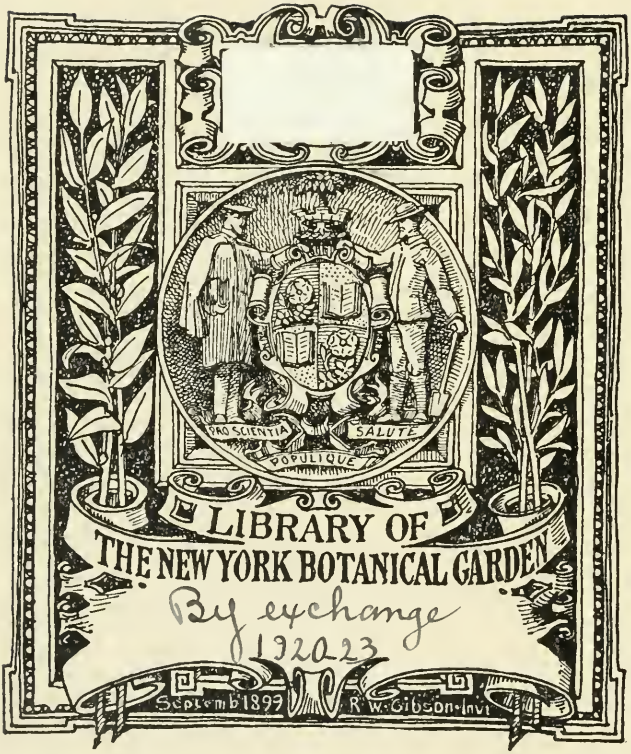
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BULLETIN

OF THE

DEPARTMENT OF AGRICULTURE. TRINIDAD AND TOBAGO.

VOLUME XIX, 1920-21.

Editor :
W. G. Freeman.

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J. de Verteuil, F.I.C., F.C.S., *Agricultural Chemist.*

TRINIDAD:

Printed at the Government Printing Office, Port-of-Spain.

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C. M. Roach	...County of St. George ...	...San Juan.
L. Mota	...Counties of Nariva and Mayaro	..Rio Claro.
R. W. M. Leacock	...Counties of St. Andrew & St. David	..Sangre Grande.
J. J. Beard	...County of Caroni ...	...Carenage.
T. Boodansingh	.....County of Victoria ...	...Princes Town.
A. Pena (Acting)	...County of St. Patrick ...	...Siparia.

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Manager.....R. S. Redman.

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Agricultural Credit Societies

under Ordinances No. 30, 1915 and No. 41 of 1921.

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Inspector.....Jos. E. Seheult.
Clerk.....Ashraff Hosein.

Registered Societies.

	Date of Registration.
Trinidad	
Diego Martin	October 12, 1916.
Lothians	April 4, 1919.
Malgretout	April 30, 1919.
Petit Morne	April 30, 1919.
Union Hall	April 30, 1919.
Malgretout East Indian	May 26, 1919.
Picton	May 30, 1919.
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Union-Marabella	July 10, 1919.
Harmony Hall	July 10, 1919.
Williamsville East Indian	July 10, 1919.
Indian Walk	August 19, 1919.
Williamsville, West Indian	September 11, 1919.
Plein Palais	November 9, 1919.
Lengua	November 9, 1919.
Peñal	November 21, 1919.
Broomage	August 11, 1920.
Cedar Hill	August 11, 1920.
Trois Amis	August 11, 1920.
Monkey Town	August 16, 1920.
Tobago.	
Pembroke	June 18, 1917.
Scarborough	April 11, 1918.
Delaford	August 26, 1918.
Mason Hall	December 16, 1918.
Moriah	December 16, 1918.
Charlotteville	February 4, 1919.
Parlatuvier	July 10, 1920.
Roxborough	October 23, 1920.
Les Coteaux	December 20, 1920.
Montgomery	January 7, 1921.

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Inspectors.....
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F. W. Urich. J. J. Beard.
W. E. Broadway. L. Mota.
R. J. Link. F. D. Davies.
H. Meaden. T. Boodansingh.
L. A. Brunton. R. W. M. Leacock.

Assistant Inspectors.....
J. A. Pinder.
J. Blackman. Alfred H. Pena (Tempy.)
A. T. Warner. G. Hodge.

Pests Proclaimed under the Ordinance.

Proclamation No. 56 of 1921.

Bud-rot disease, Red-ring disease and Little-leaf disease of the Coconut; Mosaic disease of the Sugar-cane; Blossom-blight and Wither-tip of the Lime tree; Bird Vine; Love Vine; Coconut butterfly; Parasol ant; Cacao beetle; Locust; Gru-gru beetle; Rhinoceros beetle.

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10. Plant Diseases and Pests Committee.—Hon. Carl de Verteuil, Messrs. W. C. Jardine, W. S. E. Barnardo, W. Greig, A.B.Carr and J. Black.

11. Coconut Committee.—Hon. Maurice Rostant, Captain M. Short, Messrs. W. Greig, J. J. McLeod, A. J. Anderson and W. S. E. Barnardo.

The Director of Agriculture is *ex officio* Chairman and the Assistant Director a member of the various Committees.

Reference Library.

This Library can be consulted at the Head Office of the Department, St. Clair Experiment Station. It contains standard works on General Agriculture, Horticulture, Botany, etc., and books and periodicals dealing with Cacao, Sugar, Coconuts, Rubber, Cotton, Corn, Fruit, Tobacco, and other crops and Stock.

LIST OF ILLUSTRATIONS.

Part 1.] 1920. [Vol. XIX.

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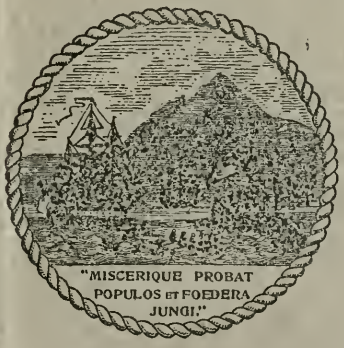

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Overseer and Clerk (Trinidad).....J. C. Hay.

