absorb excess of liquid, and often in very dry weather water is added, so as to keep the mass at the requisite degree of moisture. In the heap system, the animals stand on a hard floor, and the dung and litter are daily collected and thrown on a heap in the open. Sometimes in this case earth is also added.

These three systems were under trial on the Government farm at Bellary for many years, and the average results obtained may be taken with confidence. These show clearly that, from the same number of cattle, for the same length of time, and under the same conditions, the manure given by the box system is much greater in amount, and contains a greater proportion of all the manurial ingredients, and the value of the manure produced far exceeds that of the others. Compared with the pit system, the heap system has given somewhat better results, but this only occurs when the heap is carefully protected from heavy rains and from strong winds. If these precautions are not taken, then the losses caused by the rain washing out the soluble ingredients, and the wind removing solid particles, can become very serious, and considerable loss to the cultivator ensue. Further, if the heap is allowed to become too dry, the heat produced by the decomposition may become so great as to cause the destruction of part of the manure.

In the case of the pit system, the great source of loss is due to the liquid portion of the manure draining away, and the use of too small an amount of litter. These defects can readily be remedied. (From *Leaflet*, No. XIV (1911) of the Madras Agricultural Department.)

FUNGUS NOTES.

WOUNDS IN PLANTS AND THEIR TREATMENT.

PART 1.

Under the term Wound is included any destruction or removal of the living tissues of plants, whether by natural or artificial means. All plants whose aerial structures endure for any length of time are provided with a hard, dry outer covering layer, which serves to protect the inner tissues from the attacks of other plants, such as fungi, and of some, at any rate, of the members of the animal kingdom. In trees and shrubs belonging to the great class of Dicotyledons, this covering is known as the bark. It arises through the activity of a special layer of growing cells situated in the cortex. This layer gives rise to two kinds of cells. On the inside new living cortical cells are formed, on the outside cork cells are produced. These have special walls which are impervious to the passage of water, and, in consequence, the cells outside of them die. The mass of dry, thick-walled cells serves, however, to protect the inner tissues, since it is resistant to the attacks of bacteria and fungi, which can destroy readily the soft-walled living cells. Soft green plants and parts of plants are protected by the outer thick walls of the cells composing the skin or epidermis, but this protection is not so thorough as is that afforded by the bark.

It will now be apparent that the chief danger to plants attendant upon wounding, is the exposure of the inner unprotected tissues to the attacks of parasites, which may ultimately cause their death. In order to obviate this, dicotyledonous plants attempt to re-cover the wound with bark, and the degree of success attendant upon this endeavour depends largely upon the size of the wound, its nature, and the general conditions to which the plant is subjected. The covering is formed by the growth of the cambium at the edge of the wound, by which means a plate of tissue is produced which extends totally or partly over the exposed surface. This plate is known as a callus.

Natural wounds are those caused by the falling of leaves, fruit or twigs, when these are purposely cut off by the plant itself. They do not form a source of danger to the tree, since prior to the fall of the parts removed, a special corky layer is produced over the inner tissues, which their disappearance would otherwise leave exposed.

Artificial wounds are due to several causes, among them may be mentioned the action of wind, of animals of all kinds including man, and of other plants, such as fungi. They comprise all wounds made in pruning or in removing diseased tissue.

Intentional wounds. Under this head are included all wounds made in pruning or in removing dead or dying parts of plants. Such wounds are often necessary for various reasons, though it is undoubtedly a great mistake to prune more than is absolutely required for the best growth and development of the plants; or in the case of trees grown in cities, for the convenience of the general public. In the case of permanent crops in particular, such for example as cacao, limes and Para rubber, the extent of the pruning given should never be greater than is shown by experience to be inevitable, and the operation itself should be conducted with all due care.

In the old days, before the principles underlying careful pruning were fully understood, little attention if any was paid to the method employed. At the present time, however, certain fundamental principles are fully recognized. In the first place, it has been found that trees can entirely cover over any wound, caused by the removal of a branch up to 4 inches in diameter, if it is cut off so that the exposed wood presents a smooth surface flush with, and parallel to, the bark of the trunk. Small branches should, therefore, be removed with a saw as close to the surface from which they arise as is possible, the cut passing through the bulge at the base of the branch. The surface may then be furnished with one of the protective coverings which are described below. This prevents the entry of organisms causing disease, until the bark has entirely covered the wound.

When a large, heavy branch has to be removed, it is not safe to commence sawing it away directly. If this is done, the branch often breaks from its own weight and tears a large portion out of the stem, making an ugly irregular wound that is difficult to protect. To avoid this, a cut should first be made on the under side of the branch at about 1 foot from the stem and extending nearly half-way through the branch. Then a second cut should be made on the upper surface about 3 inches further from the stem, and should be continued until the branch falls off. Finally the stub should be cut off flush with the stem. The exposed surface must then be protected as is mentioned below.

Another kind of wound involving an actual cutting into the tree may be necessary when diseased patches such as are caused by canker have to be excised, or when boring insects like the cacao beetle have to be removed. Such excisions should be done with a chisel or gouge and a mallet; all diseased tissue should be cut out and the treated surface smoothed off and covered.

Covering wounds. Various preparations have been recommended for protecting cut surfaces. One of those in most general use is, perhaps, tar. Ordinary coal tar is the only form that can be recommended; Stockholm tar is too thin and evanescent. Tar has, however, one drawback, namely that it kills the tissues round the edge of the wound and thus delays healing, while it also kills portions of the bark if it is allowed to drip on to them. A better substance is resin oil, which does not appear to exercise any harmful effect on living tissues. The drawback to this is that it cannot be seen easily what wounds have, and what have not, been treated. This difficulty may be overcome by mixing 4 parts of the oil with one of tar, when the tar renders the treated wounds readily distinguishable. (See *Agricultural News*, Vol. VIII, p. 61.) An excellent substance for covering wounds that are expected to heal over entirely is a mixture of 2 parts of clay and one of cow dung, with the addition of a little hair. If the entrance of wood-boring beetles is feared, a few drops of carbolic acid should be added to the mixture. Another covering substance that has given good results is white paint, while Petch suggests the application of the sediment formed when Bordeaux mixture is allowed to stand; this should be applied in a layer about ⅛-inch thick. Yet another mixture is stated by Petch to have been recommended in Germany as a cheap protective for large wounds, and has been subjected to experiment there. It consists of 500 grams of melted white resin, 500 grams of wood tar, 125 grams of printers' varnish (linseed oil varnish), and 60 grams of spirit.

Large wounds caused by the removal of big branches or the excision of cankered areas cannot be expected to heal over entirely. Petch suggests the following treatment in such cases. Round the edge of the wound over a strip 1 inch in width, which is likely to become covered by the wound callus, the mixture of clay and cow dung should be applied. The central portion should then be covered over with tar, resin oil, or one of the other substances mentioned above.

PINE-APPLE EXPORTATION FROM NATAL.

Experiments have been made recently in connexion with the exportation of pine-apples from Natal to England, and they are given attention in the *Agricultural Journal of the Union of South Africa*, Vol. II, p 83. The account shows that the purposes of the experiments were to ascertain the best means of packing and forwarding the fruit and to gain some knowledge of its market value. It is pointed out that the time which elapses between the picking of the fruit and its arrival in the London sale rooms is at least twenty-three days, and if the exportation of pines from all districts suitable for growing them is considered, the time extends to thirty days.

It is stated that the trial shipments have been promising in some respects, and disappointing in others. Their spasmodic nature fits them merely to indicate the lines upon which further extensive trials should be made. The experiments were conducted with the small 'Natal' pine-apple and the larger 'Cayenne' variety, usually known as the 'Small' and the 'Queen'. The former has been recognized recently by Mr. Fawcett, the late Director of Agriculture in Jamaica, as the 'Ripley'.

In regard to the practical work entailed in harvesting and exportation, it was found, first of all, best to cut the bottom bracts from the fruits instead of tearing them away in the usual manner. Another matter of importance is that the pines were never placed in heaps or allowed to come into contact with one another in any way. The fruits were cut at a place $1\frac{1}{2}$ to 2 inches along the stalk, the cut being made straight across. There was no advantage in sealing or singeing the cut ends. The pine-apples were sized and graded when being packed; it is advised that at least two grades should be made, and defective pines should never be shipped. For ventilated hold shipment it was necessary to employ single-layer boxes; these are equally suitable for use in cool chambers, but in this case double-layer boxes, provided that they hold not more than one dozen fruits weighing $1\frac{3}{4}$ to $2\frac{1}{2}$ ℔., may be employed. The fruits are always packed in alternate positions, whether the package has one or two layers.

For shipments in ventilated holds, closed boxes should be used, as it has been found that the free access of air causes the fruit to acquire an unsightly, leaden-grey colour. The material best recommended for packing is well shredded, thoroughly dry and white maize husks. Of the readily available material, wood wool of the quality usually employed in packing crockery was found to be best, while the fine grade wool proved to be disadvantageous. When wood wool is used it should be placed above and below the fruits, and in such a way as to protect them from contact with the sides of the boxes; the packing should be tight in order to prevent bruising. A matter which is not essential, but which is useful, is the wrapping of each pine in a couple of layers of soft paper, and it is suggested that the crowns should also be wrapped when the fruits are being shipped in a ventilated hold. The fruits, before wrapping, should be carefully brushed in order to remove any grit and sand that may be adhering to them. A final matter of more general interest is that the treatment of pine-apples with preservatives containing formalin proved to be most disastrous.

PROTOZOA AND SOIL SICKNESS.

The *Annual Report of the Porto Rico Agricultural Experiment Station* for 1910 (issued on July 17, 1911) contains an article by Oscar Loew, Physiologist at the Station, in which the question is considered as to the suggested connexion between the smallest forms of animal life found in the soil (Protozoa) and the inability of the soil to produce crops (soil sickness). It is pointed out that it is difficult to discover these protozoa under the microscope, but that they can be easily seen after a nutrient solution has been added to the soil, and a short time has been allowed to elapse. The suggestion is made that some of the protozoa may be encysted in the soil, particularly in dry seasons, and that they develop afresh in the food supplied by the nutrient medium employed. One of the best ways of demonstrating their presence is to make cultures of the soil in the usual way for the nitrogen-fixing organisms (Azotobacter). A method of determining the presence of protozoa and Azotobacter is reproduced in the report as follows:—

'For sake of convenience the test for both Azotobacter and protozoa may be mentioned here. A conical flask of about 100 c.c. capacity, provided with a cotton plug and containing 15 to 20 c.c. of glucose nutrient solution, free from nitrogen compounds, and 5 grams calcium carbonate, is sterilized and then about 10 grams of the carefully collected soil is added After shaking well the mixture is left at 16° to 25°C., protected against the direct rays of the sun, for one to three weeks. The glucose nutrient solution mentioned contains 1 0 per cent. glucose, 0·2 per cent. monopotassium phosphate, and 0·02 per cent. magnesium sulphate. A film of Azotobacter cells, gradually turning brownish, will appear, accompanied by various other microbes and by protozoa'

Attention is drawn to the theory of A. D. Hall, based upon the work of Russell and Hutchinson (see *Agricultural News*, Vol. IX, p. 33), that the protozoa in the soil are injurious because they prey upon the bacteria that change organic nitrogen compounds into compounds of ammonia, and thus make them available. The criticism is made that it was not stated in the paper by the authorities mentioned above, in which their work was described, whether the increase of ammonia after disinfecting the soil was observed immediately after treatment or after several days, when the number of microbes began again to increase. Doubt is also thrown on the circumstance as to whether all the protozoa were killed by disinfecting. The obtaining of an increase of ammonia immediately after disinfection would make possible another explanation than that of Hall, for some experimenters have observed an increase of soluble organic matter in the soil after treatment with antiseptics. The suggestion is made, further, that the influence of protozoa in relation to soil sickness can only be properly estimated when their relative numbers at different levels have been ascertained, and when more is known of the extent to which they are capable of affecting the multiplication of the bacteria.

To summarize, it is indicated that, while Loew agrees that Hall's theory may be correct in special cases, it does not serve as a general statement, and other possible causes of soil sickness than the action of protozoa are brought forward, such as: (1) the reduction in number of the beneficent organisms through large increases in the total number; (2) an unhealthy increase in the number of certain injurious microbes of fermentation and denitrification; (3) the presence of injurious parasitic organisms, which eat away the fine roots and root hairs of the plants, thus inhibiting their power of absorption from the soil; and (4) the existence of various harmful kinds of soil bacteria, both non-parasitic and parasitic.

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR, September 26, 1911; Messrs. E. A. DE PASS & Co., September 1, 1911.

ARROWROOT—2½*d.* to 3½*d.*
BALATA—Sheet, 3/4; block, 2/3 per lb.
BEESWAX—£7 10*s.* per cwt.
CACAO—Trinidad, 58/- to 65/- per cwt.; Grenada, 55/- to 60/6; Jamaica, 54/- to 59/-.
COFFEE—Jamaica, no quotations.
COPRA—West Indian, £28 per ton.
COTTON—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 15*d.* to 19*d.*
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—49/- to 63/- per cwt.
ISINGLASS—No quotations.
HONEY—28/6 per brl.
LIME JUICE—Raw, 2/-; concentrated, £18 10*s.* to £18 15*s.*; Otto of limes (hand pressed), 5/.
LOGWOOD—No quotations.
MACE—2/- to 2/8.
NUTMEGS—4½*d.* to 8½*d.*
PIMENTO—Common, $2\frac{3}{16}$*d.*; fair, 2¼*d.*; good, $2\frac{5}{16}$*d.* per lb.
RUBBER—Para, fine hard, 4/10½; fine soft, 4/6½; Castilloa, 4/4 per lb.
RUM—Jamaica, 1/6 to 5/-.
SUGAR—Crystals, 16/6 to 21/9; Muscovado, 12/- to 16/-; Syrup, 12/9 to 16/9 per cwt.; Molasses, no quotations.

New York.—Messrs. GILLESPIE BROS. & Co., September 22, 1911.

CACAO—Caracas, 12c. to 13c.; Grenada, 12¾c. to 13c.; Trinidad, 12½c. to 13c. per lb.; Jamaica, 11¼c. to 12¼c.
COCOA-NUTS—Jamaica, select, $35·00 to $37·00; culls, $20·00 to $21·00; Trinidad, select, $35·00 to $37·00; culls, $20·00 to $21·00 per M.
COFFEE—Jamaica, 14¾c. to 15¾c. per lb.
GINGER—9c. to 11½c. per lb.
GOAT SKINS—Jamaica, 53c.; Antigua and Barbados, 48c. to 50c.; St. Thomas and St. Kitts, 46c. to 48c. per lb.
GRAPE-FRUIT—Jamaica, $3·75 to $4·25.
LIMES—$5·75 to $6·50.
MACE—45c. to 52c. per lb.
NUTMEGS—110's, 10½c. to 10¾c.
ORANGES—Jamaica, $1·62½ to $2·00 per box.
PIMENTO—4½c. per lb.
SUGAR—Centrifugals, 96°, 5·75c. to 5·86c. per lb.; Muscovados, 89°, 5·25c. to 5·56c.; Molasses, 89°, 5c. to 5·11c. per lb., all duty paid.

Trinidad.—Messrs. GORDON, GRANT & Co., October 2, 1911.

CACAO—Venezuelan, $13·60 per fanega; Trinidad, $12·50 to $13·00.
COCOA-NUT OIL—88c. per Imperial gallon.
COFFEE—Venezuelan, 16c. per lb.
COPRA—$4·75 per 100 lb.
DHAL—$3·90.
ONIONS—$2·00 to $2·25 per 100 lb.
PEAS, SPLIT—$5·80 to $5·90 per bag.
POTATOES—English, $2·00 to $2·25 per 100 lb.
RICE—Yellow, $5·50 to $5·60; White, $5·75 to $6·00 per bag.
SUGAR—American crushed, no quotations.

Barbados.—Messrs. JAMES A. LYNCH & Co., October 7, 1911; Messrs. T.S. GARRAWAY & Co., October 9, 1911; Messrs. LEACOCK & Co., September 29, 1911; Messrs. E. THORNE, Limited, October 11, 1911.

CACAO—$10·50 to $12·50 per 100 lb.
COTTON SEED—$26·00 per ton; meal, $1·50 per 100 lb.; 2½ per cent. discount.
COTTON SEED OIL (refined)—60c. per gallon.
COTTON SEED OIL (for export)—54c. per gallon (in bond).
HAY—$1·30 to $1·40 per 100 lb.
MANURES—Nitrate of soda, $60·00 to $65·00; Cacao manure, $42·00 to $48·00; Sulphate of ammonia, $75·00 to $76·00 per ton.
MOLASSES—No quotations.
ONIONS—$1·75 to $3·00 per 100 lb
PEAS, SPLIT—$5·75 to $5·85 per bag of 210 lb.; Canada, $2·75 to $4·65 per bag of 120 lb.
POTATOES—Nova Scotia, $2·00 to $3·25 per 160 lb.
RICE—Ballam, $5·10 to $5·60 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
SUGAR—American granulated, $6·00 per 100 lb.

British Guiana.—Messrs. WIETING & RICHTER, September 30, 1911; Messrs. SANDBACH, PARKER & Co., August 18, 1911.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	$10·50 per 200 lb.	$10·50 per 200 lb.
BALATA—Venezuela block	No quotation	Prohibited
Demerara sheet	70c. per lb.	70c.
CACAO—Native	11c. per lb.	11c. per lb.
CASSAVA—	60c.	No quotation
CASSAVA STARCH—	$6·00	No quotation
COCOA-NUTS—	$12 to $16 per M	$10 to $16 per M., peeled and selected
COFFEE—Creole	16c. per lb.	19c. per lb.
Jamaica and Rio	18c. per lb.	19½c. per lb.
Liberian	10½c. per lb.	12c. per lb.
DHAL—	$3·40 per bag of 168 lb.	$3·70 per bag of 168 lb.
Green Dhal	$3·50	——
EDDOES—	64c.	——
MOLASSES—Yellow	None	——
ONIONS—Teneriffe	——	4c. to 5c.
Madeira	5c.	5½c.
PEAS—Split	$5·75 per bag (210 lb.)	$5·75 per bag (210 lb.)
Marseilles	$3·75	No quotation
PLANTAINS—	10c. to 20c.	——
POTATOES—Nova Scotia	——	$3·50
Lisbon	1½c. per lb.	No quotation
POTATOES—Sweet, B'bados	88c. per bag	——
RICE—Ballam	No quotation	——
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TANNIAS—	$1·08	——
YAMS—White	$2·16	——
Buck	$2·40	——
SUGAR—Dark crystals	$4·00	$3·60
Yellow	$4·50 to $4·70	$3·75 to $4·00
White	——	$4·25
Molasses	$3·25 to $3·50	None
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 Definite Purpose in Agricultural Work.

In a recent issue of the *Experiment Station Record* of the United States Department of Agriculture (Vol. XXV, p. 1), there occurs a thoughtful editorial note on the miscellaneous character of station publications, in which attention is drawn to the lack of precision that exists in the nature of many of the publications issued from experiment stations, and the evils that result therefrom.

It is pointed out that, in the developments that are now taking place in the United States, the functions of various organizations are becoming more defined and specialized; that it is the duty of certain organizations to undertake the imparting and dissemination of agricultural knowledge in its widest sense—a function expressed in the article referred to by the phrase Extension Work; while it is the concern of the experiment stations to carry out investigations, research and experiment, without having the necessity pressed upon them of popularizing their work and bringing it to the close attention of those for whom it is done

It is argued that the publications of various departments or organizations should tend to make this distinction: but it is complained that, so far from this being the case, most of the publications tend to mask the distinction, and mislead the public as to the nature and functions of the institutions from which they issue. The complaint is definitely stated in the following way: 'The number of publications [of the experiment stations] has greatly increased, but in the majority of cases this increase is not made up of accounts of the station's activity as a research institution. It consists largely in the number of popular and informational bulletins and circulars, which relate to the extension department rather than to the experiment station proper. These are merged in the general station series in a manner which often gives a wrong impression.'

With the large areas and wide interests covered by the Department of Agriculture of the United States and the various organizations connected therewith, there is little doubt that such an effort at specialization as is here suggested will be of immense service in economizing the energies of those engaged in the various duties and in informing the public for whose benefit these organizations or institutions exist, of the real nature of the duties they profess to undertake. In this way the public is enabled to judge more accurately of the value of the work that is done, and incidentally to form a clear idea of the needs of the institutions and to ensure the proper appropriation of funds, and of other means of support and management.

To scientific workers in agriculture, the specialization aimed at would prove to be of great assistance. The immense volume of agricultural literature renders it impossible for any individual to deal with more than a very limited portion, and there is always the fear that some important point may escape notice; while the feeling also exists that valuable time may be lost by expert workers in reading much material having solely for its object the presentation of well-known, established facts in a form that will render them attractive and ultimately serviceable to less informed readers.

What is said with regard to publications may in a great measure apply to the institutions themselves. Under the large conditions of the United States, it is possible to ask for a marked degree of specialization in the work of various institutions dealing with agricultural matters in their different phases; hence, as time goes on, an increasingly complete severance of such functions as teaching and investigating, and of specialization in these branches themselves, may be expected. With large communities and complex conditions, specialization is an essential feature of development; but one which, if carried to extremes, brings concomitant disadvantages.

In turning attention to colonial and particularly West Indian conditions, it is readily seen that these preclude specialization in any high degree; indeed, a feature of colonial life is its requirement of ability to cope with a wide range of conditions and circumstances and to perform functions that, in older or larger communities, would be assigned to special experts. This phase was largely in evidence in the United States until quite recently, but appears, at least in populous centres, to be passing away. It is a state that still exists to a considerable extent in communities in the West Indies.

This condition is reflected in the work of local Departments of Agriculture in the West Indies, with their associated Botanic and Experiment Stations. Popular conception, rarely precise, demands of these most diverse duties—duties that fluctuate largely from year to year with the changes in local conditions and needs. These institutions are required to combine the functions of experimenting in the introduction of new crops and new methods or the improvement of old ones; of performing the duties known as extension work, that is to say the efforts at popularizing and applying the knowledge so gained; while at the same time they are called upon to act as centres for the distribution of plants and seeds needed for local industries, thus undertaking many of the functions which in larger places devolve upon commercial nurserymen. Further, they are regarded as the repositories of information concerning local agricultural industries, and particularly as regards difficulties or troubles that may arise, as for example, in connexion with pests or diseases, or imperfect methods of dealing either with soils or products. There is the added fact that in the majority of cases the work is carried on in surroundings having the nature of parks or gardens, regarded by the public as places of resort for pleasure and recreation.

No doubt this must be accepted as essential to the particular stage of development; but what is implied by the conditions should be clearly evident to the minds of those responsible for maintaining and working agricultural institutions under these circumstances. As has been indicated, the state of evolution of the experiment station in the West Indies necessitates its employment in several various directions and for many different needs. It is therefore the duty of the worker in it carefully to discriminate between the purposes for which it is employed; while those for whom it exists should be able to take a broad view of the range of its activities, in order that they may appreciate the fact that its work cannot be made subservient to any limited set of interests.

The matter under discussion required this digression from the consideration of the purposes fulfilled in the issue of publications, to that of the many-sided work of the experiment stations. To return to the former, it is expedient, in this place, to indicate the functions of the chief publications issued by this Department. In these an attempt is made to attain, at least in some degree, the specialization which is requested in the publication named at the commencement of this article. This present journal, the *Agricultural News*, has for its particular object, to state it shortly, that which is epitomized in the expression Extension Work; while the *West Indian Bulletin* purports to deal with matters of more precise scientific or administrative interest. In another direction, the Annual Reports of the several Botanic and Experiment Stations are confined to statements of the work accomplished during the periods under review: there is little attempt in these to undertake the function that has been termed Extension.

In view of the general considerations above, it should be evident that, as the work of agricultural investigation must derive its scope from its particular object; in the same way, it is expedient that those who issue agricultural publications should make their contents consistent with their purpose. If these matters are kept well in mind on the part of the workers in connexion with agricultural investigation, much of the misunderstanding that is evidenced from time to time by those for whom they work will cease to exist and there will be a corresponding increase of sympathy between the adviser and the advised.

SUGAR INDUSTRY.

SUGAR-CANE GROWING IN EGYPT.

The following account of the way in which the sugar crop is produced in Egypt is taken from Vol. II of the *Text-book of Egyptian Agriculture*, issued by the Ministry of Education, Egypt:—

First year sugar cane follows either winter berseem [*Trifolium alexandrinum*] or bare fallow in ordinary rotations, but in some cases the land is left fallow from the preceding crop of wheat.

A common rotation is: first year, sugar-cane; second year, sugar-cane; third year, berseem followed by doura [maize or sorghum]; fourth year, wheat with or without doura following.

Another rotation practised which is less severe on the land is: first year, sugar cane; second year, berseem with or without doura; third year, bare fallow (or wheat).

Cane may be left three years in the land, but in the third year the yield is small and the profit much reduced unless the plants are well tended and manured.

Cane, like cotton is almost always followed by berseem, to enable the land to recover somewhat from the exhaustive effect of the cane crop.

The plant is invariably propagated by cuttings in Egypt, the best for the purpose being the tops of second year canes. These are poorer in sugar and therefore less valuable for sugar extraction, but give canes of greater vigour and with a higher percentage of sugar than do the lower parts of the stems. Generally, however, the whole of the stem is used. This point is worthy of notice in the present position of sugar cane cultivation.

The land must be ploughed to a good depth, two or three times, zaahaffed [by dragging a balk of timber over it] and ridged 70-90 cm. [2 feet 4 inches to 3 feet] apart. Very deep ploughing to a depth of 60 cm. [2 feet] as practised in many sugar-cane growing countries does not seem necessary or profitable in Egypt.

The canes intended for seed purposes are stripped of their leaves and cut into lengths containing three or four nodes. The amount necessary is about 80 kantars per feddan [about 7,580 lb. per acre].

The commonest method of planting is then to place these pieces end to end, in the bottom of the furrows A plough is then run up the ridges, splitting them, so that the soil from the ridges falls over and covers the pieces of cane in the furrows. Water is at once applied, and again after twenty to twenty-five days.

Sowing usually takes place in February and March. The earlier date is in Upper Egypt and the later in Lower Egypt. In parts of Upper Egypt, however, particularly to the south, sowing often takes place after the winter crop is off; but this practice is not to be recommended, as it throws the harvest late, and exposes the crop to damage by frosts.

When the shoots are about 30 cm. [1 foot] high, the land is ridged again, so as to leave the shoots on the tops of the ridges. This is done by ploughing between the row and then fassing [hoeing].

Another method of sowing is to ridge as before, water, and press the canes in the mud lengthwise, by the feet. Subsequent fassing brings the cane to the middle of the ridges, as in the case of the cotton plant. The after-management of the cane crop consists in lightly fassing after each watering when the land is dry, and keeping down weeds. The crop is watered every twenty to twenty-five days until August, when the plant begins to ripen. When the rise of the Nile occurs two or three very heavy waterings are given with the red water, and then water is applied sparingly, and for the last month or six weeks none is applied.

Too little water in the summer will result in a crop with short nodes, and a consequent reduction in yield Too much water at high Nile, or near the ripening, results in a cane poor in sugar. The effect is particularly felt if water is given less than a month before ripening. By it, ripening is retarded and the sugar content much reduced.

The yield of cane varies considerably. On poor land, or if the land is not heavily manured after the first year crop, the second year crop or khilfa shows a great diminution and a third year crop will rarely pay under these conditions.

The crop is very exhausting. For this reason it is usually heavily manured where possible with farmyard manure. A common dressing is 20 cubic metres per feddan [$1\frac{1}{20}$ acre]. This is applied in two dressings, one on ridging and the other fassed in at the last fassing.

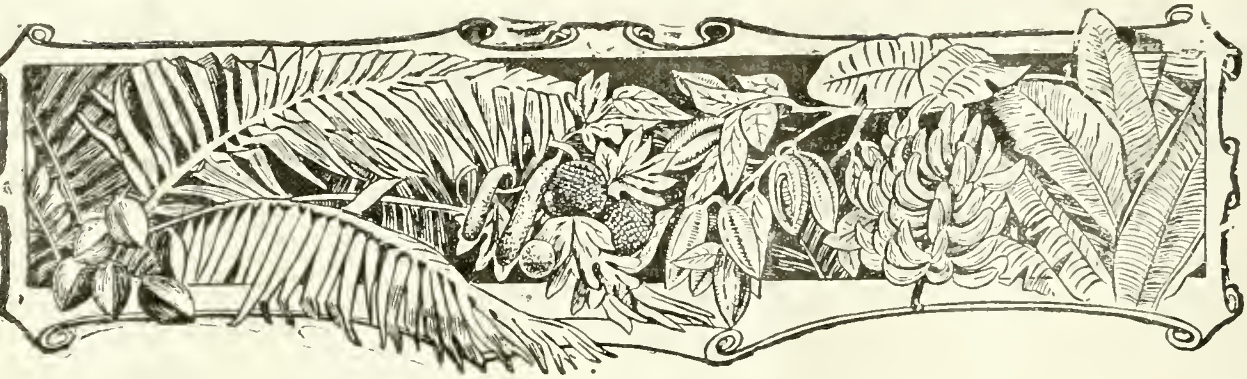
This is sometimes omitted with first year canes but is essential to success with second year canes.

Talfa [a marl or clay containing nitrate of soda] and koufri [manurial matter from ancient villages] are commonly applied to the crop where available, but the quantities vary greatly.

The effect of artificial manures is a little uncertain at present and their use seems not thoroughly understood. Nitrate is recommended at the rate of about 100 kilogrammes per feddan [210 lb. per acre].

Harvesting takes place in November till January according to district, time of sowing and climatic conditions. The canes are cut by a hook, and ten to twelve men will harvest an average feddan in one day. The cane should be sent to the factory as soon as possible after cutting as it begins to deteriorate.

Before sending to the factory the canes are trashed, i.e. the lower leaves are stripped off. Some cultivators do this before they are ripe, to improve ripening.



FRUITS AND FRUIT TREES.

LIME JUICE INVESTIGATION IN GRENADA.

Particulars have been forwarded by Mr G. G. Auchinleck, B.Sc., Superintendent of Agriculture, Grenada, of investigations that have been carried out by him in relation to the juice from thick-skinned and thin-skinned limes, prepared in Grenada, and to samples of the juice from Carriacou.

The results obtained are as follows:—

Source of juice.	Sp. Gr. at 29° C.	Citric acid, oz. per gal.
Grenada thick-skinned limes	1·0292	11·79
,, thin-skinned limes	1·0298	15·52
Carriacou No. 1	1·0332	16·08
,, No. 2	1·0339	17·25

In giving these results, Mr. Auchinleck points out that in order to concentrate these juices to a content of 100 oz. citric acid per gallon they would have to be boiled as follows:—

Grenada thick-skinned	$8\frac{1}{2}$ to 1
,, thin-skinned	$6\frac{1}{2}$ to 1
Carriacou No. 1	$6\frac{1}{4}$ to 1
,, No. 2	$5\frac{3}{4}$ to 1

A NEW METHOD OF CORN POLLINATION.

Under this heading, an article in the *American Breeders' Magazine*, Vol. II, No. 1, describes what appears to be a handy method of corn pollination. In such work the chief difficulties arise in regard to preventing the access of foreign pollen to the silks, particularly that which is bound to be carried on the hands or instruments of the operator.

In employing the method, the first requisite is to cover the tassel and the silk with paper bags; 10-lb. Manila paper bags of the kind obtainable at groceries are useful for the purpose. In each case the mouth of the bag is carefully gathered round the stalk and pinned with a long, strong pin. It is necessary that the covering of the tassel should be done before the anthers have protruded, and that of the silk before this has begun in the least to appear outside of the husk.

The best time for pollination is when the silks have grown to a length of 5 or 6 inches, having remained in the bag the whole time. As the silks appear successively, commencing from the base of the cob, pollination of the whole ear extends over some time; in nature this is from a week to ten days. It follows that, in ordinary artificial pollination, the pollen must be applied two or three times in order that as many ovaries as possible may be fertilized. It is believed that by employing the method to be described, one pollination, only, is necessary, and that the access of foreign pollen is entirely prevented.

The method depends on the use of a common insect powder 'gun' or spring blower for applying the pollen to the silk. The most handy kinds are those which can be separated in halves for the purpose of being filled. It is useful to have the nozzle of the blower cut down to a length of $\frac{1}{2}$-inch and drawn out to the size of the original aperture, in order that any anthers which clog it may be pushed back with a pin.

For the work of pollination, anthers and pollen are obtained from a bag which has been used to cover one of the tassels; these are emptied into the blower, which is quickly closed. The latter is then used for blowing the pollen on to the silk to be pollinated, the bag covering the silk being quickly removed and replaced. After use, it is necessary thoroughly to clean the blower from any remaining pollen. For this purpose, it is left for about a quarter of an hour in 95 per cent. alcohol. In order to prevent the alcohol from dissolving the varnish on the fabric of which the upper part of the blower is partly made, this should be boiled in paraffin wax until bubbles cease to rise from the fabric. The impregnation with wax not only prevents injury from the alcohol, but renders the blower more nearly air-tight.

It is evident that, among the advantages of such an apparatus used in this way are: speed of action: easy and complete sterilization of the apparatus; the avoidance of the waste of pollen; and the provision of a means of directing the pollen exactly where it is wanted.

In actual practice, two operators have been employed simultaneously in the work. One of these removes the bag from the tassel, empties the pollen into the blower, and then holds the bag beneath the tassel in order to catch any pollen that may fall while pollination is being done. The work of the second operator is that of pollinating alone: he is careful not to handle the pollen bags, or to use his hands for any purpose that would enable pollen to become rubbed on them. As soon as pollination has been effected, what remains in the blower is emptied into the bag that was over the tassel, and, as has been stated, the bag from the silk is replaced immediately. It is useful to use three blowers: one for the pollination at the time, another which is drying after sterilization, and a third that has just been used and is lying in the alcohol for sterilization. If the work is done in the way described, it is possible for two men to polliuate eighteen plants in an hour without any risk of the access of foreign pollen. This risk may in some cases be minimized further by detasselling all plants whose pollen is not required.

RUBBER CULTIVATION IN THE CONGO.

The following particulars regarding the cultivated rubber industry in the Congo State have been furnished by H. M. Consul at Boma.

The experimental cultivation of *Hevea brasiliensis*, *Funtumia elastica* and *Manihot Glaziovii* is being continued on a much enlarged scale on the plantations already in existence, and extensive new areas are about to be brought under cultivation. A number of the larger plantations, equipped with mechanical appliances for coagulating the latex, are being devoted to the exclusive cultivation of *Hevea brasiliensis*; while many of the smaller plantations, entailing useless outlay in their upkeep, have been abandoned. About 1,000 hectares (2,470 acres) have recently been planted with Hevea. These plantations occur at Musa, Likimi, Dundusana, Mobwasa and Yambata in the Bangala district, Waka and Woma in the Equator district, Kambuya and Avacubi in the Stanleyville district, and Bokala in the Middle Congo. Of *Funtumia elastica*, or the Ireh rubber tree, the most common in the Congo, there are some 3,461,000 trees, of which the greater part is reported to be thriving satisfactorily. The older trees of seven to nine years that have been tapped have yielded a rubber of good quality, that commanded a price in the Antwerp market ranging between 17 and 20 francs per kilog. (6*s.* and 7*s.* 3*d.* per lb.). The present yield of the six-year-old trees is said to be 100 grammes, which would represent a return of 62½ kilogs. per hectare of 625 trees.

Hevea brasiliensis, first introduced into the Congo by private initiative, is now being adopted by the Government as a most promising plant, adaptable to the climatic conditions and inferiority of soil, and maturing rapidly. The Government has planted 30,000 trees of this species, and has ordered seven extensive areas in the Bangala and Equator districts to be brought under cultivation.

In view of the higher prices commanded by *Manihot Glaziovii* and the advantages that are claimed for this tree over *Funtumia elastica*, the Government has decided to give extensive impetus to its cultivation. This rubber experimentally produced in the Congo, has fetched 23 francs per kilog. (about 8*s.* 4*d.* per lb.) in Antwerp, on account of its excellent quality. Up to the present, experiments with *Manihot Glaziovii* have been conducted at some twenty Government posts, the plants numbering about 185,200; the results are considered to be encouraging.

Experiments are also in progress with other species of rubber plants such as Castilloa, various species of Manihot and Ficus, as well as a latex-yielding Euphorbia introduced from Central America. Attention will also be given to the old rubber lianas, of which some 11,000,000 are known to exist. It is believed that lianas will yield an appreciable quantity of rubber in the space of a few years, but that the upkeep of plantations of less than 50,000 lianas will not pay.

As soon as the tapping of the trees becomes practicable, it is proposed to conduct the industry on scientific lines such as those obtaining in Malaysia, particular attention being paid to the process of coagulation, washing and drying, for which the most approved plant will be acquired. The smoke-drying system in vogue in Brazil is likewise being considered with a view to its adoption in the Congo.

Visiting a number of rubber plantations, including the botanical gardens at Eala, H.M. Consul was struck by the great number of trees that had been uprooted by the winds, apparently on account of some deficiency in the soil that stunts the subsoil development of the tree. Other trees were perishing owing to the ravages of an insect known as the borer, while from conversations with botanists it would appear that *Funtumia elastica* does not yield much latex after the first tapping. These signs, coupled with the fact that though this industry is ten or more years old there have been no exports of cultivated rubber beyond a few trial shipments, seem somewhat discouraging. Hopes are now, however, being centred upon *Manihot Glaziovii*, which yields an excellent rubber; this too, however, has not yet emerged from an experimental stage of development. (From *The Board of Trade Journal*, Vol. LXXIV, p. 423.)

AGRICULTURAL RESEARCH IN ENGLAND.

An article in the *Journal of the Royal Society of Arts* for September 22, 1911, contains a review of the scheme which has been devised, with the assistance of the Board of Agriculture and Fisheries, for agricultural research in England and Wales. The Treasury has now agreed that funds should be allocated for the development of the scheme, and when this is in full operation, the amount to be distributed by the Board for agricultural research will be £50,000 a year. The scheme provides for: (1) a system of agricultural research which will secure for each group of the problems affecting rural industry a share of attention roughly proportional to its economic importance; (2) the concentration of scientific work on each group at one institution, or at institutions working in combination; (3) grants for special investigations for which provision may not otherwise be made; (4) the grant of scholarships with a view to the increase of the number of men fully qualified to undertake agricultural research; (5) the carrying out of investigations into problems of local importance, especially those involving the application of modern research to local practice, and the provision of scientific advice for farmers on important technical questions.

The importance of securing the continuity of work has been recognized, and in connexion with this, provision has been made for supplying permanent staffs of specialists and experts. The groups of subjects for which grants will be made are connected with plant physiology, plant pathology, plant and animal production, agricultural zoology, and the economics of agriculture. Where provision has not been made otherwise, a sum not exceeding £3,000 will be given for the assistance of special investigations; the conditions regarding the grants will be defined by the Board's Advisory Committee on agricultural science.

On the condition that a sufficient number of suitable candidates present themselves, twelve scholarships, of the value of £150 per annum, and tenable for three years, are to be given in the present year and in the two following. There will also be grants to certain educational bodies in England and Wales for the purpose of enabling them to give scientific advice to agriculturists, and to carry out experiments in regard to matters of local interest that require investigation where they occur. It is thus hoped to supply an expert staff composed of both purely scientific and practical workers, who will give their attention to the solution of difficult local problems, and assist in the application of science to practice.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date October 9, with reference to the sales of West Indian Sea Island cotton :—

Since our last report, about 400 bales of West Indian Sea Islands have been sold at steady prices; they include St. Croix, Nevis, Anguilla, Virgin Islands, Jamaica, Antigua, St. Kitts, at 15*d.* to 16*d.*, a few Montserrat at 17*d.*, and St. Vincent 17½*d.* to 22*d.*

Carolina Islands are being held for 20*d.* and over, without finding any buyers. On the other hand, the best Florida which competes with the lower qualities of West Indian, is being sold freely at 13*d.*

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending October 7, is as follows:—

The receipts during the week have been 81 bales, making the total amount to date 104 bales. This cotton has not yet been sampled or put on the market for sale. During the coming week it is possible that the Factors may think well of putting on sale some of the cotton. In this event they will sample the receipts and admit of our seeing the quality of the crop. The old crop cotton held over from last year is practically withdrawn from the market, being held at extreme prices.

RECENT SPECIAL MEETING OF THE BRITISH COTTON GROWING ASSOCIATION.

The following information concerning a special meeting of the Council of the British Cotton Growing Association, held in Manchester on September 13, for the purpose of meeting Dr. Francis Watts, C.M.G., Imperial Commissioner of Agriculture for the West Indies, and Professor P. Carmody, F.I.C., F.C.S., Director of Agriculture, Trinidad, is abstracted from the *Manchester Courier* for Thursday, September 14, 1911.

The object of the meeting was to consider the special needs of the Lancashire spinning trade in regard to the finer qualities of cotton grown at present in the West Indies, and to give the visitors information concerning future requirements, as well as to obtain from them information in relation to the progress of cotton production in the West Indies.

In the absence of the President, Lord Derby, the visitors were welcomed by Mr. A. J. Hutton, Chairman of the Council of the Association, who stated that the members of the latter always appreciated the opportunities for holding similar conferences. It was their desire to gain information concerning the cotton industry in the West Indies, and at the same time there was no doubt that the visitors were in want of information such as could be given by the Association. Mr. Hutton referred to the damage done to cotton in South Carolina by the recent storm, and gave the assurance that whether this was as great as had been reported, or not, it was likely that prices for West Indian cotton would be good.

Dr. Watts expressed equal appreciation, on behalf of himself and his colleague Professor Carmody, of the opportunity that the conference gave for obtaining direct information. The object was to create interest, and by obtaining assurance that the standards set for cotton growers were quite correct, to assist them in gaining the best market for their produce. He referred to the part taken by St. Vincent in producing nearly all the superfine type of Sea Island, in the West Indies, and thought that St. Vincent should continue to supply this part of the industry, while it would be best for the other colonies to confine their attention to the grades of Sea Island lower than this—that is to say, to grades which he included under the designation Dixon Type. In continuation, Dr. Watts discussed, with statistics, the production and the possibilities of development in Montserrat, St. Kitts, Nevis, Antigua and the Virgin Islands, giving information concerning the way in which cotton is produced under the different conditions, and referring to the work of the Officers of the Department of Agriculture, particularly in relation to the provision of assistance to the small producer. After answering questions and taking part in a discussion of details, Dr. Watts expressed his thanks for the information that had been given, and again emphasized the importance of the possession of reliable information as to the standards of cotton that are required by spinners.

The means taken to encourage cotton-growing in Trinidad and Tobago were then discussed by Professor Carmody, who made special reference to the work in connexion with cotton production that had been done by Mr. T. Thornton, an expert of the British Cotton Growing Association, who had been formerly attached to the Imperial Department of Agriculture. Many questions were answered by Professor Carmody, and after a general discussion had taken place on the cost of producing the finer qualities of raw cotton, the conference adjourned for a complimentary luncheon to the visitors.

After luncheon, Mr. Hutton, in submitting the health of Dr. Watts and Professor Carmody, emphasized the importance of increasing the areas supplying cotton to Lancashire. He referred to the spread of the boll weevil in the United States, and the likelihood of its eventually reaching the Atlantic coast, when Sea Island cotton would be no longer available in the United States for supplying to England. In sight of the fact that the fine spinning industry was increasing daily in importance, this circumstance was of a serious nature, and in view of the position, the visit of Dr. Watts and Professor Carmody was particularly appropriate. Mr. Hutton referred to the experimentation with cotton that had been conducted in the West Indies, and emphasized the importance of the assembling of a committee for the purpose of the dissemination of useful agricultural information among the British Colonies.

In reply, Dr. Watts made acknowledgement of the great assistance that has been rendered by the British Cotton Growing Association in relation to cotton, to the Imperial Department of Agriculture He had been associated with the new cotton-growing movement since its inception in the West Indies, and at every stage of this the British Cotton Growing Association had been brought into consultation; in this connexion he mentioned the courtesy of Mr. Wolstenholme in replying to the many questions that had been addressed to him by planters and others during the time. Dr. Watts made reference to the fact that certain islands in the West Indies are now entirely dependent on cotton, and hoped that, other things being equal, British consumers would give a preference to the production of British territory—a statement that was received by the meeting with acclamation. Finally Dr. Watts referred to the Agricultural Conference to be held next year in Trinidad, and expressed the hope that among the delegates to this Conference, one at least would be received from the British Cotton Growing Association.

In turn, in his reply, Professor Carmody also made reference to the usefulness of the support of the British Cotton Growing Association in connexion with the dissemination of information, alluding to the responsibility accepted by those who handed on that information. He also referred to the idea of forming a central department which should distribute information concerning agricultural work throughout the British Empire.

The Chairman invited Sir Charles Macara to make observations on the matters that had come up for discussion, and in accepting the invitation, this speaker drew attention to the large part that had been taken in the past by the West Indies in cotton production for England, and said that it was pleasant to find that these islands realized fully the value of the cotton-growing facilities possessed by them. The Lancashire cotton spinners were using finer counts every year, and the supply of cotton for these was of the greatest importance to Lancashire. Referring to the Agricultural Conference, Sir Charles gave attention to a suggestion that a representative of the operatives, as well as of the employers, might be provided, and the Chairman stated that the Association would be pleased to pay the expenses of such a representative.

After a vote of thanks had been given to the Chairman, the proceedings concluded.

Sakellarides Cotton.—The *Textile Mercury* (for September 9, 1911) states that the discoverer of this cotton, after whom it is named, has so far made over £100,000 by his enterprise. During the present year it has been cultivated on a large scale in the districts of Ziftna and Santa, and has appeared to show immunity to attacks of the cotton worm. This pest has cost the Egyptian Government, this year, nearly £50,000 for control, and private individuals about £100,000, the total of which sums is very small in comparison with the value of the crop, which is estimated at £31,250,000.

INDIA AND THE WORLD'S COTTON SUPPLY.

The following is an abstract of a paper read by Mr. J. Howard Reed, F.R.G.S., before the Section of Economic Science and Statistics of the British Association at Portsmouth, 1911. It is taken from the *Journal of the Royal Society of Arts* for September 22, 1911.

In giving this, attention is drawn to an abstract of another paper, on cotton-growing within the Empire, by the same authority, which was specially prepared for the *Agricultural News*, and appeared in the issue for June 24, 1911:—

Shortage of raw cotton has become an almost chronic condition with which the cotton manufacturer has to contend. It has produced abnormally inflated prices, given an opportunity to cotton gamblers, caused loss and embarrassment to manufacturers, and produced distress among cotton operatives. 'Shortage' has not been produced by a falling off of the world's output of raw fibre, nor by an increased demand by Lancashire for cotton, but by an enormous growth in the manufacture of cotton goods on the Continent of Europe, and in the United States of America. In eighteen years prior to 1910 Britain's demand for raw cotton has fallen 4 per cent., while during the same period Europe's requirements have increased 70 per cent., and this on a figure much larger than ours. America, during the same time, has increased her demand 90 per cent. and her total consumption of fibre now exceeds that of Britain by no less than 54 per cent. Thirty years ago the total American crop of cotton was less than 7 million bales, but supplemented by the small crops of other countries, was sufficient to supply the world's demands and leave a surplus each season, keeping the price reasonable and fairly regular. Now, with an American crop nearly double the figure just quoted, and with increased supplies from other fields, and with the demand of Lancashire stationary, the price of raw fibre has doubled, and 'shortage' has become rampant, notwithstanding the restricted time worked in the mills. The difficulty apparently gets worse month by month, and unless measures of amelioration are successfully pressed, the cotton industry of Lancashire must decline, and ultimately be starved out of existence. India at present produces almost half the weight of cotton grown in the American fields, and has, roughly, 20,000,000 acres under cotton crops. Indian fibre is however, of short staple and, therefore, very little used in Lancashire. Britain consumed only 87,592 bales during the year ending August 31, 1910. Many experts believe that with properly directed effort the crop of Indian cotton may be doubled in the course of a few years. If this can be done, even if the staple is not improved, it will take the place of much long-fibred cotton now used throughout the world, and set free for Lancashire a proportionate amount of better material. The cultivation of cotton in India is very primitive. The lands are poorly tilled, inadequately manured, and meagrely watered; while the native farmer is not only very unprogressive, but is harried by unscrupulous money-lenders, crippled by poor seed, and handicapped by insect pests. With selected seed, longer stapled cotton can be grown, but the native ryot finds it gives a lighter crop, and as he can, under present conditions, only obtain the same price as for the shorter stapled cotton, he naturally soon reverts to the cultivation of short stapled fibre.

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 the present number, the editorial has for its subject The Definite Purpose in Agricultural Work. It is treated particularly from the point of view of the issue of agricultural publications and the work in experiment stations.

Under the heading Sugar Industry, on page 339, an interesting account is given of the way in which sugar-cane is grown in Egypt.

Note of a recent investigation conducted in Grenada concerning lime juice from different sources is made on page 340.

Page 341 contains an abstract of an account of provisions that have been made recently for the endowment and conduct of agricultural research in England and Wales.

An account of a recent special meeting of the Council of the British Cotton Growing Association, held for the purpose of meeting the Imperial Commissioner of Agriculture, Dr. Francis Watts, C.M.G., and the Director of Agriculture, Trinidad, Professor P. Carmody, is presented on page 342.

The Insect Notes, on page 346, give attention to the measures that have been adopted in the United States for the control of the Argentine Ant, and to species of mosquito-destroying fish that are described from Africa.

The Fungus Notes appear on page 350. They contain the concluding part of two articles on wounds in plants and their treatment, which were commenced in the last number of the *Agricultural News.*

The Production of Salt in the Congo.

A recent report by H.M. Consul at Boma shows that salt is made in the Congo from grasses growing by the river-side. These are burned, and after the ashes have been placed in a cone-shaped basket that is used as a filter, water is poured on them and is allowed to drip into an earthenware vessel. A very crude form of salt is then obtained by boiling the water until crystallization takes place.

One of the uses of salt in the Congo arises from its monetary value in that State, and it is still indispensable for travelling purposes. This value will be lost eventually, with the increased use of money, but the demand is likely to be maintained, as it will always be readily bought by the natives.

Calcium Cyanamide and Nitrate of Lime.

Recent experiments with reference to the subject of the value of calcium cyanamide and nitrate of lime as manures, as compared with such other forms as nitrate of soda and sulphate of ammonia, receive attention in the *Experiment Station Record* of the United States Department of Agriculture, for March 1911, p. 226. The investigations were carried out with oats, wheat, potatoes and beets, in a deep heavy clay loam containing much organic matter.

