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SCIENTIFIC CONTROL.

Agriculture, in common with every branch of industrial activity, has its own problems. There has been, however, within recent years, a gradual growth of appreciation of the assistance gained by means of scientific investigations. The old order has changed and capitalists are at present more inclined to value and pay for this assistance than formerly.

Comparatively speaking, the latest recruit in these investigations, is the Economic Biologist. When applied to tropical agriculture, the importance of the control measures recommended by these scientists cannot be over-estimated.

The many departments of agriculture scattered throughout the world, realise that there should be co-ordination in the many divisions of work and towards this end are working with commendable energy and zeal.

Co-ordination leads to co-operation, so that we find a natural dependency of one expert on another with a

common object in view, in the case of agriculture,increased yield per acre or increased production.

In these days, when the cost of living is high and a larger acreage of land should be under cultivation but which unfortunately is not the case owing chiefly to the shortage of labour, it is evident that the acreage however small it may be, should receive every attention from both capitalist and scientist. A united effort is necessary to carry out those methods of control which are advocated so as to procure a much greater yield than hitherto.

High prices obtained for crops should not, therefore, be the determining factor for the successful working of an estate but increased production, due to the combined efforts of agricultural chemists, entomologists and planters.

Previous to 1914 the price obtained for sugar had much to do with the solvency of an estate, the production of which was far below what it could have been. With the exceptionally high prices obtained during the last six years these estates are now able to declare large dividends. When the price of sugar drops, the determining factor must, of necessity, depend on the power to produce, and this production which we hope will be increased, will be dependent to a very great extent on the combined efforts of planters and scientists.

The article on the economic loss due to insects published in this issue, will it is hoped, bring forcibly to the notice of planters, as well as the small farmer, the need there is for more concerted action so that the ravages of insects may be brought within a reasonable limit. In order that this end may be attained, the control, beneficially exercised by entomologists, should be recognisep and steps taken to procure their assistance on every sugar plantation and farm in the colony.

ANNUAL LOSS CAUSED THROUGH INSECTS IN BRITISH GUIANA.

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There are probably few persons in British Guiana who realise the annual loss that the colony suffers through insects, yet this loss amounts to millions of dollars, an almost incredible amount for so small a cultivated area and population.

To get some idea of the magnitude of this loss we must first realise that there is not a single growing plant that does not suffer from the attacks of insects at some stage of its existence, and often after the crop has been reaped there are further insects which attack the stored product. Yet this is but a part of the injuries performed by insects. The losses caused by their attacks upon live-stock, to say nothing of the sickness and even death, which they inflict upon man himself—a phase of the subject that is only now being fully recognised—must all be considered and grasped before the far-reaching powers of their attacks can be fully understood.

It is possible for those familar with the damage caused by the important insect pests of the different crops to form a rough estimate of the losses they cause; but of the equally important ones which attack live-stock, and of those which are a menace to the health of man, it is, under present conditions, difficult, and in some cases impossible, to make any such estimate. How can we estimate the value of a human life? Malaria accounts for about 1,400 deaths each year, while Filaria takes another 300, and both of these diseases we know are carried by insects. In addition to the actual deaths we must also consider the number of days in every year in which per-

sons suffering from these diseases are unable to perform their appointed tasks, days in which there is a direct financial loss. Again, the losses caused through the attacks of insects on forest products—principally termites or 'wood ants'—in the form of building materials can hardly be estimated. No attempt, therefore, has been made to form an estimate of these losses, though it might safely be said that they too must amount to millions of dollars.

Basis of Estimate.

In estimating the losses in this paper, the Agricultural Statistics as obtained by the Board of Agriculture for the year 1917 have been used. In the case of the coconut crop no records were available for that year so the returns for the year 1918 have been taken. It has been difficult to arrive at a fair valuation of such crops owing to the present enhanced prices of all produce, but the value of such produce in the year 1917 has been taken, and it is thought that this ought to meet with general satisfaction; under present conditions these values would, in the majority of cases, be considerably greater, but then the losses would also be greater.

Result of Control.

Large as is the annual loss estimated to be due to insects, it would be considerably greater if such pests were allowed to go absolutely unchecked. We have but to remember the instance of the Giant Moth Borer of the sugar-cane for this statement to be fully appreciated. Originally this insect was not a pest of the sugar-cane at all, but having discovered this new foodplant, of which there was an abundant supply, the insect soon established itself therein. Under these favourable conditions the pest multiplied enormously and with great rapidity, causing immense destruction. The sugar industry was at the time already suffering from the effects of low market-rates, and if such huge losses as were caused by this insect were added to this, it appeared the industry would soon be faced

with ruin. Investigations on the pest were, however, commenced and control measures recommended. Fortunately these control measures were ceaselessly pursued—no doubt the precarious state in which the industry then found itself was largely responsible for this—and at the present time, while Castnia has not by any means been eliminated from the cane-fields, the situation is well under control. This, however, must not be taken to mean that control work against the Giant Moth Borer may now be discontinued. Far from it, if the same care and persistency with regard to the control measures are not observed, it will be a very short time before the pest will again assume its old proportions, and the principal industry of the colony once more threatened.

Value of Crops and Losses due to Insects Pests.

The value of the crops given in the table below, as already explained, was their value in 1917. At the present time this estimate would be low, but it must be remembered that while the value of the crop has risen the amount of loss has correspondingly increased, so it would make but little difference which year is used for the basis of calculation, as the percentage of the loss would be the same. The amount of loss is based on the actual crop harvested, that is to say that except for such loss, the value of the crop would have been greater by that amount. In some instances as small an amount as 5 per cent has been allowed, though it is believed that such destruction rarely falls below 10 per cent, while in years of excessive insect damage it may amount to 50 per cent or even more of a particular crop. An item which is properly chargeable to the amount of loss is the annual amount expended in the control of insects, but, with the exception of the sugar-cane crop, it has not been possible to estimate this. The writer therefore believes that the estimate given below is on the safe side, and is considerably less, rather than more, than the actual losses caused through insects.

PRODUCE AND VALUE OF CROPS WITH LOSS DUE TO INSECTS, 1917.

Crop.	Area under cultivation acres.	Produce.	Value in 1917.	Percentage of Loss.	Amount of Loss.
Sugar Cane ...	77,823	108,181 Tons Sugar	$ 10,904,644	25	$ 2,726,161
		3,956,938 Gal's. Rum	4,352,631	25	1,088,157
Rice	64,814	42,040 Tons Rice	4,077,880	5	203,894
Coconuts ...	29,710	14,217,400 Nuts (1)	255,900	15	38,385
		77,100 Galls. Oil (1)	90,225	15	13,518
		5,250 Cwt. Copra (1)	42,630	15	6,394
Cacao	1,970	3,516 Cwt. Cacao (2)	59,100	5	2,955
Coffee	4,950	14,850 Cwt. (2)	166,320	5	8,318
Limes	1,480	17,287 Galls. Conc. Juice	25,800	5	1,290
		8 Tons Citrate	4,179	5	208
		251 Galls. Oil	3,418	5	172
Provision Crops...	18,250	...	1,825,000 (3)	5	91,250
Miscellaneous (4)	...	...	2,000,000 (3)	5	100,000

(1). 1918 crop.
(2). Estimated yield, probably somewhat incorrect.
(3). Value only approximate.
(4). Includes stored products, such as flour, rice, biscuits, cigars, etc., as well as household articles which are injured by insects.

Insect Damage to Crops.

Sugar Cane.

Sugar-cane is by far the most important crop of the colony both in quantity and value, and under present conditions it is an extremely valuable crop. Sugar, with its by-products, contributes about 80 per cent of the total value of the exports of the colony, while about 33 per cent of the wage-earning population are directly connected with the sugar industry. In 1917 there were 77,832 acres under cultivation of this crop which produced 108,181 tons of sugar, besides 3,956,938 gallons of rum. The total value of this produce in 1917 was estimated at $15,257,275.

That the most important crop of the colony should be subject to severe insect attacks is particularly unfortunate, nevertheless it must be admitted that in British Guiana the sugar-cane has some destructive enemies, and within the last decade this fact has been forcibly brought home to sugar planters in the colony by the ravages of 'borers.'

The Giant Moth Borer, *Castnia licus* Drury, caused enormous losses to this crop during the early part of the decade and for a time it seemed as if the entire industry was doomed. Control measures were, however, devised, and the losses have gradually been reduced. It is not possible to form any estimate of the losses caused through this particular insect, but even now-a-days when it is under control they are considerable. It is fortunate for the industry that the insect readily lent itself to control by a method that was easily applied without being injurious to the crop.

Unfortunately the same cannot be said of the Small Moth Borers, *Diatraea saccharalis* F. and *D. canella* Hmpsn. There are control measures that are in general use against these pests, but it can hardly be said that these insects are entirely under control. Of the estimated loss

of 25 per cent to the sugar crop, the small moth borers are directly responsible for quite 20 per cent.

A loss of 25 per cent will no doubt seem exaggerated to some, but in order to support this statement it may be pointed out that in other sugar growing countries,—notably Porto Rico and the Southern United States—the estimated loss through this insect is one-third of a ton of sugar per acre—a loss of about 30 per cent. But it must not be understood from this that either the infestation in British Guiana is less severe than in these countries, or the control work performed more effective, on the contrary, it is probable that the infestation in this colony is greater than in either of the countries mentioned; the estimate has been purposely reduced to 25 per cent for this colony merely to make it as conservative as possible.

If the sugar-cane had these pests alone to contend with it would be sufficiently handicapped. For the number of minor pests of the sugar-cane, now amounting to a formidable list of over fifty kinds, such as hardbacks, *Dyscinetus bidentatus* Burm, weevil borers. *Metamasius hemipterus* F., wood-ants (Termites), mealy-bugs, *Pseudococcus sacchari* Ckll, and many other too numerous to mention, no loss has been estimated, though it will generally be recognised that in themselves they must be responsible for a large amount.

Apart from the losses caused through these pests there is a considerable additional sum expended on the control of these insects. It is estimated that in 1917 this amounted to, for the Giant Moth Borer, $15,407, while for the Small Moth Borers it was $23,653; a total of $39,060.

If this amount is added to the amount of the estimated 25 per cent loss, the surprising sum of $3,853,378 would be obtained, representing the annual loss caused to the sugar industry through insect attacks.

Rice.

Next in importance to the sugar-cane, both in the area under cultivation and the value of the produce, is the

rice crop. In 1917 the acreage reaped for this crop was 64,804 acres, which gave a yield of 70,967 tons of paddy, representing 42,040 tons of rice, valued at $97 per ton this crop would be worth $4,077,880.

While much less subject to insect damage than the sugar-cane, the rice crop suffers from the attacks of several insects, and would undoubtedly be considerably greater were it not for such depredations. The work of several of these pests is obscure, and for this reason the majority of the farmers are entirely ignorant of their existence.

The most destructive pest of rice is the Rice Worm, *Laphygma frugiperda* S & A. The larvae of this insect destroy the foliage of the plant, more especially that of the young plants in the nursery. This pest occurs at every rice planting, destroying a certain amount of the seedlings if a careful watch is not kept over them, but there are times when it is particularly prevalent and in several districts it has been observed to so entirely destroy these young plants that it was necessary to completely resow, or at least reset the nursery beds.

There are other pests which attack this crop, but because their destruction is not so noticeable the losses caused by them go unobserved. The Grass Moth, *Remigia repanda* Fab., destroys the foliage of the mature plant, while a species of Small Moth Borer, *Diatraea* sp. bores into the stem. At the present time, fortunately, this latter pest is not causing any extensive damage, but it having found this new foodplant, of which there is an abundant supply, we should take a serious view of the situation, knowing as we already do what enormous damage a very closely related species causes to the sugar-cane.

Besides these there are plant bugs, *Mormidae ypsilon* L. which destroy the developing ears; ants, *Solenopsis pylades* For. which hollow out the stems, as well as grasshoppers, *Conocephaloides maxillosus* Fab., and some other insects which destroy the foliage.

True the damage caused by each particular kind of insect is small, but when taken as a whole it is worth considering. This damage has been estimated at 5 per cent, on the 1917 crop this would be 2,102 tons of rice, valued at $203,894.

Coconuts.

Coconuts are the third most important crop in the colony, and the area under cultivation is steadily increasing. In 1918 there were 29,710 acres under this crop which it is estimated produced 14,217,400 nuts, but a large proportion of this cultivation is young and has not reached the bearing age. Besides this there was produced 72,100 gallons of coconut oil, and 5,250 cwt. of copra; the total produce being valued at $388,655.

Coconut palms unfortunately suffer from the attacks of a few serious pests, which cause a considerable annual loss. The most important pest of the coconut palm in the colony is the Coconut Caterpillar, the larval stage of the butterfly *Brassolis sophorae* L. The ravages of this insect are too well known to need description, suffice it to say that during a severe outbreak of this pest the majority of the trees in the infested area are almost completely defoliated, with the resultant loss of an entire crop, and a largely reduced crop in the following year. In addition to this defoliation a small percentage of the trees die from the effects. An idea of the loss occasioned by this insect can be gained from the following estimate made by the writer of an attack which occurred in Georgetown in 1914.*

"In September, after the insect had disappeared . . . a count was made of the palms that had died from this attack of *Brassolis*. In the whole town there were about 107 dead palms. It was estimated that there were some 2,000 of these palms in the city, so that about 5 per cent has succumbed to the attack.

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* Cleare, L. D.—A Butterfly injurious to coconut palms in British Guiana. In Bull ntomological Research, Vol. VI., Pt. III., Dec. 1915, pp. 273-278. Pt. VIII.-X.

"We can get some idea of the financial loss caused through this insect by making some simple calculations. The average age at which a tree begins to bear is about five years, so we can replace any tree in that time, and taking the average return at $1 (4s. 2d.) per tree per annum, this being the figure generally used, the loss on 107 trees is $535. To this we must add the loss from nineteen hundred trees for eighteen months, the period taken by them to recover. At the same rate this would amount to $2,850, making a total of $3,385 (£795 4s. 2d.) This estimate is for the city of Georgetown alone; should the loss in the coconut districts, Mahaicony, etc., be taken at the same figure, the amount would probably be startling."

Outbreaks of this pest occur every year in some part of the colony though the cycle for a particular district appears to be every five years. An estimated loss of 15 per cent for this pest alone would therefore not be excessive.

Another very important pest of coconut palms is "cockles"—the beetle known to science as *Startegus aloeus* L. These insects cause appreciable damage amongst young palms, and while the actual loss caused through their attacks is difficult to estimate, when considered from the point of view of the impaired health of the trees, and even the occasional death, it is a not unimportant amount.

In some districts coconut palms are attacked by the larvae of a large moth, *Castnia daedalus* Cram. by name, and closely related to the giant moth borer of the sugarcane. Like its near relative this insect is a 'borer' and readily bores into the stems of coconut palms about the leaf bases. It is a very dangerous and most destructive pest and in the districts where it occurs causes a large amount of damage, many trees dying from its attacks.

In addition to these there are several minor pests such as weevils, *Rhyncophorus palmarum* L., leaf-eating

caterpillars, *Sibine fusca* Stoll., and sucking insects such as scale insects, *Aspidiotus destructor* Sign., and Aleyrodidae. The damage caused by them may not be extensive but when taken on an area of over 29,000 acres will be worth reflecting on.