St. Augustine Estate.

Manager..... .....J. McInroy.
Overseer .....H. Lyndon Kerr. *Clerk*.....A. P. Daly.

River Estate.

Superintendent.....L. Seheult, B. Sc., (Edin.)
Manager..... .. ..R. O'Connor.

Froghopper Investigations.

Special Appointment.

C. B. Williams, M.A., (Camb.) F.E.S.

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11. Coconut Committee.—Hon. Maurice Rostant, Captain M. Short, Messrs W. Greig, J. J. McLeod, A. J. Anderson and W. S. E. Barnardo.

The Director of Agriculture is *ex officio* Chairman of the various Committees.

Department of Agriculture.

GOVERNMENT STUD ANIMALS.

THE following are the arrangements for August, September and October, 1920, with regard to Stud animals of the Government Farms in Trinidad and Tobago.

Stallions.

Name.	*Class.*	*Where standing for Service.*	*Fee.*	*Groom's Fee.*
*NELSWEEP	Thorough-bred	Govt. Farm Trinidad	$10.00	60c.
SIR HORRY	Thor'gh-bred Hackney	Govt. Farm „	5.00	60c.
RILLINGTON SPARTAN	Cleveland Bay	Govt. Farm „	5.00	60c.
MARAT	Thorough-bred	Roxburgh, Tobago	5.00	60c.
QUICKMATCH.	Thorough-bred	Govt. Farm „	7.20	60c.

Jack Donkeys.

Monarch	American Donkey	Govt. Farm, Trinidad	$ 5.00	60c.
President	Do. do.	Govt. Farm, Tobago	5.00	60c.
Barbados Joe		Govt. Farm, Trinidad	1.20	60c.

Bulls.

A.—AT GOVERNMENT FARMS.

TRINIDAD.		TOBAGO.	
Class.	*Fee.*	*Class.*	*Fee.*
2 Pure-bred Zebu	$ 1.20c.		
1 „ Jersey	2.40c.	1 Pure-bred Zebu	$1.00
3 Half-bred Red Poll	1.20c.		
1 Cross-bred Holstein-Zebu	1.20c.	1 Half-bred Guernsey	1.00
1 Half-bred Shorthorn	1.20c.		

B.—AT PUBLIC PASTURES OR ESTATES.

Place.	*Class.*
Queen's Park Savannah	1 Half-bred Shorthorn; 2 Half-bred Holsteins.
Mucurapo Pasture	1 Half-bred Shorthorn; 1 Half-bred Guernsey.
St. Clair Expt. Station	1 Half-bred Shorthorn; 1 Three-Qtr. bred Zebu.
St. Augustine Estate	1 Half-bred Shorthorn; 1 Half-bred Guernsey; 1 Cross-bred Zebu-Guernsey.
River Estate	1 Half-bred Zebu;
San Fernando	1 Half-bred Jersey.
Arima	1 Half-bred Jersey.
Tobago, Friendship Est.	1 Half-bred Holstein.

Pigs.

AT GOVERNMENT FARM, TRINIDAD.

White Yorkshire, Poland China, Berkshire, Tamworth $1.00, and Attendant's Fee 25c.

AT GOVERNMENT FARM, TOBAGO.

Berkshire ... ...Fee 50c.
Large Black ... ... „ 50c.

POULTRY.

GOVERNMENT FARM, TRINIDAD.

Eggs of Barred Plymouth Rocks, Rhode Island Reds, White Leghorns ... ... $1.00 per doz.
Great Kind Pigeons ... ... 60c. per pair.

GOVERNMENT FARM, TOBAGO.

Eggs of Plymouth Rocks, Black Minorcas, Rhode Island Reds 48c. per doz.
Also Cocks and Pullets of Plymouth Rocks and Rhode Island Reds.

* Not for Service until January, 1921.

Department of Agriculture.

NURSERY STOCK.

Cacao, Limes and any other plants required in large quantities should be ordered six months in advance. Address letters to the Superintendent, St. Clair Experiment Station, or to the Officer in Charge Botanic Station, Tobago.

Special quotations at St. Clair for Cacao, Coffee and Limes grown from selected seeds are as follows :—

Plants purchased in lots of 1 to 1,000 plants 3 cents per plant.	Delivered at Nurseries uncrated.
Plants purchased in lots of several thousands 2½ cents per plant.	
Plants purchased in lots up to 100 at 4 cents per plant.	Delivered at Railway Station, Port-of-Spain or Queen's Wharf, securely packed in open crates.
Plants purchased in lots up to 1,000 at $3.50 per 100.	
Plants purchased in lots of several thousands at $33.00 per 1,000.	

Tobago prices on application at the Botanic Station, Scarborough.

Budded Avocados select varieties at 12 cents, Budded Oranges at 24 cents and Grafted Mangos at 24 cents should also be booked at once.

Budded Cacao 12 cents each or in lots of over 100 at 8 cents.

Limes from beds 1½ cents per plant for lots over 100.

A select stock is also kept of other fruit, ornamental and flowering trees, palms, etc., a list of which can be obtained on application. Large orders must be booked six months previous to the date when the plants are required as large supplies are not kept on hand for casual demands.

Board of Agriculture.

SPRAYING CACAO, &c.

From September to November is the time for spraying cacao trees for the prevention of thrips and black rot; and early in the dry season for the Algal disease, die back, and cacao beetles.

The Board of Agriculture has on hand a supply of bluestone, which is sold to planters at 12 cents per pound, also nicotine sulphate the best insecticide for thrips, which is sold at $14.50 per gallon.

Men will be provided to superintend any spraying work which estates may wish to have done.

Spraying Machines can also be hired in Trinidad or Tobago. Friend Pump, with two leads of hose and rods complete, $1.00 per week.