With oats and wheat, sodium nitrate gave the best yields of straw; but there was as high a yield of grain with calcium cyanamide and nitrate of lime. Sulphate of ammonia gave the highest yield with potatoes, and that from calcium cyanamide was almost as great as the outturn when the other manures were used. Calcium cyanamide was found to be much less effective than sodium nitrate, in the case of beets.

Manures and Nitrification in the Lighter Soils.

In the last number of the *Agricultural News,* on page 239, a note was given on work with soils that is described in Bulletin No. 37 of the Hawaiian Sugar Planters' Association; this dealt more particularly with the effect of lime on nitrification in wet soils. An account of further work is included in the Bulletin, namely that in which investigations were made of the effect of manures on nitrification, in a soil containing a moderate amount of organic matter, rich in lime, alkaline to litmus and readily drained.

Under the conditions, it was found that such manures as double superphosphate, basic phosphate and sulphate of potash increased nitrification, the best results being obtained with the first two.

Where nitrogen as ammonium sulphate had been added already, the employment of potash and phosphate caused a decrease in nitrification: the greatest diminution took place in respect of double superphosphate. Further, the nitrification of sulphate of ammonia was greatly decreased by additions of quicklime.

Nitrogen was added both as sodium nitrate and calcium nitrate, the amount being the same in the two cases. There was no difference between the quantities of nitric nitrogen formed under the two sets of conditions.

Lastly, most nitrification took place with ammonium sulphate; the loss of lime in the drainage was less with nitrates than with ammonium sulphate; and there was no relationship between the amount of lime present in the drainage water and the extent of nitrification.

The Priprioca: a Perfume Plant.

The following description of this plant is reproduced from the *Bulletin of the Bureau of Agricultural Intelligence and of Plant Diseases* for November 1910, p. 77: 'The leaves of this plant when bruised give off an agreeable but complex perfume, recalling clove, cinnamon and bergamot at the same time, and its scent is perhaps sweeter than that of the other plants. Priprioca has been identified by Messrs Camus with the *Mespilodaphne pretiosa* =[*Ocotea pretiosa*], a tree growing in Brazil, in the provinces of Rio de Janeiro and Minas, in the forests of Amazonia, and in Guiana near the Orinoco. The tree has been briefly described under the names of *Pao pretiosa, Casca pretiosa,* and medlar-bay (*laurier nèfle*).'

Ocotea pretiosa, almost unknown in Europe, is said to contain in all its parts an essence which could be employed in perfumery and for soap, as a substitute for the essential oil of linaloe.

Cultivation of Cotton in the Transvaal

The *Journal of the Royal Society of Arts,* Vol. LIX, p 972, mentions that the development of the cotton-growing industry in the Transvaal has recently been making excellent progress. For some time past experts have been endeavouring to induce farmers, whose properties are situated in that part of the country where the soil and climate are such as will give the plant a fair trial, to make tests. Many farmers who have conducted these tests have been convinced that good crops are to be obtained from their land, and that this branch may possibly be made a profitable adjunct to their general farming operations. The efforts of the Government experimentalists are said to have been attended with striking results; a comparison between American-grown cotton and some from the Rustenburg experimental station has shown that one variety (Bancroft) at least, is well up to the mark. The American yield test gives forty-eight bolls of seed-cotton to the pound, whereas that grown at Rustenburg yielded forty-three bolls to the pound. This, says the Journal, is regarded by Manchester experts as eminently satisfactory, the more so when viewed in the light of the productions of former years.

The question, however, that is said to be harassing the promoters of extensive cotton cultivation is not so much as to whether the cotton equals the American standard, but whether it can be made a commercial success. As to this, there appears to be a wide difference of opinion. If it be true, as is asserted in some quarters, that the demand for no other article is so far in excess of the supply as is the case with cotton, it seems only reasonable to assume, concludes the Journal, 'if the cotton can be produced in sufficiently large quantities, a great industry will be built up in South Africa in time to come.'

Trade and Agriculture of Grenada, 1910-11.

The *Annual Report of the Colonial Treasurer,* Grenada, on the Treasury and Island Revenue Departments of that Colony for the year 1910-11, shows that the value of the imports and exports during the year was £279,368, and £291,760, being an increase of £11,132 and £6,914, respectively, over the corresponding figures for 1909, and disclosing the total trade of the colony for the year to have been £571,128.

The exports from Grenada in 1910 comprised principally cacao, spices, cotton and cotton seed, which together amounted in value to 97 per cent. of the total exports. In regard to cacao, there was a record crop last season, and 118,667 cwt. (76,255 bags), of the value of £259,365 were exported, being an increase of 11,539 cwts. (7,756 bags) in quantity and £10,967 in value over these figures for 1909, this representing 88 per cent. of the total gross exports of the Colony.

The values of other articles of export in 1910 were: spices £17,872, cotton £5,797, cotton seed £2,221; each of these showed a decrease as compared with the similar values for the year 1909.

The imports into Grenada for the year amounted to £279,368—an increase of £11,132 as compared with the figures for 1909.

Rice and Beri-beri.

The *Annual Report of the Indian Museum Industrial Section* for 1910-11 contains the results of analyses made of various samples of rice in connexion with an outbreak, in Bengal, of the disease known as beri-beri, as it had been suggested in the previous year that there was some relationship between the consumption of white rice and this disease. Major E. D. W. Greig, I.M.S., was placed on special duty to investigate the outbreak of beri-beri in Bengal; during the enquiry various samples of rice obtained were analyzed, as were also a large number of specimens of other foodstuffs in general use in India. As regards rice, the analyses showed that samples of Indian rice, from which the husk had been removed, contained 0·6 to 0·8 per cent. of phosphoric anhydride, while the average amount found in polished rice is 0·4 per cent. Some samples which had been highly polished contained no more than 0·26 and 0·22 per cent. A full analysis was also made of rice bran, or the polishings of the grain, which is removed in preparing rice for the market. In this substance an organic phosphorated constituent was removed, soluble in hydrochloric acid; this is of great value. Analyses were also made of edible products used by the Marwaris, who very seldom develop beri-beri, and the richness of their diet in phosphorus was very noticeable.

INSECT NOTES.

THE CONTROL OF THE ARGENTINE ANT.

A brief account of the Argentine ant (*Iridomyrmex humilis*, Mayr) was given in the *Agricultural News* for April 18, 1908 (see Vol. VII, p. 122). At that time this insect was attracting attention in the southern part of the United States, chiefly on account of its depredations on household supplies, and the stock-in-trade of the grocers, bakers, butchers, etc, but it was also becoming a serious agricultural pest. The Argentine ant fosters and protects the cotton aphis and the pink mealy bug of the sugar-cane, with the result that the latter insect has become a much more important pest of sugar-cane than it was formerly, and it is feared that the same may be true of the cotton aphis, in a few years.

For some three years or more, the Argentine ant has been known to occur in Southern California, and in 1910 a bulletin on the control of this insect was published by Professor C. W. Woodworth, Entomologist of the Agricultural Experiment Station, of the University of California (Bulletin 207, October 1910).

In this Bulletin, Professor Woodworth recommended the use of dilute poison in a syrup of sugar, placed in receptacles in such a manner that the ants could get to it, and carry it in a continuous supply to their nests, when it might be fed to queens and larvae.

By this means it was found that the insects were gradually killed out, the small amount of arsenic not being sufficient to poison the workers immediately, so that the destruction of the nests was retarded; but the continuous supply of this substance fed to the young insects resulted in the final destruction of the nest.

In an article entitled Field Work in the Control of the Argentine Ant, which appeared in the *Journal of Economic Entomology*, Vol. IV, p. 353 (August 1911), Mr. L. J. Nickels, also of the Experiment Station of the University of California, gives some interesting results as to the use of the poison recommended by Professor Woodworth.

The poison bait was prepared by using 20 lb. of sugar, 6 to 7 lb. of water and 1 oz. of sodium arsenite. The sugar and water were heated for about three hours over a water bath, and the sodium arsenite was dissolved, separately from the sugar, in a small quantity of hot water. The syrup and poison were then thoroughly mixed.

The poison bait was applied in the following manner. Suitable receptacles were employed in the form of jam pots or fruit jars with metal screw tops, entrance to which was provided by means of four small holes in the metal cover. A piece of sponge about half the size of the interior of the jar was placed in the jar and saturated with the poison syrup. The jars, thus charged, were placed in situations where the ants were known to be abundant.

The amount of poison syrup made from the quantities of materials mentioned above, and 10 lb. of sponges, were found to be sufficient for charging 300 jars.

The first systematic work in the extermination of these ants in the trials under review was undertaken in a hotel, which was badly infested, in the city of Berkeley, California; this was considered the most difficult situation within the area to be operated on. Fifty jars were distributed throughout the hotel; about half of these were visited by the ants, but only three were attended to by them constantly. Within ten weeks from the beginning of the work, the last of the ants had disappeared. This is considered rather remarkable since only about ¼-lb. of syrup was actually consumed. The cost of freeing this hotel of these objectionable insects was only $25·00—a very small amount when the damage and discomfort formerly occasioned by the ants are taken into consideration.

Similar encouraging results were obtained in dwelling houses, groceries and bakeries, and the ants were also exterminated in open lots within the area covered by the experiments.

Mr. Nickels considers the facts now established, that the Argentine ant can be exterminated on a given area, and that it can be prevented from spreading.

The Argentine ant has never been recorded from the West Indies, and while there seems to be very little chance of the introduction of this insect into these islands, it should always be borne in mind that there is a possibility of the occurrence of this. Merchandise of all kinds may harbour the pest, but it is considered that manure and nursery stock are most likely to be the means by which it is introduced into new localities, while food supplies of all sorts may serve in this connexion.

The Argentine ant is an extremely serious pest, and if introduced should be dealt with most rigorously. The appearance of any ant making an unusual development in these islands should be reported, in order that it may be definitely ascertained whether or not the insect is the Argentine ant, since it is most important that control measures should be adopted as soon as possible after the first infestation occurs.

MOSQUITO-DESTROYING FISH.

In the *Bulletin of Entomological Research* for July last (see Vol. II, Part 2), an article appears by Dr. W. B Graham, Director of the Medical Research Institute, Lagos, entitled A Fish that Preys on Mosquito Larvae in Southern Nigeria.

This fish is related to the Millions of Barbados and the West Indies, belonging to the same family—the Cyprinodontidae. It has been studied by Mr. G. A. Boulenger, of the British Museum, who has described it as a new species under the name *Haplochilus grahami*.

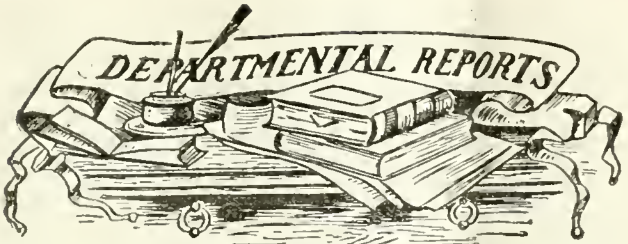
Dr. Graham was led to the discovery of this fish by the complete absence, from a swamp, of mosquito larvae. The pools of water in the swamps seemed ideal breeding places for mosquitoes, but there were no larvae to be found. There was no species of fish present other than the Haplochilus.

Mosquito larvae were greedily eaten by the fish, in the laboratory; but they did not seem to recognize mosquito pupae as being suitable for food.

A peculiar characteristic of these Nigerian fish is their power of leaping from the water to a distance of from 1 to 2 feet. Dr. Graham considers that by means of this power of leaping the Haplochilus is enabled to pass from one small pool to another, even when the water is low and the opportunity for swimming from one to another does not exist.

It is suggested that this fish should be used in pools free from other kinds, and in cisterns, barrels and similar situations.

In the same number of the *Bulletin of Entomological Research*, there is a note on two species of cyprinodont fishes in Uganda, with which Mr. C. C. Gowdey, Government Entomologist, has conducted experiments as to their capacity for mosquito control. He finds that they devour mosquito larvae voraciously, but he is of opinion that they will not play such an important part in the control of the insect as the Millions in Barbados, since in Uganda, he states, 'there are numerous swamps and rivers overgrown with papyrus and reed-like grasses, in which mosquito larvae are abundant, and in which these cyprinodonts are not found and will not live.'



JAMAICA: ANNUAL REPORT OF THE DIRECTOR OF AGRICULTURE AND ISLAND CHEMIST, 1910-11.

This commences by pointing out that, while there has been progress during the year in the work of making the efforts of the Department conform to the requirements of the Colony, the matter of importance has been the completion of the Farm School and Stock Farm at Hope. The former has maintained a full complement of students, and the many demands for admission have caused representations to be made to the Government for an extension of the accommodation. The necessary provision for the extension has been authorized, and on January 1, 1912, there will be room at the school for thirty-seven resident students. In regard to other matters, a recent development has been the appointment of a Veterinary Surgeon on the Staff of the Department.

The information given concerning the Hope Gardens and Experiment Station shows that the total distribution of plants from this centre was 144,220, of which 75,052 were free grants; the total number of economic and ornamental plants in this distribution was 136,254 and 19,966, respectively. The work of the Experiment Station was chiefly of a routine nature with sugar-cane, citrus and other fruits, provision crops, cacao, maize, rubber and vanilla. From Castleton Gardens the total number of plants distributed (not including bananas, cocoa-nuts, breadfruit and cacao sold) was 17,940. An account is given of the work at the Parade Gardens, Kingston; this is chiefly in connexion with the cultivation of ornamental plants. The same is true of the Kingston Street Gardens, which have been taken over recently by the Department. At the Hill Gardens, Cinchona, the routine attention to the ornamental plants, lawns, walks, roads and buildings has been maintained. Mention is made of virgen rubber (*Sapium* sp.) and camphor, which are being cultivated here, as well as of the fact that the residence was occupied during part of the year by a Professor and a party of biological students from Johns Hopkins University, Baltimore.

Finally in regard to these matters, information is given concerning the Bath Garden and Nursery, the Herbarium of the Public Gardens and the King's House Gardens and Grounds; at the first of these the Assistant Instructor raised and distributed 17,911 cacao plants.

In regard to agricultural experiments, it is of interest that, with reference to sugar-cane, the most striking matter has been the demonstration that more reliance will have to be placed on the improved manufacture of sugar than on the proceeds from rum. The decline in the rum industry has been partly due to increases in the duty in the United Kingdom and Germany and the predicted failure of an attempt artificially to force up the price of the product. A rapid extension of the employment of seedling canes on estates is taking place, and generally speaking, the greatest reliance is placed on B.208, which is stated to have given 4 tons of sugar per acre during the year, as compared with a yield of 3 tons from White Transparent. The general adoption of this cane for planting in Jamaica is not however advocated, on account of its failure in certain cases; further experiments are required to demonstrate its entire suitability. Jamaica seedling canes are now receiving their first trials, and Nos. 70, 71 and 72 are apparently fulfilling the promise originally given by them.

An extension in the area of coffee-growing by peasants is taking place, particularly in Manchester and St. Anns; this is chiefly because of the rise in price of the ordinary Jamaica grades and the steadiness of the market on account of the Brazil valorization scheme. This crop is being increasingly taken up by the small producer.

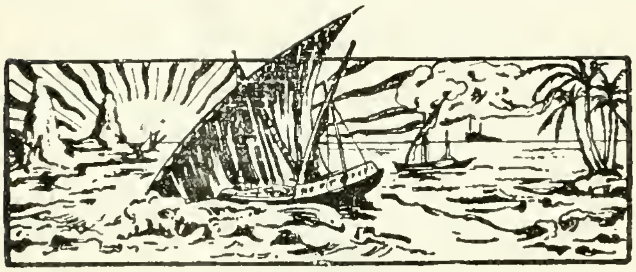
The work with bananas is chiefly concerned with the extension of the cultivation under conditions of soil and climate that have been considered hitherto as adverse, and with an investigation of the possibility of raising the fruit for the spring crop, in places where there is a small rainfall from December to April. Stringent measures are now being enforced by the Government for the prevention of the introduction of the Panama disease; these take the shape of the prevention of the importation of banana suckers or infected material from places where the disease is known to be present.

The citrus industry continues to be depressed, and in regard to cacao the extension of the crop has been interfered with by drought. There is a large demand for grafted plants of Bombay mangoes, and the growing of this tree in suitable positions is recommended by the Director. The attempts for the establishment of a cassava industry, under American direction, have failed. It is pointed out that there is apparently an unlimited market for dried cassava in the United States at £5 per ton—a price which, it is stated, would give a satisfactory working profit to the grower in Jamaica.

The interest in rubber in Jamaica is increasing. With respect to Para rubber, planters are advised to await the results of the plantings made in 1905 and 1906 before putting in this species to any large extent. Encouraging results have been obtained in the tapping of Castilloa in different parts of the island, and some of the yields have been remarkably good. The question of the adoption of this cultivation in Jamaica is considered at some length, and the conclusion is reached that Castilloa can be grown with profit in the island, under suitable conditions. With the assistance of Professor Pittier, of the United States Department of Agriculture, it has been ascertained that the original tree introduced into Jamaica from Kew, and subsequent introductions from British Honduras, are *C. guatemalensis*. It is reported that trees of *C. elastica* and of *C. costaricana* have been discovered in the parish of St. Thomas.

An important position in the agricultural concerns of the island is being rapidly attained by the cocoa-nut industry, and for its protection the bud rot of cocoa-nuts has been scheduled under the new Plant Diseases Law.

The succeeding part of the report presents many facts of interest concerning agricultural education and the work of the Veterinarian; space does not permit of detailed treatment of these. The report of the Deputy Island Chemist shows that 737 samples were examined at the Government Laboratory, as follows: official 263, agricultural 59, general 201, Sugar Experiment Station 214. That of the Government Bacteriologist and Fermentation Chemist contains, among other matters, an account of trials of rat virus and of the veterinary pathological work done during the year. The general report concludes with information as to the staff, publications, and financial matters relating to the Department.



GLEANINGS.

It is reported from China that the soy bean crop in several districts north of the Yangtse is expected to be excellent, in spite of the extensive floods that have been experienced over part of the area.

In regard to rubber production in French Indo-China, it is stated that the total shipment of rubber and gutta percha from Haiphong, during 1910, was 132·1 tons, as against 24·2 tons in 1909. This rubber is all obtained from *Ficus elastica*.

It is reported by the United States Vice-Consul-General in Abyssinia that the cultivation of cotton is fairly general in that country, but that it is chiefly carried out on lands 3,000 to 4,000 feet above sea-level. No large areas of the plant exist; the seed is sown in fields having a small acreage, and after the first crop has been obtained the plants are cut down and allowed to spring again for a second crop.

An estimate of the cotton crop of Eastern Bengal and Assam for 1911-12, being the first forecast for the season, has been received from the Director of Agriculture. The sowings of cotton have been generally a little earlier than usual, and the estimates for the area sown is 101,300 acres, as compared with 99,000 acres, which was the revised estimate for the previous year. The crop is in good condition generally, although some damage has been done in two of the districts by excessive rain.

A note in the *Textile Mercury* for July 22, 1911, states that sisal fibre is beginning to be exported from Portuguese East Africa. A decorticating plant has been erected at Quilimane, and 60 tons of fibre was shipped at the end of last year. H.M. Acting Consular Agent for the Colony expects that, during the year, the export of fine fibre will reach 200 or 300 tons. It is stated that an exceptionally heavy yield of fibre, per plant, is being obtained, and that there are large areas suitable for growing the crop.

In the *Experiment Station Record* of the United States Department of Agriculture for June 1911, p. 629, a short abstract is given of a recent review of different theories concerning the part played by latex in plants in which it is found. Investigations are also described with a number of plants which produce latex. By growing seedlings of such plants in light and in darkness, and giving attention to the fact that latex contains a number of food bodies, such as sugars, starch, fats, and proteid substances, the author considers that latex possesses important functions in regard to the nutrition of plants containing it, and that it is not to be considered as a waste product.

Information has been received from the Secretary of State for the Colonies to the effect that arrangements have been made by His Majesty's Stationery Office with Mr. T. Fisher Unwin, of 1 Adelphi Terrace, London, W.C., under which Mr. Unwin will act as sole wholesale agent for the sale of British Official Publications outside the United Kingdom, with depôts at New York, Toronto, Melbourne, Wellington, Cape Town, Calcutta, Tokio, and Leipzig, and with power to open other depôts subject to the approval of the Stationery Office.

In the recent rains experienced in St. Vincent, the ground provision crops of the peasantry in mountainous places were badly damaged. Harm was also done to the cotton cultivation on several estates, through the same cause. Small pickings of early planted cotton were made in St. Vincent during last month. The report of the Government Veterinary Surgeon for September 1911 shows that the deaths among stock were eighty-one, in three of which the cause was not ascertained; there was no suspicion, however, of the presence of anthrax.

It is stated in *Diplomatic and Consular Reports*, No. 4763 Annual Series, which deals with the foreign trade of the Port of Santos, Brazil, for 1910, that the exports of coffee in that year were 6,834,712 bags of 132 ℔., as compared with 13,453,104 bags in the previous year. As the export limit for the crop was 10 million bags, excluding coffee from Minas, estimated at some 500,000 bags, that is to say, a total of about 10,500,000 bags, there was no need to place the product quickly on the market, as had been the case in the former year. By the end of the period under review the price of coffee had risen 80 per cent. Interesting matters concerning the production of coffee in Brazil are given in the Report.

According to the *Jamaica Gazette* for July 13, 1911, four prizes, one of £2, one of £1 10*s.* and two of 15*s.* each are offered for the best elementary school gardens in each of the inspectors' districts visited by them during the calendar year 1911. In gauging the merits of the gardens, consideration will be given chiefly to the success of cultivation, to the usefulness of the garden for the illustration of the instruction that is required by the Elementary Science Code, the use that has been made of the garden for this purpose, and the continuity of the work during the year. Consideration will be given also to any observations or reports made by the Instructor for School Gardens or by the Agricultural Instructors.

The *Report on the Progress of Agriculture in India* for 1909-10 (to which reference has been made several times in the *Agricultural News*) states that experiments conducted at the Samalkota Experiment Station have shown, under the conditions, that where castor cake has been applied as a manure, the addition of superphosphate and potash, with or without lime, is unremunerative. On the Bombay farms ammonium sulphate has continued to give good results with sugar-cane, and the Agricultural Department is now definitely recommending its use for that crop, having also distributed a good deal of the manure to cultivators. Other experiments conducted at Manjari have indicated the usefulness of a mixture of safflower cake (from *Carthamus tinctorius*) and ammonium sulphate, as a top dressing for sugar-cane; it has also been shown that sunn hemp (*Crotalaria juncea*) is useful as a green manure.

STUDENTS' CORNER.

NOVEMBER.

FIRST PERIOD.

Seasonal Notes.

Green dressing crops are in full growth at the present time, and notes should have been made for the purpose of obtaining records as to the time which the plants take to attain maturity. During the period of growth, continuous observations should be conducted in order to ascertain the relative immunity of the different species to insect attack, and their power of resistance to drought. In each district, what kinds of green dressing plants are best suited to the conditions that obtain; give examples of cases in which any of them possess a special and particular use. State why green dressing plants, when used as manure, should never be buried deeply. How is the depth at which such crops should be covered related to the heaviness of the soil. What are the chief effects of the burying of green dressings in soil (1) under favourable conditions, (2) under unfavourable conditions? (See *Agricultural News*, Vol. VIII, pp. 225 and 241.)

Where onions are raised, note the length of time that elapses between the time of sowing the seed and that of transplanting seedlings, as well as that taken for the latter to attain maturity. State which kind of onion is most particularly adapted to conditions in the West Indies, naming its definite qualities. Why is it that every effort should be made to produce the crop as early as possible? What kinds of bulbs are most specially suited to the markets with which you are acquainted? Give an account of your experience in the drying and storge of onions, and state if you have observed any precautions in regard to these matters that largely increase the chances of success, and decrease the likelihood that the bulbs will be attacked by disease.

Where the cotton crop has attained sufficient development, opportunities will have arisen, by now, for conducting a careful examination of the plants in the field, and for the removal of any 'rogue' plants that might be observed. It might be well to allow one or two of these plants to remain in certain parts of the field, the latter being carefully noted, and at the end of the crop to examine the seeds and lint of a few plants of good Sea Island cotton growing near them, provided that both kinds have flowered together, in order to ascertain if there are any signs of crossing between the rogue plants and those of the good variety. A careful watch must be kept for caterpillars, in order that the presence of these may be detected as early as possible; for it is well known that the cotton worm, like most insects, is best controlled in the early stages of its existence, when it has left the egg and is actively feeding. It is well to understand, in connexion with this matter, that the use of poisons is quite ineffective after pupation has taken place. Notes should be made of the appearance of the cotton worm, and of the cotton boll worm where it is possible for this to be done, at each stage of the life-history, particularly that of the adult moth; at the same time simple experiments should be conducted for the purpose of ascertaining the length of duration of the different periods in the life-history. Compare the habits of such a pest as the cotton stainer with those of the foregoing, with special attention to the indication of methods of control, and the existence of other food plants upon which the pests are found.

Give some account of the chief expenses involved in the production of 50 acres of cotton, under conditions with which you are familiar, and indicate how any by-products obtained from the crop may be employed towards the reduction of such expenses.

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) Why do the edible seeds of pod-bearing plants possess a particular nutritive value?

(2) What are the chief differences between lime and chalk, and how would you distinguish between these compounds?

(3) Give an account of the purposes for which animals are raised on estates.

INTERMEDIATE QUESTIONS.

(1) What is the chief importance of the seeds of leguminous plants in relation to the nutrition of farm animals and man?

(2) How would you make an experiment to demonstrate the property possessed by lime of improving the texture of clay soils?

(3) Discuss the usefulness, for agricultural purposes, of the offspring of a jack donkey and a mare (a mule), as compared with that of a stallion horse and a jenny (a jennet).

FINAL QUESTIONS.

(1) Write an account of the value in commerce of any two leguminous seeds.

(2) Give a description of the uses to which lime and chalk may be placed, on an estate with which you are familiar.

(3) Supply statistics as to the cost of the upkeep of any animal that is employed on estates, stating definitely for what purposes it is kept.

CONTINUITY IN AGRICULTURAL MATTERS.

Not only is contiguity required in dealing with agriculturists, but also *continuity*, and this is one of the weak points in the present organization of the island [Ceylon] from an agricultural point of view. If a given improvement is to be introduced into certain districts, not only must it be demonstrated near to the people, but it must be continuously demonstrated. If it is demonstrated in one season to be a success, and then taken away, the man who sees it will say that it was removed because one was afraid (or certain) that it would not succeed twice running. Successful results must be shown for at least four or five seasons running before people can be expected to imitate them, other than perhaps one or two of the most intelligent agriculturists. For this reason it is important to try doubtful experiments only in Experiment Stations—and to some extent in school gardens—and to demonstrate to the people, on the spot, only those which are unquestioned successes. If, for example, there be any doubt whether a new variety of some local crop be a success, it can easily be tried all over the island by being distributed to the school gardens, and then demonstrated to the people in those districts where it succeeds.

In the same way, agricultural shows, as we have already pointed out, should be continuous in any district where they are started, or the good they do is merely evanescent. Whereas, if they be continuous, some good may be expected to follow after they have been held four or five times in the same place. (From *The Tropical Agriculturist*, Vol. XXXVII, p. 97.)

FUNGUS NOTES.

WOUNDS IN PLANTS AND THEIR TREATMENT.

PART II.

In the last number of the *Agricultural News* some account was given of wounds on plants. In the present article, some kinds of accidental wounds will be discussed, with their treatment, and a few points will be considered which arise in connexion with the whole subject.

ACCIDENTAL WOUNDS. In temperate and cold climates, several natural agencies, such as frost, hail and wind, are responsible for wounds on trees, but in the tropics wind is the only harmful factor in this class that is of any importance. Very strong winds often break off large branches, or cause splitting of the trunk at a fork where a large branch is given off. Less serious winds damage young foliage and soft green twigs, and give rise to the appearance known as die-back or stag head. When a large limb is torn out of a tree by wind in such a way that there is no danger of the torn surface holding water, the exposed wood should be smoothed down and covered with one of the preparations described in Part I of this article. If a hollow is left in which water will collect, and there is no means of preventing this by cutting a draining channel, or by smoothing away the side of the hollow, then the hole must be filled up with cement, and the surface of the cement must be smoothed off at such an angle as will enable water to run away.

Splits in the trunks of trees, which arise where two large branches fork, may be closed up in the following manner. An iron bolt should be driven through either branch at some distance above the fork. A tarred wad may be pushed through at the same time by the bolt to protect the tissues exposed by the augur in drilling the hole for the bolts. The ends of the bolts on the outer side of each branch should carry a thread; on these a flat plate may be held in position by means of a nut. The inside ends of the bolts should be connected by a strong chain. By screwing up the nuts the two branches are forced together and the split is closed. It is advisable to apply a thick coat of tar to each of the exposed surfaces before closing the split.

In the case of cacao or lime trees severely damaged by wind, the question often arises whether it is advisable to treat the damaged trees, or whether it is preferable to allow them to be replaced by a sucker or a new tree. This is a question which each planter must settle for himself, under the conditions with which he finds himself confronted. Larger trees grown for ornamental purposes are often difficult to replace and may be successfully treated in the manner described above.

Abrasions are often caused by the rubbing of one branch against another. In this case one of the branches should be cut off and the damaged surface of the other should be treated with some protective covering, as also should the cut end of the branch removed. Young twigs killed by wind should be removed by pruning.

Among the injuries inflicted by animals mention may be made of those due to the gnawing of rats and agoutis. Such wounds should be treated in a manner similar to that employed for cankered areas.

Small sucking insects injure the surfaces of leaves and green twigs and encourage the entrance of parasitic organisms, but the remedy against them lies rather in the destruction of the insects than in the treatment of the minute punctures which they inflict.

Again, wounds may be caused by other plant organisms, parasitic fungi and bacteria. The treatment for these involves pruning and excision, and has been considered already in the previous part of this article.

GENERAL CONSIDERATIONS. In dealing with the question of wound treatment in general, it must be borne in mind that the trees in a permanent cultivation represent capital, and as such, are worthy of the exercise of all reasonable precautions for their protection. Careless workmen, particularly rubber tappers, cacao pickers and men engaged in cutlassing and forking, may well cause very serious diminution in that capital. Every encouragement should, therefore, be given to such workmen to attain proficiency in their work, while at the same time very strict supervision should be exercised over them, especially when they are engaged in tapping rubber or picking cacao.

On large estates, much can be done to maintain the general health of the trees, by training very carefully a special gang of pruners, chosen for their neatness and care as workmen. There is always enough work on a large estate to employ fully at least one such gang of three or four men throughout the whole year, and even if this class of work should call for high wages, the money spent would be amply repaid by the benefit to the trees; while it should be looked upon only as a reasonable insurance against any heavy loss of capital. The members of the gang should be trained not merely to carry out the pruning operations necessary in all permanent cultivations, but also to treat adequately all forms of wounds to which trees are liable. The employment of such a gang is very strongly advocated by Petch, in Ceylon, and is actually adopted on some of the larger rubber estates in the East, as well as on certain cacao estates in Grenada.

One other point worthy of consideration is the extraordinary amount of wilful damage inflicted on trees by human beings, particularly in the West Indies. This is apparently an evil which must be tolerated, since there does not seem to be any remedy likely to have any immediate preventive effect upon it. Something may be done in course of time by dint of carefully instilling the idea of the value of plant life into children, and in this Arbor Day may play a useful part, but this course must of necessity be slow in its action. One form of damage to trees growing in public places might, however, be prevented; namely that caused by nailing advertisements upon them. This could be checked by stringent legislation.

BUD ROT OF THE COCOA-NUT PALM IN CUBA.

An interesting note on the extent of the damage inflicted on cocoa-nuts in Cuba by the bud rot disease is given in the *Cuba Review* for September 1911, p. 29. It appears that Professor F. G. Earle has been appointed as one of the commissioners to investigate this disease and has submitted, among other matters, the following information in a preliminary report (in the words of the *Cuba Review*): 'The exports of cocoa-nuts from Baracoa have dropped from 18,000,000 to 6,000,000, that more than half of the trees are dead and that many more are affected. The factory for making oil from unshipped nuts that formerly operated day and night, now operates only two days a week.

'The disease has been virulent five years. Affected trees are found on all kinds of soils and all altitudes. Whole plantations have been completely destroyed. It is a serious calamity to the district, as cocoa-nut groves are the prime source of revenue.'

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:—

With the continued unsettled state of the peace of Europe, in the conflict that has arisen at the time of writing, between Italy and Turkey, following so closely on the Moroccan dispute, and the continued Industrial Strikes both in England and on the Continent, it is not to be wondered that the produce markets generally are in a state of disorganization; and when is added the effects of the long drought of the past summer on vegetation, in causing a serious diminution in all kinds of products both of foods and drugs, it was to be expected that prices would in many cases advance, which has been the case with many well-known articles of food and medicine. Of West Indian products the scarcity of lime juice has, perhaps, attracted the greatest amount of attention, and a good supply put upon the market at once, would meet with a ready sale at good prices.

GINGER.

At the first spice auction on September 6, ginger was represented by 100 bags only, of Japanese, which were sold at 37*s.* for partly limed. On the 20th of the month, 793 packages of Cochin were brought forward, part of which was sold, small limed fetching 70*s.*, limed tips 55*s.* and brown rough 40*s.* At the last auction on the 27th, 16 packages of Jamaica were offered and sold, medium, part washed, fetching 53*s.* 6*d.* and ordinary 52*s.* per cwt. Other kinds were bought in.

NUTMEGS, MACE AND PIMENTO.

At the first sale on the 6th, some 200 packages of West Indian nutmegs were brought forward and sold at the following rates: 57's 1*s.*, 69's 8½*d.*, 71's to 74's 6½*d.* to 7*d.*, 82's to 88's 5*d.* to 5½*d.*, 125's to 143's 4½*d.* to 4¾*d.* A week later; the offerings of West India amounted to 238 packages, most of which were disposed of at slightly varying rates, 55's fetching 1*s.* 3*d.*, 59's 1*s.*, 64's to 67's 6½*d.* to 11*d.*; 85's to 89's 5½*d.* to 5¾*d.*; 128's to 132's 4½*d.* to 5¾*d.* Eighty-four packages of eastern nutmegs were also brought forward, 63's to 66's fetching 2¾*d.*; 76's to 86's 2½*d.*; 102's to 150's 1½*d.* to 2¾*d.*; 4½*d.* was paid for limed 95's to 145's. At the later sales, namely on the 20th and 27th, respectively, the offerings amounted to 43 packages of West Indian, 34 cases of eastern, 23 packages of West Indian, and 41 packages of eastern, all of which were sold at similar rates. Mace was represented at the first spice auction by 60 packages, 2*s.* 1*d.* to 2*s.* 8*d.* being paid for ordinary, and 1*s.* 10*d.* to 2*s.* for broken. A week later, 59 packages of West Indian were offered and sold at 2*s.* to 2*s.* 5*d.*, and 28 packages of eastern at 2*s.* 5*d.* to 2*s.* 6*d.*, part wormy fetching 2*s.* 2*d.* At the last sale, mace was in very little demand, a few packages only being sold at slightly reduced rates. Little or no business has been done in Pimento.

ARROWROOT.

Forty barrels of St. Vincent arrowroot were offered at auction on the 6th of the month, part of which was sold, 3¼*d.* per lb. being paid for fine. A small quantity of Bermuda was also offered and bought in at 1*s.* 7*d.* per lb. A fortnight later, 15 barrels of St. Vincent were brought forward and disposed of at the above mentioned rates. Seven kegs of Bermuda were bought in at 1*s.* 6*d.* to 1*s.* 8*d.* per lb., while 50 cases of good Natal found buyers at 9*d.* per lb.

SARSAPARILLA.

At auction on the 6th of the month, the offerings were grey Jamaica 2 bales, Lima-Jamaica 12 bales, and native Jamaica 17 bales; the whole of the two former were sold, the grey Jamaica fetching 1*s.* 7*d.* per lb. for fair, and the Lima-Jamaica from 11*d.* to 1*s.* for part rough, and 1*s.* 1*d.* for fair. Only 13 bales of the native Jamaica found buyers, part fetching 1*s.* 1*d* for good red, 10*d.* for fair, and 8*d.* to 8½*d.* for dull red mixed; the other part, composed of 5 bales, was sold at 10*d.* for dull red and yellow mixed, and 7½*d.* for common grey mixed. At the second drug auction on the 21st, the offerings were: grey Jamaica 6 bales, Lima-Jamaica 4 bales, and native Jamaica 13 bales. The whole of the grey Jamaica was sold, fair fetching 1*s* 8*d.* per lb. and ordinary dark 1*s.* 7*d.* The 4 bales of Lima-Jamaica found buyers at 1*s.* 1*d.* per lb.—a slight advance on previous prices. Only 4 bales out of the 13 of native Jamaica offered were disposed of: two of them were of dull yellow, and realized 7½*d.* per lb.; the other two were of fair red, slightly mixed, for which 10*d.* per lb. was paid.

LIME JUICE, TAMARINDS AND KOLA.

The scarcity of lime juice has been commented upon in our introductory note. In the week ending September 16, it was reported that for fair pale raw West Indian, 2*s.* 3*d.* to 2*s.* 9*d.* per gallon was quoted, but that it had been purchased as low as 2*s.* At the end of the month, a few puncheons of good pale raw were stated to have been sold at 1*s.* 11*d.* per gallon. In the middle of the month Barbados tamarinds were quoted at 15*s.* per cwt., and darkish Antigua at 11*s.* Towards the end of the month, Kola was represented by a good supply of variable quality. Fresh, but mouldy Jamaica realized only 1*d.* per lb, while for fair, but part mouldy, 3*d.* per lb. was paid. For sound dried halves 3¾*d.* was refused, a quantity of wormy and mouldy West African was offered at 2½*d.* per lb. but out of a total of 100 packages, 3 only were disposed of.

DEPARTMENT NEWS.

The Secretary of State for the Colonies has approved of the appointment of Mr. Harold Waterland as Assistant Master at the Dominica Grammar School. The work of Mr. Waterland, who has already entered upon his duties, is that of Agricultural and Science Master at the School.

The *Report on the 1911 Census of Grenada*, which has just been issued, shows that the population of the Colony, on April 2 last, was 66,750 as compared with 63,438 in 1901. The reason for the small increase is given as the very large exodus of the labouring class to the Panama Canal Zone, in recent years.

MARKET REPORTS.

London.—The West India Committee Circular, October 10, 1911; Messrs. E. A. De Pass & Co., September 29, 1911.

Arrowroot—3*d.* to 4¾*d.*
Balata—Sheet, 3/5; block, 2/5 to 2/6 per lb.
Beeswax—£7 7*s.* 6*d.* per cwt.
Cacao—Trinidad, 58/- to 65/- per cwt.; Grenada, 55/- to 60/6; Jamaica, 53/- to 59/-.
Coffee—Jamaica, 66/- to 96/- per cwt.
Copra—West Indian, £28 10*s.* per ton.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 15*d.* to 22*d.*
Fruit—No quotations.
Fustic—No quotations.
Ginger—48/- to 63/- per cwt.
Isinglass—No quotations.
Honey—28/- to 32/6 per brl.
Lime Juice—Raw, 2/-; concentrated, £18 5*s.* to £19 2*s.* 6*d.*; Otto of limes (hand pressed), 5/3 to 5/5.
Logwood—No quotations.
Mace—2/1 to 2/3.
Nutmegs—5¾*d.* to 8*d.*
Pimento—Common, 2¼*d.*; fair, 2$\frac{5}{16}$*d.*; good, 2⅜*d.*; per lb.
Rubber—Para, fine hard, 4/7; fine soft, 4/3½; Castilloa, 3/11 per lb.
Rum—Jamaica, 1/7 to 5/-.
Sugar—Crystals, 19/- to 22/-; Muscovado, 15/- to 17/-; Syrup, 15/3 to 18/- per cwt.; Molasses, no quotations.

New York.—Messrs. Gillespie Bros. & Co., October 6, 1911.

Cacao—Caracas, 12¾c. to 13c.; Grenada, 13⅛c. to 13⅝c.; Trinidad, 12¾c. to 13c. per lb.; Jamaica, 11½c. to 12c.
Cocoa-nuts—Jamaica, select, $35·00 to $36·00; culls, $21·00 to $22·00; Trinidad, select, $35·00 to $36·00; culls, $21·00 to $22·00 per M.
Coffee—Jamaica, 14½c. to 16c. per lb.
Ginger—8¾c. to 11¼c. per lb.
Goat Skins—Jamaica, 53c.; Antigua and Barbados, 48c. to 50c.; St. Thomas and St. Kitts, 46c. to 48c. per lb.
Grape-Fruit—Jamaica, $3·75 to $5·50.
Limes—$5·00 to $6·00.
Mace—45c. to 52c. per lb.
Nutmegs—110's, 11½c.
Oranges—Jamaica, $3·50 to $5·00 per box.
Pimento—4½c. per lb.
Sugar—Centrifugals, 96°, 5·96½c. per lb.; Muscovados, 89°, 5·46½c.; Molasses, 89°, 5·21½c. per lb., all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., October 16, 1911.

Cacao—Venezuelan, $12·83 to $13·60 per fanega; Trinidad, $12·50 to $13·00.
Cocoa-nut Oil—$1·03 per Imperial gallon.
Coffee—Venezuelan, 16c. per lb.
Copra—$4·90 per 100 lb.
Dhal—$3·90.
Onions—$2·00 to $2·25 per 100 lb.
Peas, Split—$5·80 to $5·90 per bag.
Potatoes—English, $1·80 to $2·00 per 100 lb.
Rice—Yellow, $5·00; White, $5·60 to $5·65 per bag.
Sugar—American crushed, no quotations.

Barbados.—Messrs. James A. Lynch & Co., October 21, 1911; Messrs. T.S. Garraway & Co., October 23, 1911; Messrs. Leacock & Co., October 13, 1911; Messrs. E. Thorne, Limited, October 11, 1911.

Cacao—$10·50 to $12·00 per 100 lb.
Cotton Seed—$26·00 per ton; meal, $1·50 per 100 lb.; 2½ per cent. discount.
Cotton Seed Oil (refined)—60c. per gallon.
Cotton Seed Oil (for export)—54c. per gallon (in bond).
Hay—$1·50 per 100 lb.
Manures—Nitrate of soda, $60·00 to $65·00; Cacao manure, $42·00 to $48·00; Sulphate of ammonia, $75·00 to $76·00 per ton.
Molasses—No quotations.
Onions—$1·80 to $3·00 per 100 lb.
Peas, Split—$5·75 to $5·85 per bag of 210 lb.; Canada, $2·75 to $4·10 per bag of 120 lb.
Potatoes—Nova Scotia, $2·50 to $3·25 per 160 lb.
Rice—Ballam, $5·10 to $5·60 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
Sugar—American granulated, $6·00 per 100 lb.

British Guiana.—Messrs. Wieting & Richter, October 14, 1911; Messrs. Sandbach, Parker & Co., August 18, 1911.

Articles.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	$10·50 per 200 lb.	$10·50 per 200 lb.
Balata—Venezuela block	No quotation	Prohibited
Demerara sheet	70c. per lb.	70c.
Cacao—Native	11c. per lb.	11c. per lb.
Cassava—	60c.	No quotation
Cassava Starch—	$6·00	No quotation
Cocoa-nuts—	$12 to $16 per M	$10 to $16 per M., peeled and selected
Coffee—Creole	16c. per lb.	19c. per lb.
Jamaica and Rio	18c. per lb.	19½c. per lb.
Liberian	10½c. per lb.	12c. per lb.
Dhal—	$3·60 per bag of 168 lb.	$3·70 per bag of 168 lb.
Green Dhal	$3·50	——
Eddoes—	64c	——
Molasses—Yellow	None	——
Onions—Teneriffe	——	4c. to 5c.
Madeira	4¾c. to 5c.	5½c
Peas—Split	$5·75 per bag (210 lb.)	$5·75 per bag (210 lb.)
Marseilles	$3·75	No quotation
Plantains—	10c. to 20c.	——
Potatoes—Nova Scotia	$2·50 to $2·75	$3·50
Lisbon	1½c. per lb.	No quotation
Potatoes-Sweet, B'bados	88c. per bag	——
Rice—Ballam	No quotation	——
Creole	$4·60 to $4·75	$5·00 to $5·50
Tannias—	$1·08	——
Yams—White	$2·16	——
Buck	$2·40	——
Sugar—Dark crystals	$3·90	$3·60
Yellow	$4·00 to $4·50	$3·75 to $4·00
White	——	$4·25
Molasses	$3·50	None
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.

Special Uses for Concrete in Warm Climates.

THIS subject received attention in an article on page 323 of the last volume of the *Agricultural News*, where a description was given of interesting work that had been done in Antigua in the making of concrete posts for use on estates. Further information regarding the matter is presented in a useful illustrated article in the *Journal d'Agriculture Tropicale* for September of this year.

It is pointed out in this article, firstly, that the employment of concrete, either reinforced or not, has only been in existence—and that not to any great extent—for about fifteen years, notwithstanding the fact that the properties of concrete render its use possible in many different ways, among these being for the making of piles, water channels, substitutes for carpenters' work, bridges, or even of entire buildings.

The apparatus employed for the purpose is very similar to machines that are used in moulding ordinary bricks, and it is arranged so that by the simple changing of the moulds and arrangements for pugging, blocks in many various shapes can be obtained, which may be used in exactly the same way as cut stones. Concrete thus employed is undoubtedly a valuable resource in regions where there are no suitable stones and no argillaceous material that might be used for making bricks. This is especially true in view of the fact that at the present time cement, for making concrete, is exported to all parts of the world, and that, with proper care, it reaches these in good condition. Difficulties of transport, too, are small, because cement is usually packed in bags of such a size that they can be carried on the backs of porters, or even by animals capable of supporting only small weights. In regard to the other mode of packing, namely in barrels, this is also convenient, as the barrels may, within reasonable limits, be rolled to their destination.

The fact that the employment of suitable apparatus has enabled the number of ways in which concrete may be used to be increased to a very large extent is of the greatest importance to agriculturists in hot climates and in new countries. This importance has been increased by the appearance on the market of moulds which admit of the making of constructive materials by simple pugging, alone. The article which is being reviewed gives illustrations showing concrete employed for making pillars on which dwelling-houses and other buildings are raised above the ground; for making fence posts; and as well, for forming braces to add to the strength of these. The illustrations to which reference is made have been supplied by W. Janke, Speersort, 17, Hamburg, Germany—a firm from which moulds may be obtained for making straight posts, squared or mortised, to take the place of carpenters' work. For the posts, the material used contains one part of cement mixed with three parts of sand or of fine gravel; from this a pug is made in suitable moulds. For constructions that are long in proportion to their width, it is recommended that. for reinforcement, round rods of iron should be buried in the mixture, to the number of three or four, for posts of medium diameter, and of a size which depends upon the purpose for which the posts are being made. It is stated that the price of the moulds is not high, and that they may be obtained in sizes and shapes to suit many purposes.

It is pointed out, further, that by the employment of the process described, constructive materials for several purposes may be obtained practically at the price on the spot of the cement and of the sand or gravel; and of the iron as well, where this is used for reinforcement. When it is considered that the constructions obtained in this way cannot decay, are unaffected either by changes in temperature, or insects such as ants, and that they require no keeping in repair, it is recognized that it is advantageous for them to be employed in hot countries, wherever it is possible for this to be done. Reference is made, in illustration, to the expense that is entailed in enclosing cocoa-nut plantations in the ordinary way: here, the employment of concrete for making posts is rendered all the more easy because of the usual proximity of the sea-coast, and the consequent supply of sand near such plantations. A further matter is that posts used in this way can be provided with special supports for attaching iron wires or obstacles to climbing.

In the West Indies, concrete has been mainly employed in the way indicated for making the pillars used to raise buildings above the ground, and for fences; as is stated above, the latter use is described in the article in the *Agricultural News* that has been mentioned already. Enough has been said to make it evident that these are not the only ways in which special, additional uses may be found for concrete, in the tropics. The subject is worthy of the attention of agriculturists, and its study in a practical manner should lead to a large increase in the number of ways in which concrete can be made useful on estates.

SUGAR AS A CATCH CROP WITH RUBBER.

Information concerning this subject appears in the *India-Rubber Journal* for September 23, 1911, and it is from the article given that the following abstract has been made.

JAVA. Although Dutch planters have always favoured the employment of catch crops, particularly with such products as coffee and indigo, it is rare to find sugar employed in the same way under rubber, for the former is considered to be of sufficient value to occupy the ground alone. There are, however, a few estates in the island where the sugar-cane is used as a catch crop, but this area is small as compared with that in which coffee is employed in the same way.

MALAYA. In a general way, catch crops are not favoured in Malaya as much as is the case in Java; in the Federated Malay States in 1909 and 1910, the area of rubber with catch crops was, respectively, only 10 per cent. and 6 per cent. of the total planted in rubber. During the former year the total area under sugar, both as a catch crop and alone, was 7,128 acres, and in 1910 this became 3,759 acres, the whole of the decrease being due to the fact that sugar ceased to be grown under rubber on several estates. The decrease in the area in sugar-cane as a catch crop was accompanied by an increase in that of coffee, employed in a similar manner. The reasons for abandoning the sugar cultivation have not been connected with prices for sugar, but have had relation to the stage of growth reached by the Hevea trees.

The areas in which catch crops are used under rubber, in the Straits Settlements, are decreasing, that in 1910 being 16 per cent. of the rubber area, as against 28 per cent. in 1909. Among the reasons that are given for abandoning the cultivation of sugar-cane in this way are the circumstance of the wearing out of machinery for sugar manufacture, the increased size of the Hevea trees, uncertain prices for sugar, and labour difficulties. Notwithstanding the decrease of this nature, the total area of sugar cane, both with and without rubber, has increased from 3,638 acres in 1909 to 5,315 acres in 1910.

In Malaya, the distance for planting Hevea trees, when catch crops of sugar cane are to be raised between them, is generally 13 × 15 feet, in order to permit sufficient light to reach the cane. The latter, under the conditions, is planted in rows about 6 feet apart, the plants being 1 foot to 15 inches in the rows. Similar distances are employed when the principal crop is cocoa nuts. With either rubber or cocoa-nuts, the canes can be raised for about three years.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture left Barbados by the R.M.S. 'Oruba', on November 6, for Trinidad, for the purpose of conferring with His Excellency the Governor with regard to the preliminary arrangements for holding the forthcoming Agricultural Conference in that Colony. Dr. Watts is expected to return to Barbados by the R.M.S. 'Thames', on the 15th instant.