The damage caused to coconuts through insects has been given as 15 per cent, and it is believed that this is a conservative estimate. On the 1918 crop such damage would be valued at $58,298.

Cacao.

The cacao industry of the colony does not occupy a very important place, the area under cultivation of this crop was in 1917 about 2,000 acres. The exports of cacao too are small, the majority of the produce being consumed locally. It has been impossible to find the quantity of cacao thus consumed so it was necessary to estimate it. Taking the yield as being 400 lb. of cured cacao per acre, and supposing that one half of the area under cultivation with this crop is in bearing, the return would be about 3,516 cwt. of cured cacao valued at $59,100.

Cacao has a few pests but none of these are very important, and for this reason the estimated loss through insects has been put down as 5 per cent, which would be $2,955.

Coffee.

Coffee, although of more importance than cacao is of itself not a very important industry, though the area under this crop is steadily increasing, and in 1917 about 5,000 acres were in cultivation. Coffee likewise suffers from no very important insect pest, and here again the loss has been estimated as low as 5 per cent. As in the case of cacao, it has not been possible to make any very accurate estimate of the coffee produced per annum, but an average yield has been estimated, and this works out

at about 14,850 cwt. per annum. The loss therefore on a 5 per cent basis would be 742 cwt, valued at $8,315.

Limes.

Although the cultivation of limes in the colony is of a comparatively recent date, it has made good progress and bids fair to be a promising industry. In 1917 there were 1,400 acres planted in limes in the colony, and the produce obtained was 17,287 gallons of concentrated lime juice; 8 tons citrate of lime; and 251 gallons of essential oil of limes; the total value of such produce being $33,427.

The pests of limes are principally scale insects, and several kinds have been found attacking this plant; none of these, however, are by themselves very destructive, but taken as a whole they probably account for a loss of about 5 per cent and valued at $1,671.

Provision Crops.

Under this head are included all such crops as Plantains, Cassava, Yams, Eddoes, Tannias, Peas, Maize, etc. Naturally it has been difficult to form any really satisfactory estimate, either of the value of the produce, or of the percentage of loss. While such losses may be high in some crops, it is small and almost negligible in others. With the object of keeping this estimate conservative the produce has been estimated at an average value of $100 per acre, while the percentage of loss has been put down as only 5 per cent. With these figures the loss on 18,250 acres which were in cultivation in 1917 would amount to $91,250.

Miscellaneous.

This includes stored products such as flour, rice, cigars, cigarettes, biscuits, and the loss represents the damage done to these commodities, as well as to the number of household articles which are subject to insect attacks.

Here again it has been difficult to estimate either the value of the goods or the amount of damage done. $2,000,000 has been estimated as the value. and it is believed that this is a fair estimate—the imports of flour alone for 1917 were valued at $1,428,824. A 5 per cent loss on this amount would be $100,000.

Conclusions.

From the figures given above it is estimated the annual loss caused to the colony through insect attacks on agricultural products is $4,280,702. With an estimated population of 300,000 this works out at an annual loss of $14 per capita of the inhabitants.

Large as this amount may seem, it is, as already pointed out, but a part of the losses caused through insects generally. It must be remembered that the losses caused through the attacks of insects on forest products, as well as those caused to livestock and man, have been entirely omitted. Furthermore, it has only been possible in one instance to estimate the cost of control against such pests. The cost of all poisons and other substances employed as insecticides, either to destroy the insects or as repellants against them,—as in the cases of substances used as a protection against cockroaches, cloths moths, house-flies, book-destroying beetles, woodants, and all parasitic insects, the screening of vats, and nets used as a protection against mosquitoes, besides a number of other little measures which we look upon as part of our everyday life,—would all have to be calculated before anything like a general estimate could be arrived at. If it were possible to make such an estimate the writer is fully convinced that the total annual loss caused through insects to the people of British Guiana could conservatively be put down as $8,560,000 ; an annual loss of $28·5 per capita of the inhabitants.

It must be clearly pointed out that the year 1917 was in no way exceptional in the loss through insects ; a similar loss occurs every year. At a rate of 6 per cent this sum would be the interest on $142,600,000.

THE PRESERVATION OF PERISHABLE PRODUCTS WITH BURNT LIME.

Lime is a product that is to be found on most farms, more particularly those on which dairying is engaged in. There are other purposes, not generally known to the man on the land, to which it can be put, besides making whitewash.

That it is an excellent preservative for a number of products, culinary and otherwise, has been the experience of the writer. It has been tested in regard to the preservation of fruits, tubers and grains. The method adopted will be described by taking a single example from each of the above.

In the storing of various products it is essential that they should, in most instances, have reached the stage of ripeness, or maturity, and moreover that immediately after harvesting they be allowed to undergo what is generally termed the "sweating process." This is the giving off of surplus water, and chemical changes may also take place to a more or less extent.

Fruit-Rough-skinned Lemons.—These are to be found in abundance in most districts during the cool months of the year, but in the hot summer weather they are generally not procurable, This of course is on account of their poor keeping qualities, more particularly in coastal areas, where, after picking, they will remain fresh for only a very short time.

During the past season rough-skinned lemons, which I stored in petrol tins during August, were found to be in an excellent state of preservation at Christmas. The treatment received was as follows :

When picked they were spread out in a shaded, airy place for two days, then packed in partially air-slaked lime, the fruits being kept well apart. If close packing is adopted, it will probably be found necessary to repack in about a week's time, more particularly if the skins of the fruit are in a soft, fleshy condition. A wooden case may

be used for storage. This can be made fairly air-tight by lining or covering with stout paper.

In a check test carried out without using lime, the lemons deteriorated very quickly.

It may be mentioned that Lisbon lemons can be kept fresh for quite a long time, by packing in sand that has been thoroughly dried.

Sweet Potatoes.—It is important that the tubers for storing should be fully matured. This is ascertained by breaking a few and leaving them exposed to the air for about an hour. If ripe, the cut surface should remain white, or nearly the same colour as when cut. If it turns black, or greenish-black they are not mature.

Sweet potatoes have been kept for six months simply packed in air-slaked lime. Being a bulky product a test was made last season by using less lime and substituting sand, in the proportion of one of lime to four of sand. The potatoes were first rolled in lime, and packed in a wooden case (not air-tight) with the above mixture. At the time of writing (January) they are quite as sound as when stored in August. To keep them fresh for a shorter period roll in lime and store in a cool dry place.

English Potatoes.—Judging by the number of enquiries received, difficulty is often experienced in keeping English potatoes—intended for seed—for an extended period. A cool, well-ventilated building with a dry floor is essential to success. The tubers should be spread out in layers (dusting with lime during the process) then covered up with either very dry sand or a mixture of sand and lime. If rotting is at all in evidence, an increased amount of lime should be used. Where the potato moth is troublesome, and sand only has been used, a thin layer of lime should be spread over the top. All spaces between the tubers should of course be filled by the sand, etc.

PRESERVING SMALL LOTS OF GRAINS FOR SEED PURPOSES.

It is well known that unless special provision has been made in the way of air-tight tanks, fumigation, etc., it

is a most difficult matter on the coast, to keep seeds such as cowpea, grain, sorghums, maize, etc., free from weevils.

It has been found that weevils cannot multiply in grain unless it contains a certain percentage of moisture. In wheat, for instance, there has to be at least 10 per cent. present. When harvested it invariably contains from 6 to 7 per cent. moisture, and is therefore weevil-proof.

A simple method of keeping the moisture content under weevil requirements is to use a vessel or container as air-tight as possible, such as a tank, petrol tin, old cream can, etc., and when storing seeds to include a quantity of freshly burned lime. In the event of the container not being insect-proof, the bags containing the seeds should be covered right over with the lime. In fact the lime can be mixed with the grain without detriment. In order to ascertain whether lime would be injurious to vitality, a number of maize cobs and grain sorghum heads were buried in partly air-slaked lime in the month of June. A vitality test was carried out in September, the maize giving 100 per cent. and the sorghums 98 per cent. germination. A further test was made at the end of December with practically similar results.

The cost of the lime used in the preservation of perishable products would be almost nil, as it can afterwards be applied to the land with, in most instances, considerable advantage.—*Journal of Jamaica Agric. Society, Vol. XXIII, No. 5.*

CROPS ON THE EXPERIMENTAL FIELDS.

By Professor J. B. HARRISON, C.M.G., M.A., Director; and R. WARD, Superintendent, Agricultural Stations.

SUGAR-CANE.

The Sugar Cane Experiments were carried on at the Experimental Fields under the direct supervision of the Superintendent, Experiment Stations.

In all 2,315 seedlings were raised. Of these 376 were possible hybrids; 76 were the product of self-fertilisation; whilst the remainder were obtained by the selection of arrows of recorded female parentage. The dry weather experienced in September and October arrested the development of the flowers and was the cause for the small number of seedlings raised.

The more important varieties crossed were:—

118 × Red Ribbon	...	145 × 4399	
118 × 95 ...	...	625 × 74	
145 × 139 Java	...	625 × 95	
145 × 625 ...	...	625 × 139	Java
145 × 118 ...	...	625 × 145	

One hundred and seven thousand and forty-one cuttings of 193 varieties of sugar cane were distributed to plantations, whilst in addition to the cuttings twelve thousand three hundred and thirty-nine new seedlings varieties raised in 1917 were supplied in plant baskets to plantations having nurseries. Of these 5,761 were ordinary selected seedlings, 1,135 were "selfed" seedlings mainly from D. 108, 118, 419, 460, and 721; whilst 5,443 were putative hybrids mainly by D. 83, 108, 118, 145, 167,

175, 419, 460, 625, 669, 721, and 732. The more important of the varieties supplied as cuttings were:—

Varieties.	Cuttings.
D 118	24,990
D 625	9,240
D 145	8,950
D 59	6,160
Green Transparent ...	5,410
D 419	5,360
D 721	3,020
D 141	2,580
D 47	2,520
Jamaica 73	2,310
D 493	2,800
D 167	2,620
D 367	2,490
D 581	2,100
D 189	1,960
D 210	1,960
D 369	1,960
D 37	1,680
D 61	1,540
D 248	1,260
6,450 B	1,260
D 98	1,120
D 71	980
D 570	600
D 12	560
D 206	560
D 32	420
D 108	300
D 40	280

RAINFALL.

The rainfall at the Botanic Gardens from January 1st to December 31st was 90·31 inches. In March and in May the precipitation exceeded 14·5 inches in each month. In July the precipitation was 10·87 inches. In December, January, June, April, and November the precipitation amounted to 9·30, 8·97, 8·85, 7·50 and 6·88 inches respectively, while in October and September the precipitation amounted to only 0·18 and 0·12 inches respectively.

South Field.—After the plant canes were reaped in June, 1917, the field was weeded and the trash relieved. Owing to the weather being unfavourable for the springing

of ratoons, the field had to be supplied twice before being forked and drilled. It was manured and later again weeded and the canes trashed.

The following were the varieties grown on this field :— D. 367, D. 248, D. 181, D. 5, D. 239, D. 59, D. 108, D. 438, D. 570, D. 648, D. 493, Green Transparent and D. 118. The last named variety is grown on the North-West and South-West plots of the field as a standard for comparison with the others.

The following shows the average yields of these varieties in tons of canes and of indicated sugar per acre, the average specific gravity and purity of the expressed juices and their contents in lbs. per gallon (hectograms per litre) of saccharose and of glucose :—

Variety.	Canes Tons per acre.	Expressed Juice.				
		Per cent. Canes.	Specific Gravity.	lbs. per gallon.		Indicated Sugar Tons per acre.
				Saccharose	Glucose.	
D 367	30·8	63·0	1·081	1·910	·057	3·47
D 248	27·8	65·4	1·081	1·843	·049	3·17
D 118	25·3	64·5	1·085	1·959	·055	2·97
D 181	27·0	63·7	1·078	1·806	·063	2·97
D 5	24·1	64·7	1 0875	2·093	·042	2·93
D 239	21·9	64·4	1·0855	2·019	·039	2·61
D 59	24·4	62·4	1·082	1·835	·104	2·58
D 108	23·1	60 6	1·087	1·965	·124	2·52
D 438	19·2	65·1	1·089	2·130	·025	2·51
D 570 ...	23·2	67·6	1·074	1·635	·075	2·42
D 648	19·1	63 6	1·084	1·944	·039	2·18
D 493	18·2	58·9	1·082	1·897	·059	1·95
Green Transparent ...	12·8	61·1	1·084	1·952	·054	1·41

The plots were either unmanured or received either 40 lbs. or 60 lbs. of nitrogen per acre in the form of sulphate of ammonia. The results of these manurings are shown in the following table:—

Variety.	Tons Canes per acre.			Tons indicated Sugar per acre.		
	No Nitrogen.	Low Nitrogen	Medium Nitrogen.	No Nitrogen.	Low Nitrogen.	Medium Nitrogen.
D 367	21·0	34·8	41·6	2·35	3·93	4·71
D 248	19·4	32·0	36·0	2·15	3·71	4·18
D 118	17·6	28 6	33·8	2·03	3·36	3·98
D 181	16·9	35·0	34·2	1·81	3·89	3·80
D 5	16·6	24·6	34.9	2 08	2·95	4·18
D 239	13·3	23·6	33·1	1·60	2·80	3·94
D 59	15·0	25 3	37·7	1·60	2·62	3·90
D 108	14·7	27·5	31·2	1·61	3·01	3 41
D 438	12·9	23·8	24·0	1·63	3·16	3·19
D 570	13·9	26·3	34·1	1·43	2·76	3 57
D 648	11·8	26·0	23·3	1·35	2·97	2·65
D 493	10·8	22 9	24·7	1·11	2·49	2 69
Green Transparent ...	7·9	15·5	17·3	0·87	1·71	1 92
Mean	14·5	26·6	31·2	1·66	3·18	3·55

It will be seen from the above table that there was a mean increase of 12·1 tons of canes, or of 1·52 tons of indicated sugar per acre due to the lower applications of Sulphate of Ammonia, whilst the higher applications gave a mean increase of 16.7 tons of canes or of 1·89 tons of indicated sugar per acre over the no nitrogen plots. As in the previous year (1917) weather conditions did not allow the higher applications of nitrogenous manures to exercise their full effects.

As in earlier years the alternate half plots of each variety were dressed with superphosphate. The results are given in the following table :—

Variety.	Weight in Tons per Acre Canes.			
	No Nitrogen.		With Nitrogen.	
	No Phosphate	With Phosphate.	No Phosphate.	With Phosphate.
D 367	20 3	22·4	39·4	37·0
D 248	18·3	21·7	35·2	32.8
D 118	16.3	20·2	32·1	30·3
D 181	15·0	20·8	36·9	32·2
D 5	15 8	18·1	26·8	32 8
D 239	12·9	14 2	29·9	26·8
D 59	15·0	15·2	31·1	31 9
D 108	14·5	15·3	29·6	29·2
D 438	11·4	16·1	25.2	22·7
D 570	10·7	20·2	31·2	29·2
D 648	10·9	13·7	24·3	25·0
D 493	9·5	13·4	23.9	23·7
Green Transparent ...	6·8	10·2	17·3	15 5
Mean	13.6	17·0	29·5	28·4

The above table shows that the mean gain by the application of superphosphate of lime to plots not manured with sulphate of ammonia was 3·4 tons of canes per acre; whilst on plots manured with sulphate of ammonia there was actually a mean decrease of 1·1 tons of canes per acre which may have been due to the application of superphosphate or more probably to the excessive amount of soluble salts added to the very impervious clay soil.