Barrel Pump with one lead of hose and rods, 50c. per week. Carriage to and fro extra.

Further information in regard to cost of spraying, etc., and applications for bluestone and nicotine sulphate should be made to

THE SECRETARY, BOARD OF AGRICULTURE, PORT-OF-SPAIN.

PUBLICATIONS FOR SALE.

The Bulletin issued quarterly, price sixpence per number or two shillings per annum post free in the Colony. To other subscribers postage extra.

Vol. XVIII. 1919. Pt. 1.—Wither Tip of Limes (Illustrated); Yam Experiments 1918–19; Cultivation of Cotton; Nitrogen Content Cacao Soils; Supposed Cure for Froghoppers; Bedding Plants for Trinidad; Fungous Diseases of Roses (Illustrated); Prize Competitions 1918–19.

Vol. XVIII. Pt. 2.—Cane Farmers and Co-operation; Root Disease and Froghopper Blight; Control of Cacao Thrips; Rice Experiments, 1915–18; etc., etc.

Vol. XVIII. Pt. 3.—The Avocado in Trinidad and Tobago (Illustrated); Sugar-Cane Experiments 1917–19; Yams 1918–19.

Vol. XVIII. Pt. 4.—Root Disease of Cacao in Trinidad (Illustrated); Varieties of Cane under Estate Cul ivation in Trinidad 1919; Durability Tests with inferior Local Woods; Tobago Vegetable Prize Competitions 1919; Reorganisation of the Board and Department of Agriculture; Development of the Economic Resources of the Empire. &c., &c.

Our Local Foods: Their Production and Use, by W. G. Freeman, and R. O. Williams.—Price 3d.

The Dasheen: Its Uses and Culture.—Illustrated.—Price 3d.

The Avocado in Trinidad and Tobago.—Illustrated.—Price 3d.

Insects Affecting Vegetables in Trinidad and Tobago, by F. W. Urich. Symptoms of pests, Treatment, Preparation of Insecticides, etc.—Illustrated.—Price 3d.

Life History and Control of the Cacao Beetle, 3 coloured plates, by P. L. Guppy.—Price 6d.

Insect Notes for 1910–11. Miscellaneous Notes on Cacao Pests, by F. W. Urich. – Price 3d.

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Control of Cacao Thrips. (Illustrated) by F. W. Urich.—Price 3d.

Annual Reports, Department of Agriculture, 1916, 1917 & 1918.— Price 1s. 9d. each.

All publications can be obtained from the Head Office of the Department, St. Clair Experiment Station, post free within the Colony. The Bulletin is also on sale at Messrs. Muir, Marshall, and Davidson & Todd, Port-of-Spain.

BULLETIN
OF THE
DEPARTMENT OF AGRICULTURE
Trinidad and Tobago.

PART 1.] 1920. [VOL. XIX.

SUGAR.

THE TRINIDAD CANE FARMING INDUSTRY.

Its past and suggestions for its future.

BY W. G. FREEMAN,
Director of Agriculture.

(*A Lecture delivered to the Savana Grande District Agricultural Society*).

I HAVE chosen as our subject for discussion to-day [1] "The Cane Farming Industry: its past and suggestions for its future." It is an industry of the greatest importance to the prosperity of the colony and the present, when high prices are being obtained by both factory-owner and farmer, but when the future is far from clear, seems to be an opportune moment to make a survey of the situation in the hope of leading to permanent improvements.

DEVELOPMENT.

The Trinidad cane farming system was initiated by Sir Nevile Lubbock at the Usine Ste. Madeleine in 1882. In a letter of August 25, 1910 published in the *Proc. Ag. Soc. T. & T. X.* 1910 *p.* 350 he says "In 1884 which was the first crop derived from the thirteen farmers whom I had induced to commence, the total was 2,242 tons." From this small beginning in Naparima the industry has progressed to such an extent that during the last four years (1916–19) the number of cane farmers in Trinidad has ranged from 20,402 to 22,226, with an average of 21,151.

In 1884 cane farmers produced an insignificant portion of the total crop: by 1899 they produced about one-fifth: by 1909 one-quarter: and during each of the years 1917, 1918 and 1919 a half, and in two of these three years slightly more than one-half, of the colony's canes, *i.e.* the factories are supplied to-day by cane farmers with approximately half the canes they grind.

Comparing 1919 with 1899 the estates cane production has decreased by about 90,000 tons and the farmers' has increased by about 160,000 tons.

The tendency is thus undoubtedly for the factories to be increasingly dependent on the farmers for their cane supplies, a tendency which is likely to be still more marked with shortage of labour unless this can be compensated by increased mechanical tillage or in other ways.

(1) June 24, 1920.

THE OPPORTUNITY FOR CANE SUGAR.

In the past the West Indian sugar industry has gone through hard times, due largely to the competition of bounty fed beet sugar. These times are past; we hope never to recur. In the future cane and beet will compete on at least equal terms and cane will then be able to hold its own. This does not however mean that in Trinidad we can afford to stand still. The market price of sugar—when the world's conditions become more normal—will doubtless be fixed by the cost of production in the most efficient cane producing countries, *e.g.*, Cuba and Java.

In a paper read before the Agricultural Society in 1915 and published in its *Proceedings* XV. 162–9 and in the *Bulletin, Department of Agriculture*, XIV. 103–7, I showed by a coloured diagram the world's production of cane and beet sugar, which was in tons:—

	Cane.	*Beet.*
1860	1,250,000	250,000
1903	5,800,000	6,000,000
1913	9,000,000	6,800,000

Also by another diagram the chief sources of supply of sugar consumed in the United Kingdom. It is of great interest to compare the latter for 1913, the year before the war, with 1918.

SUGAR USED IN THE UNITED KINGDOM.