BOOK SHELF.

A MANUAL OF PHILIPPINE SILK CULTURE. By Charles S. Banks. *Issued by the Bureau of Science, Manila.*

This work commences by stating that the first attempt on the part of the Bureau of Science, Manila, to import and propagate mulberry silkworms in the Philippine Islands was made six years ago, and that the intention of the manual which is the subject of this review is to collect all data accumulated up to the present, for the purpose of assisting in the production of silk on a commercial scale. The value of the work is increased by the fact that many sources of information have been consulted in order to make use of the experience of other writers who have laboured under conditions similar to those in the Philippines. At the commencement it is pointed out that cleanliness, a regard for detail, and perseverance are the main matters required in rearing silkworms. An interesting section follows, dealing with the history of attempts to introduce silk production into the Philippines.

A detailed description is afforded of the Japanese race of the mulberry silkworm (*Bombyx mori*), as well as of the Bengal-Ceylon race, the latter of which has afforded the best results in the Philippines. In regard to the life-history of the silkworm, the most important feature of this is its connexion with the feeding of the worm at the different stages. When it leaves the egg, the larva measures $\frac{1}{10}$-inch in length: at first it remains quiescent for three to four hours. When it begins to show activity, it should have its first food, in the shape of the tenderest young green leaves from the tips of the mulberry shoots, the leaves being placed over the young larvae so as to be within reach. When the leaves wilt, they are replaced by others laid whole upon them: the larvae will usually reach these without any assistance. The first stage lasts three or four days: after this, the first moult takes place, and when this is completed the young silkworms are transferred to regular feeding trays. For the youngest silkworms, the bottom of these is usually formed of a vegetable fibre made into a coarse mesh; for half-grown and full-grown silkworms, wire netting of $\frac{1}{4}$-inch and $\frac{1}{2}$-inch mesh is usually employed. For feeding the worms in the second stage young leaves cut crosswise into strips about $\frac{4}{5}$-inch wide are placed in the trays standing over the silkworms; the latter quickly climb up through the meshes and commence to feed. It is pointed out that mulberry silkworms should always be fed in this way, as it is cleanly, all refuse is left behind, it entails no necessity for handling the insect, and it enables the attendants to discover quickly and remove any silkworms which appear to be weak and cannot climb up through the meshes, and are there fore probably diseased. During the second stage, which lasts for three or four days, the worms are fed regularly every three hours, from six o'clock in the morning until nine o'clock at night. At the period of the second moult the length of the silkworm is about $\frac{1}{2}$-inch. At this stage care must be taken to prevent overcrowding, as this is a most fruitful source of disease. At the time of every moult the worms cease to feed, and food should not be supplied until after moulting is completed.

At the third stage, the larva measures 1 inch in length, and the period is from three to four days; during this time the worms may be fed on whole leaf. In four to five days the third moult takes place, followed by the fourth moult, which leads to the fifth and last stage. In the fourth stage the worms may safely be fed with fully-matured leaf, which has been carefully washed. Before pupating, the silkworms measure about $2\frac{3}{4}$ to $3\frac{1}{4}$ inches. To reach this stage they require 30,000 times their weight of food, of which two-thirds is consumed and the rest wasted. A table is given which shows that the larvae from 30 grams of eggs, which usually number 35,000 to 40,000 require 1,900 to 2,300 lb. of leaves. When the insect is about to spin, it ceases to eat, and begins to move its head about as if searching for something; it is then provided with a spinning place.

The portion of the work to which attention has just been given in some detail is succeeded by a table giving particulars of the life-history of silkworms raised by the Department. It is succeeded by an account of the Eri or castor silkworm* (*Attacus ricini*). In the larval stage, this insect is fed on the leaves of the castor-oil plant (*Ricinus communis*), and its life-cycle in the Philippines corresponds very closely with that of the silkworm which has just been described. For feeding this worm, the leaves do not require to be cut up, and trays of the kind used for the ordinary silkworm may be employed. The worm is allowed to spin on finely shredded, dry banana leaves, or on dried leaves of *Imperata exaltata* or *Saccharum indicum*, arranged in a wide basket having a depth of 6 inches. One of the advantages of the cocoon of this insect is that the moth can leave it without injuring the silk: the latter cannot, however, be reeled as in the case of the mulberry silk cocoon, but must be spun by means of a special apparatus.

The interest of the information given in the manual would tend to cause the reviewer to treat all parts of it in the detailed manner that has just been employed. Space does not, however, permit of this, and it must suffice to give short attention to the main matters that are considered further in the book. A short section dealing with wild silkworms is followed by a very useful summary of the chief matters connected with the enemies and diseases of silkworms, and it is stated that little fear need be entertained of outbreaks of disease in the Philippines, as long as all eggs are inspected at the entomological laboratory of the Bureau of Science, and growers are careful not to keep dirty, crowded, or ill-ventilated silk houses. As a measure against the introduction of diseases from other countries, an Act was passed, in 1907, to prohibit the importation into the Philippine Islands, except by the Bureau of Science, of silkworms, their eggs, or cocoons, or of the moth. Succeeding matters deal most usefully with the silk house, the mulberry tree (*Morus alba*), the production and shipping of eggs, and the elaboration of silk, and the manual concludes with an appendix, an adequate index, and with a series of very good plates, the value of which would, however, have been enhanced, if they had been accompanied by a short description of each, in addition to the ordinary references that are made in the text.

A sufficient use has been made of part of the information given in the manual to demonstrate the interest and usefulness of the subjects with which it deals. This has been made plain, further, by the information given as to the nature of its contents; and it remains to be said that, in view of the efficient way in which it treats of its subject, it should be available for consultation wherever an active interest is being taken taken in the production of natural silk.

*A good account of the Eri silkworm is also given in the *Agricultural Journal of India*, Vol. IV, p. 125.

FRUITS AND FRUIT TREES.

THE PROSPECTS OF COCOA-NUT GROWING IN THE VIRGIN ISLANDS.

In reply to a request from the Commissioner of Agriculture, a report has been furnished by Mr. W. C. Fishlock, Agricultural Instructor, on the prospects of cocoa-nut growing in the Virgin Islands.

It is stated by Mr. Fishlock, first of all, that he is convinced that there are many places in the Virgin Islands where cocoa-nuts could be planted to a moderate extent, with a fair prospect of success. In support of this opinion, attention is drawn to the clusters of cocoa-nut palms that are found growing in many parts of the islands. The trees in these clusters are generally fairly healthy and free from scale insects, although the latter pest attacks the palms to some extent, in the Virgin Islands. At present the trees are usually neglected, and often badly treated, as the leaves are frequently cut off and employed for the purpose of thatching huts. Under such conditions, it cannot be expected that even reasonable crops of nuts will be obtained.

As far as the market for cocoa-nuts is concerned, it is concluded that all the nuts available at present in the islands find a ready sale for cash, at prices higher than those obtainable if they were exported.

It is considered that it would be a matter of difficulty to induce small holders to plant cocoa-nuts on any reasonable scale. Mr. Fishlock is, however, keeping the matter before the peasantry. He gives a quotation from a paper read recently by him at a peasant meeting. In this he pointed out that the existence of sandy bays, which are not used by their owners for growing any plants, at present, affords good opportunities for taking up cocoa-nut cultivation. The estimate is made that every cocoa-nut tree in full bearing is worth at least 4s. per year to the peasant. In conclusion, after details have been given as to the cultivation and protection required by the palm, particularly when it is young, attention is drawn to the large market that exists for the nuts in connexion with the production of oil.

In a larger way, the conclusion is reached in the report that, as has been stated, it would be difficult to induce the peasantry in the Virgin Islands to take up cocoa-nut growing on any large scale, and that in the circumstances, the best method of extending the production is for plantations to be established by those in possession of capital, or by those who are capable of realizing the possibilities of adopting the cultivation on a large scale.

THE AVOCADO PEAR IN THE UNITED STATES.

Among other matters, the fact that this fruit is in season at the present time renders appropriate some reference to it in the *Agricultural News*. In making this, it may be pointed out that articles dealing with the avocado pear, or references to it, have appeared recently in this Journal, in Vol. IX, pp. 116 and 213, and Vol. X, p. 180. In the first of these, attention was given to the propagation of the plant and the best kinds of fruit: the second treated of methods of exportation; and the third dealt with the avocado in California, and presented information in regard to its cultivation. The particulars in the present article are taken from the *Pomona College Journal of Economic Botany*, Vol. I, No. 3 (September 1911). They have special relation to the avocado pear in Florida and California, and to the characteristics that should be shown by the fruit, for commercial purposes.

In the article of which this forms an abstract, attention is first drawn to the rapidly increasing interest in the avocado pear that exists in those parts of the United States where it is grown, as well as to the increasing demand in those portions of the country where it cannot be produced, and where a taste for the fruit has arisen. It then proceeds to give particulars of avocado-growing in Florida and California, and to deal with other matters that will be mentioned later.

FLORIDA. Greater progress has been made in this State than in California, chiefly on account of the proximity of Cuba where the fruit is commonly grown. The chief variety raised is the Trapp avocado. As regards the demand, this can only be supplied, so far, in the last half of August and the first half of September, so that work is being done in the growing and propagation of earlier and later varieties. A report from one of the firms that are interested in avocados states that the fruits are packed according to size; sometimes with only eighteen fruits in each case, but usually with thirty-six, forty-five or forty-eight. In this instance, the fruit was sent to all the eastern markets in the United States and to Chicago and Cincinnati. In the experience of this firm, budding has been found to be the best method of propagation; and of the buds put in, ninety-five per cent. are usually successful. Budded trees begin to bear in the second or third year from budding, and yield heavily in the fourth year; they show a tendency to be dwarfed. Another firm reports that the variety next in importance to the Trapp is the Pollock.

CALIFORNIA. It has been found impossible to obtain budded plants in sufficient quantity for planting in orchards in Southern California, so that, here, there are almost no plantations of budded trees The United States Department of Agriculture has, however, become interested in the development of the industry in Southern California, and has recently supplied a large number of budded plants for trial. These are all of the standard Florida varieties: Trapp, Pollock, Mitchell, Baldwin, Family, Wester, Blackman and Peacock; one variety from the Bahamas called Largo; and unnamed varieties from Mexico, Guatemala, Cuba, California, the Canary Islands, Florida and Hawaii. This importation should form a useful means of selecting choice varieties of the avocado suited to California.

CHARACTERISTICS OF THE COMMERCIAL AVOCADO. As regards season, in the United States, the greatest demand occurs during the winter months, when other fruits are scarce. In Florida, any kinds other than winter-bearing varieties of the avocado are rarely planted, because in summer, it is stated, many small avocados are imported to the east coast of the United States from the West Indies. In California it is now recognized that the hardiest varieties will prove the most successful, on account of the fact that, except in Southern California, comparatively low temperatures are experienced during certain parts of the year.

In the matter of yield, mature trees of the large varieties are often known to produce 500 to 1,000 fruits in each season; the small purple varieties are sometimes extraordinarily prolific, some trees having been known to bear as many as 4,000 fruits in one season. With respect to the size of the fruit, the mistaken opinion is often held that this should be as large as possible; under conditions in the United States, a fruit weighing from 15 to 20 oz. would appear to be the most suitable.

For export, it is best for the form of the fruits to be oval or nearly spherical; those possessing a neck require much care in packing, and are best suited for local consumption. Uniformity should exist, not only in regard to form but with respect to size, particularly as this increases the attractiveness of the fruit when it is exposed for sale. As regards colour, the purple varieties have been most in favour in California; in Florida those having a dark crimson colour seem to be preferred

In the case of avocados for shipment, the thickness and toughness of the skin are matters of importance. Many of the Mexican varieties possess a thick skin, while in others it is very thin; thickness is particularly a feature in the skins of Guatemalan types. In the matter of flavour, it seems that this is dependent on the percentage of fat in the flesh of the fruit. Lastly, the seed in avocados for export should fit tightly in its cavity, in order to prevent it from being shaken against the flesh and thus hastening the deterioration of the fruit; the seed should also be small, and it is hoped that in time the availability of a seedless variety will render the successful transportation of the fruit feasible over much longer distances than are possible at present.

Attention has been drawn in this volume of the *Agricultural News*, pp. 92 and 140, to the issue of six leaflets, by the Permanent Exhibitions Committee of British Guiana, dealing with the chief industries of the Colony. Another booklet in the same series has just been received: this deals with the gold and diamond industries, having been prepared by the Commissioner of Lands and Mines and issued, as in the case of the others, by the Permanent Exhibitions Committee.

A TRIAL WITH THE CHICK PEA IN ST. LUCIA.

The following account of an experiment made with the chick pea (*Cicer arietinum*—the Gram of Bengal) by the Assistant Agricultural Superintendent, St. Lucia, has been received from the Agricultural Superintendent in that island:—

Seeds of this plant were recently obtained from Ceylon by the Commissioner of Agriculture, and forwarded for trial to test its suitability as a green dressing crop in St. Lucia.

Owing to the small quantity of seeds received they were sown without delay to prevent the possibility of their losing vitality or being damaged by weevils.

Small holes were made 2 feet apart, and two seeds were sown in each hole. The seeds germinated well, but the plants grew very weakly. Flowering began eight weeks after sowing, the plants having at this time reached their natural height of about 1 foot.

The development of the root system was good; it was much branched and bearing numerous nodules, which must have had a good nitrating influence on the soil.

The plants did not however produce good foliage, as they made but little lateral growth, and at no period did they cover the soil. This was somewhat disappointing, as in India, *Cicer arietinum* is recorded as being a valuable rotation crop and of such dense growth as to kill out weeds.

I attribute the chief cause of failure in this respect to the fact that the seeds were sown in May, instead of November, the latter month being regarded throughout India as the most suitable time for sowing. The crop then ripens in February and March.

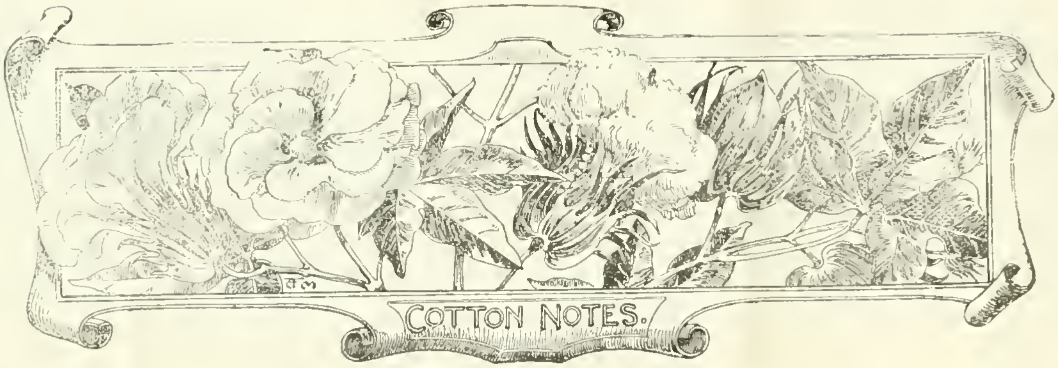
Seeds are being harvested from the plants, and further trials will be made.

Cicer arietinum is the most important grain of India, where it is extensively cultivated as a food crop. It is said to thrive best in a moderately heavy clay loam, light sandy soils being unsuitable to its growth

The following particulars, taken from *The Commercial Products of India* (Sir George Watt) may be of general interest:—

'The seed is extensively eaten both by men and cattle in every part of India except Madras. The pea is often parched and used in that form as diet, especially when cooking may be difficult or impossible. It is in this sense frequently of exceptional value to the Indian army. The seeds are also steeped in water to remove the husks, then mashed up and boiled alone or with onions, etc. (and this made into a thick soup), or the split pea may be cooked along with rice. Ground into flour, gram is used in various ways, such as in the preparation of sweetmeats or biscuits.'

H.M. Consul at Tamsui, reporting on the trade of Formosa during 1910, states that during the year a Japanese syndicate received permission to utilize some 3,500 acres of waste land in the Kagi prefecture for rubber-planting. The kinds to be put in are Central American rubber, Ceara rubber, Para rubber and Assam (Rambong) rubber, together with bananas, pine-apples and lemons; wind-breaks will be planted. The Government is also encouraging rubber-planting by raising large quantities of the trees named, and distributing them to peasants.



WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date October 23, with reference to the sales of West Indian Sea Island cotton :—

Since our last report, about 100 bales of West Indian Sea Islands have been sold, including Barbados 16*d.* to 17*d.*, St. Vincent 19*d.*, Montserrat 16*d.* to 16½*d.*, and St. Croix 15*d.* to 17*d.*, also about 50 Stains at 8*d.* to 9*d.*

The market has been firm, chiefly owing to the short supplies, but the tendency of American Sea Islands is downward.

The Carolina crop is expected to turn out rather more than previous estimates and will probably reach about 6,000 bales, against an average of 10,000 to 12,000. Prices of Carolina are quotably about 1*d.* down and Floridas and Georgias are decidedly easier, the best Floridas being obtainable at 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 21, is as follows:—

The receipts for the week were 165 bales, against 375 bales last year. They are composed chiefly of off cotton. There have been no sales, consequently the market has not yet opened and we have to omit quotations.

THE BRITISH COTTON GROWING ASSOCIATION.

The following is taken from an account received of a recent meeting of the British Cotton Growing Association:—

The ninety-second meeting of the Council of the British Cotton Growing Association was held at the Offices of the Association, 15, Cross Street, Manchester, on Tuesday, October 3. In the absence of the President (the Right Hon. the Earl of Derby, G.C.V.O.), Mr. J. Arthur Hutton occupied the chair.

WEST INDIES. It was reported that Dr. Watts, the Imperial Commissioner of Agriculture for the West Indies, had expressed the wish that the Association should be represented at the Agricultural Conference to be held next year in Trinidad, and it is hoped that Mr. John W. McConnell, of the Fine Cotton Spinners' Association, and Mr. William Marsland, of the Amalgamated Association of Operative Cotton Spinners, will be able to attend as Delegates from the Association, and as the respective representatives of employers and operatives.

WEST AFRICA. The cotton seed which has been distributed has now all been planted, and the Association's staff has been busy touring the principal cotton-growing districts; their reports show that the districts round Ibadan and Lafenwa in Lagos are suffering somewhat from drought, which is retarding the growth of the young plants.

In order to encourage planters to cultivate a better type of cotton, the Director of Agriculture for Southern Nigeria is proposing to give out seed to a number of approved planters in the neighbourhood of Ibadan, with a view to their carrying out experiments on a larger scale under the supervision of the Government, and the Association has guaranteed to purchase all the seed-cotton produced in this manner at a premium of ⅛*d.* per lb., which is equal to nearly ⅜*d.* per lb. of lint cotton.

The total purchases of cotton in Lagos to the end of September amount to 5,332 bales, as compared with 5,514 bales for the same period of last year, and 11,762 bales for 1909.

UGANDA. Reference was made to the difficulties in the transport of cotton in Uganda, more especially in the districts round Lake Choga, where an enormous quantity of cotton is being produced, and it is impossible for the lake steamer and the present railway service to carry more than a small percentage of the cotton grown. The attention of the Government has been called to this matter, and steps are being taken with all possible despatch to order at least one more steamer and additional lighters for service on Lake Choga.

The crop last year in Uganda amounted to about 15,000 bales; it is estimated that the 1912 crop may be from 25,000 to 30,000 bales, and that the 1913 crop may reach 50,000 bales. In order to deal with the rapid increase, the Association is taking measures to provide additional ginning facilities, and it is proposed to spend about £25,000 on additional machinery and plant.

It was reported that the cable between Mombasa and Zanzibar was broken on July 11, and had not yet been repaired; further, that the same cable was broken for a period of three or four weeks earlier in the year. The breakdown of the cable service has proved a very serious matter, and recommendations have been made urging the Government to construct a line of 107 miles to connect Nimule (the present terminus of the Uganda telegraph) and Gondokoro (the terminus of the telegraph line in the Sudan) in order to provide an alternative service.

SUDAN. It was reported that the experiments which are being made in the Sudan to prove whether cotton can be planted and harvested within the time that Egypt will allow the Sudan to use water from the Nile have so far been very successful. It was decided that the Chairman (Mr. J. Arthur Hutton) should visit the Sudan during the coming winter in order that arrangements may be made to proceed with the developments without delay, should the experiments ultimately prove successful.

INDIA. Some very important proposals have been received from the Indian Government, and it is suggested that the Association should commence certain experiments in the province of Sind. These proposals will shortly be considered by a Special Committee of representatives of the Master Cotton Spinners' Federation and the Association.

THE INTERNATIONAL AGRICULTURAL CONGRESS AT MADRID.

The *Journal of the Board of Agriculture* for September 1911 gives a detailed summary of the proceedings at the International Agricultural Congress held at Madrid in May last, which is based on an article in the *Journal d'Agriculture Pratique*, the latter publication having given the Board permission to utilize the information placed at the disposal of its readers. In turn, the following abstract has been prepared from the article in the issue of the *Journal of the Board of Agriculture* mentioned.

The work of the Congress was comprised in eight sections, namely: (1) economics, (2) statistics, (3) surveys, (4) forestry, (5) viticulture, (6) fruit culture, (7) breeding of live stock, (8) manures The scheme followed was to provide material for discussion by the reading of preliminary papers, to discuss the conclusions in these, and to pass resolutions based on those conclusions. For the furtherance of the work the Permanent Commission of the Congress is responsible for the transmission of the resolutions having an international object to the International Institute of Agriculture at Rome. The following paragraphs present the matters of more direct interest that came forward in the various sections.

ECONOMICS. More than twenty five papers were submitted for consideration and the first matter to which attention was given was the means of keeping agriculturists, both owners and workers, on the land. One of the most interesting papers had reference to the provision of housing accommodation for labourers in connexion with the purpose mentioned. Attention was also given to agricultural education, co-operation and agricultural credit. In relation to the last two, suggestions were brought forward with respect to the organization of credit societies, and conclusions of a general nature were made. The importance of water supply in Spain led to the reading of numerous papers on the subject; the demand in that country is for the control, by the State, of water required for agricultural operations. Another matter which came before this section was the interference with the water supply for agricultural purposes by the use of water-power for electric power systems.

STATISTICS. In regard to this section, a series of resolutions was made having relation to the following matters: (1) the provision of an official statistical department for the issue of information in regard to crop production; (2) the taking of means to obtain in each country, as frequently as possible, the prices current for agricultural products and the quantities offered and sold at the different rates; (3) the recommendation that the present work of the International Institute of Agriculture at Rome, in connexion with the issue of statistics, should be maintained and extended; (4) the provision of standards of quality of produce in different countries, for the purpose of which the International Institute of Agriculture at Rome should be asked to define useful types; (5) the provision of statistics concerning the more important crops, from the time of sowing until the attainment of maturity.

SURVEYS. In this section, there was only the adoption of a series of general recommendations dealing with the advantages and disadvantages of different official survey methods.

FORESTRY. The general conclusions have relation to the following points: (1) the necessity for reafforestation; (2) the recognition of both protective and productive forest areas; (3) complete State control in all mountainous areas owned by villages or public bodies, and technical inspection on its part for privately owned mountainous land within the forest zone; (4) the delimitation and classification by the State of the mountainous regions within the forest zone; (5) the provision of an international code in regard to reafforestation; (6) legislation for, and state support of, reafforestation; (7) the arriving at agreements among the countries interested, in regard to international rivers; (8) the popularization of the partial substitution of forestry for cultivation, where this is desirable, by the adoption of Arbor Day schemes and similar measures.

VITICULTURE AND FRUIT-GROWING Besides the matters having relation to wine-making, attention was given to the classification and exchange of insects parasitic on forms inimical to agriculture.

LIVE STOCK. The most important matter was the feeding of cattle; there was also a resolution requesting uniformity in regard to sanitary regulations relating to animals, and the teaching of animal hygiene. Attention was also given to methods of treatment of grass lands and the provision of pure seed for pasture crops.

MANURES. The object of this section was to collect information concerning the manures in the manufactue of which the nitrogen of the air is utilized. The discussion of the papers presented led to the following conclusion (in the words of the Journal): 'nitrate of lime and calcium cyanamide are nitrogenous manures well deserving the attention of the whole agricultural world, though more experiments with these manures must be undertaken in order to ascertain exactly how they should be used.' Finally, it was concluded by the Section that nitrate of lime possesses an action similar to that of nitrate of soda, while the behaviour of calcium cyanamide is apparently like that of sulphate of ammonia.

The Queensland Timber Industry.—The forest resources of Queensland are extensive, amounting to 40,000,000 acres, or 9·32 per cent. of the whole area of the State, while 3,836,191 acres, or 0 89 per cent. are specially reserved by the Government for timber. The forests of Queensland yield a great variety of woods noted for strength, durability, and beauty. The Eucalyptus dominates the forests, which contain ironbark, grey, spotted, and red gum, black butt, and turpentine. The conifers, too, are numerous, including Moreton Bay and brown, and bunya-bunya pines. Among the brush timbers of fine grain are red cedar, beach, tulip wood, and rosewood. In the extensive plateaux west of the dividing range off from the coast there is but little timber, and in the vast basin of the interior usually only stunted Eucalyptus trees are found. The quantity of timber cut and sawn in Queensland in the latest year for which the particulars are available was 100,760,000 superficial feet, valued at £660,000. (From The *Journal of the Royal Society of Arts*.)

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 treats of Special Uses for Concrete in Warm Climates. It draws attention to different ways in which concrete may be employed, in addition to the usual methods.

Page 354 presents an article giving information concerning the employment of sugar as a catch crop with rubber.

On page 356, there will be found articles of interest dealing with the prospects of cocoa-nut growing in the Virgin Islands, and with the present position of the production and consumption of the avocado pear, in the United States.

Attention is drawn to a notice concerning the forthcoming West Indian Agricultural Conference, to be held next year in Trinidad, which is given on this page.

The Insect Notes are presented on page 362. They give information concerning some insects injurious to ground nuts; and the legislation that exists in Porto Rico against the importation of the pests and diseases of plants.

The Fungus Notes, on page 366, comprise the commencement of interesting articles presenting observations on root diseases in the West Indies.

A useful article that has appeared recently, dealing with the value of different crops as green manures, is abstracted on page 367, as much of the matter in the information and conclusions possesses applicability to conditions in the West Indies.

The West Indian Agricultural Conference, 1912.

As is stated on another page of this issue of the *Agricultural News*, the Imperial Commissioner of Agriculture is visiting Trinidad, for the purpose of discussing with His Excellency the Governor, and those immediately interested, the arrangements for the forthcoming West Indian Agricultural Conference, which will be held in that Colony from January 23 to 30, 1912.

A great deal of interest is being shown in regard to this Conference, both in the West Indies and in England, and invitations to send delegates have been issued to a number of institutions in England. Among the institutions that have been approached in this way are the Royal Botanic Gardens, Kew, the Imperial Institute, the British Cotton Growing Association, the West India Committee, the Entomological Research Committee and the Rothamsted Experimental Station.

The account of a recent meeting of the British Cotton Growing Association, given under the heading Cotton Notes, on page 358, shows that this institution has already nominated its delegates, and particulars are afforded concerning the representatives chosen.

The Royal Mail Steam Packet Company has kindly placed at the disposal of the Imperial Department of Agriculture a certain number of free passages, from England to Trinidad and return, for the use of delegates to the Conference. It is not certain at present, however, if all the delegates from England can be accommodated with free passages in this way.

A Glucoside from Tephrosia Purpurea.

Information concerning *Tephrosia purpurea* has been given from time to time in the *Agricultural News* (see Vols. VIII, p. 405; IX, p. 281; and X, pp. 245, 284, 293). A further detail of interest appears in a note bearing the above title, which is given in the *Agricultural Journal of India* for July 1911, p. 325, on a paper, dealing with the subject, which appeared in the *Journal of the Chemical Society* for September 1910.

It is stated that *T. purpurea* is common in many parts of India, especially in the United Provinces, where it is often a weed. An investigation of the plant was begun in India and finished at the Davy Faraday Laboratory of the Royal Institution of London, which has shown that the leaves of the plant contain about 2½ per cent. of their dry weight of a glucoside.

The glucoside, on hydrolysis, gave rise to two sugars—rhamnose and dextrose, and to a yellow crystalline substance which was found to be quercetin.

The importance of this circumstance is derived from the fact that quercetin is used to a large extent in the dyeing industry, so that it is in demand in commerce.

The investigation showed, further, that *T. purpurea* does not contain indican, or any other substance yielding indigo.

Rubber in the Honduras Republic.

An article in the *India Rubber World* for October 1, 1911, shows that the imports, by the United States, of rubber from Honduras, have increased from 93,126 lb., value $55,709, in 1906, to 148,813 lb., value $117,808, in 1910. Between these years the largest amounts and values were 104,334 lb., and $76,444, and 102,010 lb. and $65,865, in 1907 and 1908, respectively.

Information is given to show that the variation of temperature in the highlands of Honduras is from 41° to 59° F.; in the valleys and on the coast the maximum is 86° F. Cultivation is profitable on account of the high fertility of the land and of the abundance of water.

The acquisition of all kinds of property, in the Republic, is very easy, and its disposal is free from restrictions. Grants of agricultural land are made by the Government, and on the cultivation of these they are freed from taxation; further, all machinery and apparatus for any industry are exempt from all duties and taxation.

It was pointed out at the recent Pan-American Commercial Conference that the greater part of Honduras is completely unexplored, and that the fertile land, well supplied with water, offers great advantages for the investment of capital.

It is reported that a private company has obtained a title to 3,000 acres of virgin land that is well adapted to rubber-growing, and that planting has been conducted on a large scale. It is said that this company is to open up an additional area of land, large enough to contain several hundred thousand trees which will be transplanted from large nurseries as the soil is made available.

Care with Poisonous Substances Used in Cotton Growing.

A Memorandum has been prepared by Mr. H. A. Tempany, B.Sc., Superintendent of Agriculture of the Leeward Islands, and published in the *Official Gazette*, dealing with the handling and storage of poisonous substances used in the cotton industry, and indicating the remedies in cases of poisoning by any of these substances. The Memorandum has been issued since the occurrence of a fatal case of poisoning, which took place through the drinking of corrosive sublimate solution intended for disinfecting cotton seed: it has been distributed in leaflet form among cotton growers in the Leeward Islands.

Attention is first drawn to the fact that corrosive sublimate, Paris green and London purple, which are extensively used at the present time in the cotton industry, should be preserved in closed packages, and stored in places to which responsible persons alone are allowed access. All such packages should be clearly labelled with the name of their contents, and marked plainly with the word Poison.

It is pointed out, further, that the substances mentioned are all irritant poisons, and that the symptoms of their presence are an acrid or burning feeling in the throat, nausea and vomiting, violent pains in the stomach accompanied by diarrhoea, coldness of the extremities, and subsequent collapse.

Lastly, in cases of poisoning by these substances, the most important point is that medical aid should be summoned immediately. During the time that elapses before it arrives, an emetic such as mustard and water should be given, if vomiting is not taking place freely. Where the poisonous agent is corrosive sublimate, the white of eggs mixed with water or milk should be administered at once. In the case of all the poisons, the preliminary treatment should be followed by the giving of demulcent drinks, such as barley water and flour and water. If it is indicated, a stimulant, preferably weak brandy and water, may be given; and if the skin is cold, hot blankets should be applied. Stress is again laid upon the fact that medical aid should be obtained with the least possible delay.

Agriculture in the East Africa Protectorate.

Colonial Reports—Annual, No. 669, dealing with the East Africa Protectorate for 1909-10, states that as regards the Highlands a very hopeful feeling exists both among farmers and merchants. Progress is being assisted by the formation of agricultural associations and the obtaining of new markets; in addition, much valuable information has been collected with regard to climatic conditions, the suitability of crops to various districts, and the diseases and pests affecting stock and crops. Importations have been made of pure-bred cattle, both by the Government and by private owners. Details are given which indicate that the good progress is general. A new feature in the agriculture of the country is the production of sisal hemp.

As regards the Coast and Nyanza basins, success has been obtained with cotton, in favoured localities; it seems that Egyptian cotton is most suited to the conditions of the coast, while in the Nyanza basin the Upland variety appears to be most fitted for cultivation. Several of the rubber plantations are beginning to produce; they are mainly planted with Ceara, but success is being obtained with other varieties. A great extension of rubber-planting is expected in the near future.

Particulars are given of the experimental farms. The work in these received interference through drought; much attention is given at these stations to stock-raising. On the coast, satisfactory progress is being made with Ceara and other rubber plants; heavy rains spoiled the cotton experiments. The cultivation of cacao is promising well, and trials are being made with many exotic plants.

Particulars are given concerning diseases of animals, which show that east coast fever is still prevalent, and that considerable losses have been sustained from other diseases. It is an interesting fact that the immunisation of pure-bred stock against Texas fever, before it is imported from England, has been successful; no fatal case has been reported among immunised animals. There has been a large freedom from insect pests; while wheat growers have suffered considerable losses through a disease mentioned as rust.

INSECT NOTES.

SOME INSECT INJURIES TO GROUND NUTS.

The following is abstracted from Circular 142, issued by the Bureau of Entomology of the United States Department of Agriculture, entitled The Indian Meal Moth and Weevil-cut Peanuts.

Peanuts (which are better known in the West Indies as ground nuts) are a crop of considerable importance in the United States, the peanut industry in 1910 being estimated to have a value of $15,000,000. Until a few years ago, this fruit was considered almost immune from insect attack, since the plants were affected in the field by very few insects, and the nuts in storage were protected by their thick shells. A few kinds of beetles were known to be able to penetrate the woody shells of the nuts, but the damage occasioned by these attacks was very slight.

The advent of the mechanical thresher or peanut picker has been accompanied by a great increase of injury by insects. The shells of many nuts are cracked and broken, especially when the machine is fed too fast, in an effort to accomplish the greatest amount of work in the least time. The broken shells allow easy access by insects to the kernel, which could not penetrate them in their unbroken condition.

The loss occasioned to the grower and dealer has, during the past few years, become very considerable—in fact it is estimated that this amounted to $3,000,000 in 1910, or 20 per cent. of the total value of the industry.

The Indian meal moth (*Plodia interpunctella*, Hubn.) has assumed a position of first importance in this connexion, and is chiefly responsible for the enormous amount of injury mentioned above. Other insects which are frequently found to injure ground nuts in storage are: the rust-red flour beetle (*Tribolium navale*, Fab.); the saw-toothed grain beetle (*Silvanus surinamensis*, L.); the cadelle (*Tenebroides mauretanicus*, L.); the fig moth (*Ephestia cautella*, Walk.) and the Mediterranean flour moth (*Ephestia kuehniella*, Zell.). The three first mentioned of these are beetles which have mouth parts sufficiently hard and strong to enable them to cut through the shells of the ground nuts, but they are not often seriously injurious. The entrance of the moths and their larvae is made possible only when the shells are injured in some manner.

In addition to receiving injury in the threshing machine, ground nut shells are broken after the nuts are put into the sacks. It is the practice to stack the sacks so high that it is necessary for the labourers to climb up on them, and those at the bottom are walked upon and many of the shells broken.

In discussing the control of the Indian meal moth, the greatest importance is placed upon methods of handling and storing the nuts; while fumigation with carbon bisulphide and hydrocyanic acid, and the application of high temperatures are recommended as direct remedial measures when severe attacks are experienced. Attacks by the other insect pests already mentioned may be prevented and controlled by the same means as those used in the case of the Indian meal moth.

In the West Indies, ground nuts are not a very important crop, so that the remedial measures mentioned are not likely to be necessary. It would be well, however, for growers of this nut to remember that broken shells give rise directly to insect attack; and consequently that care should be taken to harvest and store the crop in such a manner that injury of this kind may be reduced to a minimum.

PEST LAWS IN PORTO RICO.

The Government of the island of Porto Rico has recently passed an Act (No. 45, approved March 9, 1911) which creates a Board of Commissioners of Agriculture, and amends previous legislation, entitled An Act to Prevent the Introduction into Porto Rico of Plant and Insect Diseases, and Pests, and for Other Purposes (No. 60, approved September 3, 1910). The new act also provides for the introduction and protection of birds useful to agriculture.

The Board of Commissioners of Agriculture consists of seven members, representing the various agricultural interests of the island, who are appointed for a period of one year, being eligible for re-appointment.

Section 6 of the Act relates to birds beneficial to agriculture, and reads as follows:—

'That the act of seizing, killing, destroying or keeping in ones possession, any bird beneficial to agriculture, be and is hereby declared to be unlawful. Whosoever seizes, kills, destroys, or keeps in his possession any bird beneficial to agriculture, shall be guilty of a misdemeanour, and punished therefor with a fine of not less than five nor more than twenty-five dollars, or with imprisonment for not more than ten days, or with both penalties. The board shall prepare, print, publish and furnish on request, a list of birds which in their opinion are beneficial to agriculture, and any bird comprised in said list shall be conclusively considered as beneficial to agriculture for the purposes of this Act.'

Sections 7 and 8 are the sections 1 and 3 of the previous law, which have been amended to read as follows.—

'Section 1 (60—1910).—That no live tree or plant or any portion thereof, or the seeds of the same (except roasted coffee, cereals, fruits from other than tropical countries, vegetables or nuts, for domestic consumption), seed hulls, or roots, cotton lint loose or in bales, shall be brought into Porto Rico from any other place without having attached thereto, in a prominent and conspicuous place, a certificate under oath signed by a duly authorized State or Government entomologist to the effect that the said articles are free from disease; *Provided*, that in the case of cotton seed, seed cotton, cotton seed hulls or cotton lint, such certificate shall set forth that the locality in which the shipment originated was found by actual investigation by said attesting official or his agent, to be free from the pest known as 'boll weevil,' or any other pests or diseases harmful to the cotton plant; *And Provided, further*, that in the case of cocoa-nut trees, nuts or products of the cocoa-nut manufactured or unprepared for consumption, such certificates shall set forth that the district in which the articles originated is free from cocoa-nut plague, or any other disease harmful to cocoa-nut trees: *And Provided further*, that this Act shall not prohibit nor make conditional, the importation of agricultural products to be manufactured, ground, milled or utilized for industrial purposes, but its importation shall, however, be made subject to reasonable regulations to be prepared by the Board, with reference to precautions to be taken to prevent its causing harm to agriculture.'

'Section 3.—That no live tree or plant or any portion thereof, or the seeds of the same (except roasted coffee, cereals, fruits from other than tropical countries, vegetables or nuts for domestic consumption), seed hulls or roots, or cotton lint loose or in bales, except agricultural products for manufacturing, grinding, milling, or for industrial purposes, subject to the regulations provided for in Section 1 of this Act (60—1910) shall be brought into Porto Rico from any other place except through the ports of San Juan, Ponce and Mayaguez.'

A NEW METHOD OF OBTAINING RUBBER FROM CASTILLOA.

The *India Rubber World* for October 1, 1911, contains an account of a method for dealing with Castilloa, for obtaining rubber, that has been devised by a planter named Gierlings, who has had a large experience with this plant in Southern Java. The account contains an illustration of the knife with which the tapping is done. The following matters of chief interest are extracted from the article:—

Mr. Gierlings has devoted a great deal of time to experiments in tapping. His latest method, tried last year, has given the best results and it is well worthy of a brief description. His method is as follows.

With a special form of knife, which is made by the native blacksmiths, horizontal incisions are made, beginning about 1 foot from the ground and going around one quarter of the circumference of the tree. These incisions are made about 3 inches apart, being cut ½-inch deep, or down to the cambium, and are continued until there are fifty of them, reaching to the height of 13 feet. The same operation is repeated on the next quarter of the tree, beginning at the top aud working down, but a narrow strip of bark about 1 inch in width is left between these two series of horizontal cuts.

After a rest of three months, the other half of the tree is tapped in the same way, and three months later the operation is repeated on the first half of the tree, the incisions, however, being made about ½-inch below the original cuts. As the tree is allowed to lie idle during the three months' flowering season, it is tapped only three times a year. This method of tapping produces about 8 oz. of dry rubber a year from trees eight to nine years old.

The latex exuding from these incisions is in the form of a soft mass. With every tapper is a woman, whose duty it is to collect the latex. Her equipment consists of a large bamboo pot, a small bamboo pot, a spoon and some bamboo spatulas. The large pot is equipped with a sharp point at the bottom so that it can be stuck into the ground. Both this and the small bamboo pot, which she carries with her, are partly filled with water. She mounts a ladder to the uppermost incision and works her way down the tree scraping the latex with the bamboo spatula into the spoon and pouring it into the small pot, which when full is emptied into the larger one. The contents of the larger pots are collected by men and carried to the factory where the latex is passed through a coarse sieve and then diluted with water, and passed through a finer sieve into a washing vat, usually made of galvanized iron and holding from 25 to 75 gallons. After the liquid has settled, the rubber globules come to the surface and the remainder of the liquid is drained off through an outlet at the bottom. Fresh water is then poured into the vat, the mixture stirred and allowed to settle, and again drained off. This is repeated until the latex looks pure, which generally requires three or four washings. The washing of the latex is usually completed the day it is gathered.

The latex is then coagulated in round enamelled pans. About a pint of latex is poured into each pan together with ⅓-oz. of 40 per cent. solution of formalin, the two being well stirred together. In the meantime a boiler of water has been heated, containing about 1 grain of 98 per cent. acetic acid per quart of water. When the water is close to the boiling point three-quarters of a quart is poured into each pan of the latex In this way the latex is heated to from 150° to 160° F., and immediately coagulates and floats on the top of the water in spongy cakes. These cakes are pressed together and the water poured out, but is saved, and the latex it contains is secured later. The coagulated cakes are immediately rolled into thin sheets. These are placed again in vats with clean water, to which a very little formalin has been added, and allowed to remain there for a few hours, and then removed to the smoking and drying house—a building with perforated iron floor, on which drying racks are placed.

The temperature in the smoking house is kept at about 110° F., and a dense smoke is developed by means of burning damp grass. The sheets of rubber remain in this smoke house for two or three days, and get about one-half dry. They are then pressed into small squares weighing about 3½ lb. These are placed in another formalin solution for a shorter time, and then taken again to the smoking house for a final drying. The rubber is allowed to retain about 5 per cent. of water when it is shipped, experience showing that it dries out on the way, and that it keeps much better. The square blocks are packed in smooth finished cases made expressly for them.

GERMINATION OF HEVEA SEEDS IN GRENADA.

The following note on recent trials of the germination of Hevea seeds, conducted at the Grenada Botanic Station, has been received from Mr. G. G. Auchinleck, B.Sc., Superintendent of Agriculture. A report of former, similar tests made by Mr. Auchinlech was given in the *Agricultural News*, Vol. X, p. 111:—

Two of the specimens of *Hevea brasiliensis* fruited at the gardens again this year, one yielding a very small crop of about sixteen seeds, the other giving a crop of over 1,100 seeds. The total yield from the two trees was 1,191 * seeds, collecting being done between August 10 and September 20.

Contrary to the practice of former years, the fruits were not allowed to dehisce upon the trees, as it was strongly suspected that seeds from such fruits would have already lost their power of germination. The capsules were this year picked immediately after turning brown, and the seed set out at once.

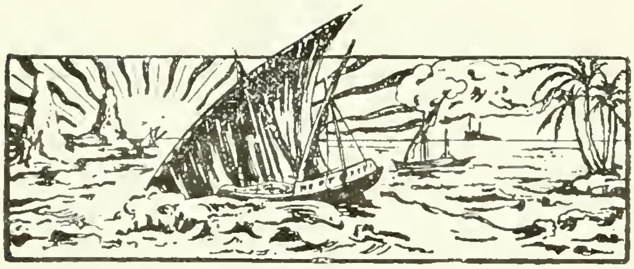
In all 394 capsules were picked, and again the irregularities which are common in the Euphorbiaceae showed themselves. The following indicates the kinds of fruit obtained and the seeds contained:—

Bi-locular capsules	6	12 seeds
Tri-locular ,,	372	1,116 ,,
Quadrilocular ,,	16	64 ,,
Total		1,192 * ,,

All seeds were planted in the sand-beds, whether rejected on the weight test or not, and the plants as they came up were potted in bamboo joints and watered when necessary. Up to October 13, 807 strongly growing plants have been sold to local planters, these being probably all that will be obtained. The germination works out as 67·7 per cent.—a fair percentage, considering that light seeds were not rejected.

These results show, however, that even when the precaution of collecting fruits before dehiscence is exercised, a loss of some 30 per cent. may be expected.

* One seed lost in handling.



GLEANINGS.

The distribution of plants from the Dominica Botanic Station during September last included the following: limes 4,550, spineless limes 200, cacao 170, Para rubber 100, grafted mangoes 5, miscellaneous 110. The total distribution was 5,135 plants.

Great efforts are being made to increase the cotton output in German East Africa. The harvest for 1911 is calculated at 3,800 bales—already twice the quantity produced in 1910, and similar efforts are being made under German influence in Brazil. (The *Textile Mercury*, September 23, 1911.)

References have been made from time to time in the *Agricultural News* to the National Dairy Show which was held at Chicago from October 26 to November 4. In connexion with this, further information has been received to the effect that the President of the United States has offered a silver cup, for competition in the Students' Judging Contest, at the show.

A letter in the *Field* for August 26, 1911, draws attention to a preparation called Antinonnin, which is stated to prevent effectively the growth of fungi, moulds and dry rot in timber. It is made by Messrs. Bayer & Co., and one of its chief advantages is that it is non-volatile, and does not possess any odour. This characteristic should make it especially adapted for use in houses.

The amounts of the principal products shipped from Dominica, to the end of August of the present year, are as follows: cacao, 5,461 cwt.; citrate of lime, 886 cwt.; concentrated lime juice, 23,390 gallons; raw lime juice, 103,143 gallons; lime juice cordial, 5,750 gallons; ecuelled lime oil, 336 gallons; distilled lime oil, 1,672 gallons; limes, 30,320 barrels and 2,118 boxes; pickled limes, 203 barrels; coconuts, 281,182.

The *Board of Trade Journal* for September 21, 1911, draws attention to an article in the *Nachrichten für Handel und Industrie* (Berlin), for September 5, 1911, in which it is stated that there has been a considerable increase, in late years, in the production of cotton in Afghanistan. This is dealt with at Peshawar, and the quantity sold yearly is comparatively small, scarcely exceeding 3,000 bales of 400 lb. The cotton has recently been imported into India by way of Chaman; it is used chiefly for the manufacture of household articles such as drapery, carpets, tablecloths and bed sheets.

At the present day there are 442 publications in the United States and Canada which deal with agriculture, sylviculture, floriculture, live-stock and live-stock breeding, irrigation, poultry, bee culture and the dairy. Out of this number, 228 are monthly publications, 57 bi-monthly, 140 weekly, 4 bi-weekly and 13 daily. It may be calculated that these publications pass into the hands of from two to three million farmers. (*Bulletin of the Bureau of Economic and Social Intelligence*, of the International Institute of Agriculture, June 30, 1911, p. 246.)

An Ordinance (No. XVII of 1911) has been passed recently in Papua, for the purpose of amending the enactments relating to the prohibition and prevention of the introduction of certain animals into the Territory, and the checking of diseases in animals. This prohibits the importation into the Territory of rabbits, foxes, hares and monkeys, under a penalty of £500; penalties of £100 are also enacted for the possession of such animals, for allowing them to escape, or for obstructing Officers of the Government in their work of destroying the animals. The Ordinance further regulates the introduction of all animals except domestic animals, and, as has been indicated, provides for the prevention of the importation of diseases of animals.

The *Experiment Station Record* of the United States Department of Agriculture for June 1911, p. 645, gives a note on tapping experiments that have been conducted with young *Funtumia elastica* trees at Amani, German East Africa. It was found that the largest yields were obtained when the quarter-section method of tapping was employed, but it is considered that herring-bone tapping will give the best results, as a general rule. Tapping operations conducted with six-year-old trees were found to be profitable; there is, apparently, an increase in the quantity of latex with the age and diameter of the tree, although in some cases comparatively high yields were obtained from slender trees. It was concluded that it is best to select the seed from trees showing a continuously high yield, as in many cases high returns are given, but are not necessarily sustained. No conclusions are available, so far, as to the damage which repeated tappings cause to the trees.

Attention is drawn to a description of a permanent label for trees and shrubs, used exclusively for such plants at the Royal Botanic Gardens, Kew, which is given in the Handbook of Tropical Gardening and Planting, by H. F. Macmillan (see *Agricultural News*, Vol. IX, p. 379). The label consists of a piece of sheet lead measuring about 3 by 2 inches, with about ½-inch of one of the longer sides turned over to form a rim, below which two holes are pierced for suspending by wire. The letters composing the name of the plant are neatly punched in with punch type, the impressions being filled in with white lead or zinc paint, and the surface afterwards rubbed over with an oiled rag. Where the atmosphere contains a large proportion of compounds of sulphur, as in Montserrat and Dominica, zinc paint would be used instead of white lead. Suitable punches may be obtained from Messrs. Baird and Tatlock, 14, Cross Street, Hatton Garden, E.C., at the price of £1 1s. per set, for letters ⅜-inch high.

STUDENTS' CORNER.

NOVEMBER.

SECOND PERIOD.

Seasonal Notes.

As has been stated already, the receipt of favourable weather during the present quarter will give opportunities for the planting out of limes. A careful review should be made of the history of the young plants in the nursery with especial reference to the various arrangements that have been required for their proper care, and the cost of the work that has been entailed. The results of such considerations should be useful, and will form a means of ascertaining if lime seedlings can be grown at a lower rate than that which is charged for them when they are sold locally. Lime plants that were placed out earlier in the season should now be making growth; in some cases they may remain stunted, and for such plants a light dressing of a nitrogenous manure should prove to be useful. Young lime plants should receive careful attention, in order that attacks of scale insects may be detected and dealt with promptly. Describe the measures that should be adopted for the purpose of freeing young lime plants from scale insects. Where spraying is employed, the process should be repeated after two or three weeks. Why is such repetition necessary? Under some conditions, a careful watch is required for the appearance of parasites such as mistletoe and the love vine (dodder). State why these are more harmful than epiphytes like the wild pine.

Work in lime plantations at the present time also includes the making of careful observations on the preparation of the products from such cultivations. Among these the chief are raw lime juice, concentrated lime juice, distilled and hand-pressed oil of lime, and citrate of lime. Under the conditions of which you have had experience, obtain a good knowledge of the market price of lime juice products, and if possible compare the values of raw lime juice, the concentrated juice, and citrate of lime. In the works where limes are dealt with, cleanliness is essential, and it is necessary to wash everything that has been used during the day, as far as this is possible. What is your experience of lime skins as cattle food? Lime skins may be made into a kind of ensilage. What is an ensilage; what are its particular matters of utility; and how is it made and used?