The seedlings raised in 1916 were reaped and the characters of their expressed juices were determined.

Several of the seedlings yielded a juice of high saccharine content and purity. Examples of these seedlings raised from selfed parentage are given in the following table:—

Parentage and Number.	Average weight of one cane lbs.	Per cent. of Juice.	NORMAL JUICE.						
			Specific Gravity. 30°/16·6°	Lbs. per Gallon of			Quotient of Purity.	Non-Sugar Ratio.	Glucose Ratio.
				Saccharose.	Glucose.	Solids not Sugar.			
D 12 Selfed—									
215 ...	5·3	65·5	1·091	2·193	·042	·253	88·9	9.4	1·92
1028 ...	7·1	64·9	1·088	2·110	·031	·247	88·4	10·3	1·47
305 ...	4·9	59·3	1·085	1·938	·053	·267	86·1	11·6	2·67
991 ...	7·8	66·4	1·081	1·905	·043	·252	86·6	11·5	2.26
1024 ...	6·8	62·0	1·083	1·905	·060	·289	84·5	12·8	3·15
267 ...	7·0	60·7	1·084	1·894	·063	·324	83·0	14·2	3·33
225 ...	9·5	65·8	1·080	1·874	·063	·238	86·2	11·0	3·36
992 ...	7·8	64·9	1·078	1·863	·054	·212	87·5	10·0	2·90
1004 ...	13·4	70.6	1·077	1·806	·058	·230	86·2	11·0	3.21
1018 ..	6·0	66.7	1·080	1·806	·125	·244	85·5	11·2	6·72
249 ...	7·0	62·5	1·0745	1·738	·057	·232	85·8	11·4	3·28
625 Selfed—									
1065 ...	6·3	63·8	1·060	2·004	·031	·140	92·1	6.4	1·55

The following table gives the results with seedlings of hybrid parentage:—

Parentage and Number.	Average weight of one cane lbs.	Per cent. of Juice.	NORMAL JUICE.						
			Specific Gravity 30°/16·6°	Lbs. per Gallon of			Quotient of Purity.	Non-Sugar Ratio.	Glucose Ratio.
				Saccharose.	Glucose.	Solids not Sugar.			
111 x 118—									
143 ...	6·8	63·0	1·084	1·988	·039	·254	87·2	11·1	1·96
4 ...	9·5	63·2	1·081	1·952	·032	·216	88·7	9·8	1·64
94 ...	9·5	68·4	1·080	1·941	·043	·191	89·2	8·8	2·22
46 ...	7·0	63·4	1·083	1·915	·068	·271	85·0	12·0	3·55
117	8·0	66·4	1·084	1·915	·078	·288	84·0	12·6	4·07
48 ...	9·0	68·1	1·081	1·894	·044	·262	86·1	11·9	2·32
91 ...	7·7	66·7	1·0775	1·848	·063	·198	87·6	9·4	3·41
136 ...	6·7	66·9	1·080	1·848	·063	264	85·0	12·1	3·41
2 ...	7·0	66·1	1·075	1·754	·069	·216	85·9	10·7	3·93
419 x 114— ...									
153 ...	4·0	65·6	1·086	2·030	·031	·273	87·0	11·7	1·53
37 x 118— ..									
198 ...	3·6	62·8	1·098	2·198	·109	·349	82·8	13·1	4·06
173 ...	4·7	60·7	1·087	2·084	·048	·229	88·3	9.7	2·30
165 ...	5·3	66·7	1·090	2·076	·046	·351	85·1	13·1	2·20
178 ..	8·2	65·3	1·084	1·941	·069	·271	85·1	11·9	3·55
184 ...	8·0	64·0	1·081	1·910	·060	·230	86 6	8·3	3·14
197 ...	8·1	66·2	1.077	1.822	·071	·201	87·0	9·6	3·90
419 x 118— ...									
753 ...	3·8	63.3	1·084	1·915	·061	·305	84·0	13·4	3·19
737 ...	6·1	65·3	1·078	1·910	.039	·180	89.7	8.5	2·04
118 x R.R.— ...									
783 ...	4·5	63·9	1·081	1·900	·034	·266	86·4	12·1	1·79
210 x 12— ...									
1141 ...	5·6	64·4	1·088	2·040	·100	·248	85·4	10·4	4·90
1142 ...	7·4	64·4	1·0785	1·848	·052	.238	86·4	11·1	2·81

The following table shows the characteristics of seedlings raised from uncontrolled male parentage:—

Parentage and Number.	Average weight of one cane lbs.	Per cent of Juice.	Normal Juice.						
			Specific Gravity $\frac{30°}{16\ 6°}$	Lbs. per gallon of			Quotient of Purity.	Non Sugar Ratio.	Glucose Ratio.
				Saccharose.	Glucose	Solids not Sugar			
Red Ribbon—									
436 ...	6·0	63·5	1·094	2,240	·078	·230	87·9	9·0	3·48
346 ...	8·8	67·4	1·082	1·884	·119	·225	84·6	10·1	6 32
477 ...	12·1	63·9	1·083	1·837	·156	·261	81·5	11·6	8·49
B 208—									
597 ...	5·7	68·4	1·083	1·936	·042	·276	85·9	12·2	2·17
517 ...	9·0	69·4	1·072	1·707	·076	·181	86·9	9·2	4·45
145—									
843 ...	3·6	64·5	1·090	2·214	·026	·201	90·7	8·2	1·17
972 ...	5·9	64·9	1·0895	2·130	·042	·256	86·6	10·5	2·00
823 ...	6·0	66·7	1·088	2·084	·042	·262	87·3	11·0	2·02
811 ...	3·9	62·9	1·087	2·040	·069	·252	86·4	10·7	3·38
838 ...	6·6	64·1	1·082	2·014	·034	·180	90·4	8·1	1·69
973 ...	4·3	64.4	1·085	2·009	·038	·261	87·0	11·3	1·89
848 ...	5·8	63·1	1·083	2·004	·043	·207	88·9	9·2	2·15
962 ...	5·6	67·8	1·086	1·993	·058	·283	85·4	12·1	2·91
971 ...	7·0	60·7	1·0815	1·941	·039	·235	87·6	10·6	2·01
953 ...	4·0	62·5	1·080	1·931	·042	.202	87·9	9·3	2·20
Jam. 73—									
1031 ...	4·8	67·6	1·089	2·099	·037	·278	87·0	11·5	1·76
1034 ...	7·8	67·3	1·0735	1.723	·057	·223	86·0	11·1	3·31
111—									
1041 ...	5·6	67·2	1 0915	2·162	·043	·276	87·1	11·1	1·99
1040 ...	6·5	65·4	1·083	1·946	·049	·259	85·3	11·5	2·52
1043 ...	4·8	67·8	1·085	1·9 6	·071	·311	83·5	13·5	3·69
1045 ...	8·8	68·6	1·080	1·801	·100	·274	82·8	12·6	5·55
1046 ...	7·1	64·9	1·078	1·801	·644	·284	84·6	13·3	2·44
1054 ...	8·6	70.1	1·077	1·759	·076	·259	84·0	12·4	4·32
1055 ...	8·0	70·3	1·074	1·738	·043	·235	86·2	11·7	2·47
1051 ...	9·1	71·0	1·073	1·712	·050	·228	86·0	11·1	2·92
4397—									
1057 ...	5·9	66·0	1·081	1·868	·081	·251	84·9	11·4	4·34
721—									
1070 ...	5·5	68·2	1·086	2·094	·028	·212	89·7	9·1	1·34
1087 ...	9·5	63.1	1·077	1·879	·031	·184	89·7	8·8	1·65
1069 ...	4·6	66·2	1·080	1·962	·036	·177	90·2	8·1	1·84
1078 ...	8·2	71·7	1·073	1·718	·057	·215	86·3	10·8	3 32
G. Trans—									
1089 ...	6.7	64·5	1·088	2·167	·023	·198	90·7	8·3	1·06
1094 ...	6·6	66·0	1·087	2·151	·031	·179	91·1	7·6	1·44
1115 ...	8·6	68·1	1·086	2·111	·036	·188	90·4	8·1	1·71
1090 ...	7·4	66·4	1·084	2·061	·042	·178	90·4	7·8	2·03
1091 ...	8·5	63·3	1·084	2·056	·041	·184	90·1	8·1	2·00
1102 ...	7·6	68·8	1·083	2.014	·063	·177	89·4	7·9	3·13
1092 ...	7·5	68·4	1·082	2·004	·057	·167	90·0	7·5	2·85
1098 ...	6·2	68·7	1·080	1·952	·035	·188	89·8	8·6	1·79
1110 ...	6·2	68·7	1.079	1·905	·041	·201	88·7	11·8	2·15
1114 ...	6·4	66·7	1·077	1.842	·035	·217	88·0	10·4	1·90
1113 ...	7·1	68·2	1·0,7	1.801	·056	·237	86·0	11·3	3·11
1111 ...	8·6	68·8	1·075	1·775	·058	·209	86·9	10·2	3.27
1112 ...	9·3	69·8	1·072	1·723	·071	·170	87·7	8·7	4·12
1104 ...	10·9	70·0	1·073	1·702	·100	·188	85·5	9·4	5·88
625—									
1137 ...	6·4	66·7	1·0775	1·837	·047	·225	87·1	10·7	2·56
1136 ...	8·5	68·2	1.078	1·816	·064	·249	85·3	11·7	3·52
1125 ...	9·8	65·4	1·077	1·816	·049	·229	86·7	10·9	2·70
1127 ...	7·7	69·1	1·077	1·801	·063	·230	86·0	11·0	3·50
1133 ...	7·6	63·9	1·076	1·801	·069	·198	87·1	9·6	3·83
1123 ...	11·0	63·6	1.073	1·733	·048	·209	87·1	10·5	2·77
1122 ...	9·1	67·1	1·072	1.707	·046	·211	86·9	10·7	2·70
1134 ...	7·3	65·3	1·071	1·707	0·48	·183	88·1	9·4	4·46
1126 ...	13·3	67·8	1·070	1·603	·083	·224	83·9	11·7	5·18
118—									
1150 ...	10·5	66·7	1·073	1·733	·031	·226	87·1	11·4	1·79
1165 ...	4·3	64.7	1·082	1·952	·048	·228	87·6	10·2	2·46
419—									
1162 ...	6·7	67·5	1·080	1·926	·053	·196	88·6	9·0	2·75

58 per cent. of the canes of selfed parentage which on account of their cultural characters were selected for analytical examination proved to be of high potential value on account of the characters of their juice, whilst of the similarly selected hybrid canes, 70 per cent. had the same characteristics. 52 per cent. of the canes of uncontrolled parentage were of exceptional value, but as only 21 of hybrid parentage were obtained suitable for examination, whilst 12 canes of selfed and 56 canes of uncontrolled parentage were similarly obtained, the value of raising canes from selfed and from uncontrolled, although selected, parentage, proved higher than that of raising hybrid canes.

The following shows the results of the trials :—

	No. Selected.	Sugar Contents. High.	Exceptionally high.
Hybrids ...	21	14	1
Selfed ...	12	5	2
Uncontrolled ...	56	19	10

These results confirm those detailed in the reports for 1915, 1916 and 1917 and shew that the method we have followed since 1901 of raising seedlings in considerable numbers from canes of high vegetative vigour and taking advantage of the great tendency of the sugar-cane towards wide variation in saccharine content, which content appears to be one of the more fixed characteristics of a seedling, is of equal if not of higher potential value than is either raising canes of selfed parentage or hybrids from parent canes of well-marked saccharine strength.

The total area in sugar-cane cultivation in the Colony during the autumn crop of 1918 was 73,565 acres; a decrease of 4,781 acres on the area occupied by the crops of 1917. For the crop of 1919, 66.528 acres are under canes on sugar plantations with an estimated area of 1,500 acres planted by cane farmers, or a total of 68,028 acres, showing a decrease of 5,537 acres on the area occupied by

sugar-cane in 1918, and 10,318 acres on that of 1917. These heavy decreases are solely due to labour difficulties.

The following table shows the area occupied by the principal varieties of canes under cultivation on sugar plantations for the crops 1919 :—

Variety.	1918 Acres.	1919. Acres.	Increase.	Decrease.
D 625	36,000	34,142	...	1,858
Bourbon	4,950	3,465	...	1,485
Bourbon mixed with other varieties	7,800	7,806	6	...
D 145	5,920	4,667	...	1,253
B 208	4,550	3,601	..	949
D 109	320	388	68	...
Diamond 185	1,120	930	...	190
Green Transparent	1,320	1,131	...	189
D 118	2,710	2,676	...	34
D 419	1,370	1,675	305	...
Java seedlings J 100	302	381	79	...
,, ,, others	328	126	...	202
B 147	110	186	76	...
D 167	140	138	...	2
D 4399	46	13	...	33
B 6450	43	58	15	...
Diamond 37 ... ... —	89	106	17	...
B 376	350	394	44	...
D 4397	17	29	12	...
B A 6032	56	112	56	...
B H 10 (12)	...	34	34	...
D 216	116	83	.	33
D 179	49	63	14	...
R P 1	72	72	...	...
R P 8	429	485	56	...
R P 21 ... — ...	79	97	18	..
R P 23	77	77	...	...
R P 73	121	150	29	...
D 418	.	47	47	..
D 199	47	42	...	5
	68,531	63,174	876	6,233

The following table indicates the relative distribution of the various kinds of cane during the crops of 1916, 1917, 1918 and 1919 :—

	For Crops of			
	1916	1917	1918	1919
D 625	49·1	48 2	47·9	46·2
Bourbon	12·0	9·4	6·4	4·7
D 145	8·0	7·9	7·7	6·3
B 208	7·9	6·4	5·9	4·8
Mixed Bourbon and seedlings principally D 625	7·0	5·4	10 2	10·6
D 109	2·3	1·1	·4	·5
Diamond 185	2·1	1·8	1·5	1·1
Green Transparent	1·8	1·9	1·7	1·5
D 118	1 2	2·1	3·5	3·6
D 419	·5	1·6	1·8	2 3
Java seedlings	...	...	·8	·7
Providence 8	...	...	·5	·7
B 376	...	...	·4	·5
Other varieties unenumerated ...	8·1	14·2	11·3	16·5
	100·0	100·0	100·0	100·0

From the returns supplied by the sugar plantations the distributions of the various sugar-canes in cultivation for the crops of 1916, 1917, 1918 and 1919, according to their origin are as follows :—

	1916	1917	1918	1919
Bourbon and other old varieties ...	17·2	16 7	13·0	13·1
Java	·3	·4	·8	·6
Barbados	9·2	7.1	6 7	5·9
British Guiana (Pln. Diamond and Providence .. Botanic Gardens)	2·6	2·7	2·6	2·6
	70·7	73 1	76·9	77·8
	100·0	100·0	100·0	100·0

The average yields in tons of commercial sugar per acre of the principal varieties under cultivation for the crops of 1918 as deduced from the returns sup-

plied by the Managers of the sugar plantations were as follows:—

Varieties of Sugar Cane.	No. of Plantations reporting.	Areas in acres.	Tons Sugar per acre.
Green Transparent	7	472	2·03
D 118	16	1,754	1 87
D 145	19	2,322	1·87
D 419	8	464	1·83
D 167	6	100	1·78
Mixed*	13	6,259	1·76
Java varieties	2	313	1·76
D 625	30	22 538	1·65
Bourbon	17	3,185	1·61
Diamond 185	4	914	1·60
D 109	6	269	1·47
B 208	9	3,453	1·37

*Principally Bourbon and D 625 with some D 109, D 145 and B 208

The results of large scale field-trials with other varieties on the sugar-plantations are shown in the following table:—

Variety.	Acreage.	Yields.
D 216	4	3·64
D 246	1	3·25
D 433	7	3·00
Diamond 581	5	3·00
B H 10 (12)	3	3·00
D 721	19	2·74
D 179	27	2·57
B 3412	48	2 55
D 651	14	2·52
R P 6	5	2·27
B 3922	17	2·16
D 199	37	2·15
R P 21	72	1·98
R P 73	113	1·94
R P 23	73	1·91
Diamond 37	62	1·88
Ba 6032	17	1·88
R P 8	291	1·85

The export of sugar for the year 1918 was 93,901 tons, a decrease of 20,106 tons on that of 1917. The total export of rum was 2,614,481 proof gallons or 801,440

gallons in deficit of that of the previous year, and 1,772,354 gallons of that of 1916. 208,262 gallons of molasses were exported during the year, but by far the greater proportion of it was used in the preparation of rum. The export of molascuit was 2,754 tons.