	Tons 1913.	*Tons 1918.*
Cane.		
British.		
British West Indies and British Guiana ...	60,000	120,000
Rest of British Empire	40,000	100,000
Foreign.		
Java	220,000	185,000
Peru and Brazil	30,000	50,000
Other Countries	70,000	840,000
Total Cane Sugar ...	320,000	1,295,000
Beet.		
Germany...	840,000	...
Austria-Hungary	340,000	...
Holland	180,000	14,000
Belgium	50,000	...
Other Countries	200,000	...
Total Beet Sugar ...	1,510,000	14,000
Grand Total Cane and Beet	1,830,000	1,309,000

Beet sugar it will be seen has practically disappeared, leaving a gap of 1,500,000 tons which has been partially filled by larger imports of cane sugar, leaving however a shortage of 500,000 tons. This extra cane sugar it should be borne in mind came chiefly from foreign sources, notably Cuba, which sent to the United Kingdom 824,000 tons of sugar in 1918, roughly fifty times the Trinidad total annual export.

MUTUAL INTEREST, FACTORY AND FARMER.

Our cane farmers now produce half the crop; it is evident therefore that the success of the colony's sugar industry depends on the efficiency of both the factory and the farmer. To secure the greatest efficiency both should be mutually interested in the results of their work, sharing fortune good or bad. It will be of use to describe briefly some methods already in use to attain this object in cane growing countries.

GUNTHORPE'S FACTORY, ANTIGUA.

The factory was erected fifteen years ago, by a group of London capitalists (with a contribution of £15,000 from the Imperial Government). Certain estates agreed to sell their canes from a stated acreage to the factory for a period of fifteen years, receiving the price of 4½ lb. of sugar for every 100 lb. of cane and half the profits made by the factory. (Other details are given in an article by me on "Agricultural Co-operation in the West Indies." *Bulletin, Department of Agriculture, Trinidad.* XVII. 1918. 118–30). The prices received by the cultivators between 1905–1919 on this basis have ranged from 7s. 5d. to £2 1s. 8d. per ton.

SHARE SYSTEM OF FIJI AND HAWAII.

An interesting account of this system was contributed to the W. I. Agricultural Conference held in Trinidad in 1905. by Sir Henry Jackson then Governor of the colony. (*West Indian Bulletin*, VI. 18–21 and VII. 311–316).

The land is divided into blocks, 60 acres is a convenient area, it is prepared (*i.e.*, ploughed, &c.), planted by the estate and then handed over to a group of men known as a "cane company" consisting of free or indentured labourers or both, who work it under estate supervision. Up to the crop they get an advance of 1s. a day. The estate pays for the cane cutting and takes the crop at a price agreed on at the beginning of the season.

An actual Fiji account given by Sir H. Jackson was as follows:—

The block yielded 1,843 tons, which at 4s. a ton gave the cane company a return of	£368	12	0
Deduct—Advances for days worked	141	19	11
Cost stripping and loading by estate	8	18	11
Hired labour for cutting (advanced to cane company)...	66	0	0
	£216	18	10
Balance due to cane company	£151	13	2

The bonus or deferred payment to cane company who had worked a total of 2,595 days was equivalent to 1s 2d a day each, making with original 1s a total of 2s. 2d. per man per day. According to the yield of canes the receipts for a block ranged from 2s 0d to 3s 0d per day per member of the cane company for 216 working days a year. The balance of their time could be spent earning in other ways, *e.g.*, in the mills in crop time, growing other crops on other lands, &c. The total cost of these canes to the estate is given as 7s 0d per ton. I give these figures which are for Fiji previous to 1905 merely to illustrate how the method works. This share system is reported to have been very successful in Hawaii and Fiji and to be worked on a large scale, with a great profit both to the cane grower and the estate.

An advantage of the block system is that it allows of much better organisation for cutting and transporting the canes than is possible with our small scattered areas, as portable tram lines are laid down to connect the blocks with the factory.

PAYMENT ON PRICE OF SUGAR.

Another method of payments practised in the West Indies, Mauritius, etc., is the market price during that crop, of so many pounds of sugar per 100 lb. of cane. According to the richness of the canes this varies from 4½ to 7 lb. of sugar per 100 lb.

BOARD OF AGRICULTURE SLIDING SCALE.

A modification of this, which formed the basis of the scale recommended by the Board of Agriculture after careful and prolonged consideration in 1916 was on equal division of the proceeds between buyer and seller based on the F.O.B. price of grey crystals in Port-of-Spain. The scale allowed for the varying capacities of different factories, and would of course require to be drawn up each year. A first payment could be made on delivery of the canes, and the balance after the crop had been sold and the average F.O.B. price ascertained and also the number of tons of cane taken to make a ton of sugar. It was also recommended that there should be a minimum price to safeguard the farmer and a maximum price in the interest of the estate, so that in the event of a bad year the estate could afford to pay the minimum price from extra profits made in the good years. There may be no necessity for minimum or maximum prices now. For a full report see *Bull. Dept. Agr.* XV. 1916. 73–85. The scale was not adopted, but the estates as you know made a first payment, and a deferred payment or "bonus" at the end of the crop.

POSITION THIS YEAR.

This year the position has become more complicated. A fall in the price of sugar was generally expected, but on the contrary it has risen enormously. Some of the largest estates sold their whole crop in advance for a price which has turned out to be very much lower than what other estates, which did not sell in advance, are now getting. Some estates can this year afford to pay very much higher prices for canes than others. This however is probably only a temporary phase and we may expect a return to more uniform prices, whether high or low.

The Department of Agriculture grows some 1,200 to 1,500 tons of cane a year in its experiment and other plots, and having them to dispose of is in the position of a cane farmer. For the last three years we have sold after advertising for tenders, on the basis of a division of proceeds. Last year we got altogether $6.42 per ton. This year, selling to an estate which is securing the benefit of the high price of sugar, we are getting $12 as a first payment, and a further sum of one-half the profits, estimated at the time the contract was made at $2.96 per ton, but which will be more by the end of the year owing to the subsequent rise in the price of sugar. This is a type of contract which is eminently fair, and having shared in the years of prosperity we shall be quite content to share in the years of adversity.