It has often been pointed out that manures derive their usefulness in relation to two matters: their effect on the texture of the soil, and the fact that they actually supply, either directly or indirectly, food that is of use to plants. The circumstance that a given manure is rich in food bodies required by plants is not the only matter to be taken into account when the question of its employment is being discussed. Unless the soil is in a state favourable to the growth of beneficial organisms in it, and to that of the plants that are being raised, the addition of such manures is almost useless. This is where the importance lies, of the use of stable manure and of green dressings. The latter also possess an important and useful property in that they increase the power of the soil to retain moisture. Plant food is taken in by the roots, in liquid form, and however well the land may have received attention in the matter of the supply of artificial manures, these are of little or no use to the plants growing in it, unless there is a sufficient amount of water present to act as a carrier of plant food. There is a final consideration, namely that the employment of rich artificial manures in badly tilled soil is wasteful under any circumstances, as these will be removed in drainage and subsoil water and thus constitute an absolute loss where they have been employed under such conditions.

AGRICULTURE IN THE BAHAMAS, 1910-11.

This is dealt with in *Colonial Reports* Annual, No. 684, issued in August last. The details given show that the value of the exports was £193,803 (including specie £3,121): in 1909 it was £171,442 (including £2,750 specie). The produce of the Colony was valued at £188,286, as against £165,116.

The number of cases of tinned pine-apples exported was 43,041, value £9,219, as compared with 46,639 cases, value £8,999, in the previous year. The industry is steadily becoming smaller in extent owing, it is stated, to poor stock, Hawaiian competition and United States duties. During the year under review, drought caused a shortage of the crop, many fields having died out entirely. An account is given of the sisal factories in the islands, which produced 6,296,687 lb. of fibre, worth £42,057. The amount of this product exported continues to increase, while the value decreases. A large amount of lumber was cut; this is taken chiefly by Cuba.

With reference to grape fruit and oranges, there was no trade with Canada during the year, owing to the want of facilities for marketing, and of means of transport. The grape fruit exported amounted to 244,000, value £846, as against 365,000 in 1909. There was an insignificant export of oranges, amounting to 42,000, value £68.

An increased interest in Sea Island cotton has been taken, but the climatic conditions during the season were unfavourable. The late Board of Agriculture had been considering a scheme for the provision of gins, and of assistance to market this product. The export of cocoa-nuts has diminished to nothing; suitable land for growing this crop exists in large areas; in order that the industry may flourish, provision is required of a market and means of transport.

As is well known, the Board of Agriculture of the Bahamas has ceased to exist, on account of the fact that the House of Assembly has decided unanimously not to renew the Act under which it was constituted. The reason given for this action is that the results obtained by the Board did not justify the cost of its work.

There has been an improvement in the sponge fishery; the sales on the Exchange were £79,102 as compared with £70,000 in the previous year, the total exports being £110,740 as against £87,657. It is stated in the Report that certain sponge fisheries remain closed, and that restrictions are imposed as to the size of wool and velvet sponge which may be gathered. An extract is given from the Report of the Marine Products Board describing an experiment that is being made in sponge propagation. The principle of this is to supply a large amount of surface on which sponges may grow, by strewing the water in an enclosed space with wattles and other material. It is the opinion of the Board that this method will prove more practical and economical than propagation by cuttings. It is pointed out in the Report, from which the above information is taken, that there is a great need for the appointment of a biological expert in connexion with the sponge industry, who would study the local conditions and give advice on such subjects as improved methods of propagating and gathering the sponges, and the opening and closing of sponge areas.

FUNGUS NOTES.

OBSERVATIONS ON ROOT DISEASES IN THE WEST INDIES.

PART I.

In the following article information is given on the subject of root diseases of cacao, limes and other host plants found in certain of the West Indian islands. This is of a preliminary nature, and is based on a report recently submitted to the Imperial Commissioner of Agriculture by Mr F. W. South, B.A., Mycologist on the Staff of this Department. The report summarizes the results of work conducted by that Officer during a recent visit to Dominica; while this article contains in addition reference to investigations made on material consisting of diseased plants of several kinds forwarded from certain of the other islands during the course of the last eighteen months.

As a result of the work referred to above, three different forms of root disease have been recognized in Dominica. Two of these have been found on lime trees only, up to the present, while the third is common to several hosts, among which are included cacao, pois doux (*Inga laurina*) and probably several other plants of economic importance. In addition to these it would appear likely that a disease of different origin occurs on limes in Montserrat and Antigua, while yet another is to be found on cacao and nutmegs in Grenada.

BLACK ROOT DISEASE. Since it is probably the most important and most widely distributed, this disease, the third of those referred to in the preceding paragraph, will be dealt with first. In the island of Dominica, it is the most common form of sporadic disease, to be met with particularly on newly cleared estates in the interior. It is frequently accountable for the death of pois doux trees planted as a wind-break; from these it may spread to cacao or lime trees in the vicinity. It must, however, be pointed out that its original attack is by no means confined to pois doux, but it has been found to spread from dead mahoe cochon (*Sterculia caribaea*) to lime trees, while it has also killed Hibiscus and Acalypha planted as hedges. Moreover, instances are on record of its appearance on lime and cacao trees that were not near any of the plants mentioned above. In these cases it is doubtful whether the causative fungus actually commenced its growth as a parasite on the trees mentioned, or spread to them from some decaying wood, such as a tree stump, buried in the soil.

Fungi with almost identical mycelial characters have been found in several of the other islands, but conclusive evidence of the identity of these with the Dominica species is wanting, since in all the former cases no fructifications have been found. One of these fungi occurs in St. Lucia on cacao, Castilloa rubber and pigeon peas, and probably also on immortel, limes and oranges. Another has been found in Grenada on young Castilloa trees, while yet another was seen in St. Vincent on cacao. Possibly, also, the disease known as 'burning' of arrowroot, in the same island, may be due to this fungus; though the evidence on this point is by no means conclusive. Another disease, possibly of the same origin as the black root disease, is that occurring on pois doux and coffee in Guadeloupe, and attributed by Delacroix to a species of Rosellinia or Dematophora, whose effect may be combined with the injurious action of eelworms. For the sake of simplifying the position, it may be added that the root disease of cacao, and probably of nutmegs and mangoes, in Grenada, described by Howard in the *West Indian Bulletin*, Vol. II, p. 207, and ascribed by him to a basidiomycetous fungus, is probably different from the black root disease.

In many instances, the first symptom of infection on limes, cacao and pois doux is a thinning of the foliage. This, however, does not always occur, particularly where lime trees are concerned; while, in some cases, it is overlooked, or attributed to other causes. The next symptom is the sudden wilting of all the foliage, succeeded two or three days later by the complete death of the tree. The suddenness of this occurrence, followed as it often is by the death of other trees near that first killed, frequently causes some alarm, as it naturally gives rise to the idea that a serious epidemic is about to destroy the whole field. Such is, however, far from being the case, and careful attention to the comparatively simple remedial measures will result in completely staying the spread of the disease.

On carefully examining the collar and roots of a diseased tree, the first thing noted, in advanced cases, is the presence of a dark, olive green mycelium, possessing a grey border along its advancing edge, and encircling the entire basal 6 or 12 inches of the stem. Where this is absent, a dark-brown mycelium, often mixed with earth, is to be found on the larger roots, and the portion of the collar below ground. Beneath this the bark is usually destroyed, and may contain a thin, black, brittle crust of fungus, from which narrow, black streaks run horizontally into the wood. Similar streaks also occur, running vertically in the wood. On removing the bark, white fan-shaped masses of mycelium are to be found on the surface of the wood, particularly in the case of cacao and pois doux. On younger roots the brown mycelium is present on the bark, while the presence of fungus in the wood is indicated by a grey discoloration. Finally, very thin plates of black fungoid tissue, appearing as lines in horizontal or vertical sections, may in some cases separate the badly infected wood from that less seriously damaged.

The mycelium of the causative fungus—a species of Rosellinia—is white when young, but dark brown when old or exposed to the air for any length of time. Numerous partition walls occur in the hyphae, while pear-shaped swellings, characteristic of several members of this genus, are formed on one side of many of these cross walls. The hyphae vary immensely in size; in some cases they form into strands consisting of colourless hyphae in the centre, surrounded on the outside by several layers of dark-brown hyphae. The streaks mentioned as occurring in the wood are about $\frac{1}{2}$ mm. wide and are made up of small polygonal black cells on the outside, with colourless hyphae running longitudinally in the centre.

The fungus reproduces itself by means of two forms of spore, both borne on the mycelium surrounding the base of the stem above ground. The first is a conidial form, which is apparently evanescent in character and has not been satisfactorily made out. It would appear to be produced on crowded, short, simple or branched black stalks, projecting at right-angles to the surface mycelium and having the effect of the pile of a carpet. This type is borne on trees that have just died. The second is a spindle-shaped black spore with a long straight or curved appendage at either end. Eight of these are produced in sacs or asci contained in black perithecia. The perithecia are superficial, crowded together, black, brittle and about 2·5 mm. in external diameter. On the outside, they are crowded with short club-shaped appendages. The spores are extruded in a black tendril through a small, scarcely prominent opening at the apex of the perithecium. This form of reproductive organ only occurs on trees that have been dead at least three months. The fungus may spread either by means of its spores or by means of its mycelium underground. It is not yet certain if the spores can produce direct infection, or if they can only germinate on decaying wood and thence spread to healthy trees. In any case the first step when a diseased tree is observed is to cut it down and burn it, before the destroying fungus can produce spores upon it. When this is being done, all the roots of trees in the neighbourhood should be examined and any infected ones should be removed in order if possible to save such trees. The soil should be well forked and dressed with lime or iron sulphate; at the end of twelve months, a supply may be put in. When the disease is spreading down a wind-break of pois doux, its progress may be arrested by digging a trench at rightangles to the direction of the wind-break in the manner usually recommended for dealing with root diseases.

In the next number of the *Agricultural News*, further information will be given, derived from the same sources, dealing with the subject of the other two diseases of limes mentioned above.

AGRICULTURE IN GREAT BRITAIN, 1911.

The following statement concerning agriculture in Great Britain during the present year has been issued recently by the Board of Agriculture and Fisheries. It is accompanied by a table giving details of the matters to which reference is made.

The preliminary statement of the agricultural returns collected in June last shows a further reduction, by 51,272 acres, of the cultivated area of Great Britain, arable land having decreased by 20,786 acres and permanent pasture by 30,486. The acreage of wheat increased by 97,189 acres, and reached a total of 1,906,043 acres, being a larger area than has been recorded in any year since 1899. The acreage of barley, on the other hand, declined by 130,734 acres, and reached a smaller total than any yet recorded. There was practically no change in the acreage of oats, but the acreage of beans recovered the loss shown in last year's returns. The potato area increased by 6 per cent. (32,330 acres), and thus nearly reached the total recorded in 1909. Mangolds also have slightly extended, but other roots show a somewhat diminished acreage. There is some indication of a revival of the cultivation of flax, which forty years ago occupied about 20,000 acres but in recent years has almost disappeared. The acreage of hops also for the second successive year shows a slight extension, though it is still nearly 12,000 acres less than it was so recently as 1907. The acreage under fruit which for several years up to 1909 had increased annually now remains stationary.

The returns of horses on agricultural holdings have been collected this year in fuller detail than heretofore. In addition to horses used for agricultural purposes, mares kept for breeding and unbroken horses, a return has been obtained for the first time of other horses kept on farms. The number of these is returned as 116,818, but it is probable that in previous years some now returned under this heading may have been erroneously included in the returns. The reduction shown in the classes for which a comparison is possible is therefore, in all probability, less than the figures indicate. The number of cattle returned on June 5 was 76,937 more than in 1910, the total now being the largest on record. The number of sheep declined by 607,953, and thus fell lower than in any year since 1907. On the other hand, pigs increased by no less than 20 per cent., the total number being restored to the same level as in 1908.

THE VALUE OF DIFFERENT CROPS AS GREEN MANURES.

This subject, under the above heading, is discussed by A. D. Hall, M.A., F.R.S., Director of the Rothamsted Experimental Station, in the *Journal of the Board of Agriculture*, Vol. XVII, p. 969. The author commences by drawing attention to the fact that the practice of green manuring is followed comparatively little in Great Britain, because the custom of the country has been to feed off green crops with sheep; when the material of fodder crops is buried, it is generally for the reason that the farmer is afraid that he may not be able to feed off the crop in time for the next in the rotation. It is suggested, however, that on heavy soils where sheep cannot be folded, the practice of green manuring might well be extended, and attention is drawn to the action of green manures in improving the texture of the soil.

In pursuing the subject, mention is made of the classic illustration of the value of green manuring with leguminous plants in the reclamation of large sandy areas in East Prussia, by Schultz, using the method of building up the soil by raising successive crops of leguminous plants with the aid of artificial manures, and burying them. Since the time of these experiments, general acceptation has taken place of the existence of the power of leguminous crops to increase the soil nitrogen. In view of this, it was naturally a matter for surprise that, in experiments made on the Royal Agricultural Society's Farm at Woburn, better yields of wheat were obtained after mustard (a non-leguminous crop) than after a leguminous crop such as vetches, both crops having been buried in the soil. Continued repetition of the trials has made no room for doubt that this condition exists, and the circumstance has led to the establishment of a similar experiment at Rothamsted, in order to ascertain if the same results would be obtained under the different conditions. To state it shortly, the opposite effects were obtained, leguminous plants in the latter case giving better yields of wheat, when used as green manures, than when rape or mustard was employed in the same way. The differences in the conditions consisted mainly in the fact that the soil at Woburn is light and dry, while that at Rothamsted is heavier, and possesses a greater power to retain water.

The observation was made that the grain, and particularly the straw, of the wheat grown after the leguminous crop were much richer in nitrogen than those of wheat following mustard or rape. Further investigation is required to find if the growing of the latter crop causes the nitrogen-fixing bacteria to show an increased activity on account of the supply of vegetable matter that is given to the soil. Results in the laboratory have suggested that this is the case; but, as is pointed out, it does not necessarily follow that the circumstance is true in soils, on the large scale.

In attempting an explanation of the peculiar results obtained at Woburn, Dr. Voelcker has brought forward the suggestion that the matter is probably connected with water-supply, as the land seems to be drier and more open after vetches than after mustard; this condition, on the light soil, appears to affect the land more than the addition of the nitrogen obtained from growing and burying the leguminous crops. The experimental results are actually in agreement with practical experience, and though further investigation is required to determine the point, it is indicated that on the heavier soils, under the conditions, leguminous crops are better than non-leguminous plants for use as a green manure.

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR, October 24, 1911; Messrs. E. A. DE PASS & Co., October 13, 1911.

ARROWROOT—$3\frac{1}{8}d.$ to $4\frac{3}{4}d.$
BALATA—Sheet, 3/6; block, 2/5 per lb.
BEESWAX—£7 5s. per cwt.
CACAO—Trinidad, 61/- to 67/- per cwt.; Grenada, 55/6 to 61/-; Jamaica, 54/- to 58/6.
COFFEE—Jamaica, 67/- to 117/- per cwt.
COPRA—West Indian, £28 10s. per ton.
COTTON—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 16d. to 19d.
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—48/- to 63/- per cwt.
ISINGLASS—No quotations.
HONEY—28/- to 34/- per brl.
LIME JUICE—Raw, 1/9 to 2/-; concentrated, £19 to £19 17s. 6d.; Otto of limes (hand pressed), 5/6.
LOGWOOD—No quotations.
MACE—2/2 to 2/6.
NUTMEGS—$5\frac{3}{4}d.$ to $8\frac{3}{4}d.$
PIMENTO—Common, $2\frac{3}{8}d.$; fair, $2\frac{7}{16}d.$; good, $2\frac{1}{2}d.$; per lb.
RUBBER—Para, fine hard, 4/9; fine soft, $4/1\frac{1}{2}$; Castilloa, $3/5\frac{1}{2}$ per lb.
RUM—Jamaica, 1/8 to 5/-.
SUGAR—Crystals, 19/- to 22/6; Muscovado, 15/- to 17/-; Syrup, 14/- to 18/- per cwt.; Molasses, no quotations.

New York.—Messrs. GILLESPIE BROS. & Co., October 20, 1911

CACAO—Caracas, 13c. to $13\frac{1}{2}$c.; Grenada, $13\frac{1}{4}$c. to $13\frac{3}{8}$c.; Trinidad, $12\frac{3}{4}$c. to 13c. per lb.; Jamaica, $11\frac{1}{2}$c. to $12\frac{1}{4}$c.
COCOA-NUTS—Jamaica, select, \$34·00 to \$36·00; culls, \$20 00 to \$21·00; Trinidad, select, \$34·00 to \$36·00; culls, \$20·00 to \$21·00 per M.
COFFEE—Jamaica, $16\frac{1}{2}$c. to $17\frac{1}{2}$c. per lb.
GINGER—$8\frac{3}{4}$c. to $11\frac{1}{4}$c. per lb.
GOAT SKINS—Jamaica, 53c.; Antigua and Barbados, 48c. to 50c.; St. Thomas and St. Kitts, 46c. to 48c. per lb.
GRAPE-FRUIT—Jamaica, \$5·00 to \$5·75.
LIMES—\$5·00 to \$5·50.
MACE—48c. to 52c. per lb.
NUTMEGS—110's, 13c.
ORANGES—Jamaica, \$5·50 per box.
PIMENTO—$4\frac{1}{2}$c. to $4\frac{3}{8}$c. per lb.
SUGAR—Centrifugals, 96°, 5·96c. per lb.; Muscovados, 89°, 5·46c.; Molasses, 89°, 5·21c. per lb., all duty paid

Trinidad.—Messrs. GORDON, GRANT & Co., October 30, 1911.

CACAO—Venezuelan, \$13·40 per fanega; Trinidad, \$12·60 to \$13·25.
COCOA-NUT OIL—\$1·08 per Imperial gallon.
COFFEE—Venezuelan, 16c. per lb.
COPRA—\$4·90 per 100 lb.
DHAL—\$3·90.
ONIONS—\$2·00 to \$2·25 per 100 lb.
PEAS, SPLIT—\$5·90 to \$6·00 per bag.
POTATOES—English, \$1·80 to \$2·00 per 100 lb.
RICE—Yellow, \$5·00; White, \$5·75 to \$6·00 per bag.
SUGAR—American crushed, no quotations.

Barbados.—Messrs. JAMES A. LYNCH & Co., November 4, 1911; Messrs. T.S. GARRAWAY & Co., November 6, 1911; Messrs. LEACOCK & Co., October 27, 1911; Messrs. E. THORNE, Limited, October 11, 1911.

CACAO—\$10·50 to \$13·00 per 100 lb.
COTTON SEED—\$26·00 per ton; meal, \$1·50 per 100 lb.; $2\frac{1}{2}$ per cent. discount.
COTTON SEED OIL (refined)—60c. per gallon.
COTTON SEED OIL (for export)—54c. per gallon (in bond).
HAY—\$1·50 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—\$2·50 to \$4·00 per 100 lb
PEAS, SPLIT—\$5·90 to \$6·00 per bag of 210 lb.; Canada, \$2·85 to \$3·90 per bag of 120 lb.
POTATOES—Nova Scotia, \$2·28 to \$3·25 per 160 lb.
RICE—Ballam, \$5·05 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
SUGAR—American granulated, \$6·00 per 100 lb.

British Guiana.—Messrs. WIETING & RICHTER, October 28, 1911; Messrs. SANDBACH, PARKER & Co., August 18, 1911.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	\$10·50 per 200 lb.	\$10·50 per 200 lb.
BALATA—Venezuela block	No quotation	Prohibited
Demerara sheet	70c. per lb.	70c.
CACAO—Native	11c per lb.	11c. per lb.
CASSAVA—	60c.	No quotation
CASSAVA STARCH—	\$6·00	No quotation
COCOA-NUTS—	\$12 to \$16 per M	\$10 to \$16 per M., peeled and selected
COFFEE—Creole	16c. per lb.	19c. per lb.
Jamaica and Rio	18c. per lb.	$19\frac{1}{2}$c. per lb.
Liberian	$10\frac{1}{2}$c. per lb.	12c. per lb.
DHAL—	\$3·60 per bag of 168 lb.	\$3·70 per bag of 168 lb.
Green Dhal	\$3·50	——
EDDOES—	64c	——
MOLASSES—Yellow	None	——
ONIONS—Teneriffe	—	4c. to 5c.
Madeira	$4\frac{3}{4}$c. to 5c.	$5\frac{1}{2}$c.
PEAS—Split	\$5·75 per bag (210 lb.)	\$5·75 per bag (210 lb.)
Marseilles	\$3·25	No quotation
PLANTAINS—	10c. to 20c.	——
POTATOES—Nova Scotia	\$2·50 to \$2 75	\$3·50
Lisbon		No quotation
POTATOES-Sweet, B'bados	88c. per bag	——
RICE—Ballam	No quotation	——
Creole	\$5·00	\$5·00 to \$5·50
TANNIAS—	\$1·08	——
YAMS—White	\$2·16	——
Buck	\$2·40	——
SUGAR—Dark crystals	\$3·85	\$3·60
Yellow	\$4·00 to \$4·50	\$3·75 to \$4·00
White		\$4·25
Molasses	\$3·50	None
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
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IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

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CONTENTS.

The Assimilation of Nitrogen by Rice.

ATTENTION was given in the *Agricultural News*, Vol. IX, pp. 97 and 328, to recent work that has been done in connexion with the assimilation of nitrogen by plants. It was pointed out that this had shown that nitrogen is not only taken in by green plants in the form of nitrates, but that they can make use of it directly by absorbing ammonium sulphate through the roots. In this way, the old opinion that nitrates alone were available for absorption from the soil by plants has received considerable modification, and it is the purpose of the present article to review investigations that have been undertaken lately in connexion with the matter.

Some of this work has been done at the Hawaii Agricultural Experiment Station, and is described in Bulletin No. 24 of that Institution. In this, it is pointed out that the usual practice is to refer to the nitrogen in nitrates as being present in a more available form than that contained in ammonium sulphate, dried blood, or hoofs and horns. As regards this, as is stated, while the application of nitrates is more economical and more stimulating to plant growth than that of ammonium salts, it is not a necessary consequence that nitrates are more easily changed into proteids, or that they are more readily assimilated than the naturally occurring ammonium compounds. The difference between the behaviour of nitrates and that of ammonium salts arises chiefly from the circumstance that continued applications of the latter are likely to cause an unfavourable soil acidity, and the fact that the former are less firmly fixed in the soil, and therefore more easily taken up by plants. In connexion with the subject, reference is made to the researches of Russell, Hutchinson and Miller, and to that of other observers. The investigations of the experimenters just mentioned, it may be said, receive special attention in the *Agricultural News*, Vol. IX, pp. 33 and 98.

Returning to the matter in the Bulletin mentioned, it is pointed out that the soils in which rice is cultivated form a useful means of investigating the question of the direct assimilation of ammonium sulphate, because little or no nitrification can take place in them, in their water-logged condition, on account of the difficulty of the access of air: in fact denitrification is likely to occur, especially as such soils often contain large quantities of organic matter which probably tend to assist in denitrification. After shortly dealing with past experiments that have been made in relation to nitrogen assimilation by rice, the Bulletin proceeds to describe manurial experiments with that crop that have been conducted at the Hawaii Experiment Station for the past two years.

On a field scale, the trials have shown that only slight effects were produced by the employment of nitrate of soda, either in one application before transplanting, or applied at intervals during the growth of the crop. The results were different with ammonium sulphate, for its use gave considerable increases in the return, more especially from the single application. It is pointed out that the greater loss of nitrate of soda by leaching may contribute to this effect, but that it is unlikely that the condition was brought about solely through this circumstance, 'for the yields from the single application of nitrate of soda were greater two times out of three than the yields from the repeated applications.'

The importance of deciding whether nitrates are carried out of the reach of the roots of the plants, and if they are lost to any great extent through denitrification, led to the making of pot experiments, with soil taken from a rice field after it had been aerated for a period of two months. In the trials, each pot received the same amount of sulphate of potash and of superphosphate; the differences of treatment were comprised in the employment of ammonium sulphate, sodium nitrate, calcium nitrate, magnesium nitrate and soy bean cake, in quantities providing 0·6 grammes of nitrogen per pot. Tests made at intervals showed that nitrites were formed in all the pots, within five to ten days after water had been added, and were present in the largest amount, by far, in pots containing nitrates. In no case was the accumulation of nitrites greater than two parts per million of the irrigating water. As time elapsed the nitrate content was reduced to a low minimum, except where it was applied repeatedly; whereas that of ammonia was maintained. Considerable increases in the ammonia content succeeded the use of ammonium sulphate or soy bean cake: but these were very small, with the application of nitrates. As regards the growth of the rice plants in the pots, the best results were obtained where ammonium sulphate was used; those from soy bean cake were intermediate between the returns from the no-manure series and the ammonium sulphate series; there was only a slight increase of growth with calcium and magnesium nitrates. Lastly, with respect to this series of experiments, the kind of manure used had no great effect on the percentage of nitrogen in the straw and grain.

Further experiments were made in flasks, in order to determine whether the loss of nitrates was due to dentrification or absorption by the rice plants: they showed that the former was the operating cause, and from a practical point of view, that nitrates do not form a suitable manure for rice. The investigation was supplemented by trials with sand cultures, both wet and dry, to determine if nitrogen as ammonia is capable of supplying all the requirements by rice in regard to that element, and what behaviour is shown by this plant when nitrogen is only available as nitrates. In the result, it was shown that ammonium nitrogen is sufficient for the vigorous growth of the plant, except in the case of ammonium nitrate, while where the soil was kept wet, nitrate of soda completely failed to bring about any growth of the rice. Where the soil was not saturated with water, similar results were obtained, and in both cases interesting observations were made with nitrates other than sodium nitrate. It should be mentioned that preliminary work with rice in sand cultures demonstrated that the presence of five or more parts of nitrites per million of irrigation water was usually fatal to the plant.

In the discussion of the results of the experiments, it is pointed out that the conversion of nitrates into proteids is essentially a reduction process: that nitrates as such do not occur to any considerable extent in plants; and that proteids, whatever their source, do not contain nitrogen derived immediately from nitrates but from ammonium compounds. It is thus to be concluded that the nitrogen content of plants is likely to be greater when they are supplied with ammonium salts than when they are given nitrates, and this conclusion is supported by the work of Russell, Hutchinson and Miller, as well as by the results of the investigations under review. In this connexion the interesting suggestion is made that the circumstance that rice has been raised for centuries under conditions that preclude to a large extent the formation of nitrates, has to a great degree caused it to lose the power of reducing nitrates eventually to form proteids. This suggestion is to be made the subject of further investigation.

It may be stated shortly that the result of the work to which attention is given has been to show that ammonium sulphate is of the greatest use as a manure for rice, in wet cultivation, while nitrate of soda produces little or no effect; that soy bean cake is useful, but inferior to ammonium sulphate in this connexion; that denitrification takes place in paddy soils, causing the formation of nitrites, and possibly the loss of free nitrogen; that in submerged rice soils the formation of ammonium salts occurs to a considerable extent; that the provision of nitrate as the only source of combined nitrogen, for rice plants, gives unhealthy and stunted growth; that the greater the presence of nitrates the greater is the extent to which nitrites are formed, and that this may reach such a degree as to injure the rice; and that the failure of rice properly to assimilate nitrates is probably due to a lack of nitrate-reducing enzymes, caused through the non-use of these over a long period of time.

For the agriculturist, the matter of practical importance is that ammonium sulphate and organic nitrogenous bodies are preferable to nitrates, in paddy cultivation. For the investigator, the suggestion arises regarding lines of research for the purpose of enquiring further into the forms in which nitrogen is assimilated directly by plants.

SEED STERILIZATION AND INOCULATION

Before inoculating the seed of leguminous plants with the nodule-forming organism (*Pseudomonas radicicola*) it is often the custom to disinfect the seed, in one of the approved ways, in order to prevent interference from other organisms with the growth of the nodule organism, or in order to ensure that the latter is not already present. The question has naturally arisen as to the possibility that the development of this organism suffers interference through the presence on the seed of the substances used in disinfection. In order to gain information concerning the matter, work has been carried out recently by the Bureau of Plant Industry of the United States Department of Agriculture. The results of this are given in Circular No. 67 of that Bureau, and the information is employed in the presentation of the following facts.

In the investigation, the object of the first trial was to gain some knowledge as to the effect of disinfectants with respect to germination, and in rendering seeds free from bacterial infection. In regard to the first, hydrogen peroxide was found to cause the least injury, being innocuous even when used on germinating seed. Leguminous seeds possessing hard coats withstood the poisoning action of formaldehyde and corrosive sublimate much better than the non-leguminous seeds. As far as the second consideration, above, is concerned, all the disinfectants (corrosive sublimate, formaldehyde and hydrogen peroxide) were found to be effective.

The succeeding part of the experimentation had relation to the residual effect of the treatment of seeds with disinfecting substances. The seed after treatment with the latter was rinsed several times in test tubes with sterile water, and then attempts were made to grow a micro-organism in the rinsing water, that employed being *Bacillus subtilis*. In the case of corrosive sublimate the proportion contained in the water used for washing the seed the fourth time was still sufficient to be fatal to *B. subtilis*. Similar tests were made with formaldehyde and hydrogen peroxide; with the latter, two rinsings were not found sufficient to remove it from the seed, and even in the case of the third wash water there was a slight interference with the growth of the bacillus, though much less in degree than that from formaldehyde or corrosive sublimate.

Repetition of the experiment, using flasks instead of test tubes, whereby about five times as much washing water could be employed, showed complete removal of the disinfectants, at least as far as their effect on *B. subtilis* was concerned, by the employment of the larger amounts of water. A result obtained during the course of the investigations was that the disinfectants which are least able to pass through the seed coat are more nearly removed when small quantities of water are used for washing, than are those capable of penetrating to the interior of the seed. Further, reference is made to the work of Hutchinson and Miller, in showing that incomplete sterilization of seed often arises from the presence of air bubbles upon it or inside it (the *Journal of Agricultural Science*, Vol. III, p. 179). The matter was improved by carrying on the disinfection beneath a vacuum pump, whereby a greater amount of penetration of the disinfectant was obtained. In relation to this subject, it was observed, further, that in the latter method of seed disinfection, the difficulty of removal of the sterilizing agent by rinsing was increased.

In the case of hydrogen peroxide used as a seed disinfectant, seeds were treated with this, the strength of the solution being 3 per cent., washed three times with sterile distilled water, and then inoculated with cultures of the nodule organism. A duplicate series was washed several times before inoculation, and it was shown that these seeds were nearly sterile as regards the presence of organisms on the coat. In the result, the bacteria on the sterilized seed showed a rapid mortality—a fact which indicates that some influence was present which lowered their normal vitality; the decrease in vitality varied with the vigour of the culture.

The conclusion of the whole matter indicates that when seeds are disinfected before being treated with cultures of the nodule organism, the work should be done with special care, and where very accurate control is necessary, disinfection is required to eliminate the chances of accidental contamination with the nodule organism. Further, the use of corrosive sublimate prior to inoculation is harmful, and that while hydrogen peroxide has been found to be effective as a disinfectant, it does much less damage than that which the nodule organism is likely to receive from corrosive sublimate or formaldehyde.

In *Diplomatic and Consular Reports*, No. 4716 Annual Series, it is shown that the value of the exports from the Zanzibar Protectorate rose from £1,011,364 in 1909 to £1,033,467 in 1910. The principal increases during the period took place under copra, grain, petroleum, and sugar, and the decreases under cloves and clove stems, gum copal, ivory and piece-goods. The value of the export of cloves—the principal product—was £330,410, as compared with £264,960 in 1908 and £396,121 in 1907; the actual export in 1909 was greater than in 1907, but the value was smaller on account of the fall of prices.

FRUITS AND FRUIT TREES.

MACHINERY FOR SEPARATING AND STRAINING LIME JUICE.

Mr. J. Jones, Curator of the Botanic Station, Dominica, has submitted a note on the Express Straining Machine, used for separating lime juice from the pulp and seeds. This is as follows:—

A new feature in the working of lime estates has been introduced by Mr. H. A. Frampton, Attorney of the Bath estate, Dominica. It consists of a mechanical means for separating lime juice from the pulp and seeds—a boon realized best by those who have most to do with the handling of large quantities of lime juice. The device is very simple and has given every satisfaction on the five or more estates now using it, in Dominica.

The essential parts are a fixed cylindrical copper sieve of a fine mesh, roughly 3 feet long and having a diameter of about 1 foot, through the middle of which there passes a revolving axle, on which are fixed four brushes resembling scrubbing brushes. The brushes are arranged so as to keep the pores of the sieve always clear, and are placed at such an angle that the refuse is ejected at the end, the clear juice running out at the spout. The fine copper gauze is strengthened by being enclosed within a perforated copper sheet.

All parts in contact with the juice are of wood, gun-metal or copper. About 300 gallons per hour can be treated; this is equivalent to about 10 barrels of limes. The axle may be rotated by the same power as is used for driving the mill, and the juice is led from the mill and into the hopper by gravitation.

The price for the machine complete is £20, an extra copper cylinder can be obtained for £2, and the brushes cost 12s. per dozen. The manufacturer is Mr. T. A. Siddall, 31, Duke Street, Aldgate, London, E.C., and the agent in the West Indies is Mr. H. A. Frampton, Dominica.

Mr. Jones also draws attention to, and sends an illustration of, a lime-crushing mill. made by the same firm, costing £50, for hand or power, and measuring for shipment 65 feet 6 inches: the agent for this in Dominica, is the same as for the above. In doing so, Mr. Jones states:—

The mill shown is capable of dealing with a large crop when driven by power, and it can be used as a hand mill during the early years of a lime estate, when crops are small.

Hitherto, the lime planter, when his trees began to bear, had to purchase a hand mill, which had to be discarded as crops increased, or he had to erect the permanent mill, and provide power to drive it, years before the output of crop warranted the expenditure. Now the planter can purchase a mill which can be driven by hand power for a period, and afterwards, when the crop warrants this, the form of power that he decides to utilize may be installed.

On the whole, to begin with, the purchase of a permanent mill, capable of being driven to suit the circumstances of planters, would appear to prevent the unnecessary locking up of capital, and make for economy in the management of lime estates.

RED SORREL AS A FIBRE PLANT.

This species [*Hibiscus Sabdariffa*] is cultivated all over India (except in the hills), and in Ceylon. It is also extensively cultivated in Jamaica for fibre, and in the West Indies generally for the calyx. The height of the plants varies with the cultivation, but may reach 10 feet. They branch profusely, the branches arising from the base and remaining parallel to the main stem, which is not much stouter than the branches.

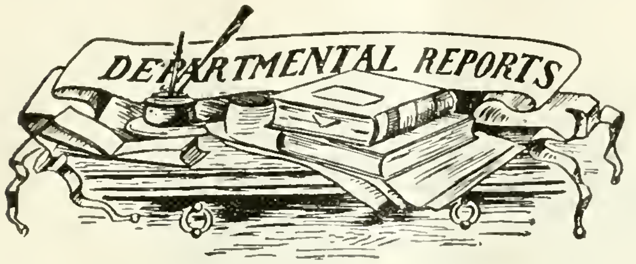
The stems are retted in the same manner as those of *H. cannabinus*. The fibres are silky and fine, but apparently not so strong as those of *H. cannabinus*: the breaking strain of the latter is given by Wiesner as 115, whereas that of *H. Sabdariffa* is only 89.

The following description of the fibre is taken from Dodge's *Descriptive Catalogue of the Useful Fibre Plants of the World*:—

'A superb sample of this fibre was shown in the exhibit of British Guiana, W.C.E., 1893, which was accompanied by the stalks, some 10 feet high, as straight and clean as jute stalks.

'The fibre was equal, if not superior, to much of the jute which comes to this country. In my examination for award it was given the following rating: length, 90 points; strength, 75 points; average 81·6.'

Most of the descriptions and statements concerning *H. Sabdariffa* or Roselle refer to a plant with red stems and red calices. In a few accounts mention is made of a variety with a white calyx, but no description is given. It is sometimes said to be less acid than the red variety. No other forms are referred to in the literature. We have at Pusa isolated not only the red and the white varieties but the intermediate forms. These are partly red, but in each the localization of the colour is different. (From *Memoirs of the Department of Agriculture in India*, Vol. IV, No. 2, p. 30.)



BAHAMAS: REPORT OF THE BOARD OF AGRICULTURE, 1910.

In this, the last report of the Board of Agriculture of the Bahamas, as it was recently constituted, attention is drawn at an early stage to the fact that the interest taken by agriculturists in the experiment plots at the Agricultural Station was increasing, and that there has also been a decided enlargement of that in Sea Island cotton growing, more attention having been given to this through the decreased cultivation of pine-apples, consequent on the depression in the pine-apple industry. The export of cotton during the year was valued at £411, which is an increase on that of last year of £92. The average yield of this crop was from 160 lb. to 250 lb. of lint per acre. In connexion with cotton, a provisional forecast is made in the report that this will gradually become the staple product of the Colony. With respect to the present staple crop, namely sisal hemp, it is stated that slight progress has been made in the treatment of the hand-cleaned fibre, and it is suggested that the possession of a practical hand, or animal power, decorticating machine would effect much in regard to increasing the area and output of the crop. The production of sisal hemp during the period 1905-1909 averaged annually 4,468,211 lb., as compared with 2,120,282 lb.—the annual average for the preceding five years. The average selling price of hand-cleaned fibre throughout the year was about 13*s.* per 100 lb., as compared with about 11*s* in 1909; machine-cleaned fibre obtained an average price of £1 2*s* 6*d.* per 100 lb. For the financial year 1909-10, 5,846,447 lb. of sisal hemp, value £48,805 was exported, as compared with 5,281,449 lb , value £42,627 in 1908-9. It is expected that, if steps are taken by the Legislature to control the shipment of badly cleaned fibre, the industry will continue to prosper for many years.

As has been stated, depression has existed in the pine-apple industry, on account of deterioration of stock and unfavourable seasons; the hope is expressed that the importation of fresh stock will, with favourable seasons, soon revive the industry. The sugar-cane crop was below the average, chiefly owing to unfavourable weather; and the importation of new varieties is required in order that a satisfactory yield may be obtained. There has been a considerable increase in the area in tomatoes, and the immediate prospects at the time of the report were satisfactory. Particulars are given concerning tomato-growing, the area of which has increased, and regarding the small citrus industry.

Hope is expressed that a profitable industry may arise in the exploitation of *Cryptostegia grandiflora* for obtaining rubber; in fact the expectation is expressed that the profits from this would be greater than those from any other crop that is being grown at present in the Colony. With reference to minor products, the exports of these during the year under report were valued at £1,383 as compared with £933 in the preceding year. The actual increase of production is greater than this, as the local consumption is becoming larger. Information is given, further, concerning the exports of forest products and native-made hats, as well as regarding the imports of agricultural products.

In the similar report for last year, a suggestion is made concerning the inauguration of a system of demonstration fields, and since that time the matter has been discussed by the Curator of the Agricultural Station, with a number of farmers, who all evinced an interest in the proposition, and some of whom offered practical assistance in the shape of land and labour, the latter to be employed under the direction of a competent supervisor. The need is expressed for an agricultural bank in the Colony for the assistance of farmers, with the aid of the Board of Agriculture. The suggestion is also made that an agricultural agency might be formed at Nassau, particularly for assisting in marketing the produce from the Outer Islands. It is also stated that a law is required to prevent the burning of growing trees and crops, particularly in consideration of the fact that on several of the islands large areas are almost treeless.

The report concludes with information concerning lectures and demonstrations given by the Agricultural Department in various islands, suggestions for improvement in the general agricultural conditions, an account of experimental work, details concerning the agricultural exhibition held during the period, facts regarding meteorological matters, an account of publications issued and received, distribution of plants, and travelling done by the Agricultural Officers.

BRITISH HONDURAS: REPORT ON THE BOTANIC STATION, 1910.

At the commencement of this recently issued report, particulars are given in regard to the rubber plants with which trials are being made at the Botanic Station. It appears from these that good results are being obtained with Para rubber plants; Castilloa plants, with one exception, are making slow growth, and there has been very little progress with Funtumia. Success is being gained with imported varieties of oranges; some of these were attacked by a scale insect, which however, it is observed, was destroyed by 'a black fungus growth'. Limes also showed good promise, and this is the same in regard to imported mangoes, particularly with respect to the variety Sandersha.

In relation to the present increased interest in cocoa-nuts, it is significant that the demand for these at the Station, for planting, has been in excess of the supply; seed nuts are not readily procurable from outside sources, on account of the high local price for commercial nuts. Good growth has been made by the plants at the Station, and the forking of the soil round the trees has been of benefit; in an editorial note it is mentioned that, in the Corozal District, light surface ploughing around young plants has been quickly followed by notably increased vigour and rate of growth.

Further information indicates that success has been obtained in experiments with Liberian coffee, ginger, onions, arrowroot, grapes and watermelons, and information is also given concerning ground nuts, varieties of maize, jack fruit and vegetables

The succeeding part of the report deals with the progress made with plants newly introduced at the Botanic Station, visits to country plantations, and the state of the flower garden. After these matters have been dealt with, it is pointed out that, with suitable accommodation, the Botanic Station would now offer good opportunities for giving agricultural training to youths. Lastly, attention is given to nursery work and plant distribution.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date November 6, with reference to the sales of West Indian Sea Island cotton:—

During the last fortnight about 100 bales of West Indian Sea Island cotton have been sold, about half of which was white cotton at 16*d.* to 18*d.*, and the remainder stained and inferior at 8*d.* to 10½*d.* There is very little stock, but prices are firm.

Fully Fine Carolina Sea Island has been offering at 15½*d.*, c.i.f., but the quality of this crop is so very inferior that we expect West Indian will be purchased in preference.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending October 28, is as follows:—

The receipts of Islands for the week were 232 bales, against 963 bales in the corresponding week of last year. As the character of the receipts continues to be chiefly of off cotton, with only a small percentage of bright, the holders of the old crop are firm in their views.

The sales for the week were 12 bales, chiefly composed of sample lots. The market has not yet fully opened and the following quotations are therefore normal, viz:—

Extra Fine	32c. to 55c.	18*d.* to 19½*d.*,	c.i.f., & 5 per cent.
Fine to Fully Fine	28c. to 30c.	16*d.* to 17*d.*	,, ,, ,, ,,
Off Cottons	21c. to 21c.	11¾*d.* to 13½*d.*	,, ,, ,, ,,

COTTON AT THE IMPERIAL INSTITUTE, 1910.

The Report on the work of the Imperial Institute, 1910, issued as *Colonial Reports*—Annual, No. 687, has just been received. It gives the following useful résumé of the work of examination of cotton and cotton seed conducted by the Institute during the year:—

SUDAN. Samples of 'Voltos' and 'Nubari' cottons, grown at Zeidab, were of good quality, and were respectively valued at 14¾*d.* to 15*d.* per lb., with 'good' Abassi at 15*d.* per lb., and 13¼*d.* to 13½. per lb., with 'good' brown Egyptian at 13*d.* per lb. A specimen of Mitafifi cotton grown at Fadlab was valued at 13*d.* to 13½*d.* per lb. on the same date.

UGANDA. Four samples were examined, one of which was of soft, long staple, and was valued at 1*d.* per lb. in advance of 'middling' American. A comparison of the cotton of Kampala with that of Buddu showed that the latter was much stained, and decidedly inferior to the former. The samples were valued respectively at 0·7*d.* to 0·8*d.*, and 0·1*d.* to 0·2*d.* in advance of 'middling' American.

NYASALAND. Seven samples of cotton and three of cotton seed were examined. The Egyptian cottons were generally somewhat inferior to standard specimens from Egypt, but the American cottons were of excellent quality, one sample being valued at as much as 2*d.* to 2½*d.* per lb. in advance of 'middling' American.

RHODESIA. Six samples were examined, and were of satisfactory quality, although the Egyptian kinds were not quite equal to standard specimens of the corresponding varieties in Egypt. A sample of American Upland was valued at 8*d.* per lb., with 'middling' American at 7·36*d.* per lb.

UNION OF SOUTH AFRICA. Three samples of 'Caravonica' cotton grown in Zululand were of good quality. One of them was regarded as readily saleable as a substitute for rough Peruvian, at 10¾*d.* to 11*d.* per lb., with 'good' moderately rough Peruvian at 10½*d.* per lb., whilst the others were less harsh, and were valued at about 12*d.* per lb., with good Abassi at 15*d.* per lb. A specimen of wild cotton from Zululand was strong, harsh, about an inch long, and worth about 7½*d.* per lb., with 'middling' American at 8¼*d.* per lb.

Seven samples including American, Egyptian, and Caravonica cottons from the Cape Province were all of promising quality. Those of the American type were valued at 5¾*d.* to 6½*d.* per lb., with 'middling' American at 5·72*d.* per lb., and the Caravonica cottons were regarded as worth 7¾*d.* to 8*d.* per lb. on the same date.

BRITISH WEST AFRICA. Eleven samples of cotton produced by hybrids grown at the Labolabo Plantation, Gold Coast, were all valued in advance of 'middling' American. Some of these were rather harsh and might prove serviceable as substitutes for rough or semi-rough Peruvian. Four specimens of native cottons from the Northern Territories, Gold Coast, were of good, saleable quality, and were valued at from 6·70*d.* to 7*d.* per lb., with 'middling' American at 6·39*d.* per lb.

Four samples of cotton from Southern Nigeria, which were probably all native varieties, were of satisfactory length but of poor quality, and had apparently suffered from the attack of insect pests. A specimen from Illushi was decidedly superior to most West African cottons, and was worth about 1*d.* per lb in advance of 'middling' American.

Two samples of native cottons from Northern Nigeria were much stained and of comparatively low value. These varieties, however, had a staple of about an inch, and would probably be capable of considerable improvement under cultivation.

INDIA. Ten samples of Egyptian and American cottons from Burma were of fairly good quality, but inferior to standard commercial specimens.

BRITISH HONDURAS. A sample of long stapled Upland cotton was regarded as of the same values as 'fully good fair' Abassi ($13\frac{3}{4}d$. per lb.). A hybrid cotton, also of long staple, was valued at $12\frac{1}{2}d$ to $13d$. per lb. on the same date.

FOREIGN COUNTRIES. Twenty-one samples of improved American Upland cottons from Mozambique were examined. Four of them were of short staple and were valued at about $7\frac{1}{2}d$. per lb., but the others were of good length and useful spinning quality, and ranged in value from $7\frac{3}{4}d$. to $9d$. per lb., with 'middling' American at $7{\cdot}59d$. per lb. A sample of 'Caravonica' cotton was of very poor quality and nominally worth $5\frac{3}{4}d$. to $6d$. per lb.

THE GOVERNMENT COTTON PURCHASE SCHEME, ST. VINCENT.

Attention has been drawn by Mr. W. N. Sands, Agricultural Superintendent, St. Vincent, to the following account of the working of the St. Vincent Government Cotton Purchase Scheme, which, it is stated by Mr. Sands, represents the facts as they actually exist. The account appears in the St. Vincent *Sentry* for October 20, 1911.

We understand that a bonus of 25 per cent. of the value of the seed-cotton sold on a profit-sharing basis by small growers to the Government Central Cotton Ginnery last season has been declared and will be paid during the next few days, commencing to-morrow. It must be a matter of congratulation both to Government and the small growers who are, as it were, partners in the business, to see such a successful result. The total sum due to the people is upwards of £838. Taking 7c. per lb. for first grade seed-cotton as the payment made in the first instance on account, and adding to it the value of the bonus, $1\frac{3}{4}$c., it will be seen that the total amount realized by the small growers for their cotton was $8\frac{3}{4}$c. per lb.

This information, which we have obtained from a reliable source, is most encouraging. The result fully bears out our ideas on the feasibility of the scheme, and the views the *Sentry* has hitherto expressed as to the advisability of the owners of small lots of land going in for cotton cultivation as well as vegetables. It proves also that reliance can be placed upon the Government for obtaining the best possible value for cotton and seed sold to the Ginnery on the profit-sharing basis. The results of each succeeding crop seem to manifest more and more clearly the great benefit that the Government Cotton Ginnery is to the small grower. Besides encouraging him to grow a crop which pays better than ground provisions, it makes him more independent and less likely to be hampered by recurring demands of the money lender. We learn also that the system the Government Ginnery recently adopted of grading the cotton has worked well. All this should convince the small man that it is in his interest the scheme is worked, and that in giving it all the support in his power he is only contributing to a co-operative business in whose success he most certainly participates in a direct manner.

Information has been received from St Vincent to the effect that fine weather was experienced in the island during the first three weeks of last month, but that heavy falls of rain were received during the last few days. The rainfall for October, at the Botanic Station, was 9·32 inches, and at the Agricultural School, 9·26 inches.

AGRICULTURAL EXPERIMENTATION IN THE CONGO.

Some advance was made in 1910 in agriculture by the creation of Government experimental stations in the districts of the Kwango, Kasai, Equator, Bangala and the Katanga. Twelve large rubber plantations were either newly created or developed in that year. A special study is being made of the agricultural resources of the Katanga, where several experimental stations have been started in the localities best suited to emigration, and particularly in those contiguous to the railways in construction or contemplation. In this district attention is likewise being devoted to meteorological observations, analysis of the soil, pastures and cattle-rearing, with a view to the organization of food-producing stations, which it is considered will have an important bearing upon the difficult question of food supplies in the mining districts, where provisions are expensive and scarce.

To assure greater efficiency in the employment of experts for promoting agriculture, the country has been divided into agricultural circuits, which at present number six in all. The first comprises the Lower Congo, Middle Congo, Kwango and Lake Leopold II, the second, the districts of the Equator, Ubangi and Bangala, in which the larger plantations of rubber occur; the third, the Uelle district, and more particularly the cattle-rearing zones of Gurba-Dungu, Bomokandi and Uere-Bili; the fourth, the districts of Stanleyville and the Aruwimi, which will embrace the cattle-rearing zones of the Grand Lacs; the fifth, the Kasai, and the sixth the Katanga.

Each circuit is under the direction of a district agronomist aided by a staff of efficient assistants, and subject to the general superintendence of the Director of Agriculture at Boma, and Assistant Director in the Katanga.

Scientific missions are to be sent to Malaysia and British India for studying tropical agriculture, irrigation and the prevention of diseases in plants. Until it becomes possible to acquire experts versed in rural economics in Belgium itself, the staff will be drawn from other countries.

The meteorological section will be well provided with instruments which will also be distributed among the various religious missions, and the work in this important branch will thus receive considerable impetus.