The following table shows the actual productions of sugar as reported by the Planters' Association and the amounts exported during the years 1911 to 1918 :—

	Sugar—Tons.		
	Produced.	Exported.	Home Consumption or in Store.
1911	108,175	98,453	9,722
1912	86,410	77,821	8,599
1913	106,211	87,414	*19,217
1914	116,622	107,138	9,484
1915	119,091	116,224	2,867
1916	114,292	101,650	12,642
1917	108,181	114,407	...
1918	107,560	93,901	13,659
	108,317	99,576	8,741

* Including sugar destroyed by the 1913 fire in Charlestown.

The local consumption of sugar, was in round figures during the period 1911 to 1918, 8,000 tons a year.

The Insect Pests of the Sugar Cane.—These are reported on as follows by the Economic Biologist :—

"*Sugar Cane.*—During the year the status of the "various pests of sugar-cane was not greatly changed. "On some estates the control of the Moth Borers "(*Diatraea's*) was facilitated by the intelligent handling "of collected egg masses of these moths with a view to "obtaining parasites therefrom. This particular part of "the control work has decided possibilities and it is not "improbable that a thorough investigation will establish "it as a superior control method to the popular practice "of 'cutting out' the dead hearts of canes attacked by the "Borer. Such an investigation will be undertaken by this "Division as soon as practicable. It is evident that re-"search work of this kind is badly needed as the small "Moth Borer still retains an unchallenged position at the

"head of the list of important pests of the sugar cane in "this country.

"The quality of the control work performed against "insect pests on the various estates varied but little from "previous years. There are a few well marked exceptions "where keenness is displayed and excellent work exe- "cuted; the majority, however, regard this important "phase of the cultivation of the sugar-cane with but "mediocre interest.

Marasmius Sacchari, the cause of the "root disease" was present in scattered parts of several plantations. Of other diseases the "ring-spot" (*Leptosphaeria Sacchari*), the "rind-fungus" (*Melanconium Sacchari*), and the "leaf-sheath fungus" (*Cercospora Virginae*) were present but did not cause any appreciable damage to the crops of 1918. The weather conditions which prevailed during the year as during 1917 were favourable to the growth of the plant, and hence the sugar-cane was resistant to the attacks of parasitic fungi.

RICE.

The return of the area under rice in the colony was 60,433 acres, an increase of 2,343 acres over that of 1917; but as two crops were taken during the year on parts of the East Coast of Demerara as well as on the Essequibo Coast, the total acreage reaped was 69,815. The crop was an average one resulting in 36,921 tons of padi equal to 590,740 bags of 140 lbs. of padi and equivalent to 23,735 tons or 295,370 bags of 180 lbs. of rice.

The exports of rice and rice-meal during 1918 amounted respectively to 7,963 tons and 66 tons.

The experiments with different varieties of rice were continued at the Experimental fields. As in the previous years varieties of proved value were planted in the

North Field on duplicated $\frac{1}{2}$ acre plots. The following yields were obtained :—

Selected varieties including strains.	Bags of 140 lbs. per acre.
No. 75, Strain 7*	32·0
Demerara Creole	31·0
No. 75, ...	30·6
No. 75, Strain 6	30·6
H 6 Strain 1	30·2
H 6	29·3

The yield, like that of 1917, was considerably below the average of previous years. During the period of fourteen years during which trials with these varieties have lasted, the mean results have been as follows :—

Variety.	Bags per 140 lbs. per acre.	Creole taken as 100.
H 6	32·7	102·2
No. 75	32.6	101·9
Demerara Creole	32·0	100·0

Whilst the Creole rice in recent years as the result of careful seed selection has shown a steady increase in yield, the variety H 6 is now giving somewhat lower returns than during earlier trials.

The duplicate and quadruplicate trials of certain varieties and strains in $\frac{1}{16}$ acre plots were continued, the Demerara Creole being employed for the comparison of yields. The trials gave the following results :—

Variety or strain	Bags of 140 lbs. per acre.
Demerara Creole, specially selected ...	25·5
Demerara Creole, Strain 2	30·3
No. 75, Strain 4	33·8
No. 75, Strain 2	30·1
No. 75, Strain 1	30·6

*These strains selected several years ago showed certain characters which differed from those of the parent. They have, on continued cultivation, reverted to the parent type.

In this series of trials carried on over 5 crops, the average yields compared with those of specially selected Demerara Creole padi taken as 100 have been :—

No. 75, Strain 2	...	...	119.1
No 75, Strain 4	...	...	117.8
Demerara Creole, Strain 2	...	...	116.4
No. 75, Strain 8	...	...	110.8
No. 75, Strain 1	...	...	99.0

Trials were also made in this series with a variety—Blue Rose—obtained for us from the United States by the kindness of Mr. Chamberlain, the Consul for that country. The Blue Rose is reported to be in the Southern States an exceptional heavy yielder of high class padi. It produced an average of 15.7 bags of padi as compared with 25.5, the average yield of the Creole. It is probable that under continual cultivation and careful selection the yield of the Blue Rose padi will improve.

Other varieties of padi were planted late in July, 1918 and reaped in July 1919, No. 75 being used for comparison. As is characteristic of late planting padi at the Botanic Gardens the yields were low. The yields were :—

			Bags of 140 lbs. per acre.
1. No. 75	...	...	19.5
2. Hybrid 37	...	...	25.5
3. „ 33	...	...	22.3
4. „ 35	...	...	17.3
5. Boeloe	...	...	34.8
6. Sapanet	...	...	25.0
7. Surinam Creole	...	...	24.5
8. Berbice Creole	...	...	17.9
9. Kiudjo Rank	...	...	16.1
10. Radin	...	...	14.6
11. Nga Kyank	...	...	13.9
12. Ketan Ileu	...	...	13.6
13. Baw ejut	...	...	11.8
14. Lantap	...	...	8.9
15. Kunchor	...	...	7.1
16. Carolina Golden Grain	...	...	6.1

Of these, Nos. 1, 3 and 4 were locally produced hybrids, Nos. 5, 6, 9, 10, 11, 12, 13, 14 and 15, varieties introduced by the late Mr. Bancroft from Malaya, whilst 7, 8 and 16 were varieties we have had long under cultivation.

During the year, upwards of 7¾ tons of seed padi were sent out from the fields at the Gardens; and of this amount somewhat more than 2¼ tons were sold to farmers whilst about 5½ tons were distributed free to small growers in lots of 30 lbs. and 60 lbs. to each. This padi should have sufficed to plant about 400 acres.

The question of the influence of tillage upon the yields of rice irrigated by artesian water continues to receive attention. Half the land under trial received two ploughings at intervals of about 6 weeks, the other half being ploughed once only just previous to the planting of the rice. The results were as follows:—

	Padi Bags of 140 lbs. per acre.	
	Two "Ploughings."	One "Ploughing."
No. 75 ...	24·3	20·9
Demerara Creole	22·5	19·0
Mean	23·4	19·9

The additional "ploughing" or forking costing in normal times about $6. per acre followed by six weeks' exposure to the air resulted in an additional yield of about 3½ bags of padi or an increase of 17 per cent. on the crop. This result supplementing that of 1917 when the excess yield produced by the double forking was 34 per cent. is a decisive one:—Irrigation with anærobic artesian water to give full returns *must* be accompanied by satisfactory æration of the soil.

The results of all the trials with artesian water may be summarised as follows:—

Period.	Crop.	Yield per Crop.
1913-16 ...	7 crops in 3 years.	21·6 bags
1917 and 1918...	3 crops in 20 months.	
	double forking.	27·6 „
	single forking.	22·8 „

Taking the total yields and comparing them with the yields using Lamaha water during the same period we get:—

Bags of 140 lbs. padi per acre. Artesian water bags per acre.		Bags of 140 lbs. padi per acre. Lamaha water bags per acre.
3 years 1913-1916.	(7 crops) 151·2	(3 crops) 108·6.
20 months 1917 and 1918.		
Double forking	(3 crops) 82·8	(2 crops) 63·3.
Single forking	„ 68·4	

In some of the earlier years of the experimental cultivation of rice at the Botanic Gardens, using Lamaha water for irrigation, two crops of padi per year were raised. The average yields of the two crops were approximately 48 to 50 bags of padi per acre. Three crops of padi per acre amounting from 72 to 75 bags of padi could have been obtained during the 20 months' period of 1917 and 1918 by this system. The yields of padi obtained by irrigating with artesian well water with double forking or thorough cultivation compare favourably with this.

There cannot be any doubt as to the suitability of artesian well water for the irrigation of rice; whilst it is now certain that to obtain full crops using this water it is necessary to till the land so as to fully aerate it prior to planting the padi. Artesian water is not quite as suitable for rice-growing as is Lamaha water or bush water being practically free from nitrogenous matters of which the latter carries a relatively high burden. It is on the other hand at least as well suited for rice-growing as rain-water, the only water naturally obtainable in the non-irrigated districts of the colony. It is probable that artesian water, obtained by tapping some of the upper aquifers as well as the deeper ones as suggested in the report on the artesian well in 1914, will be very well suited for rice cultivation, and certainly far better suited than is the exceptionally pure water flowing from the D'Urban Park well.

The results hitherto obtained do not indicate that growing rice solely by irrigation with water yielded by artesian wells of relatively small bore—the D'Urban Park well has now only an effective bore of 6 inches, that of the internal strainer—can be regarded as a business proposition. But where the artesian water is used as auxilliary to the irrigation of rice by other but insufficient methods, it may become of high value. To make rice-growing by irrigation with artesian well water successful from a business point of view, various engineering questions will have to be considered such as the most economically effective bore of the casing and especially the storage of the artesian water during periods when it is not required for irrigation. Economical and effective modes of storage of the water during such periods may prove to be the key to the situation the problem has been more or less satisfactorily solved in the Southern States of the United States, and there does not appear to be any valid reason why it should not be placed on a similar position here.

Owing to the depletion of the staff of the Botanic Gardens the experimental artificial hybridisation of rice was not continued during the year.

The manurial experiments in the North Field were on the same lines as on previous years; and the absence of any beneficial effects on the padi production by the application of nitrogenous manure was similar. It only increased the luxuriance of the vegetable growth with the result that plants were early laid.

From 1903 to 1917 the area under cultivation in rice in British Guiana increased from 17,503 British acres to 58,090. During the year under review the acreage was 60,432 acres, an increase of 2,342 acres on the acreage reported for 1917. Spring and Autumn crops were raised on 9,366 acres, the total area reaped being thus increased to 69,798.

The rates of yields per acre reported from the districts vary widely. The following table illustrates this:—

	Bags of Padi of 140 lbs. per Acre		
	Empoldered Lands on Sugar Estates.	Other Lands.	All Lands.
Pomeroon River	...	12·6	12·6
Essequibo Coast, Spring Crop... ...	10·0	...	...
,, ,, Autumn Crop ...	20·3	...	...
,, ,, Both Crops, average...	30·3	17·1	20·9
Essequibo River	...	14·7	14·7
East Demerara	18·7	10·3	13·3
West Demerara	22·2	7·6	8·3
Mahaica-Abary District	...	11·8	11·8
Berbice...	21·4	4·9	7·1

During the two crops of 1918, 69,798 acres were planted with rice, the yields on them being reported as being 590,740 bags, (140 lbs.) or 36,921 tons of padi equal to 295,370 bags (180 lbs.) or 21,800 tons of cleaned rice. The average yield per acre was by far the lowest ever reported in British Guiana.

This disastrous result was largely due to late planting for the autumn crop of 1918 with subsequent exceptional weather conditions. The rainfall during January and February, 1918, was somewhat lower than the average, being 12·88 inches as compared with 15·46. During the planting season, March, April and May, the weather was normal, 36·92 inches of rain being recorded at the Botanic Gardens as compared with the average fall of 37·14 inches. June was a dry month, 8·70 inches of rain falling in place of the average of 11·82 inches. July was practically normal, with 10·12 inches of rain as compared with 10·68. August was entered into with a deficiency of over 3 inches of rain. During the first three weeks of August only 3·72 inches of rain fell. A period of intense drought commenced on August 24th and continued until November 17th, a period of 12 weeks during which the precipitation of rain amounted only to 1·20 inches. Whilst padi planted in May and due for cutting in October suffered from the relative dryness of June, July, and the earlier weeks of August, and from the intensity of the drought at the end of

August and during September; padi planted in June, and as much was, in July and even in August was either very greatly injured by the intensity of the long drought or as occurred in several areas in the Corentyne District of Berbice, was practically destroyed.

The gradual extension of the rice industry is illustrated in the following table, which gives at five-yearly intervals the areas in British acres under rice in the counties of the Colony and the total yields of padi and of rice in long tons :—

Period.	Mean rainfall Coastal Stations Calendar year.	Are under Rice Cultivation, Br. Acres.				Yields of British Guiana.		
		Berbice.	Demerara.	Essequibo.		B. Guiana Total Acreage.	Padi, Tons.	Eq'l to tons (6 o/o yield of cleaned Rice from Padi.)
				Mainland.	Islands.			
1898 ...	49·9	4,874	1,592	...	308	6,778	6,374	3,824
1903 ...	99·2	8,684	4,951	3,676	1,001	17,712	17,701	10,620
1908 ...	99·1	16,893	13,862	5,042	3,941	39,746	50,010	33,006
1913 ...	89·6	8,752	19,422	3,936	2,472	35,582	43,170	25,902
1914 ...	73·6	16,491	22,264	4,009	4,273	47,037	66,268	39,760
1915 ...	86·3	18,443	22,122	6,244	3,928	50,737	65,700	39,420
1916 ...	89·3	19,183	28,998	4,769	4,072	57,022	67,001	40,200
1917 ...	89·7	19,387	29,979	4,615	4,037	58,090	70,067	42,040
1918 ...		35,704	16,084	5,117	3,527	60,432	36,921	21,800

The relation of the rice-growing industry to the sugar-cane and other agricultural industries of the Colony during the period 1903 to 1918 is summarised in the following table in which the areas occupied by the various industries are given in British acres :—

	Sugar Cane.	Rice.	Other Products.	Total areas under cultivation.
1903	78,860	17,503	21,442	117,805
1908	74,865	39,746	33,356	147,967
1913	72,698	35,582	43,832	152,072
1914	73,108	47,037	49,389	169,534
1915	75,744	50,737	49,888	176,369
1916	78,346	57,022	51,117	186,485
1917	77,828	58,090	55,762	191,680
1918	73,565	60,432	63,890	197,887

FIVE MINUTES CHAT WITH FARMERS.