A notable advance since 1916 has been the sliding scale introduced by the Ste. Madeleine Company and more general action on similar lines would go far to remove the danger of possible friction later when affairs are not so prosperous for all concerned as they are now.

SECURITY OF TENURE.

Cane farmers are either proprietors or tenants, the latter mainly, I think, annual tenants, usually undisturbed but with no actual guarantee of continued possession. The former are safe, but the tenants are not in a good agricultural position. Farmers are advised, and good would result if they followed the advice, to practise rotation of crops, *e.g.* ground provisions, beans and peas, young canes, plants, 1st, 2nd, and 3rd ratoons as shown on the demonstration plots of the Ste. Madeleine Company, at Union Hall, Cedar Hill and Petit Morne estates. For this more than an annual tenancy is desirable. I suggest for consideration the encouragement of men who can take up 10, 20, 50 or even 100 acres, on leases of say at least 10 years with option of renewal at an agreed figure. With larger holdings and greater security of tenure it would be possible to effect many improvements which are now impossible.

The farmer given such a lease should on his part agree to cultivate a definite area of the land in canes, and to sell them to the estate from which he holds the land on a sliding scale, based on division of proceeds or other agreed system. He should be encouraged to feel that he is a partner in the estate, and directly interested in the results it obtains. If he grows more and better canes both he and the estate will make more profit.

Possibly the estates could lay out these holdings in definite blocks, so that it would be possible to improve methods of transport, and save much of the present appalling waste of time and labour of some districts, also to get these blocks reaped on a pre-arranged plan and so better regulate the delivery of canes to the factory, another constantly recurring source of trouble and loss. With division of proceeds it will be to the farmers' interest to prevent any cause of loss to the estate, because part of the loss also falls on him.

IMPROVEMENT IN QUALITY OF FARMERS' CANES.

With the small areas cultivated by our farmers improvement in quality is a very difficult matter, as it is impracticable to buy on sugar content, as is done in some countries. The factory can, as at present refuse certain notoriously poor canes. It might also be practicable to fix the ordinary price based on division of proceeds, on the average farmers canes, and to give a bonus per ton on superior canes when grown on a sufficiently large scale to make such a course possible. The trouble that payment for quality is impracticable because the individual farmers' canes are so small in amount can, I suggest, best be remedied by the means already indicated for the improvement of transport and better organisation for delivery, namely the encouragement of cane farming on a large scale. There must be an incentive to the farmer to produce better canes, or why should he trouble to do so?

IMPROVEMENT IN FARMERS' YIELD.

So far my suggestions as to improvements have been mainly addressed to the estates. In the matter of quantity of canes, yield per acre, the burden lies on the farmer.

The average cane farmer's yield per acre is notoriously low. There are exceptions, but the majority of farmers could I believe certainly get half as much again. Instead of being content with 10 or 12 tons of cane to the acre, they should get 15 or 20. This can be done by better cultivation.

To help the farmer the Board of Agriculture in 1918 revived Cane Farmers' Competitions, offering prizes in the Naparimas to the best cultivators. All those who entered received instruction from Mr. Roach, the Board's Agricultural Adviser in charge of the competition. The following year similar competitions were held in the Couva-Chaguanas and Tacarigua-Caroni dirtricts. Proposals have just been approved by the Board to continue these competitions.

The Ste. Madeleine Company has taken similar steps, giving prizes and has also appointed a scientific officer, Mr. G. A. Jones, as superintendent of cane farmers, to give them practical advice and assistance.

That improvement can be made is indicated by the report on the Board's competition by the judges, one of whom was an unofficial sugar planter.

"As compared with the neighbouring farms of non-competitors, the farms of the competitors everywhere evinced decided superiority, and as evidence of the benefit of good cultivation, must tend to general improvement in the methods of the surrounding districts."

As other illustrations of good work by farmers I may mention that yesterday I had the pleasure of presenting on behalf of the Ste. Madeleine Company a prize of $50 to Messrs. Beckles of Union Hall, two brothers who were bracketed first in the company's competition. Their average yield, plants, 1st and 2nd ratoons was about 25 tons per acre.

Another farmer in another section of the competition got 26 tons. That lands will continue to give good results was also shown by Mr. W. Ford obtaining a 4th prize in the competition on a piece of land which he has cultivated continuously since 1879, *i.e.* for 41 years, Mr. Mark Moody Stuart showed his appreciation by giving Ford an extra special prize of $40.

Better tillage and a rotation of crops, as recommended to the Ste. Madeleine farmers by Mr. Jones, with the great advantage of keeping part of your land in foodstuffs, are the most urgent necessities. As regards tillage you will be wise to follow the example of the estates about you and whenever possible make use of animal drawn ploughs, hoes and other implements. They are amongst the earliest agricultural implements of the world and yet here in Trinidad we rely on the fork and the hoe. There will be the question of capital outlay. It may be practicable for the estate to assist you, on some modification of the share system of Hawaii and Fiji to suit local conditions. Or some one having animals might be able to undertake the ploughing of land at so much an acre, using the animals for other work at other times of the year. Lastly you can make use of your Agricultural Credit Societies, which are already doing such good work amongst you, for the purchase and use either co-operatively or individually of the necessary equipment.