Experimental gardens analogous to those at Eala, in the Equator district, will be created in the Lower Congo, Kasai and the Katanga. The gardens at Eala are credited with having done some important work, but being situated on the Equator, the results of the experiments made in the culture and acclimatization of plants are inapplicable to localities far removed from this district in which the rains are not so constant or the climate so equable

The Agricultural Research Laboratory, under the direction of two experienced chemists at Eala, is to be placed at the disposal of settlers. (*Diplomatic and Consular Reports*, Annual Series, No. 4780, p. 7.)

A preliminary forecast of the sugar-cane crop of Eastern Bengal and Assam, for the season 1911-12, gives the area planted as 177,800 acres, or 3,400 acres less than in last year. In Eastern Bengal the cause of the steady decline in cane cultivation that is taking place is said to be the fact that other crops are found to give better returns for the capital and labour employed.

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 deals with the results of work that has been undertaken recently in connexion with the Assimilation of Nitrogen by Rice. It has been shown conclusively that this plant can employ ammonium sulphate directly as a source of that element.

On page 371, an abstract is presented of a recent circular which treats of the effect of the sterilization of seed in relation to inoculation experiments with the nodule organism of leguminous plants.

A note on machinery for separating and straining lime juice is given on page 372.

Details of the Government cotton purchase scheme in St. Vincent are presented on page 375.

Attention is directed to a note which appears on this page, regarding the fortheoming West Indian Agricultural Conference. This has reference to the provisional programme of the Conference, which has just been prepared.

Under the heading Insect Notes, on page 378, two articles are given—one dealing with the cotton worm and the other with some useful insecticides.

The Fungus Notes are presented on page 382. They give the second and concluding article treating of observations on root diseases in the West Indies.

The West Indian Agricultural Conference, 1912.

It was mentioned in the last number of the *Agricultural News* (p. 360) that the Imperial Commissioner of Agriculture was visiting Trinidad for the purpose of discussing with His Excellency the Governor, and those immediately interested, the arrangements for the forthcoming West Indian Agricultural Conference, which will be held in that Colony from January 23 to 30, 1912.

As a result of that visit and consultation the Provisional Programme of meetings of the Conference, which will be held in the Council Chamber at the Red House, has been prepared and is now under revision. The important topics set down for discussion at this Conference are naturally Agricultural Education, Cacao, Cotton, Sugar, Cocoa-nut and Rubber cultivation, and they will be taken in this order. An important feature of the programme, which by the way will be a departure from the proceedings at previous Conferences, is the inclusion of evening sessions, to be held at the Queen's Royal College, where addresses on various interesting subjects, in some cases illustrated by lantern slides, will be given.

As is customary, arrangements have been made for a number of excursions to various districts. Amongst those in contemplation are: a trip to cacao estates in the Santa Cruz valley; excursions to the Pitch Lake, and to River estate, including the Blue Basin and the Wireless Telegraphy Station; and visits to educational institutions in Port-of-Spain.

Agricultural Work at the Onderneeming School, 1910-11.

The report on the Onderneeming School, British Guiana, for 1910-11, contains among other matters an account of the work at the Farm during the year under review. It shows firstly that steady progress has been made in the improvement of the cultivation at the school: this is evident by the fact that the increase in the yield of coffee, from the same area, has been from 1,808 lb. in 1904-5 to 6,389 lb. in 1910-11, and there has been a similar steady increase, during the same period, from 1,957 lb. to 5,582 lb. in the case of cacao, except in 1905-6 and 1907-8 when there were temporary decreases.

Excellent progress is stated to have been made in the recently established lime cultivation, and this fact combined with the demand for seedlings makes it expected that the work will prove a source of revenue as well as a useful means of experimentation. Seedlings of Para rubber have been planted throughout the coffee fields, and careful experimental tappings are being made. Other varieties of rubber under trial are *Sapium Jenmani*, *Funtumia elastica* and *Castilloa elastica*; the first two are succeeding, while *Castilloa elastica* is reported as having failed. Information is included concerning miscellaneous plants, comprising the souari nut (*Caryocar nucifera*), the durian, the tonka bean and the Brazil nut.

Details are presented concerning the stock farm, and an appendix contains a statement of revenue and expenditure in connexion with this. The section of the Report dealing with the farm concludes by stating that the rainfall for the twelve months ended March 31, 1911 was 112·1 inches as compared with 91·5 inches in the preceding year.

Agriculture in British India, 1910-11.

Returns issued by the Commercial Intelligence Department of India show that the yield of rice in 1910-11 was 554,029,000 cwt., from 57,852,000 acres, as compared with 557,136,000 cwt., from 58,119,000 acres, in 1909-10. The similar figures for wheat were 9,954,800 tons and 29,794,500 acres, and 9,633,600 tons and 28,106,500 acres. As regards cotton, the figures are given for the quantities exported from India and consumed in the country in and outside mills (not the net exports and consumption): they show that the quantities thus designated were 4,630,000 bales, as against 5,228,000 bales in 1909-10.

Of oil seeds, the totals of pure and mixed linseed, and rape and mustard seed, were 557,800 tons and 1,250,300 tons: in 1909-10 they amounted to 427,800 and 1,218,400 tons. Pure and mixed sesame totalled 511,600 tons, as compared with 560,800 tons in the previous period.

Others of the chief products are given, as regards yield, as follows, for 1910-11 and 1909-10 respectively: ground nuts, 479,900 tons and 459,300 tons; jute, 7,932,000 bales and 7,206,600 bales; indigo, 38,100 cwt. and 39,300 cwt.; sugar-cane, 2,226,400 tons and 2,127,100 tons.

Trade and Commerce of St. Lucia, 1910-11.

The *Annual Report* of the Treasurer of St. Lucia, 1910-11, has just been published in the *Gazette* for September 30.

It shows that the total value of the exports during the year was £238,955. Of this, £116,307 was the value of domestic produce, £116,861 that of bunker coal, and £5,987 that of the produce and manufactures of places other than St. Lucia.

Sugar and cacao were the chief domestic products, making 92 per cent. of the total value of such produce. The details are: sugar 5,275 tons, value £65,747; cacao 8,187 bags of 200 lb., value £40,935.

The chief among the other domestic products exported were in value as follows: molasses £1,914, cotton £1,302, hides £699, firewood £682, and mangoes £521. There were increases in all these cases, over the value for the previous year, except in those of hides and mangoes; the value of the cotton exported was more than treble of that in 1909.

Information concerning the direction of the export trade of domestic products during 1910 shows that the percentage to the United Kingdom was 69, to British Colonies 12, and to foreign countries 19; the proportion of the exports to the United Kingdom and British Colonies has increased from 76·8 per cent. in 1909 to 81 per cent. in 1910, while that to foreign countries has decreased from 23·2 per cent. to 19 per cent., for the same period.

It is pointed out that the total trade between Canada and St. Lucia in 1909 was returned at £15,449; in 1910 it was £26,258. Much of this increase is due to the fact that information concerning the country of origin of the produce was given in the later year, on the Customs entries forms. Nevertheless, a gratifying increase in the value of St. Lucia exports to Canada is reported, as in 1909 it was £6,321, in 1910 £11,460, and the suggestion is made: 'it is most urgent for St. Lucia's future progress that every effort be made to retain the Canadian market, even to sacrificing temporarily a certain amount of revenue.'

Excretion from the Roots and Stomata of Plants.

It has long been known that the ash of plants grown in nutritive solutions contains different proportions of the constituents from those present in the solution that was taken in by the roots. Liebig's explanation of the matter was that the roots expelled those constituents that are not needful to the plant, and caused the apparent discrepancy.

In pursuance of the subject, work has been undertaken which has been described in *Comptes Rendus de l'Académie des Sciences*, Paris, February 20, 1911. A review of this contained in the *Bulletin of the Bureau of Agricultural Intelligence and of Plant Diseases*, for March 1911, shows that maize plants were cultivated in sterilized mineral solutions, and the residual liquids examined; these were found to possess an alkaline or acid reaction, according as they contained originally, when they were absorbed by the roots, sodium nitrate and ammonium sulphate, or magnesium sulphate or ammonium nitrate.

Where the solution contained calcium carbonate and sodium nitrate, the reaction became alkaline, and it was shown that this condition was due to the assimilation of nitric acid. Roots were found to excrete organic compounds, particularly sugars and malic acid. When roots cause the solution in which they are growing to become alkaline, this is found to contain malic acid, which neutralizes the residual soda derived from sodium nitrate. The process is for the malic acid which has neutralized the soda to become oxidized by the roots, the sap of which remains acid. Another interesting conclusion is stated to be the effect that the variation in the quantity of ash constituents in plants is brought about partly by the elimination of mineral substances by secretions from the leaves. These secretions are of such a nature that the moisture collected in the evening or in the morning from leaf surfaces contains chlorides, calcium and magnesium sulphates, nitrates, ammonia and organic compounds.

The review mentioned summarizes the position as follows: 'The elimination of mineral substances through the roots and by the leaves is a cause of continual variation in plant ash.'

INSECT NOTES.

NOTES ON THE COTTON WORM.

A letter received recently at the Office of the Imperial Department of Agriculture, from 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, states that a most extraordinary outbreak of the cotton worm (*Alabama argillacea*) has been experienced in the United States during the cotton-growing season just past, the cotton fields from Texas to the Atlantic having been completely defoliated.

Mr. Hunter is endeavouring to ascertain the sources from which the enormous numbers of these moths have come. He believes that in one case they migrated into the United States along the Mexican coast, and he raises the question as to whether another migration may not have taken place from the West Indies.

It does not seem likely that the West Indies could have furnished any large number of cotton moths during the past two or three seasons, as this insect has not been very abundant, in the Lesser Antilles at least.

The cotton worm is known to have migrated over long distances in past years, and freshly emerged moths have been taken, very much to the north of the districts in which cotton is grown. Up to the present time, however, no other food plant for this insect is known, and it appears that these moths must have grown to maturity within the cotton belt, and then have migrated; but the perfect condition of many of the moths has often led to the question as to whether these insects possess some food plant growing further north than cotton is known to grow.

In this connexion, a note by Dr. H. T. Fernald of the Massachussetts Agricultural College, which appeared in *Science* for October 13 may be of interest. Dr. Fernald states that, during the last week in September, a number of moths of the cotton worm were captured at Amherst, Massachussetts. The moths were very fresh and perfect, and occurred in greater numbers than has before been recorded for this locality. In the *Entomological News* for November 1911, Dr. Henry Skinner contributes a note on the abundance of the cotton moth in Philadelphia from September 23 to 26. 'They swarmed in some parts of the city and hundreds were resting head-down on the electric light poles and on plate glass windows of stores. There were many thousands of them and nearly all that I saw were in perfect condition as though just from the chrysalis. These moths are known to migrate in numbers but it is quite strange if the great numbers seen here came from the cotton districts of the South. The moths in some places appeared to create considerable alarm, people thinking they would cause damage to plant life here.'

The fact that the abundance of the cotton worm has been observed in these northern latitudes, at the end of the season in which this insect has been so destructive in the South, might indicate that it occurs there as the result of migration directly from the cotton fields. On the other hand, the fact that the moths were remarkable for their perfection and freshness again raises the question as to whether the cotton worm has another food plant than cotton. The answer to this question would be of considerable interest to West Indian planters for, although uncultivated or wild cotton furnishes food for the cotton worm and thus helps it to survive periods when no cultivated cotton is being grown, it is obvious that additional food plants would be of value to the cotton worm during this unfavourable period.

SOME USEFUL INSECTICIDES.

For several years past, the United States Department of Agriculture has been conducting investigations in the control of the California peach borer (*Sanninoidea opalescens*), and in the process of these investigations has demonstrated the usefulness of certain washes for the protection of peach trees.

The borer mentioned is one of the Lepidoptera, the adult being a beautiful moth and the larva or borer a caterpillar. The effect upon the peach tree however is much the same as that of the cacao beetle on cacao trees, and of the lime tree bark borer on lime and other citrus trees. The methods of control found to be useful in California may also be of value in the West Indies.

The peach borer is controlled by the practice of digging out the larvae, and the use of a wash on the trunks of the trees to repel the egg-laying adult and prevent its gaining an entrance. In the case of the West Indian borers there are no such definite seasons for the different stages of insect development as obtain farther north, and consequently a constant look-out would have to be kept for the emergence of the adult or for the appearance of infested areas on the trunks of the trees. It is the general practice in cacao and lime plantations to dig out borers, and after clearing away the dead bark to treat the exposed surface with a preservative such as coal tar or resin oil.

The protective wash which has been found most useful in dealing with the California peach borer is the one described under the heading Formula No. 1. This is a mixture of lime and crude oil prepared as follows:—

Formula No. 1. The lime-crude oil mixture Place about 50 lb. of rock lime in a barrel and slake with 10 to 15 gallons of warm water; while the lime is boiling, slowly pour in 6 or 8 gallons of heavy crude oil, and stir thoroughly. Add enough water to make the whole a heavy paste. The wash should be applied immediately with a heavy brush.

This has been found effective and is not injurious. It prevents the egg laying females from gaining access to the bark of the tree and it does not seem to injure the plants. Mixtures made according to Formula No. 2 and Formula No. 3 have also been used, and as they may be applicable in certain cases in the West Indies, the directions for making are given herewith.

Formula No. 2. The lime-sulphur-salt mixture. Place about 25 lb. of rock lime in a barrel and slake with warm water. Add 2 quarts of sulphur and 2 or 3 handfuls of salt while the lime is still boiling. This wash is heavy, and is applied with a brush.

Formula No. 3. Lime, coal tar, and whale-oil soap. Unslaked lime 50 lb., coal tar 1½ gallons, whale-oil soap 12 lb. Slake the lime in warm water, and add the tar while the mixture is boiling; dissolve the soap separately in hot water, and add this to the lime solution. Add enough water to make a heavy paste.

These notes on the California peach borer, and the directions for making the washes according to Formulas Nos. 1, 2 and 3, are taken from Bulletin 97, Part IV, of the Bureau of Entomology of the United States Department of Agriculture, entitled the California Peach Borer, by Dudley Moulton.

AGRICULTURAL MATTERS IN BRITISH GUIANA.

The Secretary of the Board of Agriculture of British Guiana has drawn attention to an account of agricultural matters that transpired at a meeting of the Board of Agriculture held on October 24, 1911, and to a description of experiments, mentioned at that meeting, carried out by the Department of Science and Agriculture with respect to the tapping of *Sapium Jenmani*. The information appears respectively in the Demerara *Daily Chronicle* for October 25 and 26, 1911, and the following matters of more general interest are abstracted for use in the *Agricultural News*.

At the meeting to which reference is made, Professor Harrison, the Director of Science and Agriculture, informed the Board that the following awards had been gained by British Guiana, at the International Rubber and Allied Trades Exhibition, London, namely the silver cup for the best sample of balata from the West Indies, by the Consolidated Rubber and Balata Estates Committee; and a similar cup for the best specimen of cultivated rubber, by Plantation Noitgedacht; the prizes had been handed to the successful competitors by His Excellency the Acting Governor. In continuation, Professor Harrison, drew attention to the danger of permitting the wild Hevea trees indigenous to the Colony (*Hevea confusa*) to grow near or among *H. brasiliensis*. Owing to the similarity in the mode of bursting of the capsules it was impossible to tell the difference between these two species. The great danger, however, was that inferior hybrids would be produced, and the final state would be the possession of a mixture of *H. brasiliensis*, *H. confusa* and a hybrid between them. The importance of the matter was that not only would such a condition lead to damage in regard to the ordinary interests of the estates, but that injury would be done by the exportation of seeds to those who were expecting to get the true seeds of *H. brasiliensis*.

A motion was adopted to the effect that a record should be made, on the minutes, of the Board's high appreciation of the valuable services rendered at the International Rubber Exhibition by Mr. F. A. Stockdale, its representative, and by those who assisted him in the preparation of the exhibits; and especially to Mr. Stockdale for the lecture he gave, the interest he displayed, and the attraction which he made in the space allotted to the Colony at the exhibition.

Professor Harrison submitted his Annual Report as Director of Science and Agriculture, and drew attention to experiments that had been made in regard to the tapping of Sapium trees; these receive consideration at a later stage of this article. The meeting concluded with the making of a decision concerning the importation of certain live stock, and with the giving of notice of a motion to be brought forward in regard to the Wild Birds Protection Ordinance.

As has been stated, details of the results of exhaustive tapping experiments conducted by the Department of Science and Agriculture during the past three years with *Sapium Jenmani* are contained in the later issue mentioned of the Demerara *Daily Chronicle*. Tapping at different successive periods always showed that the yield of dry rubber quickly diminished, and the first results were supported by more elaborate experiments in which trees of various sizes were tapped. In the latter case the trees employed in the investigations measured over 50 inches in girth, between 30 and 40 inches, and under 30 inches in girth. The first gave the best yields, while the last afforded an exceedingly poor return—not because they were young trees, but on account of the fact that they were stunted in their growth. After the trials, the yield of latex gradually became less, until it ceased to flow. In a general way, it was found that, during a period of two years, 'the yield of dry rubber from matured *S. Jenmani* trees of various sizes, from 30 inches to 92 inches in girth, at 3 feet from the ground, the great majority of them being between 40 inches and 70 inches in circumference, was 18·33 oz. per tree.'

Trials with retapping gave very poor yields of dry rubber from the lower parts of the trunk, while they were better on the higher parts, from 8 feet to 12 feet from the ground. Professor Harrison drew attention to the gradual deterioration in the quality of Sapium rubber that arises from repeated tapping. That from the first tapping was of excellent quality, but the product from the second and third was sticky, and this unfavourable characteristic increased until in some cases coagulation of the latex was impossible. There was great variation in the proportion of rubber in the latex; in 1908 it was about 18 per cent, in 1910 first tappings gave 15 per cent., while the latex given by trees that had been cut repeatedly during the several periods contained about 11 per cent. of rubber.

The general conclusions from the experiments are given as follows:—

(1) The trees yield latex very freely when first tapped, and produce rubber of very high quality, not subject to 'tackiness'.

(2) The yields of latex, and consequently of rubber, rapidly fall off during successive periods of tappings. The rubber obtained from later tappings is very subject to development of 'tackiness', and this tendency increases with successive tapping periods.

(3) Some, if not all of the trees, when exhausted by successive tapping periods, yield latex from which coagulated rubber is not obtainable.

(4) In a tapping period the main yields of latex and of rubber are obtained in the first two or three tappings. The trees run practically dry of latex in from three to six successive parings.

(5) No signs of wound response have been observed, and in all probability it does not occur, in *S. Jenmani* trees of mature age.

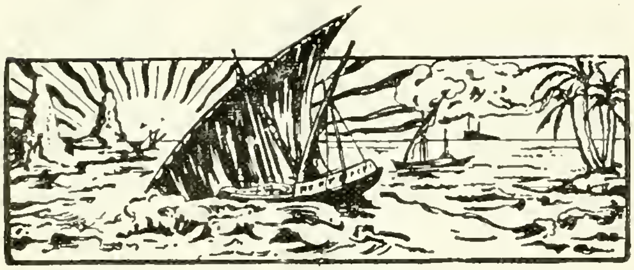
(6) When the lower parts of the trunk of a repeatedly tapped tree are practically exhausted of rubber-yielding latex, the higher parts of the trunk yield latex in a relatively large quantity. Whilst the rubber from the latex of the lower part of the trunk may be very 'tacky', or more or less resinous and coagulable with difficulty, that yielded by the upper part is of very good quality.

(7) The tendency of 'tackiness' is far more noticeable in biscuits prepared from the latex than it is in carefully prepared coagulated 'scrap'.

(8) In practical tappings of the *S. Jenmani* trees of mature age, it is advisable to tap as great lengths of their trunks as possible at one operation, and not to confine tapping to the lower parts of them.

(9) The wounds made in the bark of the trees during tapping have been found to heal very slowly and unsatisfactorily.

The article states finally that other matters are being investigated by the Department in regard to *S. Jenmani* and rubber production, and that information will doubtless be available later from Mr. F. A. Stockdale, as a result of his studies at Kew, concerning the species of Sapium, and of Hevea, as well as of balata trees, indigenous to the Colony.



GLEANINGS.

It is stated in the *Bulletin Agricole* of Mauritius, for August 1911, that recent enquiry has shown that the total number of agricultural experimental stations which exist in civilized countries, taken all together, is about 800.

Official returns issued by the Government of Ceylon show that 4,017 cwt. of rubber was exported from that island during June 1911, as compared with 2,036 cwt. for the same month of 1910. The exports for the year ended June 30 reached 48,465 cwt.; in the similar previous period, they were 22,364.

A report for October, received from the Curator of the Botanic Station, Montserrat, states that the outlook for the cotton crop continued to be hopeful. In the case of a large area where the plants had ripened, and had become almost leafless through the drought in August, new growth had started, and a large second crop will be available.

The condition of the cacao and lime crops in St. Lucia, during October, was good; while the cane crop was short in some cases. Information received from the Agricultural Superintendent shows that the weather during the month was normal, except for the rainfall, which at the Botanic Station was 7·08 inches, or about 3 inches below the average for October.

The Agricultural Instructor for the Virgin Islands reports that the long drought from which the Presidency has suffered came to an end on October 21, when useful rains were received. The breaking up of the drought was sudden, as is shown by the fact that the rainfall at the Station for the month was 8·47 inches, of which quantity 7·27 inches fell during the last ten days.

Facts relating to agricultural matters in Nevis during the month of October, supplied by the Agricultural Instructor, show that the condition of the cane crop continues to be poor. The outlook for cotton has improved considerably, though the yield is likely to be diminished on account of late planting; and leaf-blister mite and the cotton caterpillar are fairly prevalent.

Details supplied recently by the Curator of the Botanic Station, Dominica, concerning rubber-planting in that island, show that 40,000 Para rubber seeds were received toward the end of last month, and that preparations were immediately made for planting them in the nurseries. Similar work was done in connexion with the raising of 30,000 lime plants by the Agricultural Department.

It is stated by the Agricultural Superintendent in St. Kitts that, during last month, the cane crop throughout the island had much improved through the receipt of rain; it was, however, very backward for the time of the year, especially in the valley district near Basseterre. In a general way, the canes are healthy; and, with reasonable rainfall, the prospects for the crop are fair.

H. M. Trade Commissioner for South Africa reports that arrangements have been made by the Government of the Union, the East London Chamber of Commerce, and the Town Council of East London, acting together, for the planting of 80 acres of cotton near the town mentioned, for the purpose of demonstrating practically that cotton can be grown successfully in the district.

The *Louisiana Planter* for October 7, 1911, draws attention to investigations regarding the sucrose content of sugar-cane that have been carried out at the Audubon Park Sugar Experiment Station. The determinations have shown that the seedlings D.74 and D.95 are continuing to maintain their superiority as regards sucrose, and purity, over the old purple and striped canes of Louisiana. This fact is true both for plants and ratoons.

The *Textile Mercury* for July 22, 1911, states that an expert agriculturist has been officially called to Constantinople for the purpose of assisting the Government in the efforts that are to be made to develop cotton cultivation in Turkey. It has been shown so far that the climate of Western Asia Minor is very suitable for growing Upland cotton, while Cilicien (Adana), northern Syria and Mesopotamia are adaptable to the cultivation of Egyptian cotton.

The distribution from the Botanic Station, Antigua, during October included 6,247 limes, 204 plants of *Manihot dichotoma*, 137 cacao plants, 9,100 onion plants, 287 miscellaneous plants, 43,100 sweet potato cuttings and 219 miscellaneous cuttings. The Curator of the Botanic Station states that the cane crop is rapidly recovering, on the whole, from the effects of the recent drought, and that its present condition corresponds nearly to that of the similar period of last year.

La Quinzaine Coloniale, Paris, No. 19 of 1910, describes experiments that have been made with cassava for several years by the Surinam Department of Agriculture. The best yields have been obtained from native varieties. Of the others, the variety White Top, from Antigua, occupies the best position, with 22,150 lb. per acre as compared with 18,612 lb. to 34,474 lb. from native varieties. As in the West Indies, Colombian varieties have given comparatively poor returns.

With reference to the article on the avocado pear, which appeared in the last number of the *Agricultural News*, it is of interest that information obtained from Mr. J. Jones, Curator of the Botanic Station, Dominica, shows that the matter of forming a collection of good varieties of avocados at that Station is receiving attention. Plants of two Mexican varieties named Pahua and Ahuacate have been raised and planted out, and efforts are being made to propagate by budding a very good local variety.

STUDENTS' CORNER.

DECEMBER.

First Period.

Seasonal Notes.

As has been pointed out in these notes, the work of cotton selection forms a feature of the agricultural efforts during the present quarter, where this crop is grown. It is necessary that all records in connexion with this should be kept most carefully, and that the seed for future plantings should be stored where it cannot become mixed with ordinary seed. The student will do well to write an account, without reference to notes, of all the work of selection, from both plants and seeds. Why is plant and seed selection practised, and for what reasons is it particularly applicable to cotton-growing? A practical matter in regard to cotton-picking, that requires most careful attention, is to be assured that only ripe cotton is being harvested, and that the greatest care is being given to the separation of all stained and dirty cotton, after picking. Where cotton-planting has been made at different times, on account of lack of rain or for any other cause, records of the yields should be made, in order that indications may be obtained as to what is the best time for planting. The outlook for insect pests and the leaf-blister mite will have been kept constantly, and observations should have been made on the life-history of such enemies of the cotton plant, their purport having special relation to the means of control that may be adopted in each case.

Of what use to the agriculturist is the fact that most varieties of cane produce arrows in the West Indies? The present time is suitable for making observations concerning the period and extent of arrowing of different kinds of canes. Basing your information on your own observations, name four canes which arrow profusely and four in which the production of arrows is sparse.

Enough has been said to indicate the importance of the possession of careful records as to the manuring of the sugar-cane. These should have reference not only to general matters in connexion with manuring, but to the special circumstances which obtain on an estate in regard to the manure required and the availability of by-products that may be used in this connexion. Make a review of the details concerning the proper treatment of material for cane-planting. What is the best part of the cane to use, under conditions with which you are familiar? Where planting is done from ratoons, this should be effected as far as possible from areas where root disease is almost or completely absent. In some cases a field is planted late in the year, to be reaped in October or November, in order that a good supply of cuttings may be obtained. This procedure is not expedient where the canes are disposed of to a central factory, and in this case the necessity is entailed for the formation of special nurseries. Discuss the ways in which the adoption of such nurseries by planters is of special use to them in regard to: (1) the acquirement and propagation of the best cane varieties; (2) the selection of good planting material; and (3) the obtaining of such material free from diseases and pests.

Where onions are grown, they will now be transplanted from the nursery beds, where they have been raised from seed, to the field. In this work, care and the application of the results of past experience will be useful in order to prevent the arising of the necessity for supplying later. Give an account of what you know concerning onion cultivation, and summarize your observations in regard to the pests and diseases that you have noticed in connexion with this crop.

RECENT AGRICULTURAL WORK IN GRENADA.

The Superintendent of Agriculture for Grenada, Mr. G.G. Auchinleck, B.Sc., has forwarded a report on the work of the Agricultural Department, Grenada, carried out during the period July to September 1911. The information refers, firstly, to visits made by the Superintendent of Agriculture to country districts; these have had special reference to prize-holdings, rubber-growing, and the Land Settlement Scheme.

The work in the laboratory has been concerned mainly with the physical analysis of soils, analysis of manures, lime juice analysis, and examination of rum wash and muscovado sugar. There was, in addition, an investigation of material forwarded by the Chief of Police, suspected of containing poison. Details have already been given in the *Agricultural News* (p. 340 of this volume) concerning some of the work with lime juice; later on, information is also to be supplied with regard to an investigation, mentioned in the report, with Castilloa rubber produced at the Botanic Gardens.

There were no serious cases of plant disease during the quarter; though in regard to pests, the green shield-backed bug (*Nezara* sp.) had caused damage in the Morne Rouge and True Blue districts, and spraying trials were being made; the plants most seriously affected were peas, tobacco and bananas. The interesting observation is made that attacks of scale insects are lessening to a great extent, in all parts of the island.

The distribution of planting material from the Botanic Station has included: economic plants 949, ornamental plants 109, cotton seed 73 ℔., palm seed 31 ℔.; besides this there have been sent out 591 fruits and 26 bundles of grass. Other information concerning the Botanic Station includes the fact that 1,100 seeds were obtained from the two mature Hevea rubber plants there, and that about 800 vigorous seedlings have been raised from these and are being offered for sale at 3*d*. each.

The report concludes with a brief summary of the work of the Land Office, and mentions that the Agricultural Department and this office have prepared plans for a small cane mill to be erected shortly at Morne Rouge North, for allottees under the Land Settlement Scheme; the cost is being met by the Government, and a mill will be provided whose capacity (about 8 tons of cane per day) will be ample for the needs of the allottees. About 100 acres of cane are expected to be planted next season, as the result of the acquisition of the mill.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture left Barbados on Monday, November 20, by the R.M.S. 'Magdalena', on an official visit to Antigua and Montserrat. Dr. Watts is expected to return to Barbados by the R.M.S. 'Oruba', on the 13th proximo.

FUNGUS NOTES.

OBSERVATIONS ON ROOT DISEASES IN THE WEST INDIES.

PART II.

In the preceding number of the *Agricultural News*, an article appeared dealing with the black root disease found on several plants in Dominica, and probably also of common occurrence in certain other islands of the Lesser Antilles. In the present article, a description will be given of two other forms of root disease, confined, as far as is known at present, to lime trees in the island of Dominica. The investigations are, however, of a recent character, and it is very probable that one of these will be met with in other places.

RED ROOT DISEASE OF LIME TREES. This, as far as is yet known, is found only on lime trees, in Dominica, and is due to a species of Sphaerostilbe. It occurs sporadically on the roots of trees growing on estates in the interior of the island. Although there is, so far, no evidence to show that it can attack other host plants, yet it is worthy of mention that a very similar fungus has been found in conjunction with what was probably the black root disease on the roots of an unidentified tree in St. Lucia. Furthermore, it seems probable that it can live as a saphrophyte on decaying wood, as can *Sphaerostilbe repens*, B. and Br., found by Petch as an occasional parasite on *Hevea brasiliensis*, and on arrowroot in Ceylon. (The Physiology and Diseases of *Hevea brasiliensis*, p. 192; and *Circulars and Agricultural Journal of the Royal Botanic Gardens*, Ceylon, Vol. V, No. 8.)

Trees attacked by this disease lose some of their leaves, and the tips of their branches turn yellow. Eventually they wilt and die, probably somewhat rapidly, as in the case of the black root disease. This point has not, however, been properly made out. On examining the roots, it is seen that several of them are diseased, and that the damage inflicted extends right up to the collar. The bark is brown in colour, soft and rotten, and easily removed; while the surface of the wood is also soft and damp, and of a red-brown tint. On the ends of the main roots, near their point of attachment to the tree, round the collar, and in bad cases for some distance up the stem, a smooth, red-brown sheet of fungus occurs beneath the surface of the outer bark, closely adpressed to the wood. The dry outer bark falls away in places, and leaves the sheet of fungus exposed.

The fungus produces a Stilbum form of conidial fructification, either near the soil level on the collar, or beneath the soil in cavities between the principal roots. Each consists of a short red stalk surmounted by a spherical head of white spores. The whole is from 2 to 4 mm. in length. The stalks were borne upon red strands of the fungus in the cases observed, and occurred in clusters, so that they were fairly conspicuous in spite of the small size of the individual fructifications. In one instance, minute, flask-shaped, bright-red peritheccia were found clustered on a red strand. They were spherical below, with long, usually curved, necks and gave rise to bicellular ascospores, very light red-brown in colour, constricted at the septum and somewhat acute at either end.

Thus this fungus, like the Rosellina responsible for the black root disease, may spread by means of spores produced above ground. At the same time, also, it can spread through the agency of long, narrow, red strands of mycelium which grow through the soil. Since this is the case, the red root disease can probably be easily controlled by the same measures as are applicable to the black disease. These were described at the end of Part I of this article.

STEM CANKER DISEASE OF LIME TREES. This is a peculiar disease, found at present only under somewhat unfavourable conditions in Dominica. It is primarily a root disease, though the name appearing above has been given to it on account of one of its most easily distinguishable characters.

Unlike the two diseases already described, which are found only on trees four years old and upwards, the stem canker disease occurs on trees of all ages from one and a half to five years or more. The first symptom of the disease is a thinning of the foliage, accompanied by the appearance of several bare branches. At the same time the trees may take on a yellow colour, and thus have a very sickly appearance. They may remain in this condition for three months to a year, or even more; while those in bearing continue to produce fruits all the time. Ultimately, however, all affected plants die.

On examining the base of the stem of a sickly tree, an open wound extending down to the wood and surrounded by callus may be seen on one side, usually near the ground. This cankered patch may run either vertically or horizontally, and varies in width from ¼-inch to ½-inch, and in length from ½-inch to 2 inches. In more advanced cases, all the bark, for a distance of from 3 to 12 inches above the ground level, is cracked and split and has a peculiar scabby appearance. This is due apparently to abnormal and irregular activity of the cambium, which produces lumps and ridges of wood and bark, that render the surface very rough and break up the older cortex and outer bark.

The roots show the presence of peculiar open splits in the bark, each of which is usually not more than ¼-inch in width, but extends for a considerable distance. These areas are bordered by a vigorous callus, and it appears that in some instances they are completely healed over. They frequently occur at bends in the roots. In advanced cases of the disease, the scabby appearance of the bark described above extends to the roots also.

The causes of the disease would appear to be physical rather than fungoid. The presence of a heavy clay soil, difficult to drain adequately, combined with exposure to strong winds at certain seasons of the year, would seem to be factors that contribute largely to the production of this unhealthy condition of the trees. No definite fungus has been found as yet, generally, on diseased trees; though several different saprophytic species may be observed on dead or dying roots. Moreover, there is no conclusive evidence of the spread of the disease from tree to tree, in a manner which would necessitate the presence of a parasitic fungus upon affected plants, to account for it satisfactorily.

The lines along which remedial measures should be undertaken would appear to lie in the direction of providing wind-breaks and increasing as far as possible the number and depth of drains.

It may be noted here that a somewhat similar disease has been found on lime trees in Antigua and Montserrat. In the latter island, however, diseased trees were characterized by the absence of fibrous roots connected with their main roots, and also exhibited peculiar strips of soft decaying bark upon their larger roots. This bark is easily removed, and has a peculiar frayed appearance. The disease in Montserrat and Antigua was associated with the occurrence of fructifications of *Fomes lucidus* (Leys.) Fr., on a large number of dead and dying trees, and consequently the hypothesis was put forward in a recent number of this publication that the fungus named above might be responsible for this form of root disease in Montserrat and Antigua. (See *Agricultural News*, Vol. X, p. 270.) It has not, however, been established as yet what is the true cause of this form of lime root sickness, nor how far it is different from other forms of disease. This and a few other points will receive further investigation.

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:—

The general character of the drug and spice markets throughout October has been satisfactory, especially with regard to drugs, which may be said to have commanded an active trade, that might have been accelerated by a more ready supply, chiefly, however, of eastern rather than western products. The trouble in China, for instance, is already having a marked effect on many important articles of commerce, and this, with Turkish and even with Italian products, is having its influence on buyers. Like most other products at the present time, drugs and chemicals are apparently advancing in price above the normal standard.

The following are the detailed notes affecting West Indian products:—

GINGER.

At the first spice auction on the 4th of the month, ginger attracted little or no attantion, but on the 11th it was reported that a fair business was done in washed rough Cochin, at from 45*s.* to 46*s.* per cwt. The offerings at the sale amounted to 179 bags of washed Cochin, all of which was bought in at 50*s.* per cwt. At the last auction on the 25th, 324 bags of rough washed Cochin were offered, 165 of which sold at 44*s.* 6*d.* to 45*s.* Some packages of slightly wormy were also disposed of at 44*s.* 6*d.* per cwt. No Jamaica has been offered.

NUTMEGS, MACE AND PIMENTO.

At auction on the 11th of the month 320 packages of West Indian nutmegs were offered and disposed of at the following rates: 58's 1*s.*, 62's to 67's 9*d.* to 11*d.*, 69's to 74's 6½*d.* to 8*d.*, 79's 6*d.*, 89's to 97's 5½*d.* to 6*d.*, 122's to 132's 5*d.* to 5¾*d.* and 140's to 142's 5¼. to 6½*d* These prices were a slight advance on previous rates, and were maintained at the two succeeding auctions, at the last of which, on the 25th, the offerings amounted to 21 packages of West Indian and a few packages of eastern, all of which were disposed of. Mace was represented at auction on the 11th by 70 packages of West Indian; fine bold fetching 2*s.* 8*d.* per ℔., good 2*s.* 5*d.* to 2*s.* 6*d.*, ordinary to fair 2*s.* 2*d.* to 2*s.* 4*d.*, and broken 1*s.* 11*d.* to 2*s.* 2*d.* On the 18th of the month, 71 packages of West Indian sold at 2*s.* 2*d.* to 2*s* 2*d.*, and broken at 2*s.* to 2*s.* 1*d.* per ℔. Pimento has been in slow demand; at auction on the 18th, 140 bags were brought forward and partly sold at 2½*d.* per ℔.

SARSAPARILLA.

This article was represented at the drug auction on the 19th by 17 bales of grey Jamaica, 12 of Lima-Jamaica and 11 of native Jamaica. The whole of the grey Jamaica and Lima-Jamaica was sold, as were 7 bales of the native Jamaica; 1*s.* 8*d.* to 1*s.* 10*d.* per ℔. was paid for fair grey Jamaica, and 1*s.* 4*d.* for mouldy and sea-damaged. Fair Lima-Jamaica, part chumpy, fetched 1*s.* 1*d.* to 1*s.* 2*d.*, and good red and yellow native 1*s.* 1*d.*, 9*d.* to 11*d.* being paid for a few lots of yellow. At the early part of the month Mexican was quoted at 7¾*d.* and fair Honduras at 1*s.* 3*d.* per ℔.

CANELLA BARK, OIL OF LIME, TAMARINDS, KOLA, AND ANNATTO SEEDS.

At the first auction in the month 3 bales of Canella alba bark were offered and realized 50*s.* per cwt. for fair palish, part country, damaged. At the same sale, 20 bottles of hand-pressed West Indian oil of limes were sold at 5*s* 5*d.* to 5*s.* 6*d.* per ℔. Some distilled oil in tins was also offered but held at 1*s.* 3*d.* per ℔. Some further sales of hand-pressed were made later in the month at the same rate as the former namely 5*s.* 6*d.* per ℔. Tamarinds were represented early in the month by 7 barrels of darkish juicy Barbados, which sold at 16*s.* per cwt, while for 22 packages of dry and palish, from St. Thomas, 12*s.* was paid; 10 barrels of dry Antigua met with purchasers and were bought in at 11*s.* per cwt. A week later, 12 packages of dry Antigua were disposed of at 10*s.* per cwt. At auction on the 18th, 8 barrels of good West Indian kola were sold at 3¾*d.* per ℔., while one package of whole nuts fetched 4¼*d.*, and two cases of ordinary green realized only 2*d.* per ℔. In the same week, 2 bags of West Indian Cassia Fistula pods were sold at 18*s.* 6*d.* per cwt. As many as 39 packages of annatto seeds, both West and East Indian, were offered, but no sales were effected, the whole being withdrawn at 2½*d.* to 3*d.* per ℔.

DRYING RUBBER ON PLANTATIONS.

In view of the attention now being paid to detailed and scientific systems of drying rubber on Eastern estates by means of vacuum and other driers, it is desirable to draw the attention of managers to simpler means for young estates. It is not advisible to spend huge sums of money or go to the trouble and risk of erecting complicated machinery when estates are just beginning to yield; the experience gained on a small scale, even if it is limited to mouldiness and tackiness, is of considerable value when large crops are anticipated. Managers having about 1,000 ℔. of rubber per month can easily deal with their produce in a corrugated iron factory, supplied with wooden reapers stretching across the width of the building. Strips of wood 1½ inches by ½-inch are quite serviceable. It is not absolutely necessary that a fan or heating apparatus be provided; it is, however, necessary to provide such a chamber with an ample supply of fresh air. Under these circumstances, it should be possible to turn out dry rubber within a week if the air is maintained at a little over 90° F.—a by no means excessive temperature for iron-roofed buildings in the East. (From the *India-Rubber Journal*, October 21, 1911, p. 21.)

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR, November 7, 1911; Messrs. E. A. DE PASS & Co., October 13, 1911.

ARROWROOT—3¼*d.* to 3½*d.*
BALATA—Sheet, 3/4 ; block, 2/3 per lb.
BEESWAX—£7 5*s.* per cwt.
CACAO—Trinidad, 61/- to 70/- per cwt. ; Grenada, 57/- to 62/-; Jamaica, 54/- to 58/6.
COFFEE—Jamaica, 67/- to 117/- per cwt.
COPRA—West Indian, £27 10*s.* per ton.
COTTON—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 16*d.* to 18*d.*
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—48/- to 63/- per cwt.
ISINGLASS—No quotations.
HONEY—28/- to 34/- per brl.
LIME JUICE—Raw, 1/1 to 1/6; concentrated, £19; Otto of limes (hand pressed), 5/3.
LOGWOOD—No quotations.
MACE—2/2 to 2/6.
NUTMEGS—5¾*d.* to 8¾*d.*
PIMENTO—Common, 2⅜*d.*; fair, $2\frac{7}{16}d.$; good, 2½*d.*; per lb.
RUBBER—Para, fine hard, 4/3; fine soft, 4/; Castilloa, 3/10 per lb.
RUM—Jamaica, 1/8 to 5/-.
SUGAR—Crystals, 19/- to 22/6; Muscovado, 15/- to 17/-; Syrup, 14/- to 18/- per cwt.; Molasses, no quotations.

New York.—Messrs. GILLESPIE BROS. & Co., November 3, 1911.

CACAO—Caracas, 13½c. to 13¾c.; Grenada, 13c. to 13¼c ; Trinidad, 12¾c. to 13½c. per lb.; Jamaica, 11½c. to 12¼c.
COCOA-NUTS—Jamaica, select, $36·00 to $37·00; culls, $22·00; Trinidad, select, $36·00 to $38·00; culls, $20·00 to $22·00 per M.
COFFEE—Jamaica, 15¼c. to 17¼c. per lb.
GINGER—8¾c. to 11¼c. per lb.
GOAT SKINS—Jamaica, 53c.; Antigua and Barbados, 48c. to 50c.; St. Thomas and St. Kitts, 46c. to 48c. per lb.
GRAPE-FRUIT—Jamaica, $3·00 to $4·00.
LIMES—$4·00 to $5·00.
MACE—45c. to 52c. per lb.
NUTMEGS—110's, 14½c.
ORANGES—Jamaica, $2·00 to $2·25 per box.
PIMENTO—4¾c. per lb.
SUGAR—Centrifugals, 96°, 5·30c. per lb.; Muscovados, 89°, 4·80c.; Molasses, 89°, 4·55c. per lb., all duty paid.

Trinidad.—Messrs GORDON, GRANT & Co., November 13, 1911.

CACAO—Venezuelan, $13·50 per fanega; Trinidad, $12·75 to $13·40.
COCOA-NUT OIL—$1·09 per Imperial gallon.
COFFEE—Venezuelan, 17¼c. per lb.
COPRA—$5·10 per 100 lb.
DHAL—$3·80.
ONIONS—$2 25 to $2·50 per 100 lb.
PEAS, SPLIT—$5·90 to $6·00 per bag.
POTATOES—English, $1·80 to $2·00 per 100 lb.
RICE—Yellow, $4·80 to 4·90; White, $5·75 to $6·00 per bag.
SUGAR—American crushed, no quotations.

Barbados.—Messrs. JAMES A. LYNCH & Co., November 18, 1911; Messrs. T.S. GARRAWAY & Co., November 20, 1911; Messrs. LEACOCK & Co., November 10, 1911; Messrs. E. THORNE, Limited, October 11, 1911.

CACAO—$11·50 to $13·50 per 100 lb.
COTTON SEED—$26·00 per ton; meal, $1·50 per 100 lb.; 2½ per cent. discount.
COTTON SEED OIL (refined)—60c. per gallon.
COTTON SEED OIL (for export)—54c. per gallon (in bond).
HAY—$1·50 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—$2·25 to $2·50 per 100 lb
PEAS, SPLIT—$5·90 to $6·00 per bag of 210 lb.; Canada, $2·85 to $3·90 per bag of 120 lb.
POTATOES—Nova Scotia, $2·40 to $3·25 per 160 lb.
RICE—Ballam, $5·05 to $5·45 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
SUGAR—American granulated, $6·00 per 100 lb.

British Guiana.—Messrs. WIETING & RICHTER, November 11, 1911 ; Messrs. SANDBACH, PARKER & Co., August 18, 1911.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	$10·50 per 200 lb.	$10·50 per 200 lb.
BALATA—Venezuela block	No quotation	Prohibited
Demerara sheet	70c. per lb.	70c.
CACAO—Native	11c. per lb.	11c. per lb.
CASSAVA—	60c.	No quotation
CASSAVA STARCH—	$6·00	No quotation
COCOA-NUTS—	$12 to $16 per M	$10 to $16 per M., peeled and selected
COFFEE—Creole	16c. per lb.	19c. per lb.
Jamaica and Rio	18c. per lb.	19½c. per lb.
Liberian	10½c. per lb.	12c. per lb.
DHAL—	$3·60 per bag of 168 lb.	$3·70 per bag of 168 lb.
Green Dhal	$3·50	——
EDDOES—	84c.	——
MOLASSES—Yellow	None	——
ONIONS—Teneriffe	——	4c. to 5c.
Madeira	4¾c. to 5c.	5½c.
PEAS—Split	$5·75 to $6·00 per bag (210 lb.)	$5·75 per bag (210 lb.)
Marseilles	$3·25	No quotation
PLANTAINS—	10c. to 20c.	——
POTATOES—Nova Scotia	$2·75 to $3·00	$3·50
Lisbon	—	No quotation
POTATOES-Sweet, B'bados	96c. per bag	——
RICE—Ballam	No quotation	——
Creole	$5·00	$5·00 to $5·50
TANNIAS—	$1·20	——
YAMS—White	$2·16	——
Buck	$2·40	——
SUGAR—Dark crystals	$3·50	$3·60
Yellow	$4·00 to $4·10	$3·75 to $4·00
White	——	$4·25
Molasses	$3·10 to $3·25	None
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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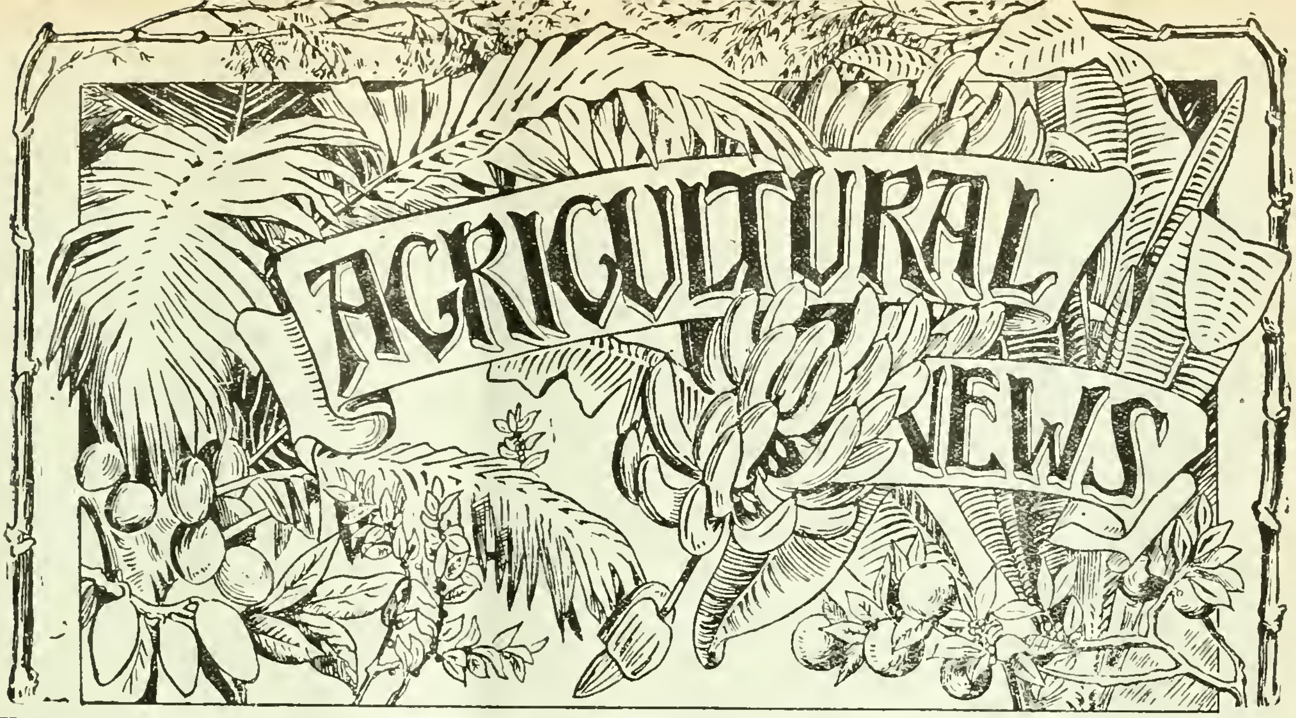

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AGRICULTURAL NEWS.

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

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CONTENTS.

The Agricultural Conference, 1912.

NOTICES concerning the next West Indian Agricultural Conference, to be held in Trinidad in January 1912, have appeared recently in the *Agricultural News* (pages 354, 360 and 376), and the time has now arrived at which a provisional programme of the proceedings can be drawn up. This has been done, and copies of such a programme are now being issued by this Department, and distributed in the West Indies. The present opportunity is being taken, also, to reproduce it at a later stage of this article.

The programme indicates that the discussions at the Conference are likely to be of the greatest interest and importance, and these will doubtless be increased largely by the fact that several institutions in England are to send delegates. As was stated in the *Agricultural News* of November 11, p. 360, the institutions that have been approached in this connexion are the Royal Botanic Gardens, Kew, the Imperial Institute, the British Cotton Growing Association, the West India Committee, the Entomological Research Committee and the Rothamsted Experiment Station. Up to the present, it has been ascertained that representatives will attend the Conference from the Royal Botanic Gardens, Kew, from the British Cotton Growing Association, the number in this case being two, and from the Entomological Research Committee. It is a matter for regret that the arrangements for the coming year at the Rothamsted Experiment Station will not permit of the attendance of its distinguished Director—Mr. A. D. Hall, M.A., F.R.S.