By Rev. Eric R. O. Robertson.

The Editor has requested me to write a few words. I have to do this hurriedly because of the pressure of other duties.

It is most important that the rice farmers should sow their crops in time and I am afraid that there is hardly a farmer from Mahaica to Corentyne who does not dream or talk "rice" this month. You will forgive my hurry when I assure you that my work just now is to help the farmers as much as I can to sow their seeds in time. The rains are expected in a week or two and man, beast and machinery, are endeavouring to make secure the food supply of the country. I am a hopeless optimist. I do not believe in failure, only in success. I believe in prosperity, not in poverty and I am always attracted by the bright side of things. I keep the shadows behind so you must not be surprised if in the first of the series of chats I have with you, I point out the change which has come over our calling. Everybody agrees that Agriculture is coming to its own. That is an admission for which we ought to be devoutly thankful. But more than this is the fact that we are being looked upon as the bulwark of the State and its chief security against anarchy and red revolution. It would be terrible to contemplate what would happen to the people of this country if we so neglected our cultivation as to decrease the food production. The pillars of the State would crash and tumble. Every acre, therefore, put in cultivation, helps to strengthen confidence in the State and to build up its material prosperity. Every rice or cane crop is an insurance policy effected against Bolshevism and the farmer is the agent who issues the policy. Our patriotism is unquestioned and our loyalty is sincere. It is difficult I know, in the face of these things, to account for the lack of sympathy farmers meet with, the apathy of the general public towards those questions which are so important to the farming communities, and the ignorance of our legislators of the

conditions and difficulties of our calling and the anxiety of the Government to do nothing to forward or advance Drainage or Irrigation schemes. The reason was not in our stars but in ourselves. The politician, the Government, the general community, took the farmer at his own valuation. His pauperized appearance, his failure in his calling, his poverty, indeed everything about him, proclaimed him a nonentity and a failure. He believed implicitly in this himself. He lost ambition and hopes, and fell and in his fall published his ruin, depreciated his calling. The public listened and believed him and he reaped what he sowed.

SOAKING SEEDS.

It has been held by scientists that soaking seeds such as peas, beans and corn—seeds with large grains—in water, previous to planting, showed an increased yield. Only enough water should be used to cover the peas, and it does not harm them if they get dried a little afterwards so long as they are not thoroughly dried. We have done this regularly with peas and beans for garden purposes and several times with corn for field purposes to hasten the growth when rain was due and evidently coming but holding off when all arrangements were made for planting. A week or more could thus be saved thereby. If the seeds are soaked in an excess of water too long it will do more harm than good; they should only be soaked sufficiently to become swollen. This is generally not more than 6 hours.

—*Journal Jamaica Agricultural Society.*

BOTANICAL NOTES.

SOME INTERESTING SPECIES OF PALMS.

Chrysalidocarpus Glaucescens, Waby, *Sp. Nov. Hort. 1919.*—Stems 6 - 7 inches in diameter with wide-spreading bases 9-12 inches wide. The bases like overturned bowls, the stems springing from the centre. Leaves 8-9 feet long, petiole 2 feet, standing semi-erect, the ends curving over gracefully ; leaflets alternate in two regular rows, semi-erect, set about an inch apart, 2 feet long, 2 inches wide, tapering. Spadices springing from between the lower leaves, compound, drooping, 4 feet long, spreading 3 feet, secondary branches 7-9 inches long, crowded with tiny *white* flowers Fruit, greenish yellow on ripening, elliptical, $\frac{5}{8}$ inch long, $\frac{1}{4}$ inch thick, The whole plant glaucescent, without a particle of lutescence except the tinging of the ripe fruit, The rings on the stems are more pronounced and wider apart than on the stems of *C. lutescens*; the foliage is of the same form but larger, as also the spadices,

There are four plants of this particular form growing within a short distance of each other, with several *C. lutescens* near by, evidently all planted as being the same species, in a Public square in Port-of-Spain, Trinidad, belonging to the City Council of Port-of-Spain. The plants of both kinds are of a similar size and age, bearing their first spadices, and shew plainly their differences. The largest plant of the new species has two stout stems with swollen bases, forked just above the ground, exactly like the forking of the "Doum Palm, *Hyphaene* ; three stout stems with swollen confluent bases crowded together but not forked; one single short stem younger and rather smaller than the others, two stems which have been cut out, and two others just springing. The other three plants have no forked stems but the bases of all the stems are widely swollen like those of the larger plant and crowding on each other.

DIFFERENCES OF THE TWO SPECIES.

C. Lutescens has a yellowish tint all over the plant especially in the midribs and spadices.

C. glaucescens is glaucous in every part except the fruit.

C. glaucescens has large stems with large swollen bases.

C. Lutescens stems are much smaller without swollen bases.

C. glaucescens has large foliage and larger spadices, the flowers *white* and the fruit pale yellow.

C. Lutescens flowers are yellow and the fruit intensely yellow.

I have sent a description of this species to the Royal Gardens, Kew. With regard to its being a new species. Sir David Praim, the Director of the Royal Gardens, comforts me with the fact that Dr. Beccari, the Palm Specialist, has already designated 14 species of this genus, so it may turn out to be one of them. However, herbarium material is being sent to Kew for determination and we shall learn later how the matter stands.

Since finding these plants in Port-of-Spain I have come across another large specimen which is probably the parent of these at a place named Dabadie, a plant nursery some few miles in the country. It is doubtful if this will solve the question of its introduction as the place has changed hands many times during the past several years.

J. F. W.

THE NECESSITY FOR CO-ORDINATION OF EFFORT IN WEED CONTROL.

In the April 1918 issue of this Journal attention was drawn to the "Congo" Weed.

The late Government Botanist advised digging the plant up wherever it appeared and burning it.

The following article taken from the Bulletin of the Department of Agriculture, California, should be a means of drawing attention of agriculturists to serious economic losses which can be traced to lack of weed control.

The ability of weeds successfully to persist and thrive in direct competition with other plant life is known too well by agriculturists.

Notwithstanding these great losses visited upon the farmer through the medium of weeds, but little active work, until recently, has been done toward eradication.

Weeds intrude themselves always where they are least desired and the various mediums through which they are introduced to new localities would read like fiction. They are introduced as impurities among other seeds and may carry the spores of fungus diseases; through the feed and excretions of travelling stock and horses from other states; by the flight of birds; or borne on the crest of flood and irrigation water; in trucks and railroad cars in which stock has been carried; on the hoods and tops of transcontinental trucks and automobiles; in manure, chaff, hay and threshing machines.

In order successfully to cope with the weed problem, a knowledge of the life history and habits is most essential, for while an "annual" may be completely eradicated in a given locality by destroying it before it matures and perfects its seeds, a "perennial" may not be so eliminated.

Persistent cultivation may destroy thousands of tiny seedling weeds, but it is not always possible to devote the necessary time and labour to this end. Certain chemicals have been recommended from time to time as efficacious weed destroyers, but many have their own peculiar disadvantages.

Plants of the thistle variety may be propagated anew through a small fragment of the root, each capable of producing another plant.

It is now becoming known more generally the great vitality and resistance of our common weed seeds, and most of them in their horny seed coats lie dormant in the moist soil, until some action brings them near enough to the surface to receive the benefit of the warm sun and air, which encourage germination. Experiments in England tend to show that weed seeds buried for periods as long as sixty years, are still viable and will germinate upon being brought to the surface.

Naturally the most reasonable method of weed control is suggested in the destruction of the seed crop, either mechanically with tools or by hand-pulling, and much valuable time would be saved by piling the wilted plants with combustible matter and destroying by fire, aided by a little oil if needed.

The proper time to destroy annuals and biennials by mowing is just before the blooming period, as the roots are then less vigorous.

Weed control, under present conditions, may be secured only by persistent, energetic work, and if land owners would co-operate, much could be done toward the successful accomplishment of the task.

Every farmer should exercise caution to prevent weeds and weed seeds from spreading from his own ranch or farm into clean and uninfested country.

This may be accomplished best through concerted action and promptness in destroying new outbreaks of noxious weeds as soon as they appear. To neglect a given weed pest means proportionately greater loss when it reaches a point where necessity demands its removal.

An educational campaign involving weed destruction conducted as a part of school work throughout the state not only would have value in imparting a knowledge of botany which all should know, but would go a great way toward the eradication of many alien weed pests which contribute so largely to preventable economic losses of today.

A REVIEW OF THE WORK OF THE BRITISH GUIANA SUGAR PLANTERS EXPERIMENT STATIONS COMMITTEE FOR APRIL, MAY AND JUNE, 1920, WITH AN ACCOUNT OF THE OPENING OF THE SOPHIA STATION BY HIS EXCELLENCY THE GOVERNOR.

At a meeting of the British Guiana Sugar Planters Experiment Stations Committee held on Monday, 19th April 1920, the Chairman reported the arrival of Mr. Jas. Crabtree, M.Sc., F.I.C., and introduced him to the meeting. The agreement between the Committee and Mr. Crabtree was thereupon duly signed.

The Chairman notified the members that permission had been granted by the Lamaha Committee for a bridge to be erected across the Lamaha Canal. The erection of an inlet koker at Sophia was also sanctioned. At this meeting a tender by contractor J. D. Greenidge for erecting the manager's office at Sophia was accepted. The Chairman referred to a letter he had received from the Department of Agriculture, Jamaica, relative to the Mosaic disease of sugar cane. It was agreed that the mycologist and Mr. Crabtree should direct their attention to this matter.

The Chairman read a letter from the Secretary of State, submitted to him by the Governor as to the conditions regarding veterinary affairs in this colony. At the present time there is only one British trained veterinary surgeon here and the meeting requested that in the reply to the letter attention should be called to the great need for more professionally trained veterinarians in the colony. The Superintendent promised to investigate the methods of mechanical tillage at present in use on the estates with a view of suggesting improvements therein.

At the meeting held on the 10th May, Mr. Crabtree's notes on the Mosaic disease were laid over. It was agreed to have these printed in the form of a leaflet for distribution to the various estates. The committee were informed

that permission had been granted by His Excellency the Governor for the Superintendent to use the offices of the Board of Agriculture in the course of his work. The Superintendent notified the Committee that he had visited several sugar plantations during the past month.

On the 12th May the Committee paid a visit of inspection to Sophia Station. They expressed satisfaction with the progress which the Field Manager, Mr. J. P. Bastiaans had made in clearing the land and trenches. They also inspected the manager's office, the erection of which was nearing completion. The Committee considered that the building of the bridge over the Lamaha should be proceeded with as soon as possible as the land was nearly ready for planting.

At a meeting on the 14th June, Leaflet No. 1 on the Mosaic Disease was circulated. It was decided that the leaflet be republished in the Board of Agriculture Journal. Attention was drawn to the differences in the figures of the acreage returns sent in by the Estates (Form A) and those supplied to the Department of Lands and Mines and in the Government Agricultural Census returns. This in part was due to the returns being given in Dutch and British acres respectively.

It was decided at this meeting to invite His Excellency the Governor to formally open the Sophia Station on the 21st June.

On that date His Excellency the Governor Sir Wilfred Collet, K.C.M.G., opened the Sophia Station in the presence of a large and representative gathering of planters, officials, and other prominent colonists. His Excellency opened the new bridge over the Lamaha and planted the first tops and young plants of seedlings canes on the Station. The Hon. Prof. J. B. Harrision addressing those present said that he found from records of the Department of Agriculture that the earliest proposals for the establishment of Experiment Stations were made in 1885 when Messrs. Wm. Russell, and G. S. Jenman and Professor E. E. H. Francis formulated them, but nothing was done for years. In 1890-91 an attempt was made, Messrs. Howell

Jones and Quintin Hogg assisting. This attempt failed, but the small field was planted at the top of the Botanic Gardens in which the research work with Sugar Canes had been carried out for many years. In fact 80 per cent. of the area at present under cane cultivation in the Colony is in canes of varieties first raised in that small field. Another effort was made in 1905 but without success. In 1912 several leading sugar estate proprietors and planters in the Colony, among whom were Messrs. A. McConnell, C. S. Parker, A. Campbell, B. H. Jones, R. G. Duncan, Cecil Morris, W. M. B. Shields, E. R. (now Sir Edward) Davson, E. Crum-Ewing and others drafted a scheme which was worked out to a considerable extent but unfortunately things happened which caused its postponement. Great interest was taken in and support given to the scheme at the time by Sir Charles T. Cox who was then the Officer Administering the Government. From time to time the matter was discussed and about two years ago a renewed attempt took place. The leading members in this were the Hon. R. E. Brassington, Messrs. R. Strang, W. M. B. Shields, J. C. Gibson, A. E. Bratt, and A. E. Craig, who were backed by the various sugar proprietors who had been educated during the 35 years from 1885 to agree to support the stations, they went further than the original proposal and expressed their desire that several stations should be established. There had always been the danger, and it was that danger which had ruined the earlier attempts, that some of the proprietors after joining would find reasons for not continuing and so they very wisely combined and asked the Government to introduce an ordinance to prevent them giving effect to possibly changed minds. The ordinance enabled the proprietors to tax all land under sugar cane and thus they tied themselves up tightly. The larger proprietors suggested that it would be unfair to the small cane farmer with only a few acres to make him pay any assessment. The Government therefore arranged that the assessments of cane farmers should be paid from the general revenue. After the ordinance was passed, the Committee whose names he had mentioned worked out the scheme. They visited Sophia in January

last and under the guidance of Mr. R. Ward walked through what was then dense bush or forest on the spot where His Excellency had just planted the young canes They had a hot and thirsty time. The place was one vast overgrown swamp. The land had not been cultivated since 1892 when Mr. Bastiaans was acting manager of Pln. Bel Air. The Committee was fortunate in getting him to return to his old life and be the first manager of the present Station. It was to be regretted that Mr. Crabtree, the scientific Superintendent of the Station, was ill and hence unable to be present. His Excellency the Governor had taken very great interest in the scheme and so had Mr. Clementi whilst recently administering the Government. The acting Attorney General made the short ordinance in which he tied up every sugar planter as securely as possible to pay not more than one dollar for every acre the latter had under sugar cane cultivation to carry on the work.

His Excellency then declared the Station open and in so doing said that it must be a satisfaction to Sir Charles Cox to know that he at any rate of all the various administrators at one time or another who had had to do with that scheme, had been able to see it in actual operation. He thought they all congratulated him especially and themselves in general that the event had taken place.