I recommend these matters to your careful consideration, as it is just as necessary for the farmer as for the large estate to make economies in labour to secure greater efficiency at a reduced cost. A friendly critic writing in the *Louisiana Planter* for November 22nd, 1919 (which well-known paper has recently I may mention recommended our cane prize competitions as worthy of adoption by the Louisiana sugar planter) says: "When we reflect that as a rule two men and two mules can successfully cultivate 20 acres of sugar cane, which would make an average of 10 acres to the single man, and counting on a cane yield in the tropics, as we should, of at least 17 tons per acre, we should have 170 tons of cane per man from these various farmers instead of 13 tons." The average in 1919 in Trinidad on which the paper is commenting was actually 12.87 tons per farmer. After referring to the value of labour saving devices, *i.e.* ploughs and other agricultural implements the *Louisiana Planter* concludes "these data would seemingly carry conviction to the minds of those familiar with the sugar industry that Trinidad has now before it immense resources that they have not yet availed of with the labour that they have. . . . . ."

CONCLUSION.

I began by showing how important was the cane farming industry, what great results had been achieved from the small beginning in 1884. I conclude by stating that it is capable of far greater development. It is at present in the main an unorganised industry. The world is calling for sugar. We are calling for labour. By improved organization and better and more efficient methods we can make far better use of the labour we have, and produce more sugar. These are the objects I had in mind, which prompted me to venture to lay some suggestions before you this afternoon. I hope you may find them worthy of consideration and also that some of them can be put into practice with mutual advantage and profit to both the cane farmer and the factory.

SUGAR CANE BLIGHT IN TRINIDAD:

A Summary of Conclusions.*

By W. Nowell, D.I.C., and C. B. Williams, M.A., F.E.S.

I. THE FROGHOPPER.

1. An infestation of froghoppers can produce a definite form of blight without necessary co-operation of other insect or fungus agencies.

2. The characters of the condition so produced consist of:—

(*a.*) Leaf injury, beginning with the formation of elongated spots and patches, pale at first, then red brown, and finally dry and silvery brown; which injury in well-developed infestations results in the premature withering of most or all of the leaves.

(*b.*) The more or less complete arrest of growth, in which the well-developed canes in a stool suffer little, the youngest shoots die outright, and the shoots of intermediate age are affected in inverse proportion to their size. (It follows from this that the better the canes are developed the greater is their resisting power).

3. This condition differs, in plainly recognisable characters, from that produced by any form of root disease known to the writers.

4.—(*a.*) In some cases the appearances produced agree very closely with those described for the Sereh disease of Java, but the subsequent history of the stools shows that the resemblance is one of appearance only, the continued degeneration in successive years characteristic of Sereh being entirely absent.

(*b.*) Nothing has been seen to suggest that the Mottling or Mosaic disease, now giving trouble in Porto Rico and Louisiana, is involved in the production of blight.

5. The general condition described seems to be mainly the result of injury to the leaves, as appears both from the observation of attacks and from consideration of the symptoms of the affected stools. This conclusion is supported by the following evidence:—

(*a.*) The condition reaches its most acute phase shortly after the chief flights of adult froghoppers.

(*b.*) Where there is no complication with root disease or hindrance by drought, the stools, even in the case of low ratoons in which all or nearly all the shoots are killed to the ground, resume vigorous growth when the brood of froghoppers has passed.

(*c.*) The root system and underground stem system in these uncomplicated cases do not appear on examination to be seriously affected.

6. In the present year (1919), which is one in which the froghopper is near its minimum, the third brood infestations can be classified as follows:—

(*a.*) A belt of infestation in the Naparimas which coincides closely with the occurrence, in bands and patches, of a particular type of red clay soil.

* Prepared as a preliminary report on investigations in 1919.

(*b.*) An area of several acres in the Northern sugar district in which the soil, a fine silt, is closely compacted and probably sour.

(*c.*) Scattered small patches, mostly with no immediately recognisable defect in conditions, but strictly local, frequently distinctly related to the contour of the ground, and surrounded by large areas of healthy cultivation.

7. These infestations are of a type approaching in local numbers and severity the more widespread infestations of maximum froghopper years.

8. Froghoppers are very lightly distributed through the unaffected fields, therefore the damage does not arise from the locally accentuated action of insects generally distributed, but from the development of the insects in large numbers where the local conditions of a field or patch especially favour it.

9. In some cases the patches of infestation and damage are sharply defined from the rest of the crop in the same field.

10. From consideration of the effects of difference of rainfall in certain periods and certain districts and from local observations of soil and seepage effects, it appears most probable that the conditions governing the development of froghopper infestation arise in some way not understood from a soil and moisture relation.

11. A merely backward or stunted condition of the crop is not in itself sufficient to induce a froghopper infestation. There are very many such fields this year which are quite free from blight.

II. ROOT DISEASE.

12. The fungi capable of causing root disease of sugar-cane at present known in Trinidad belong to the genera *Marasmius* and *Odontia*.

13. They occur to some extent in all cane fields, but vary very greatly in quantity and development in different fields and at different seasons.

14. Under conditions favourable to the cane they can be present in notable quantity without any visible ill effects, existing on dead or dying material only.

15. Root disease is brought about when for any reason these fungi are enabled to attack parts of the living plant.

16. Any factor adversely affecting the vigour of the cane may decrease its resistance sufficiently to allow of the development of root disease.

17. The common type of root disease consists of the invasion and destruction of the roots. Its effects are difficult to distinguish from the direct effects of defective aeration or poverty of soil.

18. There is a much rarer and much more severe type, due as it appears to certain species of *Marasmius*, in which the base of the stem is killed for several joints, the death of the whole cane following in consequence.

19. There is a field of first ratoons at present under observation attacked by this severer form of the disease when the canes were already well-grown and large, which seems likely to be practically destroyed. In this case there was distinct injury to the leaves by froghoppers in August and again in October. The field would be known locally as blighted, but the real cause of the injury, as shown by its nature, is the root fungus infestation.

20. It now appears that the prevalence of root disease over wide areas in Trinidad late in the season, reported on last year by one of us (W.N.), is largely due to the weakening of resistance by previous attacks of froghopper.

21. The effect of root disease accompanying or following froghopper injury is to increase its effects and to prevent recovery, making the blighted condition permanent.