The programme indicates that the matters for presentation and discussion will be mainly concerned with the work of experiment and research with the principal crops of the West Indies and British Guiana, and with the state and progress of the chief agricultural industries of the various colonies. As in the past, agricultural education will take an important place in the proceedings: attention will also be given to the proposal for the appointment of a West Indian Trade Commissioner for Canada, and to the work that is being carried out by the Entomological Research Committee.

Excursions of a useful nature have been arranged, and evening addresses on various interesting subjects will be given at the Queen's Royal College.

The provisional programme of the Conference, as published at the present time, is as follows:—

TUESDAY, JANUARY 23.

1.30 p.m. to 4 p.m. Delegates arrive. Opening of Conference in the Council Chamber at the Red House. President's address. Preliminary Papers on Agricultural Education.

4.30 p.m. Reception at Government House by His Excellency the Governor, and Garden Party.

8.30 p m. At Queen's Royal College. Address on Colour Photography. Mr. J. B. Rorer, A.B.,M.A. Notes on Some Agricultural Activities in Trinidad. Mr. W. G. Freeman, B. Sc.

WEDNESDAY, JANUARY 24.

7.30 a.m. to 8.30 a.m. At St. Clair Experiment Station. Cacao Demonstration. Methods of trapping cacao beetles. Mr. P. L. Guppy. Methods of spraying cacao. Mr. J. B. Rorer, A.B.,M.A.

9 a.m. to 12 noon. Session of Conference at the Red House. Papers and discussions relating to Cacao.

1.30 p.m. to 4 p.m. Session of Conference at the Red House. Papers and discussions relating to Sugar.

THURSDAY, JANUARY 25.

7.30 a.m.to 8.30 a.m. Excursions in and around Port-of-Spain. (*Arrangements will be announced later.*)

9 a.m. to 12 noon. Session of Conference at the Red House. Papers and discussions relating to Cotton.

Afternoon. Alternative excursions. (*a*) St. Augustine Estate and Government Farm. (*b*) To Cacao Estates in the Santa Cruz Valley. (*c*) Visits to Educational Institutions in Port-of-Spain.

(*Further particulars regarding these Excursions will be announced later.*)

FRIDAY, JANUARY 26.

7.30 a.m. to 8.30. a.m. Demonstration at St. Clair Experiment Station.

9 a.m to 12 noon. Session of Conference at the Red House. Papers and discussions on the Cocoa-nut, Lime and Fruit Industries, and on Plant Pests and Diseases.

1.30 p.m. to 4 p.m. Session of Conference at the Red House. Papers and discussions on Agricultural Education.

8.30 p.m. At Queen's Royal College. Addresses on Rubber Cultivation, illustrated by lantern slides, by Dr. Cramer and Mr. F. A. Stockdale, M.A.

SATURDAY, JANUARY 27.

(*a*) Excursion to River Estate (including the Blue Basin; the Wireless Telegraphy Station; the Water Works Pumping Station, etc.), leaving Port-of-Spain at 8 a.m. During this excursion there will be Demonstrations and Papers relating to cacao cultivation and other subjects.

(*b*) Alternative excursion to the Pitch Lake, leaving Port-of-Spain by train at 7 26 a.m.

(*c*) An alternative excursion may be arranged to visit places of interest in connexion with the Sugar Industry.

Evening. Conference Dinner.

SUNDAY, JANUARY 28.

It is probable that an afternoon excursion to the islands near the Bocas may be arranged.

MONDAY, JANUARY 29

7.30 a.m. to 8.30 a.m. St.Clair Experiment Station. Demonstration of matters relating to Rubber.

9 a.m. to 12 noon. Session of Conference at the Red House. Papers and discussions relating to Rubber.

Afternoon. Visit to the Agricultural Show.

TUESDAY, JANUARY 30.

7.30 a.m. to 8.30. a.m. (To be arranged.)

9 a.m. to 12 noon. Session of Conference at the Red House. Subjects for discussion. The proposal for a West Indian Trade Commissioner in Canada. The work of the Entomological Research Committee. Closing of the Conference.

It must be understood that the information presented above does not indicate the full range of the subjects that will be available for discussion. Such other matters as possess importance will receive attention, and it is intended that everything shall be done to permit the giving of adequate consideration to all agricultural subjects that are of interest to representatives at the Conference.

SUGAR INDUSTRY.

SUGAR-CANE EXPERIMENTS IN ST. KITTS.

At a meeting of the St. Kitts Agricultural and Commercial Society, held on the 3rd ultimo, Mr. H. A. Tempany, B.Sc., Superintendent of Agriculture for the Leeward Islands, gave an address presenting a short résumé of the results obtained in the recently concluded experiments with varieties of sugar-cane in St. Kitts. A report of the address has been received from Mr. Tempany, and this has been used for making the following abstract.

Mr. Tempany commenced by calling attention to the fact of the general acceptance of the necessity for continued experimentation, if agricultural results of utility are to be obtained. Selection experiments were among the most important of these, and in illustration Mr. Tempany quoted figures showing how in Germany the richness in sugar of the sugar beet had been increased by systematic selection of seed for sowing. In regard to seedling canes the matter was not as simple, on account of the large number of varieties from which a choice has to be effected, but assistance was available in the form of local variety experiments which were intended to indicate the kinds of cane that are best suited to the districts in which such experiments are made.

The raising of cane seedlings presented peculiar difficulty, particularly from the fact that suitable weather is essential if it is to be conducted successfully. It was for this reason that sugar planters in the Northern Islands are dependent to a large extent on introduced varieties as a means of improving the yields. In view of the fact that large numbers of valuable seedling canes had been produced in Demerara and Barbados, it was perhaps only natural that enquiry should be made as to the necessity for making trials of seedling canes in St. Kitts. The answer to this enquiry was that it had been proved that, although a given cane may show productivity in one locality, it does not follow that this quality persists in another place. The matter was not merely one connected with cane-growing in different islands, but it had its importance in regard to the behaviour of sugar-canes in the various cane-growing localities in any given island. There was the further circumstance that it is believed that the characteristics of some varieties are modified, in differing degrees, on their introduction into fresh localities, where the conditions of growth are no longer those to which they have become habituated. Finally, from the planter's point of view, the very fact of the existence of a large number of varieties of seedling canes made it very difficult for him to effect a useful choice, without assistance in the form of experiments carried out under the conditions actually experienced by him.

After giving attention to these introductory considerations, Mr. Tempany proceeded to outline the main results obtained in the experiments with plant and ratoon canes during the past season, pointing out, firstly, that the trials were conducted on six stations for plants, and on five for ratoons. The actual system was to cultivate the main collection of forty-two varieties at two stations, La Guérite and Molineux, as plant canes, and at the latter station as first ratoons; while at the remaining stations a selection of fifteen of the most promising canes was grown, both as plant and first ratoon canes. The weather experienced during the growing season was somewhat unfavourable during the period April to July, especially in the cane-growing districts near Basseterre, while it was generally favourable during the latter part of the year. This circumstance had affected the returns in the experiments, to some extent.

Mr. Tempany here referred to tables showing the yields that had been given by the canes, both plants and ratoons, during the season under review. He pointed out that in the former case the lead was taken by B 208—a cane which in the past had demonstrated its suitability to conditions in St. Kitts. D.625 and Sealy Seedling came second and third, and it was pointed out that, as neither of these canes had previously shown any particular promise in St. Kitts, their present position was probably due to variation in season. The succeeding canes were D.109, B.4596, D 116, and B 254; while B 1753, which had held the premier position last year, had fallen to the eighth place—as a result, probably, of variation in season, and partly to error of experiment; for in the western districts of the island, this cane had given satisfactory returns and was regarded favourably by planters. Among the ratoons for last season, the first was D.625, followed in succession by B.1753, B.4596 and D.109.

Other tables presenting the results for the whole period of experimentation, namely eleven years, showed that the first four canes were successively B.208, D.116, D.109 and B.1753, among plant canes. With ratoons the leading canes were, similarly, B.1753, B 208, B 4596 and White Transparent.

The usual method of reviewing the results, namely by ascertaining which canes occupy the upper third of the table at the different experiment stations was adopted, as it affords a means of judging which varieties are suited to a wide range of conditions. The facts adduced in this way were as follows, for plant canes :—

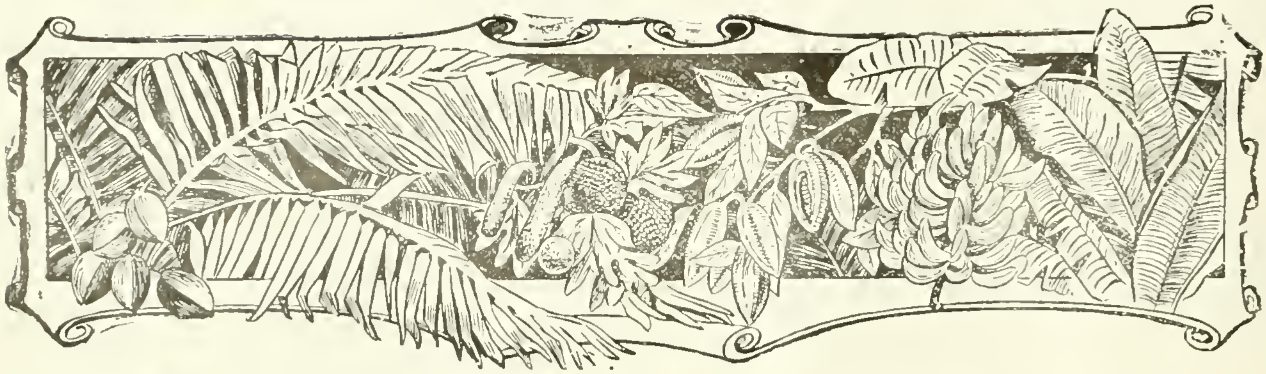
B.208	had come within the first 5 varieties on	6	stations.
B.4596	,, ,, ,, ,, ,,	4	,,
D 625	,, ,, ,, ,, ,,	4	,,
Sealy Seedling	,, ,, ,, ,, ,,	3	,,
D.109	,, ,, ,, ,, ,,	3	,,
D.116	,, ,, ,, ,, ,,	3	,,
B.254	,, ,, ,, ,, ,,	2	,,
B.1753	,, ,, ,, ,, ,,	2	,,

The similar facts for ratoon canes were :—

B.1753	had come within the first 5 varieties on	5	stations.
D.625	,, ,, ,, ,, ,,	4	,,
B.4596	,, ,, ,, ,, ,,	4	,,
D.109	,, ,, ,, ,, ,,	4	,,
B.208	,, ,, ,, ,, ,,	2	,,

It was stated that, during the past year, the work of cane experimentation had been extended to Nevis, on Pinneys estate, and that it was hoped that the work in this direction would be increased in scope

In conclusion, Mr. Tempany called attention to a table showing the annual exports of sugar from St. Kitts-Nevis for a number of recent years. During the past five years a reduction of some 1,500 acres had taken place in the area cultivated for sugar-cane; nevertheless the average exports of sugar from the Presidency during that time had been slightly in excess of the average exports for the ten years previous to that. This pointed to an appreciable increase in the average sugar production per acre, during the past five years, and this was notwithstanding the fact that on many estates an intermediate crop of cotton was grown with sugar-cane. He finally gave the opinion that this increased productiveness could in some measure be fairly attributed to the introduction of improved varieties of cane.



FRUITS AND FRUIT TREES.

THE FRUITING OF A 'MALE' NUTMEG TREE.

In the *Agricultural News* for October 14, 1911, a note appeared that had been received from Mr. J. C. Moore, Agricultural Superintendent, St. Lucia, dealing with the circumstance of the fruiting of one of the staminate nutmeg trees at the Botanic Gardens in that island. Since this, Mr. J. Jones, Curator of the Botanic Gardens, Dominica, has kindly drawn attention to the following note in relation to the subject, which appeared in the *Agricultural Bulletin of the Malay Peninsula* for April 1897, and in so doing, states that the same phenomenon has been observed in that island:—

As a rule each tree is either male or female, and this is only distinguishable by the flowers. The female flowers are solitary, and much larger than the males, and thicker in texture. If opened, they will be found to contain a pubescent cylindric pistil, cleft at the top into two short styles. The male flowers, on the other hand, are produced in little racemes of three or four, and each contains a column of stamens all joined together.

Some trees produce both male and female flowers in various proportions, and it is well known that trees on their first flowering bear male flowers only; after about two years they will sometimes produce female flowers, and eventually bear no males.

Female trees are naturally of the greatest value to the planter, but it is of course essential to have some male trees in the plantation, or the fruit will be of no value. Even without males the fruit will sometimes set and develop up to a certain point, but never ripens, and soon falls off. The pollen is conveyed from male to female flowers by small insects, chiefly apparently a very small, flattened, brownish beetle, but bees often visit the flowers as well.

In relation to the same subject, the following interesting information has been communicated by Mr. W. N. Sands, Agricultural Superintendent, St. Vincent:—

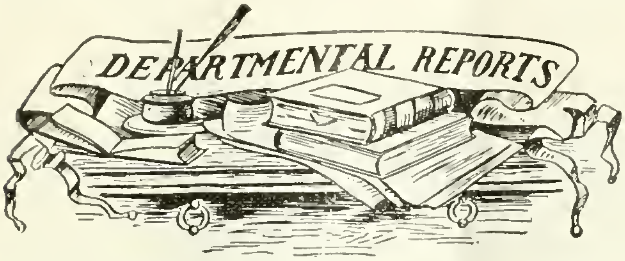
I would draw attention to the *Trinidad Bulletin of Miscellaneous Information*, April 1907, p. 202. There, Hart describes a monoecious nutmeg tree growing in Trinidad, and states that it is possible that such a form has been previously produced and records registered, but mentions that he has been unable to trace any note in available literature.

In the nutmeg grove at the Botanic Gardens here, there are two 'male' trees, each twenty-one years old, which have borne fruit. One of these at the present time has two fruits on it and has each year for the past six years to my knowledge, exhibited this abnormal feature. About five years ago I germinated two fruits, but unfortunately lost sight of the plants owing to carelessness on the part of an employee. I have examined many flowers on the trees and they are produced in great abundance, but all appear to be 'male'; this points to the fact that very few flowers capable of forming fruits are produced, but whether these are unisexual, or hermaphrodite, or both, is a point which requires to be investigated.

These monoecious trees, although of a good bearing age, have never borne more than two or three fruits at any time, so that they are not likely to be of any commercial value; but they are certainly of much interest from a botanical point of view.

Further in the same connexion, the following short article appeared in the *Port-of-Spain Gazette*, for October 29:—

We have read a rather interesting account from St Lucia which appeared in the *Agricultural News* of the Imperial Department of Agriculture, Barbados, just to hand and issued on the 11th instant, under the heading, The Fruiting of a 'Male' Nutmeg Tree, page 324, and asking if any similar observation had been made by other persons. We, ourselves, remember to have seen at Bellevue estate in the parish of St. Andrews, Grenada, a long time ago now, several plump, ordinary-looking nutmegs upon a male tree. There were blossoming, at the same time, the usual numbers of flowers characteristic of this sex. Near by were to be seen some of the oldest nutmeg trees in the West Indies. Everybody knows it, but it might be said that Grenada is famous for its extensive nutmeg cultivation, and that it is due to this fact that the island is referred to sometimes as the Isle of Spices, or the Spice Island. Since the visit to Bellevue we have seen another male tree producing nuts in the parish of St. David, Grenada, the chief fruit parish of that beautiful island



BARBADOS: REPORT ON THE LOCAL DEPARTMENT OF AGRICULTURE, 1910-11.

After giving details concerning the staff, establishment, financial matters and repairs to buildings, this report presents information concerning the distribution of plants during the period under review; it is shown that this has been concerned mainly with sugar-cane cuttings, seeds of leguminous plants, cotton-seed, sweet potato cuttings and plants for Arbor Day.

A review of the experiments with sugar cane is presented, which shows that the lines of investigation have comprised the following: (1) variety experiments on estates, with White Transparent as a standard; (2) similar co-operative experiments on estates; (3) manurial experiments with sugar-cane; (4) trials in regard to the effect of cutting out 'dead hearts' on the yield of sugar-canes; (5) an experiment on the action of superphosphate as a manure for sugar-cane in red soils; and (6) determination of the yield of canes grown from cuttings made from plant canes, cuttings made from first ratoons, cuttings made from seventh ratoons, and from small cuttings. The variety and manurial experiments have received the usual attention in the special report. The trial with superphosphate seems to indicate that this increases the yields of cane on red soils. In regard to the other matters, the continuation of the experiments is required, in order that definite results may be obtained.

A large portion of the report is taken up with information concerning the cotton industry, cotton selection, the production of cotton hybrids, and reports and valuations of the cottons produced, furnished by Mr. C. M. Wolstenholme, of Manchester. The work is too detailed in nature to be made the subject of general statements. This part is followed by an account of experiments with sweet potatoes, sweet and bitter cassava, economic colocasias, and various leguminous plants. In regard to the first, descriptions of the characters and yields are presented in some detail, and a short account of an experiment with Apterite for the control of scarabee of the sweet potato (*Cryptorhynchus batatae*) shows that this pest was not affected by applications of the insecticide. Details of the yields of the colocasias are given, and it has been indicated in one experiment that the best returns are obtained by using the heads of these plants as planting material. Among the leguminous plants giving the best results are the Lyon bean (*Stizolobium niveum*, not *S. deeringianum*, as is stated in the report), an unnamed pea from Porto Rico, and the horse bean (*Canavalia ensiformis*). As it had been found that no nodules were produced on the roots of alfalfa and the soy bean, soil in which these had been grown was imported from the United States, and mixed with Barbados soil, in which the seeds were subsequently planted, when seedlings were obtained with roots bearing an abundance of nodules.

In connexion with fruits, improved mangoes have been imported, and grafted mangoes have been sold. The fact that there is a small banana industry in Barbados is shown by the circumstance that 12,941 bunches of the fruit were shipped during the year by Messrs. H. E. Thorne & Sons, Ltd.; it may be mentioned that the local Department of Agriculture also shipped 196 bunches. Shipments of mangoes were continued, and trial shipments of grape fruit and shaddocks were made. Further particulars indicate that little attention is given to onion-growing in the island. Succeeding matter deals with the Local Agricultural Show of 1910 (see *Agricultural News*, Vol. X, p. 11), Canadian Exhibition, the fumigation of plants, Arbor Day, the Reading Courses of the Imperial Department of Agriculture, live stock and the herbarium. In regard to live stock, two well-bred rams, descended from stock imported by the Imperial Department of Agriculture, have been placed for service in different districts of the island.

An account is presented of the insect pests and fungus diseases on the principal crops and some others during the year, particularly with reference to those on the sugar-cane; the question of insect pests on sugar-cane in Barbados has received attention recently in the *Agricultural News*. A large, detailed section on the meteorology of the island succeeds, and it is pointed out in this that the sugar crop reaped in 1910 comprised 34,871 tons of sugar and 77,720 puncheons of molasses, of which 49,817 puncheons are estimated to have been fancy molasses; while the cotton crop from October 1, 1909, to September 30, 1910, amounted to 1,288 bales, containing 644,279 lb. of lint, having an estimated value of £38,548.

NYASALAND PROTECTORATE: ANNUAL REPORT ON THE DEPARTMENT OF AGRICULTURE, 1910-11

This shows that the amount of the most important crop —cotton—exported during the year was 4,342 bales of 400lb., as compared with 2,147 bales for 1909-10; this is an increase of more than 100 per cent. in a single season. The values of the cotton exports for the seasons mentioned were £58,687 5*s.* 10*d.* and £26,208 16*s.*, in order. The quality of the crop, apart from strength, is stated to be all that can be desired; the best price during the season was 1*s.* 0½*d.* per lb. and a considerable part was sold at 11*d.* to 1*s.* per lb. The Nyasaland product is on the dividing line between the Egyptian and the long staple Upland crops, and its improvement enables it to enter the higher priced market, namely the former. Further details concerning cotton relate to experiments with the crop.

Successful experiments have been made with soy beans and the velvet bean (*Stizolobium deeringianum*); the former promises to be of value as a native food crop, while the latter will prove to be a most useful green dressing. The area under tobacco increased from 2,368 acres in 1909-10 to 3,274; the exports of the cured product amounted to 1,704,637 lb., valued locally at £42,626. The tobacco industry is assisted by the Imperial Tobacco Company, Ltd.

The exports of rubber during the year under review amounted to 59,471½ lb., of a local value of £10,659; the quantity has more than doubled since the previous year, owing to the improvement in prices. A most important development has been the exploitation by machinery of *Landolphia parvifolia*, by the African Lakes Corporation, Ltd. Particulars are given in the report concerning Para and Ceara rubber. As regards maize, the export was 39,804 cwt., valued at £6,002.

After giving information concerning certain other crops, such as coffee, tea and hemp, as well as in regard to live stock and other important matters, the general report concludes with the Report of the Agriculturist, the Report of the Chief Forest Officer, the Report of the Veterinary Bacteriologist, and details concerning the meteorology of the Protectorate.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date November 20, with reference to the sales of West Indian Sea Island cotton:—

Since our last report, about 200 bales of West Indian Sea Islands have been sold, the bulk of them being composed of the remainder of last season's crop, which realized prices from 13*d.* to 16*d.* A few bales of superior New Crop cotton have been sold in the region of 18*d.*

The market is steady, and the stock is exhausted. The fine spinning trade is still rather inactive.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending November 18, is as follows:—

There has been some demand in the market this week, resulting in sales of 200 bales, consisting chiefly of off cotton and small lots bought for types, at the following prices:—

Extra Fine,	32c. = 18*d.*,	c.i.f., & 5 per cent.
Extra Fine, off in colour,	28c. = 15¾*d.*,	,, ,, ,, ,,
Fully Fine,	28c. = 15¾*d.*,	,, ,, ,, ,,
No. 1 Off Cotton,	22c. = 12½*d.*,	,, ,, ,, ,,
No. 2 Off Cotton	19c. = 11*d.*,	,, ,, ,, ,,

There has been no demand as yet for crop lots, which are being held at 40c. and upwards.

THE COTTON CROP IN VARIOUS COUNTRIES.

The *Bulletin of Agricultural Statistics*, of the International Institute of Agriculture, Vol. II, No. 9, gives the following recent information concerning the present cotton crop in Bulgaria, the United States, Japan and Egypt:—

BULGARIA. The condition of the crop, expressed on the Institute's schedule, [100 = condition promising an average yield] was, on September 1, 100.

UNITED STATES. The following table shows the condition of the cotton crop on August 25, 1911, compared with conditions on July 25, 1911, and the average condition on August 25 for the past ten years:—

Date.	Condition. Scale of the United States. (100=normal.)	Institute's Scale. (100 = condition promising an average yield.)
August 21, 1911	73·2	99·6
July 25, 1911	89·1	112·2
10-year average on August 25	73·5	...

JAPAN. The condition of the crop on September 1, expresssd on the Institute's scale, was 100

EGYPT. Weather during the month [September] has been slightly more favourable, a few hot days have assisted in the recovery of the cotton plants, by the drying up of the third brood of cotton worm.

The cotton crop is, however, very late, and it is feared that much injury may be done by the boll worm, on this account. The last-named pest has appeared in some parts of Upper Egypt, but not severely.

The area planted in cotton is 718,858 hectares [= 1,437,716 acres]. The condition of the crop on September 1, expressed on the Institute's scale, was 91.

Some Cotton-Spinning Statistics.—The statistics just published by the International Federation of Master Cotton Spinners' and Manufacturers' Associations give the total number of spindles throughout the world as 137,278,752. The estimated number of spinning spindles in Great Britain is given as 54,522,551. Of this number, 39,977,255 are mule spindles, and 8,050,925 ring spindles. Egyptian cotton is used by 13,169,923 spindles, and 31,858,237 spindles are engaged on American, East Indian, and sundry cottons. At the present time there are in course of erection in Great Britain 896,934 spindles. The curtailment of production during the past season amounted to 113 hours in Great Britain, 140 hours in Germany, 105 hours in France, 419 hours in Austria, 339 hours in Italy, and 180 hours in Switzerland. The consumption of cotton per 1,000 spindles is 70·47 bales in Great Britain, 105·23 bales in Germany, 132·99 bales in France, 352·15 bales in India, and 162·65 bales in the United States. The stocks on August 31 of all kinds of cotton throughout the world are given as 2,619,052 bales, against 2,523,782 bales at the same time last year. The stock of American cotton is stated to be 1,135,166 bales, as compared with 1,123,526 bales twelve months ago. The consumption during the season ended August 31 last of all spinners throughout the world amounted to 17,819,070 bales, as against 17,030,511 bales during the previous year. The figures for American cotton are 11,559,401 bales, as compared with 11,145,678 bales during the previous year. (*Journal of the Royal Society of Arts*, October 13, 1911.)

A DISEASE OF ALFALFA IN ITS RELATION TO SOIL INOCULATION.

The following details of a way in which a disease of alfalfa (*Medicago sativa*) may be spread, through mistaking nodules produced by it on the plants for those containing the true beneficial nodule organism (*Pseudomonas radicicola*), are taken from Circular No. 76 of the Bureau of Plant Industry of the United States Department of Agriculture:—

The relative merits of the inoculation of legumes by the pure-culture method and by the scattering of soil taken from old well-inoculated fields have been widely discussed, and both methods have been recommended by this Bureau. In case old soil is used, the fields from which it is secured should be free from objectionable weeds and insect pests, and free from plant diseases.

From time to time specimens of supposedly well-inoculated plants of alfalfa, crimson clover, and alsike clover have been forwarded to the Laboratory of Soil-Bacteriology Investigations with the explanation that although nodules were produced in abundance the leguminous crop was not satisfactory. In these cases the appearance of the nodules was abnormal and the bacteria isolated from them, although resembling the nodule-forming organism, did not have the power of fixing nitrogen in culture solutions, and as a tentative explanation it was suggested (Bulletin 71, Bureau of Plant Industry) that this was but an extreme case of pleomorphism of *Pseudomonas radicicola*, which could be of no symbiotic advantage to the leguminous host.

During 1909 the organism occurring in the abnormal nodules of alfalfa was studied more extensively, and it was decided that this organism represented a new, although not a destructive, disease of alfalfa. Through the courtesy of Drs. Smith and Townsend, a comparative study was made of material furnished by the Laboratory of Soil-Bacteriology Investigations, which showed that the bacteria causing the abnormal nodules upon alfalfa were practically identical with those causing the crown gall of orchard trees.

Fortunately, the difference between nodules produced by the beneficial nodule-forming organism of the legumes and those produced by the crown gall organism is sufficiently typical to be easily recognized by an experienced observer. Though it may be possible to confuse these during a hasty examination, it is obvious upon close inspection that the nitrogen-fixing nodule is an outgrowth from the plant root, and that it has no more apparent effect upon the root than has an ordinary branch of the root. The interior of the nodule contains flesh-coloured cells full of bacteria, which may be easily seen under the microscope. The crown gall tumour, on the other hand, causes much distortion of the root, frequently forcing it to branch into many small roots, which project from the tumour itself. The interior of the tumour is white, and it is difficult, if not impossible, to see any bacteria in any of the cells, even in the most carefully prepared sections of the tumour tissue.

The fact that must be emphasized especially in connexion with farm practice is that the excrescences, or tumours, formed on certain legumes by the crown gall organism have occasionally been confused with the desirable nitrogen-fixing nodules. The use of soil for inoculating alfalfa or clover, if selected at random, may be a serious menace. In the few years that this matter has been under observation, many records of the shipping of alfalfa soil infected with crown gall, under the designation of inoculated alfalfa soil, have been obtained.

CONCLUSIONS. (1) The crown gall organism has been found in tumours somewhat resembling the normal nitrogen-fixing nodules upon the roots of alfalfa, crimson clover and alsike clover. (2) Great care should be taken in using soil or cultures for inoculating legumes in regions which may eventually be used for sugar beets or for orchards. (3) It is usually possible to distinguish the tumour produced by the crown gall bacteria from the nodule formed by the nitrogen-fixing bacteria by their external appearance. (4) By the use of special media it is possible to distinguish between the bacterium which causes crown gall and the nitrogen-fixing bacterium which forms the desired nodules upon the roots of leguminous plants. (5) It is not known what other leguminous crops are susceptible to crown gall infection. It is believed, however, that there is reason to suspect all the clovers.

THE LIME IN BASIC SLAG.

The *Journal of the Board of Agriculture* for October 1911 gives the following abstract of a paper dealing with this subject, which appeared in the *Journal of the Society of Chemical Industry*, May 15, 1911:—

In a paper by Mr. James Hendrick in the *Journal of the Society of Chemical Industry*, in 1909, it was shown that there is a much smaller percentage of free lime in basic slag than is commonly represented, and that calcium carbonate is practically absent. At the same time, it was shown that there is a considerable amount of 'lime available as a base', that is, lime capable of neutralizing acidity in the soil and of acting as a base during nitrification. An attempt was made to measure the available base in basic slag, chiefly by distilling a solution of ammonium sulphate with the slag and estimating the basicity from the amount of ammonia given off. Ammonium sulphate was chosen on account of its being extensively used as a fertilizer. It undergoes nitrification in the soil, with the production of nitric and sulphuric acids, and in order that its action may not be harmful by rendering the soil sour these acids must be neutralized as produced. This paper describes some further experiments on the subject. It was pointed out that when dilute solutions of ammonium salts are distilled, ammonia is given off, and that consequently the ammonia given off, in estimating the amount of lime available as a base in basic slag, might not be due to the basic slag. By distillations of ammonium sulphate without basic slag, Mr. Hendrick found that ammonia was given off, but only in an amount which, when stated as its equivalent in lime, would amount to a very small percentage of the slag. He concludes that the results in the former paper are not materially affected by the fact that ammonia is volatilized when a dilute solution of ammonium sulphate is boiled, but that these further experiments support the conclusion that there is in basic slag a considerable proportion of lime capable of acting as a base in the soil, and that a part of this lime is readily liberated. Distillation with a solution of ammonium chloride provides, however, a better method of determining the available base in slag than distillation with ammonium sulphate.

Finally, the glass of the vessels used for distillation in experiments on ammonium salts may have a very appreciable influence, especially if alkaline solutions have previously been boiled in the glass.

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 in this number gives information concerning the forthcoming Agricultural Conference, and includes the provisional programme of the proceedings.

An interesting summary of the results obtained in the last sugar-cane seedling experiments in St. Kitts is given on page 387.

Under the heading Departmental Reports, on page 389, reviews are presented of the reports on the agricultural departments in Barbados and the Nyasaland Protectorate, for the period 1910-11.

Page 391 contains an article dealing with a disease of alfalfa which causes changes in the roots similar to thsoe produced by the nodule organism. It is to be understood that the existence of this disease is a matter of importance in relation to the inoculation of new areas of soil with that in which alfalfa has been grown.

A description is given on this page of the contents of the *West Indian Bulletin*, Vol. XI, No. 4, recently issued. This may be obtained from the agents for the sale of the publications of the Imperial Department of Agriculture: price 6*d.*, post free, 9½*d.*

The Insect Notes on page 394 present an illustrated article dealing with the cotton stainer in Trinidad. A note is also given concerning legislation in connexion with the frog-hopper of the sugar-cane.

On page 398 the Fungus Notes are presented. They deal with the interesting and important subject of the rotting of timber and its prevention.

English Delegates to the Agricultural Conference, 1912.

Information has just been received by the Imperial Department of Agriculture as to the sending of delegates to the forthcoming Agricultural Conference, from the Royal Botanic Gardens, Kew, and from the Entomological Research Committee.

The delegate from the former institution is Mr. Arthur W. Hill, M.A., F.L.S., Assistant Director, while as regards the Entomological Research Committee, Mr. Guy A. K. Marshall, Scientific Secretary to the Committee, will attend the Conference as its representative.

The names of the representatives of the British Cotton Growing Association have been published already, in the *Agricultural News*, for November 11, p. 358. Information is not yet available as to the representation of others of the English institutions to whom invitations have been sent, except that as is stated elsewhere in this issue, it will not be convenient for a delegate to attend from the Rothamsted Experiment Station.

Publications of the Imperial Department of Agriculture.

The *West Indian Bulletin*, Vol. XI, No. 4, has just been issued. The purpose of this is to afford a broad review of the work of the Imperial Department of Agriculture in the past, and to indicate some of the problems to be considered by it in the future. For this reason, this number of the *West Indian Bulletin* is concerned solely with matters that pertain directly to the interests and history of the Imperial Department of Agriculture.

In pursuance of the scheme, the contents are of the following nature, and are arranged according to this plan. A short editorial introduction is succeeded by the paper entitled The Imperial Department of Agriculture in the West Indies, read by Sir Daniel Morris, K.C.M.G., before the Royal Colonial Institute, on January 10, 1911, and reprinted by permission from *United Empire* (Journal of the Royal Colonial Institute), for February 1911. This is succeeded by a reprint, also by permission, from *Nature* for February 9, 1911, of the article by Sir W. T. Thiselton-Dyer, K.C.M.G., F.R.S., entitled What Science Has Done for the West Indies.

The succeeding subjects are dealt with mainly from the aspect of the internal work of the Department. They are presented, in order, as follows: Chief Matters Concerning Departmental Administration; Matters of Indirect Interest; Entomology in the West Indies; A Summary of Ten Years' Mycological Work of the Imperial Department of Agriculture for the West Indies; The Work in the Botanic Stations from Year to Year; General Progress in the West Indies Since 1897; Agricultural Education and Instruction; and Publications Issued by the Imperial Department of Agriculture.

The Bacterial Deterioration of Sugars.

A study of the bacterial deterioration of sugars receives attention in the *Louisiana Stations Bulletin*, No. 25, where the opinion is given that it is caused by the potato group of bacilli. A matter of interest and practical importance is that the spores of the kinds that were examined were found to be capable of resisting the effects of high temperatures. The changes in the sugar are stated to be due to an extracellular, gum-forming enzyme which has been called Levanase.

Attention is drawn to the fact that the presence of the gum in sugars introduces an error in sucrose determinations, in both the single polarization and the Clerget methods. The amount of the error in the former is a decrease of 0·6° Ventzke for every 1 per cent. of the gum present; in the Clerget method the same amount of gum gives an increase of 0·67° Ventzke.

Further Work with Sleeping Sickness in Central Africa.

It is stated in *Nature* for October 19, 1911, that, according to Reuter's agency, a further commission is being despatched to Central Africa in connexion with sleeping sickness. The Commission will be in charge of Colonel Sir David Bruce, and will include Professor Newstead of the Liverpool School of Tropical Medicine. Operations will be confined to Nyasaland, where more than forty cases of sleeping sickness have occurred since 1909, and it is expected that the Commission will be absent for three years. Sir David Bruce left Marseilles on November 10. It is being sent out by the Government under the auspices of the Royal Society, and one of its principal objects is to ascertain if there is any connexion between the presence of big game and the existence of the fly that is supposed to be responsible for sleeping sickness in Nyasaland.

Trade and Agriculture of the Gold Coast, 1910.

In Colonial Reports—Annual, No. 688, it is stated that the gross value of exports from the Gold Coast in 1910 amounted to £2,697,706, as against £2,655,573 in 1909; this is an increase of £42,133, exclusive of specie, and is said to be due to the expansion of agricultural industries and the consequent larger shipments of economic products.

The quantities and values of the chief agricultural products exported during the year were as follows: cacao 50,692,949 ℔., value £866,571; kola nuts 5,156,500 ℔., value £77,716; palm kernels 14,182 tons, value £185,058; palm oil 2,044,868, gallons, value £161,388; rubber 3,223,265 ℔., value £358,876; lumber 14,938,749 feet, value £148,122.

The chief increases over the exports of the previous year took place in regard to the first and last four of these products. The principal decreases in the value of exports are with respect to: gold, gold dust and concentrates; specie; and kola nuts.

Tapping Experiments with Castilloa.

An account of the results obtained from two Castilloa trees at the Botanic Gardens, Grenada, has been forwarded by Mr. G. G. Auchinleck, B.Sc., the Superintendent of Agriculture. An examination in the laboratory, of the rubber obtained, gave the following percentages: loss on washing, 2·01; caoutchouc, 80·05; resin, extracted by acetone, 16·65; ash, on crude rubber, 1·41.

Mr. Auchinleck states that the latex was obtained by lightly scoring channels with a Golledge knife, and puncturing the floor of the channels with a chisel; good results were not obtained from the use of the knife alone, as it tended to close the latex vessels. One side of each tree received a single perpendicular cut 2 to 3 feet long, with four or five subsidiary channels about 18 inches long and 8 inches apart. Coagulation was effected with 2 or 3 oz. of acetic acid, in wooden vessels. The total yield of dry rubber was somewhat small, for the trees were at least nine or ten years old; it amounted to 70·65 grams ($2\frac{1}{2}$ oz.). An explanation of the last circumstance is suggested in the fact of the dryness of the soil of the Gardens, and that tapping was only done on one side of each tree. The sample of rubber obtained became tacky in four months.

The results of the experiment are of special interest, as they are the first information of the kind that is available from Grenada.

The Formation of Prussic Acid During Germination.

Past investigations have shown that some seeds, such as sweet almonds and those of *Mespilus japonica*, form large quantities of prussic (hydrocyanic) acid when they begin to germinate. In reviewing recent experiments in connexion with the subject, *Nature* for November 2, 1911, draws attention to the work of Guignard with the Lima bean (*Phaseolus lunatus*) which demonstrated that decomposition of prussic acid takes place, on the other hand, when the seeds begin to sprout, particularly in the case of plants kept in the dark.

The work which it is the special object of the note in *Nature* to review was conducted with the seed of Guinea corn, which does not contain appreciable traces of prussic acid, and of a variety of linseed in which it is present to a considerable extent. With the Guinea corn seed, prussic acid was formed during germination, until a certain stage was reached, when it appeared to be progressively destroyed: in the case of linseed, there was a continuous increase in the proportion of the compound present, without any observable decomposition. The production of the prussic acid was always greater in green plants than in those kept in the dark; but if the latter were watered during growth with a 2 per cent. solution of glucose, the proportion of prussic acid became equal to that in the green plants. This shows that the formation of the prussic acid is greatly influenced by the amount of carbohydrates in the seeds. Further investigations are to be made, in order to determine the source of the nitrogen employed in the formation of the acid.

INSECT NOTES.

THE COTTON STAINER IN TRINIDAD.

The Board of Agriculture, Trinidad, has recently issued two circulars, prepared by Mr. P. L. Guppy, Acting Entomologist, providing information as to the life-history, habits and control of the cotton stainer.

The following notes are taken from the circulars and should be of interest to cotton growers in the West Indies, especially those which refer to the methods of control of the pest.

The cotton stainer of Trinidad is *Dysdercus howardi* (see Fig. 14) and is perhaps the worst pest of cotton in that Colony. The life-cycle, from the time the egg is laid until the development is completed and the adult insect appears, occupies a period of from thirty-six to forty-two days, divided into five stages—the egg and four larval stages—at the end of each of which the developing insect moults, or sheds its skin.

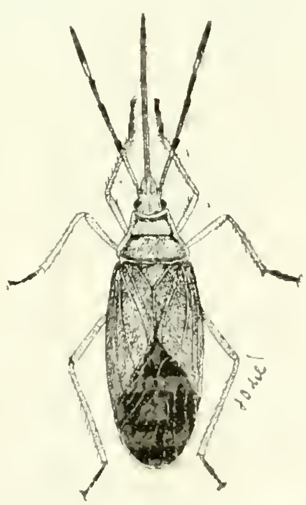


FIG. 15. THE TRINIDAD COTTON STAINER.

(*Dysdercus howardi*, Ballou.)

Three times natural size.

The cotton stainers are gregarious in all the larval stages, and in the adult condition. The bright-red colours of the young stainers make them conspicuous objects, especially when they are congregated in masses within the open bolls, where they feed. The adult insects, which are less brightly coloured, and possess yellowish wings with black tips, are to be found in the same places as the young.

The cotton stainers feed on the seed in the bolls, and stain the lint with their excrement, the injury to the lint resulting both from the feeding of the insects and from the staining of the cotton.

In hot, sunny weather these insects are very active; but in the early morning, in the evening, and on dull or rainy days they are sluggish in their movements. The adults are capable of long sustained flight; but they are not very ready to avail themselves of this ability, and as a consequence do not often use their power of flying for the purpose of invading new territory, as long as their food supply continues in the old.

The suggestions for the control of the cotton stainers include the old methods of hand collecting and traps, and in addition a new form of trap devised by Mr. Thomas Thornton of Tobago.

This last method consists of the use of stained or damaged seed-cotton, tied into balls the size of a man's fist and hung, by means of a bent wire, on the branches of the cotton plants. The stainers collect on these for the purpose of feeding, and may be shaken off into a vessel containing kerosene or crude petroleum and water. The balls are then again hung on the plants to attract a further lot of stainers, when the process of collecting may be repeated. It should be borne in mind, however, that the oil should not be allowed to come into contact with the trap balls, as the odour would prevent the stainers from returning to them.

These traps should be visited every day, and the stainers collected. When the insects are few, the traps need not be placed close together, but when they become more abundant, the number of the former should be increased

The older methods of collecting from the plants, and trapping by means of heaps of cotton seed on the ground, are also described in a modified form.

It is recommended that all leaves, trash, etc., on the ground in the cotton fields should be carefully cleared away from beneath the plants, and left in small heaps in the spaces between the rows. Into each of these heaps a small handful of cotton seed is dropped, and each heap is then covered with a broad leaf, such as that of certain palms.

The stainers on the plants are collected by being jarred or shaken into vessels of oil and water. Many of those which fall to the ground will take refuge in the heaps of trash, and finding food there, are likely to remain. The trap heaps should be regularly visited, and the stainers which are collected there killed by means of hot water or kerosene. The heaps should then be stirred so as to present a fresh surface, and clean cotton seed added. The covering leaf is replaced, and the trap is ready again.

After the cotton crop is finished and the old plants have been removed, many stainers will find their way to these traps. After an interval of two or three days, to allow as many of the insects as possible to congregate, the traps should be completely burned.

By following this system of trapping and collecting, and by practising clean cultivation, cotton planters should be able to reduce the numbers of stainers very considerably. Attention is specially directed to the necessity for destroying all wild food plants of the pests, thus depriving them as much as possible of the means of surviving during the interval between the close of one cotton-growing season and the beginning of the next.

The Frog-hopper of the Sugar-cane.—The Barbados Government has issued an Order dated November 10, 1911, under the Trade Act (1910-15, Sections 45 and 46), prohibiting the importation of sugar-canes from Trinidad and British Guiana, except that sugar-cane cuttings intended for propagation may be imported under a special licence from the Governor-in Executive Committee, to be obtained through the Superintendent of the Local Department of Agriculture.

The serious nature of the frog-hopper attacks in Trinidad causes planters to be apprehensive as to the possibility of the pest being introduced, and this Order is intended to prevent this occurrence.

The Order gives the Superintendent of Agriculture power to direct the destruction of any sugar-cane cuttings imported in violation of its provisions.

OILS AND OIL SEEDS AT THE IMPERIAL INSTITUTE, 1910.

COUNTRIES OF ORIGIN. Sudan, East Africa Protectorate, Uganda, Nyasaland, Rhodesia, Gambia, Gold Coast, Sierra Leone, Southern Nigeria, Northern Nigeria, India, British Honduras, Fiji, and foreign countries.

BACO OR ABAKU SEEDS (*Mimusops Djave*). The kernels from a sample of these seeds from the Gold Coast yielded 60·5 per cent. of a white, solid fat which was regarded by experts as of about the same value as medium qualities of palm oil for soap-making. The dried kernels would be worth about £13 10*s.* per ton (February 1910).

A specimen of Mimusops seed was also received from Southern Nigeria.

BEESWAX. A sample of beeswax from Uganda was of good quality and worth £6 17*s.* 6*d.* per cwt. (January 6, 1910).

BEN OIL SEEDS (*Moringa pterygosperma*). A small consignment of ben oil seed from Northern Nigeria was expressed by machinery. The oil was tested by manufacturers, who reported that it was suitable for soap-making, and for this purpose would be worth a little less than cotton seed oil. It is now being subjected to a prolonged trial by a chronometer maker in order to determine its value as a lubricant. The oil-cake, on analysis, compared favourably with cotton cake and linseed cake with respect to its nutritive constituents, but unfortunately it has a bitter taste, and for this reason would probably be unsuitable for use as a feeding stuff and could only be employed as a manure.

CASTOR OIL SEEDS. A sample of castor oil seed from Rhodesia contained 52·2 per cent. of oil, and was valued by manufacturers at £13 per ton (June 1910).

A sample from the East Africa Protectorate yielded 51·6 per cent. of oil, and was regarded as of about the same value as Bombay castor oil seed, which was then quoted at £13 5*s.* per ton (October 1910).

COPRA AND COCOA-NUT OIL. Two samples of copra from the Gold Coast were examined. One was of fair quality and was valued at £19 per ton (December 1910), but the other was in poor condition and worth only about £14 per ton.

A specimen of copra from Southern Nigeria was equal in appearance to Ceylon copra, but yielded an oil which was more acid than that from the latter. It was stated to be worth £19 per ton (June 1910).

A sample of cocoa-nut oil from Southern Nigeria was of the usual character, and such oil, if quite clean, would be readily saleable at the current market price.

COTTON SEED OIL. A study was made of the suitability of Indian cotton seed oil for edible use, with special reference to its employment as a ghi substitute. It was found that the chemical and physical contents of refined oil from Indian seed are practically identical with those of refined Egyptian cotton seed oil, and no difference in taste could be detected. A firm of manufacturers stated that the Indian oil is regarded as inferior to Egyptian for edible purposes, on account of its bloom, or fluorescent appearance.

CROTON SEEDS. A small quantity of *Croton Tiglium* seeds from Nyasaland was examined. The kernels yielded 58 per cent. of oil, which possessed the usual properties of croton oil. It was reported that croton seed was in small but regular demand, at 40*s.* to 50*s.* per cwt. (February 1910).

GROUND NUTS. A sample of ground nuts from Fiji was of excellent quality, and valued at £13 10*s.* to £14 per ton.

Two samples of ground nuts from the Gambia were also examined.

NIGER SEED (*Guizotia oleifera*). A specimen of Niger seed from the East Africa Protectorate contained 37·6 per cent. of oil. This oil is serviceable as a substitute for linseed oil, for soap-making, and would be worth 36*s.* to 38*s.* per quarter of 416 lb. (September 1909).

OIL PALM PRODUCTS. The investigation which was in progress during 1909 of the products of the different varieties of the West African oil palm was completed. Numerous samples of palm fruits, palm kernels, palm oils, and palm kernel oils from the Gold Coast, Sierre Leone and Southern Nigeria were examined, and the results have been included in an exhaustive article published in the *Bulletin of the Imperial Institute*, Vol. VII, p. 357, which also contains suggestions for the improvement of the oil palm industries of West Africa.

Specimens of palm fruits from Nyasaland and Uganda were also examined.

Among other products examined may be mentioned Ceara rubber seed from Uganda, seeds of *Trichilia emetica* from Nyasaland, Benni seeds (sesame) from Northern Nigeria, seeds of *Calophyllum Wightianum* from India, and M'fucuta seed from Mozambique.

A large number of enquiries were received from merchants, manufacturers and others with reference to the cultivation, production, and export of various oil seeds, as well as to the properties of the different oils, and the machinery employed in their manufacture. Several specimens were received for identification. (From *Colonial Reports*, Annual, No. 687, p. 29.)

THE CUBAN TOBACCO CROP.

The total receipts of tobacco from the country since January 1, 1911, amount to 193,401 bales, of which 120,810 came from Vuelta Abajo, 8,843 from Semi-Vuelta, 15,221 from Partido, 43,349 from Remedios, and 5,178 from Mayari (Oriente).

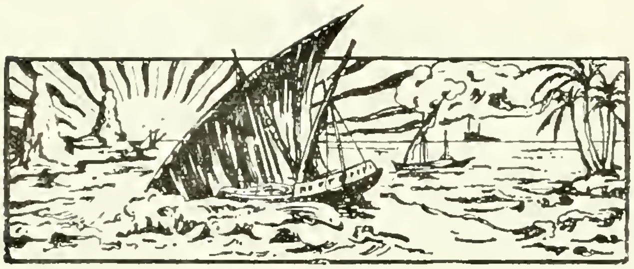
The tobacco situation in Havana is rather trying from the viewpoint of the buyer, as prices range from 10 to 30 per cent. higher than for the same grades last year, and the supply at even these prices is decidedly limited.

A factor which makes the position of the American manufacturer of cigars who uses Cuban tobacco at times very difficult is that the American taste is for a light-coloured leaf, and very often it is extremely difficult for the manufacturer to obtain enough light leaf, owing to various conditions in the Cuban production. Tobacco experts here insist that the light-coloured leaf is really not fully matured, and does not possess the fine flavour of the darker grades.

Consul General Rodgers, Havana, reports the production of tobacco in Cuba during the past three years as follows:—

Districts.	1908, bales.	1909, bales.	1910, bales.
Vuelta Abajo	257,628	220,458	189,728
Semi-Vuelta	24,519	28,868	21,485
Partida	38,843	33,824	27,905
Santa Clara	192,874	162,178	91,231
Matanzas	445	428	732
Camaguey	12,522	9,089	7,194

The average price of tobacco per 100 lb. in Cuba in March 1911, was: first class $50, second class $32 and third class $18. (From the *Cuba Review*, October 1911, p. 19.)



GLEANINGS.

His Majesty the King has communicated his intention of opening the forthcoming Royal International Horticultural Exhibition. This is to be held on May 22, 1912, and promises already to meet with much success.

The broom corn crop, both on the European Continent and in the United States, is short. For this reason, broom corn was selling during last month, in the latter country, for $200 per ton, which is about twice the normal price of the product.

The American Consul-General at Havana mentions that the total sugar crop of Cuba, up to September 30, 1911, was stated to be 1,460,397 tons. Of this quantity 1,403,870 tons was exported, 50,184 tons consumed in the island, and the remainder was being kept in stock.

It is reported by H. M. Commercial Attaché at Yokohama, in a communication dated September 12, that it is stated in the Japanese press that very serious damage has been done to the sugar crop and sugar factories in Formosa, by recent storms, so that the former has probably been decreased by 15 to 30 per cent.

Cotton-growing was introduced into the Beirut (Syria) district in 1910. So far, the production has been purely experimental, the total output in 1910 being about 44,800 ℔. The outcome of this experiment, however, has been so successful, that, reinforced by the necessity for landowners to change the nature of their crops, on account of emigration, it promises a considerable growth. (The *Textile Mercury*, September 23, 1911, p. 254.)