Sir Charles Cox said when Professor Harrison asked him to attend, the Professor accused him of being the godfather or the wetnurse of the scheme. However that might have been he knew that Professor Harrison was both its father and mother. It was not the first of the measures which he had known the Director of Agriculture to devise and bring to a satisfactory conclusion or the beginning of the conclusion. It was not the first thing Professor Harrison had done for the benefit of the Colony and he, Sir Charles, was glad to have lived to see the station started. He wished it every prosperity and hoped Professor Harrison's efforts would be crowned with success.

Professor Harrison then moved a vote of thanks to His Excellency who in turn called for three cheers of congratulation for the Professor which were heartily given.

SEEDLING CANES UNDER CULTIVATION ON SOPHIA STATION.

During the fortnight ending 16th July, one hundred and fifty six seedlings were transplanted from baskets in which they were grown from seed sown in 1919, obtained from variety D. 12. A like number of selfed seedlings from parent D. 118 were also planted out.

In addition to these, a number of varieties have been extended on Sophia from tops obtained from the Botanic Gardens Experimental Field. The following table gives the names or numbers of those varieties which have been extended to date and the year in which they were produced or introduced.

Variety.	Year Introduced	Variety.	Year Produced.	Variety.	Year Produced.
G. Trans ..		564	1910	673	1913
Cayana ..		20	1911	683	,,
Prata ...		9	1913	686	,,
Rosa ...		49	,,	689	,,
Jamaica 71..	1911	51	,,	690	,,
,, 72..	,,	60	,,	695	
,, 73..	,,	88	,,	705	,,
Java 139..	1912	103	,,	708	,,
,, 228..	,,	107	,,	717	,,
,, 247..	,,	114	,,	734	,,
	Year Produced	127	,,	735	,,
		133	,,	739	,,
		140	,,	742	,,
145	1890	224	,,	747	,,
625	1892	262	,,	760	,,
181	1901	320	,,	779	,,
438	,,	329	,,	782	,,
493	,,	335	,,	785	,,
570	,,	402	,,	874	,,
581	,,	413	,,	887	,,
108	1902	426	,,		
118	,,	458	,,		
419	,,	503	,,		
460	,,	511	,,		
239	1903	524	,,		
248	,,	562	,,		
12	1904	566	,,		
59	1905	575	,,		
100	1908	600	,,		
141	,,	652	,,		
64	1909	662	,,		
437	1910	663	,,		
461	,,	667	,,		
492	,,	671	,,		

PLANT DISEASES AND PEST NOTES.

LEAFLET No. 1.

BRITISH GUIANA SUGAR PLANTERS' EXPERIMENT STATIONS COMMITTEE.

Mottling, Yellow Stripe or Mosaic Disease of Sugar Cane.

A serious epidemic of cane disease has been raging in Porto Rico for several years and is causing heavy losses, the damage occasioned to date being estimated at $2,500,000.

The disease has been referred to under a variety of names, the above now being the more usual. It is essentially a leaf disease and is characterised by a mottling of the leaves. It follows approximately a three years course; in the first year of its occurrence isolated stools appear irregularly over the fields and may comprise from 1 to 5% of the total: at this stage the only symptom is the discolouration of the leaf, the stalks of the affected plants being indistinguishable from normal plants; in the second year, a much larger percentage of infection is present, and in addition to the mottling, a dwarfing of the stools may occur causing a loss in yield of from 10 to 60%. There is always a decided shrinking of the cane between the joints. In the third year the crop (second ratoons) is usually an almost total loss, due to the combined effect of dwarfed stools, dry pithy stalks and lack of juice. Endeavours to determine the nature of the disease have so far proved unavailing. Experiments demonstrate that soils, fertilisers, liming, treatment of tops, manner of disposal of trash or moisture content of soil have no direct influence. The disease is transmitted by "tops" from affected plants but is spread also by other means not yet apparent. Aerial infection through the medium of insects is suggested. Infection does not occur through the soil. There appears to be no immune variety though some are more resistant

than others. Control at present lies in the use of disease free tops and the elimination of diseased cane stools. The same or a similar disease has been recorded in other parts of the West Indies, South America and Hawaii for many years, but does not appear to have reached the degree of virulence attained in Porto Rico. Nevertheless it is desirable that no risks be incurred of a spread of the disease in this Colony and planters are requested to keep a sharp look out for plants bearing the characters described below, and in the event of any such being suspected, to communicate at once with the Superintendent of the Sugar Planters' Experiment Stations.

Symptoms.

The one marked and constant symptom and the one by which it is easily recognised is the peculiar mottling of the leaves. These are marked with numerous very light yellow-green to nearly white spots and short stripes. The background varies from normal green in plants only recently attacked to a yellow green in more severe cases. The markings producing the mottled effect are always much lighter in colour, giving a decided contrast. They are irregular in shape varying from points to irregular spots about $\frac{3}{4}$ inch long with indefinite margins. They will at times constitute 50% or more of the total leaf surface. The midrib remains normal to all appearances. Mottled leaves do not die or fall from the stalk any sooner than normal ones, nor is there any tendency to adhere unduly to the stalk. There is no difference in size of leaves until dwarfing of the stool commences. The cane itself is to all appearances normal. The dwarfing of the stools and shrinkage of the cane in the later stages have been referred to above. In some varieties, brownish oval shrunken lesions or "cankers" appear on the cane joints in the second year.

RATS AND MICE.

DESTROYERS OF GRAIN AND FOOD.

C. GORDON HEWITT,

Dominion Entomologist and Consulting Zoologist.

The brown rat is the worst pest with which man is afflicted. Both this rat and the house mouse came to North America from abroad; possessing habits adaptable to almost any kind of environment, and feeding upon all kinds of animals and vegetable matter, they have increased and spread over a vast area. In Canada they have not yet spread over the greater portion of the prairie provinces, but in their gradual migration from the east they have now spread over Southern Manitoba, and as the west becomes more settled their destructive hordes will certainly extend further afield, menacing especially the grain interests.

Destruction of Food.—Their destructive powers are well known. No kind of grain is spared, whether growing or stacked in the field, stored in the granary or elevator, transported by rail or water; everywhere they take an enormous toll of this chief source of our food supplies, the conservation of which is a paramount necessity at the present time. Never have the destructive powers of mice been so strikingly demonstrated as in Australia during 1917. Owing to the lack of transportation, vast quantities of grain destined for export have accumulated in New South Wales and Victoria. A plague of mice developed, and the destruction of grain has been enormous. We are informed that in some places the ravages of the mice were so great the huge stacks of grains were reduced to what resembled mere heaps of debris in a few months. The Wheat Board of New South Wales organised a campaign of destruction; in one place the catch for two nights totalled seven tons of mice. While this outbreak was exceptional, it serves to show the destructive powers of these small creatures in the mass.

The brown rat invades houses, stores, warehouses and markets, and besides destroying fabrics of all kinds and

leather goods, it attacks all kinds of food-meats, groceries, fruits, vegetables. In town and country it attacks poultry, destroying eggs and chickens. The foundations of buildings are damaged by their activities, and everywhere they destory unceasingly, and yet we tolerate their presence.

In Europe it was estimated, after a full enquiry in 1907, that the average annual loss caused by each rat in Great Britain equalled 1·80, in France 1, and in Denmark 1·20. The losses in rural districts in Great Britain and Ireland in the same year were computed to be seventy-three million dollars, and a capital of about ten million dollars was employed in the industry of supplying means for their destruction. In 1904, the losses in France were computed at forty million dollars. At the present time the English Board of Agriculture is making special efforts to combat the rat pest in England as a means of saving food supplies, and the Sanitary League in France is also carrying on a vigorous campaign against rats.

Recently Mr. E. W. Nelson, Chief of the Biological Survey of the United States Department of Agriculture, has estimated that the annual losses in the United States due to rats equal at least 200 million dollars. He also states that in order to feed and otherwise provide for this enormous destructive army of rats, the labour of 200,000 men is required annually.

Menace to Health.—Besides the enormous destruction of food supplies, the brown rat is a serious menace to public health. It is a carrier of bubonic plague, one of the most devastating of human diseases, which has been carried by the rat all over the world. In the fourteenth century it is estimated that about twenty-five million people died in Europe from the "Black Death" as this disease was called and 2,000,000 deaths are stated to have occurred during the epidemic of the plague in India in 1907. Bubonic plague is transmitted from rats to human beings by fleas, and modern methods of preventing the spread of plague involve the most vigorous eradication of rats, and the prevention of their landing in sea-ports from ocean going vessels by which they are transported.

Investigations into the recent outbreak of infantile paralysis (Poliomyelitis) which was especially prevalent in the eastern United States, have indicated that the rat may be an important factor in the spread of this disease.

Prolific Habits.—The serious nature of the menace is more keenly appreciated when their prolific habits are realized. The brown rat begins to breed when it is about three or four months old; they breed from six to ten times a year, and produce, on the average, ten young in a litter. If we imagine a pair of rats breeding at this rate uninterruptedly for three years without any deaths to their progeny, at the end of that period the number would have increased from two to over 350 million rats.

Mice produce fewer young in a litter, but they bring forth their families with astonishing rapidity.

HOW TO PROTECT GRAIN FOOD, AND OTHER STORED PRODUCT FROM RATS AND MICE.

The main reason for the abundance and destructiveness of rats is that we provide ample food and shelter for them. To combat these pests successfully we must deny them both these essentials. We must starve them out and build them out.

They should be denied access to places where they obtain food and rear their young. To accomplish this, buildings should be made rat-proof; and the best method of construction for this purpose is concrete.

In the construction and maintenance of buildings in which food is kept and rats are likely to find lodgment, special attention should be paid to the closing of all apertures especially in foundations where drain and other pipes enter. Doors to such buildings should be bound with strong sheet metal. Constant vigilance should be exercised with a view to checking any inroads of these pests; the holes of rats or mice can be readily stopped by a little concrete or broken glass or crockery. Cement should be used for foundations of all kinds of storehouses, granaries, poultry houses. Corn cribs can be rendered ratproof by inclosing them in heavy galvanized wire netting of half-inch mesh. Storerooms should always be made rat-

proof by the adoption of the foregoing constructural methods.

So long as old buildings and storerooms are maintained in a state of disrepair, rats and mice will flourish and destroy their contents. It is not only in the interests of private economy, but as a national service, that owners of such rat-infested buildings should take immediate steps to "build out" the rat and save food supplies. Everywhere destruction is proceeding, and everywhere there is greater need than ever at the present time for the saving of every bushel of grain and every pound of food.

Civic authorities and particularly the health authorities should adopt and enforce sanitary conditions in towns and cities. Cleanliness and the prevention of the accumulation of refuse and garbage are essential in the eradication of rats. The maintenance of garbage dumps is one of the greatest contributing causes to the abundance of rats. From all points of view the immediate incineration of garbage is the only proper treatment and method of preventing the increase of rats and the breeding of flies, those unsurpassed agents in the spread of our worst infectious diseases.

HOW TO DESTROY RATS AND MICE.

Trapping.—One of the most effective methods of destroying these pests is trapping. The best traps are those of the spring or guillotine type. Such traps may be baited with any of the baits preferred by these animals, such as meat, oatmeal, cooked eggs, or fruits. It is necessary to use a large number of traps, the more the better. The wire cage traps are excellent when rats are abundant.

Poisoning.—Where there is no danger of food becoming contaminated or of other animals eating the bait, poisoning is a speedy method of destruction. But naturally the greatest care must be exercised in the use of poison. In destroying rats and mice in houses it is inadvisable to use poison, not only on account of its danger, but the occurrence of the inaccessible corpses

these animals is likely to prove objectionable Barium carbonate is a cheap tasteless, and odourless poison. It may be fixed in a dough composed of four parts of meal or flour and one part of the poison, or a stiff dough of eight parts of oatmeal and one poison. The poisoned dough should be placed in the runways of the animals. Strychnine is a well-known and rapid poison, usually used in the form of strychnia sulphate. The dry crystals of this chemical are inserted in baits, such as meats or cheese. With oatmeal or grain, such as wheat or corn, it is used in the form of a syrup which is made by dissolving half an ounce of strychnia sulphate in a pint of boiling water; a pint of thick syrup is added, and the whole mixture is stirred thoroughly. Oatmeal should be moistened with the syrup, and grain should be soaked over night. Arsenic is used in most rat poisons. It may be fed in the form of powdered white arsenic, used as described above. A good bait is prepared by thoroughly mixing a pound of oatmeal, a pound of coarse brown sugar, and a spoonful of arsenic. This is placed in the runs of the animals. Phosphorus is a common ingredient of rat and other animal poisons, but owing to the danger involved in mixing it and in the subsequent use of the home-made or commercial preparations on account of its very great inflammability, its use as a rodent poison is not recommended.

THE VALUE OF DOMESTIC AND WILD ANIMALS AS RAT DESTROYERS.

The great value of small terriers as ratcatchers is too well known to need emphasis They are often used in connexion with the ferrets, the latter animals being employed to drive the rats from their runways. But ferrets should always be muzzled when hunting.

While weasels are regarded as "vermin" and enemies of chickens and young game birds, there is no doubt that as rat destroyers they have few superiors. When they can secure rats, they will usually leave the chickens unmolested.

Among the active natural enemies of rats and mice around farm buildings, snakes occupy an important place

and this fact should be realized. Only our species of Canadian snake—the rattlesnake—is poisonous ; our other native snakes are not only harmless but are useful as destroyers of rats, mice and other pests, and they should, therefore, be protected.

In country districts, farmers should protect owls, the greatest of mice destroyers ; and many of the hawks are valuable as destroyers of noxious rodents The continued destruction of these natural enemies of rats, gophers and mice has been largely responsible for the increase in the numbers of these food-destroying rodents, and it is important that the valuable services of these birds should be recognized.

Organized Destruction.—In England excellent results have been obtained by the co-operative efforts of farmers and others in the destruction of rats, and such organized destruction is essential if results of real value are to be obtained. The offer of prizes and bounties by local authorities has been found to stimulate efforts. In many cities and towns the local authorities, and organizations have promoted rat destruction, and it has been successfully stimulated by educational work.

We would urge the various organizations in cities and towns, and farmers' and women's institutes in rural districts, to undertake educational work with a view to arousing public opinion as to serious losses caused by these pests, and to promoting campaigns for their destruction.

Rats and mice are destroying millions of dollars worth of food in Canada at the present time, when the conservation of food is a duty that devolves upon every one. The more food we permit the rats to destroy, the less there is for us and our kinsfolk across the sea to eat. Never was the need of saving food supplies a greater necessity; never was the need of the most relentless campaign against these food destroyers. Eradicative measures should be prosecuted with the greatest vigour wherever these pests occur, whether on the farm or in the city.—*Farmers' Journal, Vol. No. 26.*

POSSIBILITIES OF FARMING ON THE BANKS OF THE BERBICE RIVER.

By J. M. Cush, District Instructor.

I paid my first visit of inspection to the farms up the Berbice River on the 12th August last, and was pleasantly surprised at the size and quality of the ground provisions I saw, although they were not properly grown or selected.

In my opinion the soil is suitable for almost everything that can be grown in the colony.