III. CONTROL.

22. No direct method for control of the froghopper is at present in sight. Natural enemies, especially the fungus diseases of the adults, exercise a considerable measure of control under favourable conditions.

23. Root disease can be controlled by reducing the ratooning period, by improving preparation, cultivation and drainage, by the use of organic manures and of lime, and by rotation of crops.

24. The general evidence goes to show that it is in the fields which have had least attention in these matters and in fields naturally poor that the froghopper finds the most suitable conditions for rapi multiplication.

25. The admitted exceptions occurring in froghopper years, in which some good fields may be attacked, may very well be due to migrations of the pest from fields in worse condition.

26. The practice of throwing out fields to grass, especially when the old stools are left to sprout, is definitely bad with reference to both froghopper and root disease, (as well as all other insect and fungus diseases of cane).

27. It should be an invariable rule to plough out as soon as possible stools not intended to be cultivated as ratoons. It is highly desirable that in addition to this a cultivated crop not belonging to the grass family should be grown.

28. It is our conclusion that well-considered application of the measures referred to in paragraph 23 will give the best protection available against the development of froghopper infestations, will greatly reduce the direct effects of such an infestation when it occurs, and will remove the serious contribution now made by root disease to the final condition of blighted fields.

January, 1920.

REPORT ON A VISIT TO TRINIDAD IN CONNEXION WITH FROGHOPPER BLIGHT OF SUGAR-CANE.

By W. Nowell, D.I.C.,
Mycologist, Imperial Department of Agriculture for the West Indies.

Imperial Commissioner,

In pursuance of the arrangement made at the conclusion of my previous visit I left Barbados for Trinidad on the S.S. "Arzila", departing from Bridgetown on Friday, September 19, and arriving in Port-of-Spain on September 20. On the same day I got into touch with the Acting Director of Agriculture and on the 27th I had an interview with His Excellency the Acting Governor. I attended and reported at meetings of the Board of Agriculture on October 16 and November 20. On November 20 and 22 I had interviews with His Excellency Sir John Chancellor who had then recently resumed the Governorship of the Colony. I left for Barbados by the "Chaudiere" on November 22, arriving in Bridgetown on Monday November 24.

2. The purpose of this visit, as suggested at the meeting of the Froghopper Committee of the Board of Agriculture held January 16, 1919, was to afford an opportunity of seeing froghopper infestations in an active phase. This object was satisfactorily effected although the number and area of the third brood infestations, current during my visit, were relatively small this year.

3. I regret that the investigation was considerably interfered with by an attack of dysentery which began to develop within a few days of my arrival in the Colony. Later I spent some ten days in hospital in San Fernando, and my capacity for work was reduced for a much longer period.

4. Following the lines of my previous visit, the enquiry was pursued in close co-operation with Mr. C. B. Williams, Entomologist in charge of Froghopper Investigations, whose accumulation of observations and ideas regarding froghopper blight formed the basis of our joint investigations. Our combined conclusions have been already put forward in the form of a summary, and the present report is an expansion of this from my own point of view.

5. It may be said at the outset that the observations made this year do not at any point conflict with the opinions expressed in my previous report,(1) which dealt with conditions after the cessation of froghopper activity. What follows is intended to be taken as an earlier chapter in the same story, subject to the differences arising from the restricted area of infestation this season.

6. It became evident from the study of infested fields that the immediate effect of froghopper attack is the direct production, with a greater or less degree of development, of a definite and recognisable type of injury to the growing plants. This condition, of which so far as I can learn no exact and detailed description has been published, may appropriately be referred to as *froghopper blight*, to distinguish it from sugar-cane blight in general, which may be due to any cause or combination of causes.

(1) "Report on an Investigation of Froghopper Pest and Diseases of Sugar Cane in Trinidad."—*Bull. Dept. Agr.* XVIII. 1919, 57-69.

7. The first recognisable symptom is the presence on the leaves of elongated spots and patches, often running out into streaks; pale at first, then red, and finally dry and brown. These spots follow the appearance of the adult froghoppers and have been shown by Mr. Williams to appear on leaves of healthy canes when froghoppers are caged upon them. They are undoubtedly due to the feeding of the adults on the leaves and their size suggests a locally toxic effect following the puncture, such as is known to occur with various species of bugs feeding on plant or animal hosts. The spots do not begin to show plainly until more than a week has passed from the first feeding of the froghoppers. The appearance of the spots in quantity is followed by the general withering of the leaves, the oldest first, until in severe infestations only the young leaves in the centre of the shoot remain green and the infested area takes on a general scorched appearance. Accounts agree that this condition may be reached within two weeks of the first notable indications of its onset.

8. Associated with the injury to the leaves and apparently consequent upon it there is an equally definite condition produced in the stool as a whole. When stripped of the clinging dry leaves the individual shoots show, in different degrees according to their age, the effects of arrested development and of the degeneration which ensues. In all respects these effects are greater in severity in proportion to the youth of the shoots. In a given case of first ratoons, for example, the gradations were as follows:

(*a.*) Well-developed stems (4-5 ft.) with arrested growth but no degeneration. Green leaves reduced to a partly extended fan at the extreme top, and these heavily spotted with red.

(*b.*) Stems still of good length (3-4 ft.) but more slender and unripened. Green leaves reduced to a few at the tip.

(*c.*) Very pale stems, less than half an inch in diameter and about two feet long, with only the central unexpanded leaves green. Upper joints very tender, snapping readily just above the nodes.

(*d.*) Similar stems 15-18 inches long, tapering very quickly at the top; leaves all withered; tip of stem reddened and watery, obviously degenerating.

(*e.*) Similar stems about 9 inches long, upper joints watery and collapsed, rotting; basal joints still sound.

(*f.*) Shoot bases from half an inch to 3 inches, quite dead.