The *Louisiana Planter* for November 11, 1911, contains an article which shows that the increase in the area of sugar cultivation in Java, in 1911, was about 13,000 acres. In the same year the production of raw sugar reached 1,455,000 long tons. The planting that is taking place for the crop of 1912 indicates that the area will further increase to the extent of about 10,000 acres, and it seems probable that the production will be brought up to 1,500,000 long tons of sugar.

The *Journal of the Royal Society of Arts* for November 3, 1911, draws attention to Chinese tea seed oil. This is not obtained from the tea tree (*Camellia Thea*) but from the seed of *C. Sasanqua*. The latter plant, whose leaves cannot be used as tea, is found wherever the china wood oil tree (*Aleurites Fordii*) grows. The oil is used by the Chinese for cooking, and is sold locally for 31*s.* to 33*s.* per picul (133⅓ ℔). In 1909, the value of the exports of this oil, from Hankow, to foreign countries and Chinese ports was £6,500; in 1910, it was £17,300.

In the *India-Rubber Journal* for October 28, 1911, it is pointed out that the official figures have shown a steady increase in the importation of rubber goods into India. The values of the imports for the years mentioned were as follows: 1905-6, £51,927; 1906-7, £66,986; 1907-8, £75,545; 1908-9, £77,055; 1909-10, £76,552. During 1909-10, the share of the United Kingdom in this trade was £63,470.

The *International Sugar Journal*, for October 1911, abstracts a note contained in the *Mauritius Bulletin* for 1911, p. 75, in which it is stated that 40 per cent. formol, in the proportion of 1 part to 10,000, has been used with excellent results for preserving cane juice, in the case of stoppage of the factory; no trace of alteration had taken place, even after a period of forty-eight hours. It is advised that, for the preservation of scums and 'bottoms', the proportion of the antiseptic should be 1 part in 4,500, and that thorough mixing should take place.

The *Experiment Station Record*, Vol. XXV, p. 514, gives a short abstract of a paper in which the author refers to the observation by geologists, to the effect that more water is evaporated annually from the soil than that which falls as rain, and attempts to explain that the deficiency is made up by the absorption by the soil of water vapour in the air. In illustration of the principle, a number of instances are given (Canary Islands and Estremadura) where almost no rain falls, and vegetation is apparently maintained by water from this source.

According to the *Board of Trade Journal* for October 12, 1911, excessively dry weather in June and July has caused a partial failure of the cotton crop in Turkey, which will only reach three-quarters of the amount of the previous year, instead of one-and-a-half times as much, as was expected at first. The quality of the Egyptian and American varieties will be better than usual, on account of the higher temperature that has been experienced. The standard of the cotton crop in Turkey, as a whole, is not improving, because of the absence of irrigation, and the mixing of the seed at the factories.

Attention is drawn to a use for the pseudobulbs of orchids, in the *Kew Bulletin* 1911, p. 351. This is for making tobacco pipes, and the species employed is *Schomburgkia Thomsoniana*, which is used in this way in Grand Cayman. This plant is known to the natives as the wild banana; its pseudobulbs are about 9 inches long, and make useful pipe bowls. Attention is also drawn to another species which grows in Honduras, named *S. tibicinus*. The pseudobulbs of this are between 1 and 2 feet long, and are employed by the native children as trumpets; this gives rise to the name Cow-horn Orchid, by which it is commonly known.

Legislation against the love vine or dodder (*Cuscuta* sp.), in Grenada and Barbados at the present time, makes interesting the information given in the *Journal d'Agriculture Pratique*, No. 42, p. 497, that this can be destroyed, when growing on alfalfa, by the heavy application of sodium nitrate, in such quantities as 880 ℔. per acre. The investigations that have been described indicate further that sodium nitrate is preferable to ferrous sulphate and other poisonous substances, for the purpose; and that alfalfa and other leguminous forage plants are benefited by its use, notwithstanding their ability to utilize the nitrogen in the air by means of their root nodules.

STUDENTS' CORNER.

DECEMBER.

Second Period.

Seasonal Notes.

During the time that the cacao crop is ripening and the pods are attaining maturity, a careful lookout should be kept for diseases of the fruits, and information should be obtained as to the nature of the best means by which they may be controlled. Discuss the usefulness and merits of spraying, for this object, under conditions with which you are familiar. Make observations in order to trace whether, in cases of disease, the infection proceeds from the fruits to the stems, or from the stems to the fruits. What general practice, in regard to the working of a cacao estate, should be followed, in order that the chances of infection with pod diseases should be lessened as much as possible?

Careful notes should be made of the different stages in the preparation of cacao for market, as well as of the reasons for the procedure at the different times. Information should also be available always as to the state of the cacao market. What are the chief reasons for the fluctuations in the market price of cacao?

The grafting of cacao may be resumed, now that the hurricane season is past. Gain as much information as you can concerning the practical details of this operation, and give an account of its advantages. Why is it that grafted trees do not always exhibit immunity from diseases?

Where it is necessary to remove dead branches from lime trees, this should be done at an early stage, as the decay rapidly spreads downwards; and tardiness in the matter leads to the necessity for cutting away a large amount of wood, while even then it is often impossible to remove the whole of this, on account of the extent to which the decay has spread. Even when all the dead parts have been removed, the severe cutting that is required in bad cases increases greatly the difficulty with which the tree heals the wounds. What is the process of the healing of wounds in dicotyledonous plants, and what portion of the stem takes the most active part in this?

Note that where lime trees have received particularly good cultivation, the effect is quickly seen in the improved development and colour of the foliage. Where such trees are grown in grass, they most frequently show a yellowish tint in the colour of the leaves. Give an account of any theories that have been proposed for the purpose of explaining the unfavourable effect of grass on trees.

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) Why is it sometimes expedient to lessen transpiration from plants, and how is this done?

(2) What is the special value of farmyard manure, in relation to tillage?

(3) State the changes that take place during the germination of the castor oil seed.

INTERMEDIATE QUESTIONS.

(1) What is the chief difference between water transpired from plants and that absorbed from the soil?

(2) Discuss the precautions to be observed in the storage of farmyard manure.

(3) How is the oil obtained from the castor oil seed, and which process gives the most valuable product?

FINAL QUESTIONS.

(1) Give an account of the water requirements of a crop with which you are familiar.

(2) What is the nature of the (a) favourable, (b) unfavourable changes that may take place in stored farmyard manure?

(3) Write an account of the cultivation and possible uses of the castor oil plant.

TRADE AND AGRICULTURE OF FIJI. 1910.

The total trade in respect of the year 1910 is the highest yet recorded in the history of the Colony, and, notwithstanding the disastrous hurricane, exceeds that of 1909—the next highest—by an amount of £250,461 (exclusive of bullion and specie), imports being responsible for £191,779, and exports for £58,682, of that amount.

The bulk of the Colony's trade continues to be with the Australian Colonies and New Zealand. Other countries with which there is considerable trade are India, Canada, and the United States of America.

The exports of the staple products of the Colony, during 1910, were: sugar, 61,761 tons, value £669,432; copra, 13,078 tons, value £258,841; green fruit, value £47,302. It will be seen that, so far as values are concerned, the year, in regard to the export trade, was an exceptionally good one, and it is to be regretted that the green fruit trade was retarded, to the extent shown above, by the effects of the hurricane. This industry, however, was revived considerably, and the figures of this year are anticipated to exceed those of 1909, which are the highest recorded. The quantity of bananas exported during 1910 was 271,024 bunches and 81,225 cases. The total area of land under sugar-cane cultivation on December 31, 1910, was estimated at 19,828 acres, from which were produced 547,399 tons of sugar-cane. The area under cocoanuts, or cultivated by Europeans, and exclusive of native plantations, is estimated at 30,741 acres. The estimated cultivated area under bananas and pine-apples, on December 31 last, was 4,742 acres. This does not include native plantations, from which the bulk of the fruit is derived.

After deducting the three principal items of export from the value of the total exports of the Colony, the value of the minor products exported during 1910 amounted to £30,171.

The principal minor exports were 'sici', or trocas shell (£12,331), molasses (£11,240), turtle shell (£1,596), and hides and pelts (£1,498).

It will be noticed that the principal minor export in 1910 was 'sici' (trocas) shell, which is placed on the list for the first time. This shell is found on the reefs surrounding the greater part of the Colony. It is exported for use principally in France and Japan, where it is used in the manufacture of buttons. For some months the local price per ton offered for the shell was very high, but the large quantity exported has apparently had the effect of lowering the market price considerably. The shell is abundant, and is now an additional easy source of income to the natives living on the coasts of the islands, who gather and sell it to European merchants in the Colony. It is gratifying to note that the total value of molasses exported has increased almost 100 per cent., and that hides and pelts continue to hold their place as one of the principal minor exports. (From *Colonial Reports*—Annual, No. 689, p. 8.)

FUNGUS NOTES.

THE ROTTING OF TIMBER AND ITS PREVENTION.

It is a well-known fact that all kinds of timber, when they are exposed unprotected for any length of time to the action of the weather, gradually decay and become useless. This is particularly observable in tropical countries with a heavy rainfall, though it occurs also, and to an equal extent, in temperate climates, the difference being that the rate of decay under the drier, cooler conditions is not as rapid. The rotting is usually attributed, in a vague way, purely to the action of the weather, but in reality it is due primarily to two sets of definite causes, namely, fungi and insects. In temperate countries, the former are probably the more important, but in the tropics the latter are at least of equal moment, owing to the occurrence there of the different species of wood-destroying ants.

The attacks of the numerous forms of timber-destroying fungi are directly dependent upon two important factors—the presence of moisture and free access of air; while their rate of growth is influenced by the quantity of moisture usually present, and by the prevailing temperature. Timber that is exposed freely to the air, but is only wetted by moderate rains, and is usually practically air-dry, does not as a rule rot rapidly, since the water-supply, particularly within the timber, is insufficient for the growth of the destroying fungi. That this is the case is shown by the comparatively long life of the upper parts of telephone posts, or of gate posts, in all but very damp localities. Again, timber will not rot under damp conditions when air is excluded, as is shown by the fact that planks stored in water last better than those kept in any other way. These factors are of far less importance in the case of insect attacks, especially those of wood ants.

One other important matter, influencing the occurrence and rate of rotting of timber, is the thoroughness with which it is seasoned. Badly seasoned timber is damp internally, and thus affords a possibility of growth to fungi that would be unable to live on really dry wood. Furthermore, such timber contracts and expands unevenly with the changes in temperature of the surrounding atmosphere, so that larger and more serious cracks form in it than appear in well-seasoned wood. These cracks afford a means of entrance for insects and fungi, and often negative the effects of protective treatments, when they appear after such have been applied. The reason for this will be explained below.

Since both moisture and air are necessary for the growth of wood-destroying fungi, it is natural that timber should decay most rapidly in that part immediately above the point where it comes in contact with the soil. Thus, posts of all kinds that are buried in the soil are liable to rot through the foot or two of their length that is immediately above the soil surface. The wood in this part absorbs moisture continually from the earth, while there is also free access of air to it. The portion higher up is dry, while that in the soil receives but little air. For a similar reason, railway sleepers are rapidly destroyed when unprotected. Other timbers that do not come in contact with the earth are far less quickly disintegrated by fungi, except where the rainfall is very heavy, and fairly uniformly distributed throughout the year. The same does not apply to the attacks of insects, especially wood ants, since they may be found in any timber, however dry.

In order to reduce the loss occasioned by the rotting of wood, that is to prolong its period of service to the greatest possible extent, use is made of various substances that are poisonous or distasteful to insects, and poisonous to fungi. These are always employed in the liquid form and are either applied to the surface or made to penetrate the wood itself. Examples of the first class of substances are paints and varnishes, and of the second various solutions of chemicals such as bluestone (copper sulphate), zinc chloride, and corrosive sublimate and liquids such as heated creasote, heated tar, and carbolineum preparation. There are also others, some of which will be mentioned below.

In either of the classes of treatment just mentioned, the object aimed at is to cover the timber with a protective skin that shall completely enclose the inner substance. In the first case, this skin is composed of the paint or varnish itself; in the second it consists of the outer layers of the wood, which are rendered poisonous by the presence in them of the permeating compounds. The superficial nature of such treatment makes it easy to see why splits in timber that occur after it is treated defeat the object of the treatment.

There are several methods of applying permeating wood preservatives. The most elementary is hand application, with a brush. The penetration obtained by this means is poor, and the method is expensive when it is employed on a large scale. Another method, especially applicable to posts or poles whose butts alone need be treated under ordinary conditions is, as is explained above, to stand them upright in suitable tanks of the liquid, most generally cold creasote, where they are left until they are well permeated. In dealing with creasote, and indeed with many other substances, an extension of this method is found to give better results. The wood is immersed for two or three hours in hot liquid, and then transferred to a tank containing cooler liquid, or the original liquid is allowed to cool over night. The heating drives out some of the air and moisture in the wood; so that when cooling commences the liquid enters to take their place. An even more elaborate system depends on forcing the preservative in, under pressure. The wood is placed in a closed chamber, which is partly exhausted of air. Hot preservative is then allowed to enter, and the pressure is increased. Such a method ensures good penetration, but requires an expensive plant, and is impracticable on most tropical estates. Of the liquids used as preservatives creasote is that most commonly employed. Various carbolineum compounds, such as Carbolineum Avenarius are, however, frequently used, as well as others. A new preparation has lately been put forward, namely Cresol-Calcium which consists mainly of the calcium salts of certain tar acids obtained from creasote. These are soluble in water (see *Agricultural News*, Vol. IX, p. 137). A somewhat different method of preserving wood is the Powell process, in which green wood is boiled in a solution containing 30 per cent. of molasses, allowed to cool in the liquid, and finally dried in specially constructed chambers. Further particulars of this are to be found in the *Agricultural News*, Vols. VIII, pp. 249 and 408; and IX, p. 201.

The primary advantage derivable from the use of protectives for timber of all kinds is that its period of usefulness is doubled or even trebled; while the cost of treatment, though far from negligible, is considerably less than that involved in replacing decayed structures made of unprotected wood. In India and in other parts of the tropics, protection of some sort is practically essential for all wood-work in houses on account of the attacks of termites, and it is probable that much money could be saved in the West Indies if timber was rendered less liable to destruction by wood ants. Railway sleepers, and telephone and electric power posts are regularly creasoted in many parts of the tropics, and of temperate countries. An instance of the value of creasoting telephone posts, as demonstrated in Antigua, is given in the *Agricultural News*, Vol. IX, p. 377. There, creasoted telephone posts have been in use since 1896, while at present they number over 1,000. Only a few of these have required replacing, while the majority are sound. Untreated posts only last from three to four years. A way of using creasote for preserving gate posts, which is under trial in Antigua, receives attention in the *Agricultural News*, Vol. IX, pp. 312 and 377, and in the Annual Report of the Botanic Station, Antigua, 1909-10. Another advantage of protective treatment is that inferior timber, as long as it is well seasoned, when treated in this way, may be employed in the place of more expensive material, and will last as long. In view of these advantages it is remarkable that protective methods are not more in vogue in the West Indies, though this may be partly accounted for by the fact that the methods themselves as well as the protective substances are not yet as perfect as they might be. Future work will probably bring about a considerable advance in these respects.

THE EXPLOITATION OF MANGROVE BARK.

An article on this subject appeared in the *Agricultural News*, Vol. VIII, p. 309. The information contained in this may well be supplemented by part of that which is available in the *Journal d'Agriculture Tropicale* for September 30, 1911, p. 257, which gives attention to work that has been done in relation to the matter in East and West Africa. This states firstly, that the exploitation in the first-mentioned part of Africa commenced on the Mozambique coast, with Ibo as the place of export. In 1903 purchase of the bark was begun at Nossi Bé, Madagascar, and the prices obtained in Hamburg ranged between £5 13*s.* and £6 9*s.* per ton—a rate which, it is considered, should prove of equal advantage for similar exportation from West Africa. The industry has extended, and in 1909 the exports from Madagascar reached 15,295 tons.

The collection of the bark in Madagascar is made under the direction of Europeans, who pay a fee to the Government for the privilege. The bark is dried by simply spreading it out on the sandy areas that exist in the mangrove forests. It is worthy of notice that, unlike the varieties in West Africa, the kinds of mangroves in this island are hardly ever found growing in anything but mud. The bark was obtained from the largest trees, at first, and the average tannin content was then 42 per cent.; it has since fallen to 40 per cent., and is now reckoned at 38 per cent., as the best trees have almost all been exploited.

Numerous applications for concessions for bark-collecting have been made in French Guinea; but little has been done other than the exportation of wood for telegraph posts. The French tanning factories have commenced, although late, to interest themselves in the product from French Guinea; and it remains for the tanning content of this to be determined before it can be decided if the export will be remunerative, especially in the light of recent lowering of prices.

Attention is drawn to a note in the *Kolonial Zeitschrift*, in which it is pointed out that the mangrove in the Cameroons has not been exploited, because the bark only contains 25 per cent. of tannin, as compared with the tannin content of the East African varieties, which reaches as much as 45 per cent. Another disadvantage is that the continual wet weather experienced in the Cameroons renders impossible economic drying of the bark, and causes decomposition in the latter during transport. The remedy for this is suggested in the preparation of the extract of the bark in the country itself.

The value of the wood of various kinds of mangrove differs considerably; a characteristic of that in West Africa appears to be extreme hardness—a property which makes the cutting of the tree a matter of great difficulty, and has suggested the employment of the Sautke system for felling the trees; this consists in encircling the trunk with a metal band which is moved to and fro while an electric current is passed. In the experience of the writer of the article from which this information is being taken, the trunk of the tree should be supported while it is being felled; and when it has once been cut, it should be placed so as to lie on the roots of neighbouring trees, as otherwise it will sink into the mud, and be lost. The wood of the West African varieties of mangroves, as the consequence of its hardness, appears to be best adapted for making piles and railway sleepers; no information can be given as to its usefulness for making telegraph posts, as a result of the trials mentioned above is not yet available. In connexion with the employment of the wood for railway sleepers, its weight would appear to make it useful; but the effect of sunlight and heat on the wood has not yet been determined. The largest proportion of mangrove wood is of too small a girth for the purposes mentioned, but there are doubtless many ways in which this could be employed, on railways.

In New Caledonia, applications for mangrove concessions have been made to the Government, but the Chamber of Agriculture has opposed these on account of the fear that the removal of the mangroves from the coasts would promote erosion, and would take away the shelter that they give to the cocoa-nut plantations. At the same time, successful exports of mangrove products have been made from New Caledonia, and it is proposed that a tanning factory shall be erected in the country, the promoters of which will promise to keep the cutting within reasonable bounds, and to plant two trees for every one taken away. As far as New Caledonia is concerned, it is not expected that the project will go forward, on account of the opposition, mentioned above, of the Chamber of Agriculture. It is pointed out that, nevertheless, there is no reason why mangroves in other countries where they grow in large quantities should not be exploited, through the efforts of the principal buyers and the encouragement of direct sales on the part of the natives of those countries.

One of the most recent conclusions in respect to the investigation of pellagra is thus stated by Dr. L. W. Sambon, in the *Journal of Tropical Medicine and Hygiene*, Vol. XIII, Nos. 18 to 21: 'The many analogies existing between the epidemiology of pellagra and the best known insect-borne diseases; the constant association of the disease with Simulium-infested streams; the absence of any other arthropod with similar distribution that might account for it; the striking correlation between the fly and the disease in wide geographical distribution, peculiar topographical exigencies, extraordinary double season activity, the marked influence of temperature, heavy rains, and inundations; are all facts which strongly point to Simulium as the necessary carrier of pellagra.'

MARKET REPORTS.

London.—The West India Committee Circular, November 21, 1911; Messrs. E. A. De Pass & Co., November 10, 1911.

Arrowroot—$3\frac{1}{2}d$.
Balata—Sheet, 3/4 to 3/6; block, 2/1 per ℔.
Beeswax—No quotation.
Cacao—Trinidad, 61/6 to 70/- per cwt.; Grenada, 57/- to 61/6, Jamaica, 54/- to 58/6.
Coffee—Jamaica, 54/- to 59/- per cwt.
Copra—West Indian, £26 17s. 6d. per ton.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 13d. to 16d.
Fruit—No quotations
Fustic—No quotations.
Ginger—48/- to 63/- per cwt.
Isinglass—No quotations.
Honey—No quotation.
Lime Juice—Raw, 1/ to 1/6; concentrated, £19 15s. to £20; Otto of limes (hand pressed), 5/3.
Logwood—No quotations.
Mace—Firm.
Nutmegs—Firm.
Pimento—Common, $2\frac{1}{4}d$.; fair, $2\frac{3}{16}d$.; good, $2\frac{3}{8}d$.; per lb.
Rubber—Para, fine hard, 4/3; fine soft, 3/11; Castilloa, 3/9 per lb.
Rum—Jamaica, 1/8½ to 5/-.
Sugar—Crystals, 19/- to 22/6; Muscovado, 15/- to 17/-; Syrup, 16/6 to 18/3 per cwt.; Molasses, no quotations.

New York.—Messrs. Gillespie Bros. & Co., November 17, 1911

Cacao—Caracas, 13½c. to 13¾c.; Grenada, 13c. to 13¼c; Trinidad, 13c. to 13¼c. per lb.; Jamaica, 11¼c. to 12¼c.
Cocoa-nuts—Jamaica, select, \$33·00 to \$34·00; culls, \$16·00 to \$17·00; Trinidad, select, \$32·00 to \$34·00; culls, \$16·00 to \$17·00 per M.
Coffee—Jamaica, 15c to 17c. per lb.
Ginger—10¼c. to 11¼c. per lb.
Goat Skins—Jamaica, 53c.; Antigua and Barbados, 48c. to 50c; St. Thomas and St. Kitts, 46c. to 48c. per lb
Grape-Fruit—Jamaica, \$2·75 to \$3·00.
Limes—\$4·00.
Mace—40c. to 52c. per lb.
Nutmegs—110's, 12½c. to 12¾c.
Oranges—Jamaica, \$1·75 to \$2 25 per box.
Pimento—5¼c. to 5½c. per lb.
Sugar—Centrifugals, 96°, 5·12c. per lb.; Muscovados, 89°, 4·62c.; Molasses, 89°, 4·37c. per lb., all duty paid

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Trinidad,—Messrs Gordon, Grant & Co., November 27, 1911

Cacao—Venezuelan, \$13·50 per fanega; Trinidad, \$12·50 to \$13·00.
Cocoa-nut Oil—\$1·03 per Imperial gallon.
Coffee—Venezuelan, 17c. per lb.
Copra—\$5·00 per 100 lb.
Dhal—\$4·25.
Onions—\$2·25 to \$2·50 per 100 lb.
Peas, Split—\$6·00 to \$6·25 per bag.
Potatoes—English, \$2·00 to \$2·50 per 100 ℔.
Rice—Yellow, \$4·80 to 4·90; White, \$5·75 to \$6·00 per bag.
Sugar—American crushed, no quotations.

Barbados,—Messrs. James A. Lynch & Co., December 2, 1911; Messrs. T.S. Garraway & Co., December 4, 1911; Messrs Leacock & Co., November 24, 1911; Messrs. E. Thorne, Limited, December 5, 1911.

Cacao—\$12·00 to \$13·50 per 100 ℔.
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 per 100 ℔.
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—\$2·25 to \$3·00 per 100 lb
Peas, Split—\$5·90 to \$6·40 per bag of 210 lb.; Canada, \$2·85 to \$3·90 per bag of 120 lb.
Potatoes—Nova Scotia, \$2 40 to \$3·25 per 160 ℔.
Rice—Ballam, \$5·05 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, November 25, 1911; Messrs. Sandbach, Parker & Co, August 18. 1911.

Articles.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	\$12·00 per 200 ℔.	\$10·50 per 200 ℔.
Balata—Venezuela block	No quotation	Prohibited
Demerara sheet	70c. per lb.	70c.
Cacao—Native	11c per lb.	11c. per ℔
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	16c. per lb.	19c. per ℔.
Jamaica and Rio	18c. per lb.	19½c. per ℔.
Liberian	10½c. per lb.	12c. per ℔.
Dhal—	\$3·60 per bag of 168 lb.	\$3·70 per bag of 168 lb.
Green Dhal	\$3·50	——
Eddoes—	\$1·20	——
Molasses—Yellow	None	——
Onions—Teneriffe	——	4c. to 5c.
Madeira	5½c. to 6c.	5½c.
Peas—Split	\$6·00 to \$6·50 per bag (210 lb.)	\$5·75 per bag (210 lb.)
Marseilles	\$3·25	No quotation
Plantains—	20c. to 40c.	——
Potatoes—Nova Scotia	\$3·00 to \$3·25	\$3·50
Lisbon		No quotation
Potatoes-Sweet, B'bados	\$1·68 per bag	——
Rice—Ballam	No quotation	——
Creole	\$5 00	\$5·00 to \$5·50
Tannias—	\$1·44	——
Yams—White	\$2·88	——
Buck	\$3·12	——
Sugar—Dark crystals	\$3·25 to \$3·30	\$3·60
Yellow	\$3·80	\$3·75 to \$4·00
White	——	\$4·25
Molasses	\$3·10 to \$3·25	None
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 Substitution of Bases in Plant Nutrition.

THIS interesting subject has received attention in a recently issued journal*, in the shape of a translation of a paper read before *La Société Centrale d'Agriculture de Belgique*, and appearing in the number of the journal of that Society for May 7, 1911. Investigations in regard to the matter have been carried out over a period of many years, and it will be well at the present time to draw attention to some of the more important results that have been obtained, employing for the purpose the information presented in the paper just mentioned

* *American Sugar Industry*, October 1911.

The British Association for the Advancement of Science, at the meeting in Liverpool in 1837, requested that a review should be made by Liebig and Dumas of the state of the knowledge, at the time, of organic chemistry. The result was the preparation, by Liebig, of his Treatise on Organic Chemistry, as well as of a special memoir dealing with organic chemistry, in relation to agriculture and physiology.

It was pointed out in the memoir that the bases most usually met with in plants are potash, soda, lime and magnesia, and that these are capable of replacing one another, in chemical compounds, in amounts that are constant, and are known as equivalent quantities. As these quantities are different in the case of each element, it follows that, when one of them is substituted by another, in a salt, there must be a change from the absolute weight of the old compound to that of the new.

Plants, again, all contain organic acids, which vary in nature in the different kinds. These are necessary, in order that the life-processes of the plant shall continue. They usually exist combined with one or more of the bases mentioned. It is probable that the presence of these bases acts as a stimulus to the formation of the organic acids, and this matter receives support from the observation of de Saussure, to the effect that the bases are found in greatest quantity in those parts of the plant nearest to the regions in which assimilation is taking place; thus the leaves contain proportionately more ash than the branches, and the latter more ash than the trunk.

Liebig stated further that it is not likely that a plant, under normal conditions, produces a much greater quantity of any given acid than it requires for its existence; it is also to be expected that the amount of alkaline base in a plant will always remain the same, no matter in what kind of soil it is growing. It was explained by Liebig that any deficiency in regard to one base would be supplied by the substitution of an equivalent amount of another base. It results from this circumstance that, as the weights of the bases vary, the absolute weight of the ash must differ according to the kind of substitution in the compounds which it contains. Another conclusion reached by Liebig, which is pertinent to the matter under discussion, was that, even where plants have been grown in soils containing very different proportions of lime, magnesia and potash, the equivalent amount of these bases, expressed in terms of oxygen, is the same, within reasonable limits, for similar quantities of wood and of the ash.

The results of the work of Liebig and others were expressed more clearly by Champion and Pellet, † and their statements virtually corresponded with what has just been put forward. In regard to the interchangeability of the bases, the author of the paper mentioned at the head of this article agrees that this exists, but draws attention to the presence of limits to the extent to which any one base may be excluded by the substitution of one or more that are different. When this critical point is passed, the plant ceases to develop favourably; this fact is supported by the work and opinions of Loew in Japan, Bernardini, and May at Washington. Claassen has also reached the same conclusion, as the result of investigations with sugar beets, and Pellet has shown that the heart rot of the beet is most prevalent in soils possessing an undue proportion of potash and a deficiency of magnesia. Further Marchal, of Gembloux, has proved that the formation of nodules on the roots of leguminous plants receives interference from an excess of potash in the soil, and that the development of the plants themselves is adversely affected; so that the ultimate effects are lessened yields, with the minimum fixation of atmospheric nitrogen. Lastly, other investigators have made the observation, in the case of certain plants, that an excess of potash produces decay; and that if some of the potash is replaced by other bases, as for example magnesia, the plants can be made to revive and resume normal growth.

Sufficient has been said to indicate that much harm is likely to arise through the absorption of an undue proportion of potash by plants. The condition may bring about large changes in the nature of the crops; and it certainly causes a diminution in the power of plants to assimilate nitrogen, so that from a practical point of view a waste takes place of this important and comparatively expensive item of plant food. From the point of view of economy the matter is affected in another way. Next to nitrogen, potash is the most costly element that has to be supplied to plants; thus its supply in excess leads to waste on this account alone. There is the further consideration that the fact of the presence of an undue amount of potash causes the assimilation of other bases to be deficient, and the plant is accordingly deprived of the means by which the important and useful anatomical and physiological changes that are dependent on them may be brought about.

The conclusions reached in the article under review are that, firstly, since lime, soda and magnesia cost nine-tenths less than potash, practical field experiments should be made in order to determine how far these bases may be substituted for potash: secondly that there should be ascertained the best proportions of lime, magnesia and phosphate of lime, for the development of legumes and all other plants, as well as the extent to which, when these proportions are assured, nitrogen should be added to the soil; thirdly, for different soils, the effects on the soil of potash, and of lime and magnesia, should be investigated.

It is evident that the proper carrying out of such work should do much toward the devising of methods of manurial treatment that will contribute to the realization of maximum returns with minimum expenditure.

† See *Comptes Rendus de l'Académie des Sciences de Paris*, 1874, 1875, 1876.

In the *Agricultural News* for October 28, 1911, it was stated that information had been received from the Secretary of State for the Colonies to the effect that arrangements had been made by His Majesty's Stationery Office with Mr. T. Fisher Unwin, of Adelphi Terrace, London, W.C., under which Mr. Unwin would act as sole wholesale agent for the sale of British Official Publications outside the United Kingdom, with depôts in certain cities that are mentioned.

This Depaatment has since been informed by the Secretary of State that it is not at present found possible to give effect to the arrangement; and that the nature of any future developments will be communicated.

SUGAR-CANE EXPERIMENTS IN ANTIGUA.

The following information concerning the experiments with seedling canes that have been conducted in Antigua by the Department of Agriculture in 1910-11, has been taken from details supplied by Mr. H. A. Tempany, B.Sc., Superintendent of Agriculture for the Leeward Islands, of an address delivered by him at a meeting of the Antigua Agricultural Society held on November 3, 1911.

After introducing the subject, Mr. Tempany drew attention to the fact that the experiments had now been repeated twelve times under identical conditions of working. The canes for the observations were grown at nine stations, namely, Cassada Garden, Bendals, Blubber Valley, Tomlinsons, Ffryes, Big Duers, Thibons, the Diamond, and Friar's Hill. They are planted in rows across the field, each row containing a variety; they receive the same treatment as the canes being grown for the crop, so that the experimental results are directly comparable with those of the latter. The rainfall was unfavourable, as serious drought had been experienced during the earlier part of the year, so that both plants and ratoons had yielded poor returns, and the effects of the root fungus had been increased. It was of interest to mention, in passing, that the total output of sugar from the island for the period was 13,600 tons, comprising 6,500 tons of crystals and 7,100 tons of muscovado sugar.

The list of varieties under experiment contained forty-one, and was almost identical with that of the previous year. The best results among plant canes had been given by B.4596, Sealy Seedling, D.1111, B.1528, B.306, D.625, B.208, B.156, B.376, B.1355, D.109, B.6346, B.6450 and B.4507. As with the general crop, the yields had not been large; that from White Transparent, the standard cane, had been exceeded by the returns from sixteen varieties. The cane giving the best result—B.4596—had produced 5,380 lb. of sucrose to the acre; its consistently good behaviour during the short period of its tests in Antigua caused the speaker to recommend it to planters for trial. The second place was taken by the well-tried cane Sealy Seedling, with a yield of 5,330 lb.; while D.1111 came third with 5,060 lb., and this cane appeared to be gradually adapting itself to local conditions. Another promising cane was B.1528, the fourth on the list, with a yield of 4,950 lb. of sucrose to the acre.

The following table indicates the best yields:—

Means for 1910-11. Name of cane.	Sucrose, lb. per acre.	Means for past four years. Name of cane.	Sucrose, lb. per acre.
B.4596	5,380	B.4596	6,280
Sealy Seedling	5,330	Sealy Seedling	6,010
D.1111	5,060	D.625	5,560
B.1528	4,950	B.156	5,310
B.306	4,910	B.208	5,090
D.625	4,880	B.1528	5,070
B.208	4,800	D.1111	5,060
B.156	4,790	D.109	4,980
B.376	4,760	B.1355	4,980
B.1355	4,680	B.306	4,970
D.109	4,650	B.1753	4,910
B.6346	4,600	B.376	4,910
B.6450	4,540	B.3696	4,890
B.4507	4,440	D.848	4,880
B.393	4,400	White Transparent	4,770
B.3675	4,400	B.393	4,750
White Transparent	4,380	B.6346	4,600
B.3696	4,300	D.116	4,570

When the results were compared, according to the method introduced by Dr. F. Watts, C.M.G., it was found that the upper third of the returns included the different varieties as follows: B.4596, B.1528, and Sealy Seedling at eight stations; B.306, B.208, D.109, B.6450, and D.625 at five stations; D.1452, B.6346, B.4507, and B.1753 at four stations; White Transparent, B.147, B.3696, B.3675, and D.848 at three stations.

Among ratoon canes, B.4596 again occupied the first place, with 3,750 lb. of sucrose per acre; satisfactory positions were also occupied by B.208, B.156, and B.1528. D.1111 was twelfth on the list, and again is improving its position, so that this forms another reason for the suggestion that it is undergoing adaptation to local conditions.

The method for comparison of behaviour at different stations, just employed for plant canes, showed that the following had been included in the upper third of the returns: B.156 at six stations; B.376, B.109, B.1528 and B.3696 at five stations; B.4596, D.116, Sealy Seedling and B.208 at four stations.

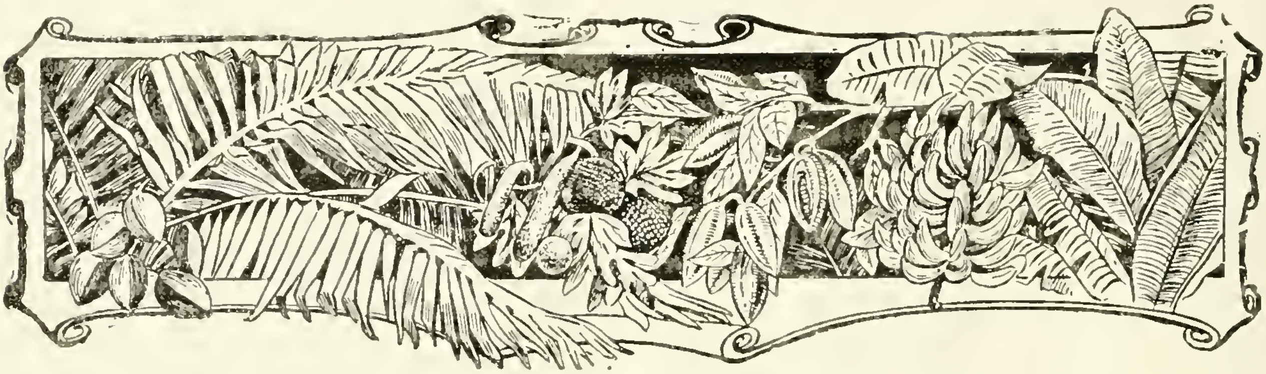
The following table gives the returns from the first eighteen ratoon canes, for the year under review, as well as the averages for the past three years:—

Means for 1910-11. Name of cane.	Sucrose, lb. per acre.	Means for past three years. Name of cane.	Sucrose, lb. per acre.
B.4596	3,750	B.4596	3,620
B.208	3,550	B.1528	3,450
B.156	3,310	D.109	3,480
D.1184	3,230	B.156	3,320
B.1528	3,170	B.109	3,140
B.376	3,120	B.376	3,080
B.109	3,090	B.3696	3,040
D.109	3,080	Sealy Seedling	3,020
B.3696	2,990	B.1753	3,020
Sealy Seedling	2,950	B.306	2,950
B.306	2,830	B.147	2,920
D.1111	2,790	D.116	2,840
D.3157	2,780	B.208	2,830
B.1753	2,750	D.2190	2,820
D.130	2,740	D.625	2,720
D.625	2,720	D.95	2,640
D.95	2,710	White Transparent	2,540
D.848	2,630	D.1452	2,520

Small yields had been obtained from ratoon canes in all cases; although these were greater than those of the previous year, in spite of the fact that the rainfall had been more favourable in that year. Mr. Tempany suggested, as an explanation of the circumstance, that the results may be due partly to the fact that the rainfall received by the canes as plants appeared to affect to a marked extent their yields as first ratoons.

The adverse effect during 1909-10 was due to the small rainfall of 1908-9; and this had made itself felt notwithstanding the fact that the rainfall of 1909-10 was much more favourable, and had produced a good growth of plant canes.

In concluding his address, Mr. Tempany thanked the owners, attorneys and managers of estates on which the trials had been conducted for the active way in which they had afforded assistance to the Agricultural Department in carrying out successfully, once more, the sugar-cane experiments.



FRUITS AND FRUIT TREES.

RECOMMENDATIONS FOR AGRICULTURAL SHOWS.

A booklet bearing the title Recommendations for the Work of the Department in Assisting the Agricultural Shows of Bengal, by E. J. Woodhouse, M.A., Economic Botanist to the Government of Bengal, has been issued recently by the Department of Agriculture of that Province. This commences by pointing out that the number of scientific officers belonging to that Department does not admit at present of the giving of much direct assistance with regard to agricultural shows. For the purpose, more funds and a greater number of qualified officers are required, and it is considered to be absolutely essential that some organization should exist in the Province that is capable of drawing attention, in each district, to the recommendations of the Agricultural Department, at least once a year. It is held that agricultural shows in Bengal are now well established, so that it remains for the Agricultural Department to direct the efforts rightly and economically.

Up to the present, the Department has assisted at shows by (a) giving grants to exhibitions and (b) lending exhibits which are placed in the charge of an inspector. Suggestions for work of the Department in additional ways are made as follows: (c) the giving of special prizes of agricultural implements or seeds, for exhibits of crops grown from planting material supplied by the Department or according to methods recommended by it; (d) the payment of the fares of selected cultivators, and the supply of food to them during the time of the show; and (f) the drawing up of schedules to assist in judging the exhibits.

One of the difficulties of the Department has arisen through the holding of several shows on a particular date, owing to their being made to coincide with some time of festival; it is suggested that this could be remedied by spreading the dates of the shows over a definite period, in order to give more time to the Department for the moving of its exhibits. Under the conditions that are dealt with, the most convenient duration of agricultural shows appears to be three to six days.

As regards size, the exhibits of the Bengal Agricultural Department are intended to be of two dimensions: the larger for the more important shows, and the smaller each designed for a particular group of shows. In connexion with these, recommendations are given concerning the constitution of the Departmental Staff to accompany the exhibits: it is considered that at least two inspectors, with their assistant staffs, are required for each exhibition. During such time as the duties of these are not required for agricultural shows, they would be available for touring through the different districts, for attending meetings of agricultural associations for purposes of demonstration, for making special enquiries during the off season, for taking the place of officers on leave, for undergoing training in special subjects, or for making preparations in connexion with the forthcoming show season.

It is recommended that the large exhibits of the Department should comprise the following: the general crop exhibit; examples of crops recommended, as well as of manures and implements; mycological and entomological sections; material such as photographs, diagrams, maps and leaflets; plant specimens and group labels; the last are used to mark each separate section of the exhibit. The labels on the samples are printed on stiff cards, divided into two or three portions, one for English and the others for one or more vernaculars; they are filled in by hand, fitted with eyelets with a Triumph eyelet punch, and fastened to the exhibition bags by means of brass paper fasteners.

The purpose of the photographs is to illustrate the working of agricultural implements, as well as to show the difference between varieties of crops. The diagrams summarize the experimental results obtained by the Department, and are used in conjunction with photographs of crops. The maps are prepared from the rainfall and crop statistics of the province, and are intended to show the dependence of various crops on rainfall, soil and other conditions. The leaflets chiefly form an addition to the diagrams, as a means of presenting the results of experiments.

Information concerning the nature of the smaller exhibits is followed by a section dealing with the duties of agricultural officers at exhibitions. This contains details concerning the arrangement of bags of crop samples on the show benches; where these are large they may be placed in two rows one behind the other, alternately in the rows, while the small bags may be of such a size as to permit of the making of four rows, from back to front, those in the first and third rows, and those in the second and fourth rows, being one behind the other. In this section, a series of interesting suggestions for officers inspecting exhibitions is included. This is followed by advice as to the nature of the special prizes to be awarded by the Agricultural Department, and the booklet concludes with appendixes containing catalogues of the crops recommended for exhibition by the Bengal Department of Agriculture, as well as of manures, implements, entomological and mycological exhibits and other matters intended for the same purpose; suggestions concerning financial arrangements for exhibitions; and lastly, a series of useful plates illustrating various matters connected with the work of the Department at agricultural shows.

THE WAX OF COTTON LINT.

The following is taken from a paper dealing with some of the constituents of raw cotton, which appears in the *Textile Institute Journal*, Vol. II. No. 1:—

By extracting raw cotton with benzole, the whole of the waxy and fatty matters are removed, and the solution yields on evaporation a residue which, in colour and consistency, resembles beeswax. Kneaded between the finger and thumb, it softens like beeswax, and when heated it melts to a clear liquid. On cooling, the latter solidifies, and subsequently contracts considerably, giving rise to characteristic fissures. It is proposed to call this substance, which contains the whole of the wax and fat-like constituents which raw cotton yields to such volatile solvents as benzole, carbon tetrachloride, etc., Crude Cotton Wax. The amount present was found to vary from 0·38 per cent. in a sample of Bengal raw cotton, to 0·47 per cent. in Egyptian, and 0·55 per cent. in American raw cotton. I do not wish this statement to be taken too literally, however, because the number of samples which we have, so far, been able to procure for examination is quite inadequate. These figures are the averages of numbers of determinations on the same bulk samples, and serve to show that the abnormally low figures obtained by Schunck (0·004 per cent.) and the figure usually stated in text-books (2 per cent.) are both wide of the mark.

By extracting crude cotton wax with petroleum spirit it is possible to separate it into two portions, one soluble, which I will call Cotton Wax A, and the other insoluble, which I will call Cotton Wax B. The separation may also be effected on the fibre by extracting first with petroleum spirit and then with benzole

Cotton wax A, which constitutes, in the case of Egyptian cotton, about 70 per cent. of the crude wax, is considerably lighter in colour than the latter, and closely resembles beeswax in texture and fracture. It melts at 66° to 67° C., and consists for the most part of a true wax, but contains besides free fatty acids (palmitic and stearic equivalent in amount to 22 per cent of oleic acid) a small amount of combined glycerine, and both saturated and unsaturated hydrocarbons.

Cotton wax B, obtained from Egyptian cotton, constituted about 30 per cent. of the crude wax, and was a dark-green, almost black, granular, though plastic, substance. It melts at 68° C., and contains very little free fatty acid. The dark colour and the comparatively small amount available rendered its examination much more difficult than that of cotton wax A, but it seems to contain substances similar to those obtained when drying oils are exposed to air for some time (oxy-acids, etc.) It seems to owe its colour, in part at any rate, to the same substance which is found in crude cotton seed oil.

The account goes on to deal with various extracts of the lint from which the wax had been removed, and then gives the following summary of the behaviour of such lint in weaving trials:—

The treated yarn was made into a ball warp, and during the processes it behaved indifferently; it was subsequently ball-sized and beamed. At the loom it gave considerable trouble by reason of the frequent breaking of the threads. The normal yarn gave no trouble either in the preparatory processes or during weaving.

RUBBER PRODUCTION AND CONSUMPTION.

According to the customary statistics prepared by the firm of Hecht for the year ended with June 30, the total production of rubber throughout the world amounted to 79,305 tons in 1910-11, as compared with 76,553 tons in the twelve months which closed with June 30, 1910, being an increase of 2,752 tons. On the other hand, the world's consumption is returned at 74,082 tons in 1910-11, as against 76,026 tons in the preceding year, being a reduction of 1,944 tons. The harvest of Para qualities comprised 33,480 tons of the world's total production in 1910-11, as contrasted with 38,996 tons in 1909-10, and the consumption with 33,291 tons and 39,363 tons in the two years respectively.

The arrivals of rubber in Europe amounted to 45,085 tons in 1910-11, as against 44,336 tons in the previous year, or an advance of 749 tons, but the arrivals in the United States experienced a diminution of 2,433 tons. The stocks throughout the world are stated to have reached 12,563 tons on June 30, 1911, as compared with 6,998 tons in the preceding year, being an augmentation of 5,565 tons. In the case of Europe alone the stocks are returned at 6,554 tons, or 1,447 tons in excess of the quantity in 1909-10, and those in the United States also advanced from 228 tons in the latter year to 589 tons on June 30, 1911. The statistics further show that the price of fine Para, which amounted to 10*s.* per lb. at the beginning of July 1910, had fallen to 4*s.* 10*d.* by the middle of January, and to 3*s.* 11*d.* by the end of May, recovering to 4*s.* 1*d.* at the close of June. Since then the price has been fairly stable, and has experienced an increase to 4*s.* 7*d.* (The *Financier*, August 19, 1911.)

Lemon Grass Oils.—In one of our earlier reports, we described several lemon grass oils produced in the Jalpaiguri District of Northern India. Mr. J. H. Burkill of Calcutta, who sent us the samples of the oils in question at the time, has now briefly informed us in writing that this particular species of grass has been identified since then as *Cymbopogon pendulus*, Stapf. The information is of particular interest because up to the present only two grasses have been known to produce lemon grass oil, namely *C. flexuosus*, Stapf, which yields the Malabar oil, and *C. citratus*, Stapf, the parent plant of the sparingly soluble, so-called West Indian lemon grass oil. The oil from *C. coloratus*, Stapf, which is also one of the lemon grasses, has only lately become known, and is said to possess characteristics resembling those of a mixture of lemon grass and Java citronella oils. (*Semi-Annual Report* of Messrs. Schimmel & Co., October 1911.)

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date December 4, with reference to the sales of West Indian Sea Island cotton :—

Since our last report, about 170 bales of West Indian Sea Islands have been sold, including Old Crop Montserrat at 14*d.* to 16*d.*, New Crop 17*d.* to 19*d.*, St. Kitts both Old and New Crops 18½*d.* to 19*d.*, a few St. Vincent at 20*d.* and Stains 7*d.* to 7½*d.*

The market is firm and the stock is exhausted, but whether buyers will require a concession, when large quantities are offering, depends largely upon the action of the holders in South Carolina.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending December 2, is as follows:—

In the absence of any demand the market has remained quiet and unchanged throughout the week. The receipts and stock consist largely of off cotton, which Factors are anxious to dispose of, and to do so would be willing to make some concession to effect sales.

We quote :—

Extra Fine,	32c. = 18*d.*,	c.i.f., & 5 per cent.
Extra Fine, off in colour,	25c. = 14¼*d.*,	,, ,, ,, ,,
Fully Fine,	28c. = 15¾*d.*,	,, ,, ,, ,,
No. 1 Off Cotton,	21c. to 22c. = 12*d.* to 12½*d.*,	,, ,,
No. 2 Off Cotton,	18c. to 19c. = 10½*d.* to 11*d.*,	,, ,,

THE BRITISH COTTON GROWING ASSOCIATION.

The following is taken from an account received of a recent meeting of the British Cotton Growing Association :—

The ninety-third meeting of the Council of the British Cotton Growing Association was held at the offices, 15 Cross Street, Manchester, on Tuesday, November 7, 1911. The President, the Right Hon. the Earl of Derby, G.C.V.O., occupied the chair.

INDIA. It was reported that proposals had been received from the Indian Government that the Association should commence direct operations in the Province of Sind in order to encourage the cultivation of long-stapled cotton, and a detailed scheme has been drafted and submitted to the Indian Government for its consideration.

WEST AFRICA. It was reported that there had been good rains throughout Lagos during the month of September, and it is certain that the growing crop has been greatly benefited by the break in the weather.

The purchases of cotton in Lagos up to the end of October amount to 5,378 bales, as compared with 5,575 bales for the same period of last year and 11,894 bales for 1909.

NYASALAND. Reference was made to the rapid advance of agriculture during the past three or four years in Nyasaland: in 1903 the value of cotton exported from the Protectorate was only £3, in 1904-5 it had increased to £5,914, and in 1908-9 to £28,555, and for the past financial year the exports of cotton were valued at £56,000. Unfortunately, it is practically impossible for Nyasaland further to increase its acreage under cultivation with the present means of transport, although as a matter of fact the fringe of the agricultural possibilities of the country has scarcely been touched. At the present time the whole produce of the Protectorate is held up for about six months each year owing to the shallowness of the Shire River. In order to develop properly the resources of the country, it will be necessary to extend the railway northwards from Blantyre to Lake Nyasa and southwards from Port Herald to Beira, and it was decided that this question should be taken up with the Colonial Office.

The report concludes with a statement showing that a sum of £38,000 remains to be raised, in order to secure the total authorized capital of the Association, namely £500,000. It is also reported that, in view of the improved condition of the cotton trade, the Federation of Master Cotton Spinners and the North and North-East Lancashire Associations have been approached again for the making of a further effort to secure the balance of the capital. In the same connexion, the amount realized from the workpeople's collections has been very disappointing. Lastly, the Lancashire County Council has approved that the King Edward Memorial fund of about £11,000 should be handed over to the Association.

It is reported from St. Kitts that the picking and ginning of the cotton crop are proceeding rapidly, and good returns are being obtained on some estates, though on the whole, an average crop, only, is to be expected. The cotton worm has continued to be controlled successfully, on most of the estates.

THE PRODUCTION OF COCAINE IN PERU.

This subject receives attention in a recent number of *The Engineer*, in an article which is reproduced in *Peru To-Day* for September 1911. In introducing the article, the latter publication points out the importance of the cocaine industry in Peru; this is shown by the circumstance that the value of the annual production of the drug is £2,500,000. A great part of this is exported, while most of the rest is consumed by the native Indians.