Any two or three men with strong minds and healthy bodies, can make a first-class living up the Berbice River. First, in clearing land for farming there will be found mora and other woods that can be cut and sold for ton wood at any of the plantations or New Amsterdam, if not it can be burnt into charcoal and sold wholesale to speculators in New Amsterdam. Crabwood is also plentiful; it can be squared and floated down the river to the saw mills and sold at 18 to 20 cents per cubic foot.

When free of wood and properly drained the land produces bountiful crops. The recognised ground provisions of the colony are growing at their best on the banks of the river.

The Berbice River District seems to be the home of the cacao plant, for it thrives well without disease or many insect pests. It bears early and produces many large pods. Coffee also thrives and bears well.

It is possible for thousands of dollars to be made from the large areas of fertile land in this district. There is a public road leading from New Amsterdam to Mara, a distance of twenty-five miles, with ample locations for the

prospective farmer. Land can be had for the asking or very little rent. The right men can get financial assistance until they can help themselves. On the left bank there are also good locations where the new farmer can make good from the time he starts. Such places as Fern, Deliftie, Lusintruss, Berestyne, Horse Sterting and several others are good starting points. The location is unlike many other farming districts where the crops were put in too late, too early, washed away by floods, dried up by the sun, or are being destroyed by wandering herds, on account of poor lands all run to vines, tops, straw, smut, or cobs as the case may be. Every farmer who follows the rules of good farming makes a good crop.

Poultry and swine raising can be successfully undertaken. A piggery or poultry farm will make ample profit for the investor.

The future of the Berbice River District is beyond the imagination of many of our colonists. In the past nearly every farmer's boy took an oath that he will never cultivate the soil. As soon as he reaches the age of twenty-one he leaves the desolate and dreary farm and rushes to town or city, the gold fields or balata bush. If he completes the public school's course of study he thinks he has too much education for the farm, therefore he wants to be a clerk, or a professional man, in fact anything to avoid the farm, but to-day I find many intelligent young men starting farms up the Berbice River. They are beginning to realise that the only independent people of the world are the good tillers of the soil. The farmers up the River are to live in better houses, they are to make their farms more attractive, and intend to raise more fowls and hogs. When you visit the farms you will be welcomed with flowers and greeted with trees loaded with fruit.

Everything will be kept in order. The farmer will be able in the cool of the evening after a hard day's work to take a seat under the trees amid the perfume of flowers surrounded by his family, then and only then will he know how to enjoy life.

We hope soon to see this district thickly settled with industrious people, as it has very good soil for farming, conveniently situated, and owned by the Government, that promises the greatest return for the least labour.

The farmer will visit his neighbour, exchange thoughts, read good books, and keep abreast with the advanced thought of the day. He has more time than the mechanic or merchant. If he is not well informed it is his own fault.

Books are reasonable in price and every farmer can have enough to give him the outline of every science and an idea of all that can be accomplished by man. It is being felt daily in our colony that it is a thousand times better to be a farmer than anything else; it is better to till the ground and work for yourself than to be hired by corporations. Every man should endeavour to belong to himself.

In the Journal of the Jamaica Agricultural Society under Stock Notes, it is advised to keep a box of charcoal or wood-ashes before your pigs or put a handful of each in their food. It is the best condition powder you can use. A good mixture to put in the food is an equal mixture of charcoal, wood-ashes, salt and sulphur. The dose is a handful. Where pigs are kept in pens, fling in half-burned sticks and some pieces of turf or tufts of grass torn up by the roots. The pigs will enjoy turning these over and routing through them.

The following Order issued by the Governor of Guam should be of value to manufacturers of copra :—

It has been found after experimenting that one hundred (100) pounds of meat of ripe coconuts will produce about sixty-five (65) pounds of first class copra when properly dried, for which the producer should receive at least **three (3) cents* a pound, making the value one dollar and ninety-five cents ($1.95) cents.

The same weight of coconut meat taken from unripe nuts will produce about fifty (50) pounds of poor quality of copra worth about two (2c.) cents a pound, making the value about ($1.00) dollar or about half the value of well dried copra made from ripe nuts. So much poor quality of copra has been produced in Guam that the copra made here has a poor reputation in the outside market.

Coconuts in the husk may be stored for months if kept clear of the ground and dry. Coconuts thus stored are better for copra than coconnts when they first fall from the trees.

The real gauge of the value of copra is its condition upon arrival at destination. Most of the copra from Guam goes to San Francisco and has to be in the hold of a schooner for fifty (50) to sixty (60) days. None but first class copra can stand such a trip without undue deterioration.

The deterioration in copra is caused chiefly by containing too much water, due to not being properly dried; being made from unripe nuts, when the copra contains too much free fatty acid; or by getting wet during the curing. Any of these conditions cause rapid deterioration of copra when stored in bulk. Even a small amount of poor copra mixed with good copra will cause rapid deterioration in the whole cargo.

The shrinkage in Guam copra after purchase has heretofore averaged about fifteen (15%) per cent. It should be in the neighbourhood of five (5%) per cent.

*About 8 cents at present.

The following instructions are issued in regard to making copra:—

1. None but ripe nuts should be used.
2. All copra should be well dried before being stored or shipped.
3. Copra dries more quickly and uniformly if cut in strips not more than one and one-half (1½) inches wide.
4. After April 1, 1920, every copra producer should have a drying shed suitable to his needs. Community sheds for small producers are recommended. All copra should be dried on ventilated frames well clear of the ground and must be protected from rain, salt water and dirt.
5. A copra inspector will be appointed who will be authorised to inspect copra wherever found at any time, and who will inspect all copra before exportation.
6. On and after January 1, 1920, it will be unlawful to export any but first class copra which is defined as copra made from ripe nuts, well dried, brittle and free from dirt and other foreign matter and which is not rancid, badly moulded or badly discoloured. In case of a typhoon or other disaster special instruction will be issued.
7. The penalty for exportation of any but first class copra, except by special permit, will be a fine not to exceed one thousand (1,000.00) dollars.

NOTES ON A COLLECTION OF PRESERVED DRY FRUITS AND SEEDS—*Continued.*

By J. F. Waby.

Inflorescence of the "Traveller's Tree, or Palm" of Madagascar, Ravenalia madagascariensis.—My specimen is the finest in my collection, a magnificent object, and the largest I have seen. Inflorescence triangular, 2 feet 6 inches high, with a spread at the base of 3 feet 6 inches, composed when mature of hard, woody, boat-shaped, sharply pointed bracts, in distichous tiers, each pair of bracts shorter than the ones below, the top pair measuring 2 feet across. The inflorescence springs from between the leaves about one-third up the assemblage of leaves and not from the apex as is usual in this class of plant. The fruit, of which there are many in each bract, is a triangular capsule of hard woody texture, 3 or more inches long, 1½—2 inches across, dehiscing in 3 valves adhering at the base; the seeds are black, ½ inch long ⅜ inch wide, fairly hard, embedded in a dark blue floss-silk-like aril. The flowers are composed of 5 petals, pale yellowish green, 6-7½ inches long lanceolate, ½ inch wide, tapering, pointed, with a number of filiform stamens 4-5 inches long, curling at the tips, anthers tiny; the pistil 6-7 inches long, strong and tense, with a stigma ½ inch long. The flowers spring from the centre of each bract, 7 or 8 in number, enclosed in a small boat-like bract. The foliage is in distichous arrangement so that the plant is quite fan-shaped. The leafstalks close together, clasping each other presenting a flat surface on each side, and so tightly clasping that they can hold water at the bases, thus giving the plant the name of "Travellers' tree"; travellers in the forests where they grow indigenously are able to obtain drinking water by piercing the bases of the leafstalks. Petioles 4-6 feet long, rounded, 1½ x 1¼ inches diameter; leaf blades 6-8 feet long, 2-2½ feet wide, glaucous green, like stiff plantain or banana leaves, rigidly semi-erect, splitting freely by the force of the wind;

midrib channelled, ribs parallel, fairly close. The generallity of the plants produce but one stem, some however have several stems forming a group, the mature stems measuring 9-10 inches diameter, old plants reaching a height of 25, 30 or more feet. I am indebted to the authorities of the Trinidad Botanic Garden for the privilege of describing this inflorescence. The plant is common in Trinidad and flowers freely. Although there is a fair number of it in Demerara it has never yet bloomed. This plant here described is closely allied to the Plantain and Banana, but in these the inflorescence is terminal, springing from the apex of the stem, thus determining its life. The same obtains in the second species of Ravenalia, *R. Guianensis*, a much smaller species,—very much like the Manilla hemp plant. In this plant the silk-floss-like aril in which the seeds are imbedded is of a bright red colour.

Sterculia fulgens, from Malaya. The inflorescence of this tree is the most peculiar of all I have met, the specimens include the inflorescence or at least part of it. The greater number of the sterculias produce what are known as follicles, i.e.. pods which dehisce by one suture only, the seeds attached alternately on each side, most of the pods gouty; exceptions are: *S. alata*, the seeds of which are grouped together in the centre attached to the dorsal suture each seed winged; and the fruit of the colaut tree, *S. acuminata* which is a large pod with a tense skin which splits open shewing the large angular nuts filling the whole skin closely packed together like a box of toy bricks or the seeds of the crab-wood tree, *Carapa guianensis*. The one under description is entirely different as will be seen by the following description. The inflorescence is a large terminal panicle, the flowers cup-like $\frac{1}{2}$ inch deep and as much across, with 5 acute lobes, reddish brown. The pistil in the centre is $\frac{1}{2}$-$\frac{3}{4}$ inch long, quite stout, on which a small square platform is formed; from this arises a set of thick yellow floral bracts with a $\frac{1}{2}$ inch stalk and a blade 3 inches long, ovate-spathulate 1-$1\frac{1}{4}$ inches wide at the widest part, narrowing to a blunt point $\frac{1}{4}$ inch wide, slightly curved, midrib plain, veins running from the edge to centre, netted between. The strangest

thing in the whole construction is that the fruit, a bean-like object,—$\frac{1}{2}$ inch long, $\frac{3}{8}$ inch diameter, is fixed on the edge of the bract, $\frac{3}{4}$ inch from the stalk, in some, one on either side of the bract, this is at first yellow turning brown, when the fruit dries it is netted all over. The bracts form in ones, twos, threes, fours and fives, when more than two they stand up like shuttlecocks. This is undoubtedly the most extraordinary inflorescences ever seen, which appears covering the whole tree when it is quite bare of foliage. Leaves large, palmate, with three deep lobes, 9 inches across and deep, 5 main ribs radiating from the base and several straight veins across, others meeting in between; leafstalks stout 9-10 inches long. The seed and the fruit are identical, a thin skin filled in with a nut-like substance. A medium sized deciduous tree. Specimens from Trinidad Botanic Gardens.

The "Queensland Sour Plum," *owenia acidula*.—The specimens are the "nuts" on the hard cases under the skin of the fruits. Fruit purplish black, more or less circular or triangular depressed, $1\frac{1}{4}$-$1\frac{1}{2}$ inches diameter, 1 inch thick. Skin thick covering a layer $\frac{1}{4}$ inch thick of edible pulp of a sourish taste. The centre is filled up with a hard woody stone, practically square with slanting sides, base $\frac{5}{8}$ inch square, top 1 inch square. Foliage pinnate of $3\frac{1}{2}$ pairs. leaflets unequal sided, 4 inches long, $1\frac{3}{4}$ inches wide. Inflorescence a small axillary panicle with very small yellowish flowers below the last formed leaves. A small well shaped tree with dark green foliage and strong branches. Specimens from the Botanic Gardens, Georgetown.

The "Chapotte," *Lucuma deliciosa* of the West Indies.—The specimens are the seeds. Fruit spherical, 3 inches long, $2\frac{3}{4}$ inches diameter, much like a large sapodilla or small mammee apple, brown, slightly rough with a tough skin, soft when ripe. The inside filled with an orange coloured pulp with the smell and taste of the sapodilla, though not so good, in which is embedded one seed on one side of the pulp, $2\frac{1}{2}$ inches long, $1\frac{1}{4}$ inches thick, boat shaped; the case of the seed is hard, of a dark polished brown, but absent from one third of its looking

as if it had been deliberately removed. The seeds are used as a condiment, being grated like the nutmeg. Inflorescence solitary on naked branches just below the leaves. Foliage fairly large in vesticills of 10 or more leaves at the points of all the branches, obovate, leathery, 7-8 inches long, 3-3½ inches wide, dark green above, silvery beneath, veins distinct and regular below the leaves. A medium sized tree with straight stem and rough bark, branches strong and wide spreading, all the foliage on the surface. Specimens from the Trinidad Botanic Gardens.

The "Ceara Rubber," *Manihot Glaziovii*, specimens the seeds. These are of a bright speckled brown, ½ inch long, $\frac{7}{16}$ inch wide, flattish front, rounded back, hard, looking like large "cattle ticks." The fruit is a tricoccus woody capsule, ¾ inch long ⅞ inch diameter, with a thin skin which splits into 6 pieces and the capsule into 3 valves, dehiscing with a sudden cracking noise, ejecting the seeds. Inflorescence a short terminal panicle between the young growths. Flowers ⅝ inch long and of a similar width, greenish grey, purplish inside. Foliage palmate, with 5 lobes cut to within an inch of the centre, 8 inches deep and 12 inches across the basal lobes; the leafstalk strong, entering the leaf an inch from the base. Veins prominent, whitish, upper surface green, under surface milky green. A tall slender tree with a white stem and rough scaly bark, flaking off in large pieces; branches straggling, brittle. Specimens from Botanic Gardens, Georgetown.

"Devils Claws," *Mastynia*, two kinds, *M. diandra*, from New Spain. The fruit 1¾ inches long, ¾ inch wide, with a thick soft grey covering and a short beak; when ripe the skin peels off showing a dark coloured hard-woody object curiously marked, which splits down the centre, the beak forming into 2 short sharp claws; the seeds small, escaping through the slits.

M. Proboscidea, an American species. Fruit 1½ inches long, an inch wide, with a beak 3 inches long, also covered with a soft grey woody skin pealing off when ripe, showing a dark polished object curiously marked. This also

splits down the centre and the beak forms 2 long sharp horns, ends curved downwards; the seeds small, escaping through the slits. These are both small soft-wooded shrubs with soft flannelly foliage, the first with pretty red tubular flowers 2-3 inches long, and in the second the flowers are pale blue. Specimen from Georgetown Gardens.

"The Nunewah," "Niniwah," "Vegetable Sponge," "Wash Rags," "Strainer Gorind," "Loofah," *Suffa Cylindriac*, imported from India and naturalized in the West Indies, always to be found where East Indians are settled. The fruit a cucumber-like capsule, 12-15 inches long, 2-2½ inches diameter, cylindrical, smooth, with longitudinal lines all round, dehiscing by the breaking away of a small cap at the end. The skin is thin and tender, peels off easily, disclosing a yellowish fibrous netted mass, with an inner cone in 3 sections, containing innumerable black flat cucumber-like seeds which easily shake out when ripe. This fibrous cucumber-like mass is the commercial "Loofah" one sees on sale in shops in Europe and is extensively used for cleansing purposes in the bath; by cutting out the triangular cone a splendid washing glove is made, and used with soap and water makes quite as useful an article as flannel. It is often seen made into hats and ornamentel baskets, and wall-pockets, the cones being used to form handles and divisions. When young and tender the fruit is used as a vegetable and in curries by the East Indians, though it has a slightly bitter flavour. There are two kinds, known as the white and the black, the latter being larger and of a much darker green than the former. A strong growing soft-wooded climber with large salver shaped yellow flowers and 5 pointed palmate foliage.