The account in *The Engineer* states that the processes employed in Peru for the extraction of cocaine from the leaves of the coca plant (*Erythroxylum Coca*) are crude, owing to the fact that the treatment takes place in the interior, on account of the expense of transport of the leaves; the extent of this expense is illustrated by the fact that 200 lb. of coca leaves are required for the manufacture of 1 lb. of cocaine. Doubtless, improved means of communication will bring the manufacture nearer the coast, and then better methods will be employed.

For the extraction of the drug from the leaves, three operations are employed: (1) maceration, (2) intermediate precipitation, and (3) final precipitation. For maceration, the leaves are placed in four tanks, in the first of which they are treated with a 0·5 per cent. solution of sulphuric acid. After twenty-four hours, the liquid is allowed to flow into the second tank, and the first is again filled with new leaves and the acid solution. After another interval of twenty four hours, the contents of the second tank are run off into the third, while the former is filled from the first as before, the first again receiving a new charge. The fourth tank, after another period of twenty-four hours, is filled from the third, and the preceding processes with the other tanks are repeated. In this way, leaves in a state for further treatment, namely, those originally put into the first tank, are obtained at the end of four days. The tincture thus obtained is next placed in a strainer, for the purpose of filtration, after which the process of maceration is complete.

For the intermediate precipitation, the tincture is subjected to the action of sodium carbonate in cylindrical vessels. At this stage, in order to test if precipitation is complete, a small quantity of the tincture is removed, filtered from the cocaine, and the filtrate tested with ammonia, when there should be no precipitate formed. The obtaining of a precipitate indicates the necessity for the addition of sodium carbonate to the tincture in the cylindrical vessels.

The first operation for the final precipitation is the addition of petroleum, the mixture being stirred carefully for three to four hours at a very slow rate. At the end of this period the oil, which now contains the cocaine, is washed with acid-free water, and then treated with acidulated water, the proper amount being determined by the testing for precipitation of an aliquot part. During this process, the mixture is stirred vigorously for half an hour to forty minutes, with the result that the cocaine is transferred from the oil to the acidulated water, which can be separated from the former after the mixture has been allowed to stand for about a quarter of an hour.

At this stage, the extract is ready for final precipitation, which as before is effected with sodium carbonate, the amount required being determined by a test with an aliquot part of the solution. The mixture is then allowed to settle for twelve hours, and filtered while being washed with distilled water, to remove any excess of sodium carbonate. The wet residue of cocaine is finally subjected to pressure, when the drug is obtained as a white paste containing 87 to 93 per cent. The usual yield is about $2\frac{1}{4}$ lb. of cocaine per day of twenty-four hours.

When inferior leaves are used, the product is brownish in colour, and has to be subjected to further treatment, similar to the above; this results, however, in the loss of some of the cocaine. A last matter of interest is that the approximate cost of producing 1 lb. of cocaine is about £5—an amount which naturally varies with the price that has to be given for the leaves.

AGRICULTURE IN THE ARGENTINE, 1910.

Diplomatic and Consular Reports, No 4785—Annual Series, gives the following particulars of agricultural production in the Argentine Republic, through Buenos Ayres, for 1910:—

The leading feature in 1910 was the large decrease in the production and export of some of the staple grains, such as wheat, linseed, oats, barley, bird seed and flour. There was an increase in the export of maize, bran, pollards and oil cake. The price of maize fell so much that grain shows a decrease of £370,000. On the other hand, linseed rose in value so that with a decreased output of 280,000 tons, the value showed an increase of £180,000. There was an export of 6,000 tons of potatoes, 2,800 tons more than in 1909, and at the same time an import for seed purposes of 32,000 tons, being an increase of 18,000 tons over that of 1909—figures that are somewhat difficult to understand.

A new article of export was Guinea grass, of which 380 tons were shipped.

The export of oil cake was 4,500 tons greater than in 1909.

This falling off in quantity and price has brought the value of the agricultural products to only £7,000,000 more than the animal products. This is the smallest difference during the past four years. Eight years ago animal products exceeded agricultural products, but since that time the latter have been in excess of the former by sums varying from £5,000,000 to £25,000,000.

Forest products are valued at some £2,000,000, more than half of which is accounted for by quebracho logs [*Aspidosperma Quebracho*—for tanning], which showed an increase of 47,000 tons (£240,000). On the other hand, extract of quebracho diminished in quantity by 2,200 tons and increased in value by £40,000.

Other forest products are of minor importance.

Messrs. Schimmel & Co., in their *Semi-Annual Report* dated October 1911, state in regard to bay oil that within the past six months it has not been possible to remove the difficulties in the way of procuring suitable raw material; so that the firm has therefore again been restricted to the use of imported oil. It is further stated that the few parcels of West Indian origin that were offered showed mostly very dubious quality, so that there had been a scarcity and a distinct advance in prices. There were also higher quotations from the producing country, and it was alleged that new taxation had increased the cost of distillation. A very lively demand has existed for terpeneless bay oil, but the lack of raw material has prevented this from always being met.

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 issue, the editorial deals with the subject of The Substitution of Bases in Plant Nutrition, and summarizes the results of much of the investigation that has been carried out in connexion with this matter.

Page 403 presents an article giving the general results of the sugar-cane experiments conducted in Antigua during the past season. It will be remembered that the similar experimentation in St. Kitts received attention in the last number of the *Agricultural News*.

The succeeding page contains an article in which are presented useful recommendations in connexion with agricultural shows, based on experience in India.

An interesting description of the production of cocaine in Peru is given on page 407.

The Insect Notes, on page 410, are concerned with an account of work that has been done recently in connexion with the possible employment of a disease of grasshoppers for the control of this pest.

Reviews of the Reports on the Botanic Station and Experiment Plots, Montserrat, 1910-11, and of the Report of the Director of Agriculture for the Federated Malay States, 1910, appear on page 411.

The Fungus Notes of this issue (page 414) are in the nature of an interesting and useful summary of the information that has been given under that heading during the present year.

The West Indian Agricultural Conference, 1912.

Information has been received from the Government of Trinidad to the effect that the following have been appointed as an Organizing and Reception Committee, for the forthcoming Agricultural Conference: the Colonial Secretary, the Hon. S. W. Knaggs, C.M.G.; the Director of Agriculture, Professor P. Carmody, F.I.C., F.C.S.; the Hon. G. T. Fenwick, C.M.G.; the Hon. C. de Verteuil: Messrs. J. B. Rorer, J. Morton, D.D., E. Tripp: the Hon. Adam Smith, Lt.-Colonel Collens, W. Burslem, Captain M. Short, H. Hoffmann, E. C. Skinner and W. G. Freeman (Secretary).

In regard to the English delegates to the Conference, information is to hand to the effect that a representative of the Imperial Institute cannot conveniently be sent.

Inoculation Experiments with Different Leguminous plants.

Experiments have been made recently in the inoculation of new moor soil for the growing of soy beans, yellow and blue lupines, serradella and hybrid clover. In the trials, which receive attention in the *Experiment Station Record* for August 1911, p. 123, the inoculating materials consisted of a new trade preparation of nodule bacteria called Azotogen, nitragin, and soil which, except in the case of the soy bean, had been previously used for growing the same legume.

Beneficial results were obtained in all cases, except in that of soy beans: here, the inoculating soil had previously grown garden beans (*Phaseolus vulgaris*) and no nodules were formed on the roots of the soy bean. The best results were obtained with Azotogen, and with the soil that had been used previously for growing the plants: while the effects of nitragin were less favourable and more uncertain.

Mineral Food for Nitrogen-Fixing Organisms.

Recent interesting work concerning the mineral nutrition of the nitrogen-fixing organisms of the soil (*Azotobacter* spp.) receives attention in the *Zeitschrift für das Landwirtschaftliche Versuchswesen in Oesterreich*, Vol XIV, p. 97.

This has shown firstly, that for Azotobacter and other soil organisms to flourish in solutions, these must contain soluble iron and aluminium, especially in the case of bacteria using the nitrogen of the air: for the supply of the elements mentioned, silico-phosphates have been the most useful. The growth of Azotobacter is also favoured by manganese.

Provided that sufficient mineral food is supplied, the assimilation can be brought about by Azotobacter, even in pure cultures, if dextrose is employed to supply carbon.

In regard to the presence, again, of iron and aluminium, these are held to be the cause of the favourable influence of humus, of soil extracts and of organic salts in regard to Azotobacter.

Candelilla Wax.

Several notes on candelilla wax, which is a product of a species of Pedilanthus growing in Mexico, have been given, in this volume of the *Agricultural News*, on page 203, and in Volume IX, pp. 104. and 124.

Through the courtesy of H B.M. Consul at Tampico, Mexico, planting material of candelilla has been obtained by the Imperial Commissioner of Agriculture. This was forwarded during last June to the Botanic Stations in Antigua, St. Kitts and Montserrat, in order that trials may be made.

Enquiries have since been sent to these Stations by this Department in order to gain information as to the progress made by the plants. In reply Mr. H. A. Tempany, B.Sc., Superintendent of Agriculture, Antigua, states that plants have been established successfully at the Botanic Station in that island: Mr. F. R. Shepherd, Agricultural Superintendent, St. Kitts, makes a similar report: and Mr. W. Robson, Curator of the Montserrat Botanic Station, also states that plants are now growing at that Station, adding that they appear to be capable of being propagated with great ease. In all cases, however, the specimens have made little growth. When they have attained a sufficient development, it is intended that the plants in Antigua shall be used for trials of the extraction of the wax.

Trade of Venezuela, 1909-10.

The following general information concerning this matter is taken from *Diplomatic and Consular Reports*, No. 4758 Annual Series, issued August 1911.

The exports of coffee, which amount to 35 to 50 per cent. of the total, were poor: the crop for the succeeding year is expected to be exceptionally good. This circumstance with, an increase in prices, should do much to enhance the general prosperity. As regards the important exports, rubber and balata the former is obtained from wild trees of *Hevea brasiliensis* growing on the Upper Orinoco and the Rio Negro, and the inferior Sernambi is also produced: balata is obtained principally from the Guayana district. The exports of asphalt from Venezuela have increased slightly.

The divi-divi produced in Venezuela is sent chiefly to Germany. That country and the United States are the chief consumers of tonga beans, from Venezuela, which is used in the curing of tobacco, and for the extraction of coumarin, for employment in the manufacture of perfumes.

The chief timber exports from Venezuela consist of fustic wood and boxwood (zapatero). A certain amount of lignum vitae is also exported, as well as some cedar wood. The value of the timber shipped in 1909-10 was, in round numbers, £16,000.

It was feared by the larger sugar planters of Venezuela, in 1909, that local prices would fall because of over-production; so that it was determined to export as much sugar as possible. The official statistics state that the value of the exports in 1909-10 was £200,000, and these were made at very unsatisfactory prices, which however have improved later.

In regard to the trade of Venezuela with the West Indies, the total value of the imports was £13,952, £13,820 being with Trinidad, and the rest with Barbados. The exports from Venezuela to the West Indies amounted in value to £180,415, taken as follows: Trinidad £175,749, British Guiana £4,560, Barbados £55, Grenada £51.

An Insect Pest in Samoa.

An interesting account of the introduction of an insect pest into a new area is contained in *Diplomatic and Consular Reports*, No. 4756 Annual Series, dealing with the trade of Samoa for 1910. The introduced pest is the rhinoceros beetle (*Oryctes* sp.) chiefly affecting cocoa-nut palms, and it is supposed to to have arrived in baskets of earth in which rubber stumps were packed.

It is stated that, up to the time of reporting, the Government had spent nearly £2,000 in making the most strenuous efforts to exterminate the pest, by employing men to destroy the larvae, by paying for larvae and beetles brought in, and by providing piles of cocoa-nut stumps, where eggs are laid and larvae produced, which are then destroyed.

Ecanda Rubber.

A note in the *Agricultural News*, Vol. VIII, p. 89, gave attention to the plant yielding Ecanda rubber (*Raphionacme utilis*), which is a native of Portuguese West Africa. This was based upon information presented in the *Kew Bulletin*, 1908, p. 209. Since that time, the plant has received a full description in the *Kew Bulletin* for 1909, p. 321, and still another note appears in the same publication for 1911, p. 352. From the last the following details are taken.

It was understood from the first that the plant would yield good rubber, but further information was required as to the rate of growth of the rubber-yielding tubers, before its cultivation as a profitable crop could be recommended safely.

A decision in the matter has been reached in a recently issued *Diplomatic and Consular Report* on the Trade of the Province of Angola for the year 1910. It states that experiments made by Europeans to grow the plant have shown that, although it is easily raised in seed beds, the development of the tubers is too slow to be profitable.

In support of this, the note in the *Kew Bulletin*, last quoted, states that the growth of the seedling plants of *Raphionacme utilis* at Kew has also been found to be remarkably slow.

Seeds of the plant were distributed among some of the West Indian Botanic Stations in 1909, and it will be of interest to know what results have been obtained with these.

INSECT NOTES.

A DISEASE OF GRASSHOPPERS.

The present interest in the control of insect pests by assisting in their destruction by means of bacteria and fungi renders important a paper which was read recently before the Académie des Sciences, Paris. This is reproduced in the *Journal d'Agriculture Tropicale* for August 1911, p. 238, and the matter in the article is utilized in presenting the following which is partly a free translation.

At the commencement of the year 1910, the author observed an epidemic disease of bacterial origin raging among grasshoppers in Yucatan (Mexico); the species indigenous to this part of the world is the same as that in the West Indies —*Schistocerca pallens*. In all dead grasshoppers examined the presence was noticed, in the intestinal tube, of numerous coccus bacilli which were isolated: these were not seen in grasshoppers captured where the disease was not present, and always on the contrary, it was found in insects, dead or dying, whether they had been infected naturally or artificially. In some cases, even, an almost pure culture of the organism was found in the intestine of the dead insects. The following experiments demonstrate sufficiently the pathogenic nature of the bacillus.

On May 12, twenty-four grasshoppers were inoculated with a drop of a culture in broth, twenty-four hours old, the needle being forced in between the second and third anterior rings; all the insects died in one to twenty-three hours after the injection. Twenty-four other, uninoculated, insects, used as a control, were injected in the same way with a drop of tap-water; none were dead, after four days.

On the same day, a drop of the same culture was placed by means of a pipette on the buccal orifice of twenty-four grass-hoppers; they all died in ten to thirty-two hours. Twenty-four control insects were still alive, ten days later.

The digestive system of all the dead grasshoppers contains a blackish liquid in which the specific micro-organism swarms, and this is found in the same way in the tissues. The inoculation of broth with the intestinal contents always gave an almost pure culture of the bacillus.

On May 15, twelve healthy grasshoppers were placed under a bell-jar, with the corpse of another specimen which had died after ingesting a drop of the culture. Of the twelve living insects, only two devoured the corpse supplied to them; one of these died nine hours after the infecting meal; the other about twelve hours afterwards. The ten grasshoppers which had not touched the corpse were still living, ten days later. In another experiment, five of the insects out of twelve ate the corpse, and were dead between seven and fourteen hours afterwards. These experiments, repeated several times, show that the cause of the disease is the coccus bacillus that was the subject of the study. This is very mobile and bears cilia all over its surface: in one and the same culture there were observed slightly ovoid forms measuring 0·5 microns, together with bacillary forms measuring 1·0 to 0·5 microns. The organism does not stain with Gram, but easily takes up aniline colours. In young cultures and in the intestines of the grasshopper, the bacillus stains most strongly at the extremities. It is a facultative aerobe, that is to say, it can live either with or without air, but preferably with air. It affords cultures between the temperatures of 16° C. and 43° C., and develops very rapidly in ordinary broth at 37° C. In this case, clouding appears after the fourth hour and gradually increases: at the end of thirty-six to forty-eight hours, a thin coat is formed at the surface, and at the same time a deposit appears at the bottom of the tube, without any clarification of the medium.

In gelatine, in eighteen hours, the cultures show a thin white line, granular in appearance, which does not develop to such an extent in the depths of the culture as it does near the surface. This takes the shape of a nail on the surface; at the end of eight days liquefaction commences there, and proceeds along the track of the needle in the form of the finger of a glove. In streak cultures, a thin whitish line is obtained which shows a bluish tint; the track broadens until the eighth day, to a breadth of 2 mm. when the gelatine liquifies. Plate cultures exhibit, in eighteen hours, small colonies having a diameter of 1 mm.; these are transparent, with an irregular outline, and toward the fourth day become opaque and yellow. On gelose, at 37° C, round colonies develop, which are whitish, sticky and translucent and possess a diameter of 1 to 2 mm., the surface being wrinkled. In the body of the medium, small, lenticular, opaque colonies arise. In a streak culture in an inclined tube, the surface is rapidly overrun, and eventually a thin whitish layer is formed. The odour of the cultures recalls that of broth from Liebig's extract.

In successive cultures, the bacillus rapidly loses its virulence. The first culture, administered by the mouth, kills the insect in 8 to 24 hours; the second in 12 to 36 hours, the third in 36 to 96 hours; after this stage of successive cultures, the grasshoppers recover. The fourth culture permits half of the insects to survive, the tenth does not kill when it is administered by the mouth. Cultures can be caused to regain their virulence by successive injections of several drops into the abdominal cavity of grasshoppers; after three repetitions they are sufficiently virulent to kill, when injected, in 5 to 6 hours, and when administered by the mouth, in 8 to 12 hours.

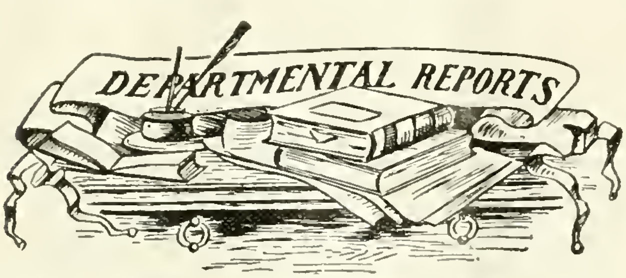
The author was not able to kill, by causing them to injest cultures which were virulent, grasshoppers that had recovered after taking the attenuated cultures. In view of the fact that, ordinarily, grasshoppers died in all cases where a drop of the virulent culture had been absorbed by them, it is natural to conclude that immunity is acquired after a benign attack of the disease.

Observations were made of flights of grasshoppers when the disease was raging. In these, of twenty-five grasshoppers captured and chosen among the most lively, six died in three days, and the others survived; among the nineteen remaining insects, which were dissected after having been under observation for eight days, five gave evidence of the presence of the specific coccus bacillus in the intestinal contents, and at the same time did not appear to be suffering from the disease. It was proved that this coccus bacillus was actually the specific organism, and that it was virulent. These observations lead to the conclusion that the proportion of grasshoppers acquiring immunity is 20 to 25 per cent. As it is impossible to keep the insects in captivity more than fifteen days, the observer was not able to determine the duration of this acquired immunity.

Information supplied by the planters in Yucatan, in March 1911, was to the effect that the number of grasshoppers had diminished to such an extent that the damage from them, this year, was considered to be of little importance; the disease was continuing to rage in the succeeding flights.

The specific organism does not cause sickness in the fowl, the guinea pig, or the rabbit.

The article concludes with the suggestion that it would be of interest to introduce into other countries the disease attacking grasshoppers in Yucatan, with an effort to utilize the bacillus for the control of this pest in those countries.



MONTSERRAT: REPORTS ON THE BOTANIC STATION AND EXPERIMENT PLOTS, 1910-11.

The commencement of this report shows that several interesting species of plants have been introduced at the Grove Botanic Station, and the section following, dealing with the distribution of plants at the stations, gives evidence that this has been large and useful in nature. The planting material sent out from the Grove Station included 14,404 plants, and that from the Harris's Station 3,004; this was in addition to seeds and cuttings.

Some of the most interesting work is described under the heading Cotton Selection, and has made available a large amount of detailed information. It has included the forwarding of samples of cotton to Manchester for spinning trials, which have beeen conducted through the courtesy of Mr. A. H. Dixon, Chairman of the Fine Spinners' and Doublers' Association. After the results of these are given, the report deals with experiments with cotton seed which appear to show that a lowering of the vitality of such seed may take place through careless handling, particularly by storage in bulk without sufficient previous drying. There are other matters in this section, among which the observations on differences in lint and seed characters at various parts of the season, cotton manurial experiments and the cross-pollination of cotton flowers deserve special mention.

The cultural experiments with lime trees that were started in October 1907 have been continued, and have given indications, among other matters, that clean weeding in such cultivation may favour the development of scale insects. Trials of Bengal beans in lime plantations have shown that the growing of these between the trees, but not over them, does not reduce the numbers of the purple scale; while such a reduction does take place if the beans are allowed to grow over the trees. At the same time, serious injury accrues if the beans are allowed to remain very long on the trees. Successful results have been obtained in the growing of bay trees and in the distillation of oil from the leaves.

The report presents particulars of trials with provision crops, fodder and green dressing crops, and Jequié Maniçoba rubber, at the Grove Station. Among newly introduced plants that are under observation, there are included Indian fodder grass (*Pennisetum cenchroides*), *Paspalum dilatatum*, soy bean (*Glycine hispida*), urd or Jerusalem pea (*Phaseolus trinervis*), *Tephrosia candida* and *T. purpurea*, the Bambarra ground nut (*Voandzeia subterranea*) and the rubber tree just named. At Harris's station similar experiments are being conducted, but on a smaller scale; these include the trials with bay trees already mentioned.

Previous to the conclusion of the report, particulars are given concerning the cotton industry, in which it is pointed out that the season 1910-11 was particularly favourable; a record output of lint was reached, namely 402,666 tb.; the area planted exceeded that of the previous year by 400 acres, being 2,050 acres. In this section, there is presented an interesting account of the introduction into Montserrat of an enemy of the cotton worm, namely the St. Vincent Jack Spaniard (*Polistes annularis*). The report is concluded with a statement of the rainfall for 1910, in the usual form.

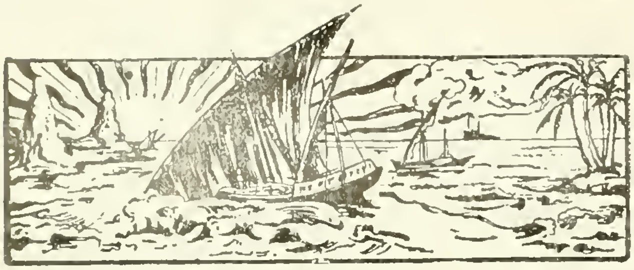
FEDERATED MALAY STATES: REPORT OF THE DIRECTOR OF AGRICULTURE, 1910.

This report, by the Director of Agriculture, Mr. L. Lewton-Brain, B.A., F.L.S., presents firstly particulars concerning the increase in the area of rubber-growing in the Federated Malay States in 1910; this was 48,813 acres, as against 28,905 acres in 1909 and 41,813 acres in 1908. The rubber output again increased by more than 100 per cent., and has now become nearly four times as great as that of 1908; the output for 1910 amounted to 12,563,220 tb., as compared with 6,083,493 in 1909. It should be stated that these figures do not represent exports, only, but include the rubber on hand in drying houses and stores, on the plantations at the end of the year. An increase of 100 per cent. also occurred in the total output of the Peninsula; this was over 6,400 tons, as against 3,000 tons in the previous year. The Director of Agriculture gives an estimate of the increases of rubber production in Malaya for the next four years; these are as follows: 10 million pounds for 1911, 15 million pounds for 1912, a similar amount for 1913, and 20 million pounds for 1914; these are subject to the provision that the supply of labour remains adequate for the increases. On the present acreage alone, the output for Malaya in 1916 should be at least 65,000 tons. As regards catch crops and cover crops for rubber, the Director discourages the employment of the former, and states that absolute clean weeding is preferable to the use of the latter, unless a good leguminous cover—particularly one which would give a yield to pay for the expense of its cultivation—can be introduced. At the present time, the Department is making trials of ground nuts in the latter connexion.

The subjects of tapping and the manufacture of rubber receive attention. As regards manufacture, the preference for smoked rubber is leading planters to contemplate the erection of smoke-houses. An interesting development in connexion with this is the fact that, as cocoa-nut husks form the best fuel obtainable in large quantities for smoking rubber, there will be an increase in demand for these, and hence an enhanced employment of cocoa-nuts as a secondary crop. With regard to this crop, it may be stated here that the report of the Acting Inspector of Cocoa-nut Plantations shows a steady increase in the area in cultivation, in all the States. The exports of copra reached 1,872 tons.

The area under coffee was 6,475 acres, as compared with 5,885 in 1909, and 8,431 in 1908; it is practically all grown as a catch crop, either with rubber or cocoa-nuts. There was again a decrease in the area under sugar, in the Federated Malay States, from 7,128 acres in 1909 to 3,759 acres in 1910: an increase took place in the Strait Settlements, from 3,638 acres to 5,315 acres. The report of the Director of Agriculture concludes with a short review of the work in the experiment stations.

The section which has just received attention is succeeded by the reports of the Government Entomologist and of the Mycologist. Mention of much of the matter in the report of the Mycologist has been made from time to time in the *Agricultural News*. The succeeding sections contain the Report of the Inspector of Cocoa-nut Plantations, to which reference has been made, the Report on the Experimental Plantations, and that on the Government Plantation at Perak; while the whole matter is concluded by useful tables giving statistics concerning crops and labour in Malaya.



GLEANINGS.

It is noted, for the purpose of record, that the Barbados *Official Gazette* for October 9, 1911, contains regulations relating to the Barbados Science Department, made by the Education Board and approved by the Governor-in-Executive-Committee.

The distribution of plants from the Dominica Botanic Gardens during last month was as follows: limes 7,487, cacao 995, grafted cacao 50, Para rubber 850, grafted mangoes 16, miscellaneous 8, the total number sent out being 9,406. The rainfall at the Botanic Station for the month was 6·94 inches.

The *Commercial and Industrial Gazette*, which is an official publication issued in St. Petersburg, states that favourable progress was being made with the cotton crops in Russian Central Asia and the Caucasus Good yields are also expected in the Trans-Caspian and Trans-Caucasian Provinces.

At the St. Lucia Botanic Gardens, during last month, 8,000 seeds of Para rubber were received; 7,000 of these were sown at the Experiment Station and the rest at the Botanic Station. The distribution from this Station during November comprised 9,348 plants, including cacao 450, limes 8,750, coffee 100, Para rubber seeds 500, and 81 packets of vegetable seeds.

The *Board of Trade Journal* for September 28, 1911, draws attention to a notice issued by the Italian Ministry of Agriculture, Industry and Commerce, fixing the price to be paid to holders of stocks of citrate of lime and concentrated lemon juice, for the working year 1911-12, at about 55*s.* per cwt of citrate of lime (basis, 61 per cent. of citric acid), or for an equivalent quantity of concentrated lemon juice.

Among the planting material sent out from the Antigua Botanic Station during November, there were included: limes 5,305, cocoa-nuts 305, cacao 104, red cedar 83, onions 2,600, sweet potato cuttings 11,000, miscellaneous plants 72; 80 bags of seed were also sent out during the month. In connexion with the cocoa-nut industry that exists in the island, 1,150 seed cocoa nuts were imported in the same month.

Information contained in *Diplomatic and Consular Reports*, No. 4641—Annual Series, shows that in the year 1910, 1,555,273 pine-apples were exported from St. Michael's, in the Azores. Of these, 310,697 fruits went to London and Southampton, and the rest to Hamburg. The exports to London and Hamburg in 1909 amounted to 114,956 and 1,017,487 fruits, respectively.

In the *Bulletin of the Bureau of Agricultural Intelligence and of Plant Diseases* for November 1910, attention is drawn to a new method of tapping rubber trees. According to this, strong pressure is applied to the bark, for a certain distance around the tree, by means of steel rings fixed round the trunk, the incision being between the rings. The rings are gradually made to approach the incision, with the result that the latex is squeezed out

During the Charcot Expedition to the Antarctic regions examinations were made of samples of rain and snow collected in different localities. A paper in the *Comptes Rendus de l'Académie des Sciences*, 1911, p. 166, shows that the amounts of nitrates in the samples were much the same as those in the rain and snow of temperate Europe. The average quantity of nitrates in rain was 0·225 mg. per litre; in snow it was 0·233 mg.

It is reported by H.M. Consul-General at Manila that a modern sugar mill having a capacity of about 100 tons of cane per day is to be erected in Luzon, Philippine Islands; this is expected to begin work on January 1, next. The fact that the sugar shipments in 1910 only amounted to 99,105 tons, while free entry, into the United States, of 300,000 is permitted under the Payne Law, is causing local producers to make special efforts to increase the export of sugar to that country.

Attention is given, in the *Experiment Station Record*, Vol. XXIV, p 620 (June 1911), to the part played by muscovite mica in soils, as regards the furnishing of plant food. The work described has shown that this substance is capable of supplying a greater amount of potash to plants than that derivable from orthoclase felspar. The reason is stated to be the higher solubility of the mica— a solubility which is increased by the use of gypsum, peat, ammonium sulphate, quicklime, monocalcium phosphate and other substances.

The growing of cotton was introduced as an industry in Santo Domingo only about three years ago, when the Government distributed American (Sea Island) seed among a number of small planters. The cultivation promises to be successful, and gins are now in operation in Monte Cristi and Puerto Plata, at which ports the fibre sells at 16*s.* 8*d.* to 21*s.* per 100 lb. A small quantity of cotton was first shipped in 1908; the export figures in 1909 reached 17,820 lb.; while last year 137,768 lb. was exported, with a declared value of £3,600. (The *Textile Mercury*, October 21, 1911, p. 333.)

Information has been received by the Commissioner of Agriculture, from the organizing manager, Mr. A. Staines Manders, that the Third International Rubber and Allied Trades Exposition will be held at the New Grand Central Palace, 46th to 47th Street and Lexington Avenue, New York City, from September 23 to October 3, 1912. The further information has been received that Mr. H. C. Pearson, Editor of the *India Rubber World*, has consented to become the Vice-President of the Exposition Mr. A. Staines Manders will be remembered as the organizer of the successful rubber exhibitions held in London in 1908 and 1911.

STUDENTS' CORNER.

JANUARY.

First Period.

Seasonal Notes.

Opportunities should be taken of examining cotton bolls at their various stages of development, particularly with the object of noting in what ways they are affected by disease and by abnormal weather conditions. Bolls are commonly lost through boll-dropping, which appears to be due to the latter cause. In other cases, the bolls may be observed to have become woody, and in others still, those near the ground are likely to be attacked by a rot. In some instances, too, the bracts of the bolls that have nearly attained complete development become flared; on opening such bolls, the immature lint is seen to be discoloured. Try to correlate these different appearances with their several causes—disease or otherwise. Bolls which open at a time of damp weather most usually contain matted masses of lint, and there is likely to be loss from this cause.

In the preparation of land for sugar-cane, careful attension should be given to the details, especially in regard to the application of manures and the turning in of green dressings. Discuss the use of green dressings on lands where the rainfall is small, as well as their employment in heavy, wet lands. State what conditions are most favourable for the proper changes to take place in green dressings that have been buried in the soil.

What are the chief precautions to be taken in sowing seed, of kinds of which you are familiar, in nursery beds? In such work, small seeds are often covered with a layer of soil that is too thin and too loose, with the result that they do not obtain the moisture that is necessary for germination, and seedlings are not produced from them. It is important that the soil should be compacted by pressure, after seeds have been sown. Why is this the case, and what means exist in practice for effecting it on a large scale? Give an account of the sowing, in the field, of such a crop as maize. On what conditions does the good germination of seeds depend, and how would you test the capacity to germinate of a sample of seed?

How is the fact, that plants of the same kind grown from seed tend to show variation, made use of in practical agriculture? Discuss the matter particularly in regard to the control of diseases and pests. Distinguish carefully between growth from a cutting and growth from a seed.

What is meant by the texture of a soil, and what relation does this bear to what is known as tilth? How does good texture assist in the beneficial changes that take place in the soil, as well as with the growth of the plants in it? Give an account of all the ways, of practical application, in which the texture of the soil may be improved.

Questions for Candidates.

Preliminary Questions.

(1) What are the uses of roots?

(2) Give an account of the general life-history of a fungus.

(3) State the uses of stock to the agriculturist.

Intermediate Questions.

(1) How do roots obtain plant food from the soil?

(2) Write a description of the life-history of any fungus that you have observed.

(3) How may the by-products from stock on an estate be utilized?

Final Questions.

(1) Discuss the question of the depth of tillage, in relation to the root systems of different crops.

(2) Give an account of the ways in which fungi are beneficial in agriculture.

(3) State the approximate ages at which the male and female of the following should be allowed to breed: horse, donkey, goat, pig, sheep, various kinds of poultry.

THE INHERITANCE OF MILK YIELD IN CATTLE.

In the *Journal of the Board of Agriculture* for November 1911, the following abstract is given of a paper dealing with the subject of the inheritance of milk yield in cattle, appearing in the *Scientific Proceedings of the Royal Dublin Society*, Vol. XIII (New Series), No. 7:—

Professor James Wilson suggests in this paper, from an examination of milk records, that milk yield is a factor inherited according to Mendel's principles. Danish records, relating to the breed of red Danish cows, were chiefly considered, as British records have seldom been kept for a long enough period to give information relating to several generations of cows, and American records usually refer to the butter yield, which depends upon both the yield and quality of the milk—factors that are inherited separately. In order to consider the performance of a cow during a lactation period, it was necessary to apply corrections to the record when the lactation period had been prolonged, owing to a longer interval than the usual twelve months between two calvings, and also on account of the natural rise in milk yield with the advancing age of the cow. With regard to the latter point, Professor Wilson considers, from an examination of the records of the Irish Department of Agriculture's farms, that a cow's yield usually increases up to the birth of her fourth or fifth calf, that is, when she is six or seven years old, and that the total increase, from the first to the fourth or fifth calf, is on the average about 50 per cent.

The records of a number of Danish cows and their progeny for several generations are given in the paper, and Professor Wilson concludes from them that improvement in milk yield by breeding is not a slow and gradual process, as has formerly been supposed. If a daughter is not on an approximate equality with her dam as a milk producer, she is either much higher or much lower. He divides these cows into three grades, and suggests a Mendelian explanation of the differences between mother and daughter, namely, that the extreme grades are the parent strains, and the intermediate, the hybrid. The records that have been obtained of the progeny of a few bulls also lead to the same conclusions.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture returned to Barbados on Wednesday, December 13, by the R.M.S. 'Oruba', from an official visit to Montserrat and Antigua

FUNGUS NOTES.

SUMMARY OF INFORMATION GIVEN DURING THE YEAR.

In the following article is summarized the information relating to diseases of crops, and to other matters of interest from the plant-pathological point of view, that have appeared in the volume of the *Agricultural News* concluded by this number. The object of the articles that have appeared under this heading has been to present to those interested a review of the work on diseases of crops that is in progress, not only in the West Indies, but in all parts of the world, as far as it is in any way relevant to conditions obtaining in these islands. It follows that many of the articles lay claim to no original research on the part of this Department, but there are some exceptions. The information relating to the 'burning' disease of arrowroot in St. Vincent, p. 174, and that presenting some facts connected with root diseases of cacao, Castilloa, limes and some other plants, given on pp. 222 and 366, is the outcome of work conducted by the Mycologist to this Department; furthermore, the articles on miscellaneous fungi, appearing on pp. 190 and 222, have resulted from the examination, in the laboratory at the Head Office, of specimens forwarded from the different islands by the local officers and by others interested in the subject of plant diseases.

RUBBER AND CACAO TREES. It is now generally accepted that two important diseases of Para rubber and cacao, namely canker and die-back, are of the same origin on either host plant. Some account of Petch's work in Ceylon, which led to this conclusion, will be found on p. 78, where it is shown that *Phytophthora Faberi* is the cause of canker on both hosts, as well as of a rot of the fruits of Hevea, very similar to that of cacao pods, due to it. Mention is made on the same page of Bancroft's preliminary work on the die-back fungus of Hevea and cacao, and of his discovery of its perfect or ascigerous stage. In consequence of this, its name is changed to *Thyridaria tarda*, and thus an end has been put to the complicated mass of synonyms, such as *Diplodia cacaoicola*, *Lasiodiplodia theobromae*, as well as many others, by which it was formerly known. An account of Bancroft's further work, and of his successful inoculation experiments on Hevea with spores of the fungus produced on cacao, is given on p. 286. The occurrence of the black root disease of the West Indies on cacao and Castilloa is mentioned on pp. 78 and 222; a further description of this appears on p. 366, as is stated below.

SUGAR-CANE. A short account of the disease of sugar-cane known in Java as Sereh is given on p. 238, where attention is also called to the ease with which it may be confused with other diseases of this plant.

PALMS. Bud rot of certain palms in India, as described by Butler, received attention in two articles appearing on pp. 14 and 30, respectively. The three palms concerned are the Palmyra (*Borassus flabellifer*), the cocoa-nut and the areca nut (*Areca Catechu*). Of these, the Palmyra, by far the most important economically, is that upon which the most serious damage is inflicted. The organism responsible for this is a species of Pythium called by Butler *P. palmivorum*—one of the more primitive fungi. The methods of infection are discussed, and an outline is given of the campaign undertaken for combating the disease. On p. 206 appears an account of Coleman's work on a rot of the nuts and terminal bud, of the Areca palm, as it occurs in Mysore. In this case the causative organism is a variety of *Phytophthora omnivora*, called by Coleman, var. *Arecae*, and is very closely related to *P. Faberi*—the fungus causing cacac canker and pod disease.

CITRUS. On p. 46, a résumé is given of the work conducted by Fawcett on two diseases, namely, scaly bark and scab, in Florida. The first is due to a species of Hormodedron—a form often included in the life-cycle of Cladosporium. It is not as serious in its effects when it occurs alone, as when it is followed by the citrus wither-tip fungus, *Colletotrichum gloeosporioides*: its attacks are principally confined to the orange. The second, due to *Cladosporium citri*, rarely if ever attacks this tree, but is found on several other species of Citrus. Two fungi on limes in Dominica, namely *Fomes lucidus* and *Polystictus hirsutus*, are referred to on p. 190; and on p. 270 the suggestion is made that the former may be responsible for a form of root disease of this plant found in Montserrat and Antigua. The attack of black root disease on the orange in St. Lucia is mentioned on p. 222; and its occurrence as well as that of red root disease on limes in Dominica is recorded on p. 366. A third form of disease—stem canker—on the same host in that island, is dealt with on page 382. Finally, a disease of Natal citrus fruits, described by Pole Evans and attributed by him to *Diplodia natalensis*, receives attention on p. 318, where mention is made of a gum-inducing fungus closely related to the above, which attacks the peach and Citrus, in Florida.

BANANAS. Some diseases of bananas, found in Central America, Surinam and Trinidad, are reviewed on p. 110. They comprise the Panama disease, attributed by Essed to *Ustilaginoidella musaeperda*, in Surinam; the moko disease of Trinidad due, according to Rorer, to bacteria; the root disease due to *Marasmius semiustus*, found in Trinidad and elsewhere; and the disease known in Surinam as elephantiasis. Further information on the Panama and moko diseases is given on p. 254.

PINE-APPLES. Some account of one of the chief parasite of this host, namely *Thielaviopsis paradoxa*, a fungus also causing pine-apple disease of cane cuttings and stem bleeding of cocoa-nut palms, is given on p. 126. The two succeeding articles on pp. 142 and 156 are devoted to an account of Larsen's work on pine-apple diseases in Hawaii. These are: fruit rot, base rot of cuttings and leaf spot—all due to *Thielaviopsis paradoxa*; brown rot—possibly the same as black heart—of uncertain cause; ripe rot, wilt and tangle root, the cause of which is also not finally determined.

ARROWROOT DISEASE. On p. 174 appears a preliminary note on a disease of arrowroot, long known in St. Vincent as burning. The attack of the causative fungus on other host plants is noted, and remedial measures are suggested.

ROOT DISEASES. Information of a preliminary character on the root diseases attacking limes, cacao, pois doux and some other host plants is to be found on pp. 366 and 382. Three definite diseases are distinguished. The first is due to a species of Rosellinia; it has been given the popular name of black root disease. It attacks several plants and is, in all probability, to be found in Dominica, St. Lucia, St. Vincent and Grenada. A note on the same disease may be found on p. 222. The second, due to *Sphaerostilbe* sp., occurs on limes in Dominica, and will probably be found elsewhere; it has been called red root disease. A third form of disease attacking the collar and roots of limes, in Dominica, has been named stem canker; it is of uncertain origin, but may be due to physical causes. In the same article, mention is made of what is possibly a fourth disease of lime roots, in Antigua and Montserrat; it is associated with the presence of *Fomes lucidus*.

ENTOMOGENOUS FUNGI. Notes on these useful species may be found on pp. 62, 94 and 190. On the first-mentioned page reference is made to the green muscardine fungus (*Metarrhizium anisopliae*), on frog hoppers in Trinidad. On the second is an article dealing with general considerations as to the use of fungi for controlling scale insects, giving some account of recent experiments in Grenada and Barbados, and recording the discovery of the shield scale fungus (*Cephalosporium lecanii*) on the mealy shield scale (*Protopulvinaria pyriformis*). In the third reference, mention is made of a new parasite, *Hypochrella oxyspora*, found on scale insects in Dominica and St. Lucia, one of whose hosts is the mango shield scale (*Coccus mangiferae*); while the others are not yet known with certainty. An unidentified mycelium on the larva of a beetle, *Cryptorhyncus* sp., attacking croton in St. Vincent is also recorded.

MISCELLANEOUS FUNGI. The following diseases are dealt with on p. 190: fruit spot and die-back of the mango in St. Vincent, probably due to *Gloeosporium mangiferae*; leaf spot of Bengal beans, in Grenada, due to *Cercospora* sp; and Guinea corn rust in Barbados, due to *Puccinia purpurea*, with *Darluca filum*—another fungus—parasitic upon the rust. On p. 222, is a note on white rust of sweet potatoes, due to *Cystopus Ipomoeae-panduratae*; while on p. 318 are observations on a species of Jew's ear fungus, *Hirneola polytricha*—a very common saprophyte on wood.

MISCELLANEOUS ARTICLES. These comprise the following, and contain matter of mycological or pathological interest: The Secretion of Poisons by Fungi, p. 62, with special reference to the Botrytis stage of Sclerotinias, to the fungus (*Stereum purpureum*) causing silver leaf of various fruit trees, such as the plum and apple, in Europe, and to *Colletotrichum gloeosporioides*, the wither tip fungus of citrus; The Bracket Fungi, p. 270; Recent Work on Bordeaux Mixture, p. 302, a review of some results obtained by Barker and Girningham; Wounds in Plants and Their Treatment, Part I, p. 334, Part II, p. 350; and the Rotting of Timber and its Prevention, p. 398.

Oil From Grape Seed.—An oil of somewhat similar type to that of the olive may be obtained from the stones or seeds of the grape. During the eighteenth century the manufacture of this oil was an industry of considerable importance in many towns in France, especially at Albi (Department of Tarn). The seeds contain from 15 to 20 per cent. of oil, the manufacture of which, thanks to modern processes, has been revived in Italy during the last two or three years. Grape-seed oil is coming into use for soap-making, as well as for lubricating and lighting purposes. It is estimated that from two to three million of quintals of this seed could be supplied annually by France alone, which, if separated from the skins of the grapes, would produce from 300,000 to 450,000 quintals (say 6½ to 10 million gallons) of oil The value of the residuum after wine-making would be considerably enhanced as a raw material for distillation. The brandy (eau-de-vie) thus obtained would not only be of superior quality, but also free from any disagreeable taste due to the essential oil of the seed. (*Journal of the Royal Society of Arts*, November 17, 1911, p. 20.)

GUAYULE RUBBER.

Attention is given, in the *India Rubber World* for October 1, 1911, to the recently published work of F. E. Lloyd, entitled Guayule, a Rubber Plant of the Chihuahuan Desert, and the following is taken from the matters presented.

EARLY EXPORTS FROM MEXICO. Dr. Lloyd estimates that the total export of Guayule rubber from Mexico during the four fiscal years ending June 30, 1909, was 20,000 short tons, of which 80 per cent. was taken by the United States.

YIELD. A further estimate is made of the weight of the shrub that was required to produce the above amount of rubber, and on a basis of a 7-per cent. yield, this must have been 286,000 short tons. The return of rubber was higher, however, in some cases, so that a re-estimate is made to the effect that 225,000 short tons represents the quantity of the plant disposed of, up to June 1909.

SUPPLY OF THE PLANT. It was estimated by Endlich that the original quantity of Guayule shrub represented 375,000 short tons of rubber, the calculations being based on a yield in virgin fields of one fifth of a ton per acre, from 1,880,000 acres—the supposed area occupied by the plant in Mexico. A re-estimate by Dr. Lloyd places the original quantity at 500,000 tons of rubber; of this it appears that about four fifths have been consumed so far.

CULTIVATION. Up to the present time, field operations have been mainly concerned with the harvesting of the plant in the quickest way—most generally by pulling it up by hand. It is easily understood that the best method is to cut the plants, in order that they may be enabled to spring again. It is recommended that, at the first cutting, only plants at least 16 inches in height should be taken. In five years these will be replaced, under normal conditions, by a new crop of plants over 16 inches in height, and these can then be harvested. It is considered that the maximum economic efficiency of growth is reached at a height of between 12 and 16 inches. In the opinion of Dr. Lloyd, the ultimate solution of the raising of the shrub lies in its cultivation as an ordinary crop. It has been established already that it grows well under a system of irrigation in which proper periods are included for the withholding of water.

RAISING SEEDLINGS. For this purpose the seeds are planted in wooden trays partitioned into compartments by paper receptacles, and the soil is watered from beneath. When they are ready, the seedlings are placed out, still contained in the receptacles in which they were grown. It has been observed that germination takes place most readily, and the seedlings grow best, during the summer months. A method of transplantation that has been found to be successful is to cut the plants back as far as the top of the tap root, before placing them in the ground; in this case the severed top is sent to the factory for the extraction of its rubber.

PROSPECTS OF GUAYULE CULTIVATION. So far, the facts which have been ascertained have not warranted the making of cultural trials on anything but a small experimental scale. It appears that successful cultivation is mainly a matter of water-supply and the careful harvesting of the plant.

It may be mentioned that an account of the extraction of rubber from the Guayule plant appeared in this volume of the *Agricultural News*, on page 229. It may also be stated that the work which forms the subject of the above information is also reviewed in the *India-Rubber Journal* for September 16, 1911, p. 19.

MARKET REPORTS.

London.—The West India Committee Circular, November 21, 1911; Messrs. E. A. De Pass & Co., November 10, 1911.

Arrowroot—$3\frac{1}{2}d.$
Balata—Sheet, 3/4 to 3/6; block, 2/1 per lb.
Beeswax—No quotation.
Cacao—Trinidad, 61/6 to 70/- per cwt.; Grenada, 57/- to 61/6; Jamaica, 54/- to 58/6.
Coffee—Jamaica, 54/- to 59/- per cwt.
Copra—West Indian, £26 17s. 6d. per ton.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 13d. to 16d.
Fruit—No quotations.
Fustic—No quotations.
Ginger—48/- to 63/- per cwt.
Isinglass—No quotations.
Honey—No quotation.
Lime Juice—Raw, 1/ to 1/6; concentrated, £19 15s. to £20; Otto of limes (hand pressed), 5/3.
Logwood—No quotations.
Mace—Firm.
Nutmegs—Firm.
Pimento—Common, $2\frac{1}{4}d.$; fair, $2\frac{3}{16}d.$; good, $2\frac{5}{8}d.$; per lb.
Rubber—Para, fine hard, 4/3; fine soft, 3/11; Castilloa, 3/9 per lb.
Rum—Jamaica, $1/8\frac{1}{2}$ to 5/-.
Sugar—Crystals, 19/- to 22/6; Muscovado, 15/- to 17/-; Syrup, 16/6 to 18/3 per cwt.; Molasses, no quotations.

New York.—Messrs. Gillespie Bros. & Co., December 1, 1911.

Cacao—Caracas, $13\frac{1}{4}$c. to $13\frac{3}{4}$c.; Grenada, $12\frac{3}{4}$c. to 13c.; Trinidad, $12\frac{3}{4}$c. to $13\frac{1}{4}$c. per lb.; Jamaica, $11\frac{1}{4}$c. to $12\frac{1}{4}$c.
Cocoa-nuts—Jamaica, select, $31·00 to $32·00; culls, no quotations; Trinidad, select, $30·00 to $32·00; culls, $16·00 to $17·00 per M.
Coffee—Jamaica, 15c. to 17c. per lb.
Ginger—$8\frac{3}{4}$c. to $11\frac{1}{4}$c. 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 $3·75.
Limes—$3·50.
Mace—45c. to 48c. per lb.
Nutmegs—110's, 14c.
Oranges—Jamaica, $2·00 to $2·75 per box.
Pimento—$5\frac{3}{8}$c. per lb.
Sugar—Centrifugals, 96°, $5\frac{1}{16}$c. per lb.; Muscovados, 89°, $4\frac{1}{16}$c.; Molasses, 89°, $4\frac{5}{16}$c. per lb., all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., December 11, 1911.

Cacao—Venezuelan, $12·90 per fanega; Trinidad, $12·40 to $12·75.
Cocoa-nut Oil—97c. per Imperial gallon.
Coffee—Venezuelan, 17c. per lb.
Copra—$4·25 per 100 lb.
Dhal—$3·90 to $4·00.
Onions—$2·50 to $2·75 per 100 lb.
Peas, Split—$6·50 to $6·75 per bag.
Potatoes—English, $2·25 to $2·50 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 16, 1911; Messrs. T.S. Garraway & Co., December 18, 1911; Messrs. Leacock & Co., December 8, 1911; Messrs. E. Thorne, Limited, December 5, 1911.

Cacao—$12·00 to $13·00 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 $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—$1·90 to $3·00 per 100 lb.
Peas, Split—$5·90 to $6·40 per bag of 210 lb.; Canada, $2·85 to $4·10 per bag of 120 lb.
Potatoes—Nova Scotia, $3·00 to $3·50 per 160 lb.
Rice—Ballam, $4·95 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 9, 1911; Messrs. Sandbach, Parker & Co., December 8, 1911.

Articles.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	$12·00 to $12·50 per 200 lb.	$13·00 per 200 lb.
Balata—Venezuela block	No quotation	Prohibited
Demerara sheet	70c. per lb.	70c.
Cacao—Native	11c. 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	17c. per lb.	18c. per lb.
Jamaica and Rio	18c. per lb.	20c. per lb.
Liberian	$14\frac{1}{2}$c. per lb.	14c. per lb.
Dhal—	$3·60 to $3·75 per bag of 168 lb.	$3·75 per bag of 168 lb.
Green Dhal	$3·50	——
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	$3·00 to $3·25	$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	$3·30 to $3·35	$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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