The "Ghingee", *Suffa Acutangula.*—The fruit of a similar size to the "Nunewah" is cylindrical also, but with sharply defined longitudinal corrugations creating furrows all round. Similar in growth, flowers and foliage, is edible when young without the bitter flavour of its congener, is far preferable and more delicate, has been

sought for as an appetizing dish to tempt the appetite of weak patients. The skin of this is more tense than that of the other and peels off in short flakes, the fibrous material is much stronger and more durable so much so that it has been made into soles for slipplers.

A third species, the "Sat-puteah" or "Five fingers," *Luffa Satputeah*, is very scarce and as far as I know is only grown in very small quantity on the East Bank, Demerara River, only very occasionally to be seen in the market. Though similar in growth to the other two species it is not nearly so strong. The fruits are much smaller, being only 4 or 5 inches long and grow in bunches up to five fruits, hence the name. It is of as good quality as the "Ghingee." Specimens from Georgetown.

The "Jamaica Walnut," *Picradercia Asboncum*. The fruit roundish, green, $1\frac{1}{8}$-$1\frac{1}{4}$ inches diameter; seeds covered with a thin skin, splits into two halves similar to the ordinary Walnut, with 2 divisions, the substance very bitter. Infloresence axillary on the young growth, small, solitary, one small flower to each axil. Foliage trifoliolate, oblong, 3-$3\frac{1}{2}$ inches long, $1\frac{3}{8}$-$1\frac{1}{2}$ inches wide, pale green, A medium sized tree with a compact head. Specimens Trinidad Botanic Gardens.

Jacaranda ovalifolia plicifolia or *caerulea*, of South America, known in Demerara as the "Wakenaam Lilac." These three species are so much alike that their differences are by no means plain to the uninitiated. The fruit is very much alike in all of them with probably a little difference in size though not much. A thin woody silicula, 2-$2\frac{1}{2}$ inches long, $1\frac{1}{4}$ inches wide, rounded at base, the point short and sharp dehiscing as soon as ripe into 2 flat valves, with numerous small flat winged seeds attached to the centre of the valves, no replum. Inflorescence axillary in short compact panicles. Flowers purplish with a white throat, campanulate, flattish, $1\frac{3}{4}$-2 inches long, lip $\frac{3}{4}$-1 inch wide. Foliage bipinnate, over a foot long, fern-like, pinnae in 14 or more pairs set regularly $\frac{5}{8}$ inch apart, pinnules in 13 or 14 pairs very small, close together, an odd one larger than the rest at the point. A medium sized tree, main branches straightish,

secondaries bushy, brittle. The flowers last by a few days, but a tree in full bloom is a beautiful sight and the ground becomes covered with the fallen flowers. Specimens from Gardens.

The "Water Chestnut," or Water Caltrops *Trapa natans* a hardy annual of Europe. Specimens the fruits. These are like a Bull's head quite hard with two stout sharp horns, some straight, some curved, dark brown, $2\frac{1}{2}$ inches across the horns, $\frac{5}{8}$ inch thick; tops of the head with a hole in it through which the seeds presumably fall. Specimen given from Canadian Museum.

Some winged fruits—*Securidacca*. The fruit, a small pointed knob at the base of a one-sided parchment like wing 2 inches long, the widest part $\frac{1}{2}$ inch wide, numerous, indehiscent. The inflorescence is terminal on all the long shoots, in most cases a huge compound of panicles, the branches of each panicle racmose, 7-9 inches long; the inflorescence anything from 2-6 or more feet long and spreading on either side from 1-2 feet, a very beautiful sight when in full bloom. There are several species of this genus, West Indian and South American, varying only in the colour of the flowers to a novice, from pale variegated pink, through various shades to a deep purple, but all with similar fruit the flowers might easily be mistaken for Leguminose at first sight, indeed they are very similar and about the same size as ordinary bean flowers. The foliage is simple, ovate, dark green, $2\frac{1}{2}$ inches long and $1\frac{7}{8}$ inches wide, bluntly pointed, arranged alternately on long slender shoots, looking like long pinnate leaves. The plants are strong climbers and twiners growing up any trees or bushes near them, making a grand show in the wild bush. It is not often seen in cultivation, presumably because it is a wild plant, but it is very desirable grown in a group or on a palissade. Specimens from Georgetown and Trinidad.

I once found a white flowered sport in the bush a the back of the Botanic Gardens; thinking what a splendid addition this would make to our collection I had the branch layered. But unfortunately for this venture I

went on 6 months leave of absence, and when I returned I found my instructions had been disregarded, the bush had been allowed to smother my plant, the layers had been neglected and consequently died, and worse luck, the white flowers were never seen again.

Petrea. Fruit a 5 winged parchment-like capsule—which is the persistent Calyx and Ovary,—1¼ inches across, like a 5 pointed star, wings less than ¼ inch wide, enclosing a small single Verbena-like seed ; the Corolla in the centre about ½ inch wide, falling early. Infloresence racemose, terminal, 9-12 inches long. Foliage in pairs, shining dark green, rough, 4-5 inches long, 2 inches wide, lanceolate or oblong acuminate, entire, veins prominent. There are several species and varieties, varying from pure white, to the deepest purple, passing through all the shades between these two. Most of them are strong climbers and twiners, the growth generally of long-reaching shoots, but all however can be pruned to form large shrubs. Whatever the shade of colour this plant developes they are truly beautiful objects in full bloom. One species must be singled out as different to the rest *P. asborea.* It grows in an erect form with no long-reaching shoots, making a handsome pyramidal small tree ; each of its short branches crowded with short purple racemos. The foliage of this is rather smaller than that of the others, but all the species agree in the form of fruit. Specimens Botanic Gardens, Georgetown and Trinidad.

Banisteria Ciliata. The "Kaieteur flower". Fruit a samaroid or winged fruit, something like that of the Securidacca, i.e. A small knob at the base containing one seed, though generally several together, with parchment-like wings 1 inch long ⅜ inch wide, oblique. Infloresence a large terminal panicle ; flowers bright yellow in the form of those of the Barbados Cherry, *Malpighia Glabra,* and as large; calyces ciliate. Foliage in pairs, elliptical, 4 - 4½ inches long, pointed, 2 - 2½ inches wide, the base clasping, fairly thick, the leaves close to the panicle very small, all ciliate and with blunt points below the actual end. A small climber, a beautiful object when in bloom. It is called the "Kaieteur flower" because the late Mr. Frank

Fowler is said to have brought it from the region of the Kaieteur Falls, though it was not unknown before. Specimens from Georgetown.

The "Queensland Nut," *Macadamia ternifolia*, as its local name denotes is indigenous to Australia. The fruit is round with a decided blunt point, an inch in diameter, with a tense green skin $\frac{1}{8}$ inch thick, a slight ridge occurs on one side by which dehiscence takes place. A round brown nut fills the centre; the shell of the nut is at least $\frac{1}{8}$ inch thick, hard to break, it dries quite hard with a broad opening by which the nut escapes and the point splits into a V; the edible portion is white, tasting much like the Hazel or Filbert nuts. The inflorescence is a terminal raceme 8 inches long and 1 inch across, flowers very small, white, with a faint perfume. Foliage generally in sets of 3, though not always so, elliptical, stiff and harsh, dark green, edges wavy with a few fine spines, 4-5 inches long, 1-1$\frac{1}{2}$ inches wide. I am told by one who has been in Queensland that the Aboriginees hold a big feast every year when the nuts ripen, so much are they appreciated. I have known this plant in Georgetown for many years but have not seen it in bloom there. In Trinidad Gardens it has fruited for several years, but the squirrels are very fond of the nuts and these voracious little creatures leave very few to collect for seed. The size of the fruiting tree in Trinidad—which is small—does not give one a good idea of the large tree it is said to grow to in its native land. Specimens from Trinidad.

THE LATE G. S. JENMAN'S RECIPES FOR THE PREPARATION OF AKEE FRUITS.

First I will describe the making of the well known dish, saltfish-and-akees. After careful cleaning and washing, put the akees into boiling water in which a good pinch of salt has been thrown and boil slowly for ten or fifteen minutes, being careful not to boil too much. The use of boiling water is essential: if cold water be used the substance loses its firmness and becomes soft and watery before the boiling heat is reached. When they have boiled the required time, pour the water off and drain as dry as possible. In the meantime the saltfish has been boiled in the ordinary way; it has been shredded with a fork, and all the bones carefully removed. Then take both fish and akees, adding butter or lard according to taste, and mix them together, in doing so, being careful, for the sake of effect when the dish is placed on the table, not to break the akees too much, and serve hot.

Akees may also be used for making fritters. For this purpose boil in the same way, drain dry, and beat them up with egg and seasoning. Fry and serve hot. The fritters may be modified by the addition of other substances in the making, such as fish or potatoe.

There is a famous dish called "Twice laid." This, too, is composed of saltfish and akees, but it is somewhat differently prepared from the dish of the latter name. Either shred the fish very fine, all bones having been removed, or pound it in a mortar. Then take an equal quantity of akees, which have been boiled and drained as before directed, and beat them up with egg, butter, or lard, making it into a thick paste. Add seasoning. Then take a pie-dish and in it place alternate layers of the prepared fish and akees till the dish is full, the top layer being akees, and place in a quick oven to brown, serving hot as usual. If akees are scarce a portion of boiled Irish potatoes may be employed, mashed and beaten up with

them. If the fish and akees or other ingredients were mixed together first, instead of being placed in layers, much the same result would be realised.

Lastly, akees may be boiled or fried and served as a side dish, and, cooked in the former way, with a little butter over them, an excellent dish they make too, though, personally, I regard this as the least desirable way to use them, it being rather a waste of good material for other dishes. Doubtless other ways too, of preparing akees will occur to skilful or inventive cooks now that I have said so much.

To this I have only to add for the information of the entirely uninformed, that the part of the fruit eaten is the white fleshy aril, in which the black glossy seeds are imbedded, and that in separating it care must be taken that the red integument by which it is united to the seed is removed. The akees should be washed in salt and water before boiling, and in this operation the lobes can be opened and this raddish ligament, if any is left of it, taken out.

ATTENDANCES AT THE DISTRICT GARDENS.

Year.	Bourda.	Belfield, E. Coast.	Stanleytown, New Amsterdam.	Suddie, Essequibo.	Den Amstel.	Houston, E. Bank.	Wakenaam.	Total Attendances.
1912 ...	5,514	4,395	3,302	2,100	2,544	2,156	718	21,729
1913 ...	5,156	4,535	2,519	3,399	2,568	1,836	1,319	21,332
1914 ...	4,243	3,869	2,443	3,025	1,791	1,653	1,533	18,577
1915 ...	1,123	1,006	769	59	503	339	401	4,200
1916 ...	4,705	1,161	1,510	225	623	2,251	1,297	12,026
1917 ...	4,991	2,820	1,366	3,297	1,186	2,564	1,663	17,886
1918	4,834	3,081	1,653	2,671	2,162	2,790	2,067	19,258
1919	4,769	2,425	1,582	2,798	1,851	2,480	1,556	17,461
1920								
1st Quarter	1,325	749	445	397	595	840	483	4,834
2nd Quarter	1,792	560	489	723	790	976	709	6,039

EXPORTS OF AGRICULTURAL AND FOREST PRODUCTS.

Below will be found a list of the Agricultural and Forest Products of the Colony exported during the first six months of the year 1920. The corresponding figures for the two previous and the average for the five years previous to that are added for convenience of comparison.

Product.	*Average 1913-17.*	*1918.*	*1919.*	*1920.*
Sugar, tons ...	43,455	34,867	37,167	36,329
Rum, gallons	1,809,295	1,547,526	3,036,093	1,011,761
Molasses, gallons	15,862	7,806	171,247	—
Cattle-food, (Molascuit) tons	1,416	1,126	818	552
Cacao, cwts. ...	156	50	None	8
Citrate of Lime, cwts.	141	8	83	229
Lime Juice, gals.	*5,249	4,099	7,551	—
Essential Oil of Limes, gals.	* 166	102	136	—
Coconuts, thousands	1,513	596	2,328	2,218
Copra, cwts. ...	661	1,452	864	296
Coffee, cwts. ...	1,859	1,432	7,128	2,989
Kola-nuts, cwts. ...	½	8	None	10
Rice, tons ...	7,388	6,643	1,288	8,036
Ricemeal, tons ...	222	5	None	—
Cattle, head ...	444	272	1	—
Hides, No. ...	2,333	1,316	3,769	3,405
Pigs, No. ...	583	None	None	—
Sheep, head ...	11	10	None	136
Balata, cwts. ...	4,349	2,373	2,262	2,167
Charcoal, bags ...	26,348	18,759	22,764	24,785
Firewood, Wallaba, etc., tons ...	4,427	3,790	4,339	2,708
Gums, lbs. ...	445	None	315	3,361
Lumber, cub. ft. ...	126,002	55,658	84,311	130,330
Railway sleepers, No.	9,017	6,000	1,508	4,707
Rubber, cwts. ...	64	None	51	118
Shingles, thousands	1,260	1,181	1,336	883
Timber, cub. ft. ...	62,799	6,126	38,825	29,587
Coconut Oil, gals....	* 11,913	20,344	4,451	24,971

*No records available for 1913–6.

Meteorological Data—April–June, 1920.

1920 Months.	Rainfall.	Number of days of rain.						EVAPORATION	Air Temperature and Humidity.			
									Air Temperature			Hu'y
	Inches.	Under ·10 Inches	·10 to ·50 Inches	·50 to 1.00 Inches	1.00 to 2.00 Inches	Above 2.00 Inches	Total days	Inches	Maximum	Minimum	Mean	Mean
Botanic Gardens												
April ...	1.12	7	4	...	...	...	11	6.68	85.3	75.3	80.5	73.5
May ...	4.78	11	8	1	1	...	21	5.16	85.1	75.4	80.2	79.4
June ..	11.54	4	7	5	5	...	21	3.88	84.2	75.0	79.6	81.4
Totals & Means	17.44	22	19	6	6	...	53	15.72	84.8	75.4	80.1	78·1
Berbice Public Gardens												
April ...	2.78	2	3	1	1	...	7	...	91.5	76.1	83.8	71.2
May ...	4.92	1	15	3	...	...	19	...	92.4	75.7	84.0	74.2
June ...	5.00	3	6	3	1	...	13	...	91.4	75.9	83.6	75.1
Totals & Means	12.70	6	24	7	2	...	39	...	91.8	75.9	83.8	73.5
Onderneeming												
April ..	.55	2	2	...	...	...	4	...	86.8	74.7	80.7	
May ...	5.99	...	9	3	1	...	13	...	86.1	73.6	79.8	
June ...	13.20	...	10	4	5	...	19	...	86.2	73.7	79.9	
Totals & Means	19.74	2	21	7	6	...	36	...	83.0	74.0	80.1	
Morawhanna												
April ...	.85	6	3	...	...	...	9					
May ...	6.62	6	11	2	...	1	20					
June ...	23.91	1	9	6	7	3	26					
Totals ...	31.38	13	23	8	7	4	55					