9. The condition as described represents effects of about medium severity in respect of the attack and its duration. In the worst examples the whole stool may be killed to the ground, or in a few cases killed outright. From the account just given it will be seen that this result can readily occur where no developed canes are present, a liability which affords one reason why ill-grown ratoons are so subject to severe damage. Where on the other hand the earlier shoots have formed canes with a fair degree of ripeness, these usually, in such cases as have come under my observation, survive even the worst infestations, and where the canes in general are well developed, as is commonly the case with plant canes and may be the case under favourable conditions with ratoons, the damage consequent on a froghopper infestation will commonly be

restricted to a temporary arrest of development due to the blighting of the leaves, together with the death of the young leafy shoots at the base of the stools.

10. It will be seen that the actual nature of froghopper blight is the same in all these cases. With a field in a given condition the effects of a heavier or lighter infestation result in the scaling upwards or downwards, among the shoots of differing ages, of the degrees of damage described above, while from an infestation of given severity the amount of damage is governed by the condition of the stool attacked in respect of the degree of development of its canes.

11. The associated condition of the underground stems and roots does not, as I have seen it, suggest that it has any important causative relation to the symptoms above ground. A large proportion of dead roots may be found in the affected stools, but this appears to be equally the case with many uninfested ratoon fields in poor or compacted soils, and several badly blighted stools examined had quite as much or more development of fibrous roots than is seen to suffice for the maintenance of stools which are, and remain, healthy and vigorous. Moreover the younger canes, in the stools dissected, have had the better roots, while showing the worst effects of the trouble.

12. The foregoing observations are supported by the behaviour of the affected stools. When favourable conditions have prevailed after the passing of the infesting brood an exceedingly vigorous new growth has been seen to appear over areas where no green leaves were left and where most of the short bunches were killed to the ground. Even during the course of an infestation, where soil conditions are good, the retained vigour of the underground system finds expression in the forcing of growth from several or many of the eyes of the developed canes.

13. The experimental production of froghopper blight has been limited to the leaf effects observed on plant canes caged with adult froghoppers. Pending the results of further experiments, conclusions as to the manner of production of the condition under discussion have to be drawn from observation of the course of attacks and from consideration of the symptoms of affected stools. By these respective lines of investigation Mr. Williams and I independently reached the conclusion that the condition could be largely and perhaps completely attributed to the effects of the injuries caused by the feeding of the adult froghoppers on the leaves. How far the feeding of the nymphs on the roots may function as a contributory cause there is at present no evidence to show.

14 The experimental evidence illustrates the possibility of the causation of failure in the leaves by adult froghoppers; it has been further shown that the condition of the individual stalks is closely associated with leaf failure. The production of the unhardened spindly canes can be directly attributed to the failure of the food supply from the leaves, while inability of the soft and ill-developed younger canes to maintain themselves during a period of arrested food supply may be readily conceived to be responsible for the degeneration of their upper nodes and eventual dying-back.

15. Describing the process in another way: the youngest shoots, which have no developed stem, fail when their current leaves are destroyed; each older shoot is able to go on forming new leaves, as the older ones are destroyed, to an extent proportional to the development of its stem. In a continued infestation each shoot in turn fails to maintain an adequate amount of leaf surface, and in canes below a certain standard of ripeness the terminal bud succumbs and the stem begins to die back from the top.

INFLUENCE OF ROOT FUNGI ON BLIGHTED CANES.

16. The development of the general condition above described is commonly closely accompanied by a notable increase of the development of root fungus, especially of the Odontia type. The increase in the quantity of dead material available for its support may be regarded as largely responsible for the conspicuous extent to which the fungus frequently occurs. The manner of its appearance and its relation to the blighted stools strongly suggest that its increase in these circumstances is consequent upon the existence of froghopper blight.

17. The extent to which froghopper injury is increased by the presence in quantity of root fungus is difficult to estimate, and is no doubt highly variable according to circumstances. Knowledge of the ability of root fungus to attack weakened canes would lead one to expect a very considerable effect, and this the observations made during both my visits have strongly confirmed. It is true that cases have been seen this year where under the stimulus of favourable weather badly blighted canes have resumed vigorous growth in spite of root fungus, but in other cases, and especially after the wider attacks of last year, areas were seen in which the blight initiated by froghopper had assumed a permanence which could only be attributed to the prevailing infestation of the fields with root disease.

18. In accordance with the often-stated nature of root disease its effectiveness in this direction is governed, not only by the condition of the cane as affected by the insect, but by the condition of the field as to tilth and fertility and by the nature of the prevailing weather.

CONTRIBUTORY EFFECTS OF MOTH-BORERS.

19. The present season is marked by a very notable increase over last year of damage by the small moth-borer *Diatræa*. Rather heavy infestations were seen combined with froghopper damage. It was evident that in such cases the effects of froghopper would be seriously exaggerated if the borer damage were left out of account. The same consideration was seen to apply, in other instances, to damage occasioned by the large moth-borer, *Castnia*.

COMPARISON OF FROGHOPPER BLIGHT WITH OTHER DISEASES.

20. Sereh Disease. The writer was very much struck in some instances by the close correspondence between the effects of froghopper and the descriptions and photographs published of the Sereh disease of Java. It may be recalled that Dr. Gough noticed this in certain particular cases and submitted specimens to Professor Went of Java,

receiving the reply that while the agreement in appearance was very close the absence of discoloured vascular bundles at the nodes prevented a decision that the disease was actually Sereh. In specimens collected by Mr. Williams and myself not only was the correspondence with the appearance of Sereh complete but the character mentioned by Professor Went as essential was also present. There is no difficulty in deciding, however, that the resemblance is one of symptoms only, since of the character from which Sereh derives its destructiveness—the steady and invariable degeneration of the affected cane stool, proceeding year by year until a grass-like condition is reached—there is no trace whatever.

21. Mosaic Disease. A mosaic or mottled-leaf disease has for several years been causing widespread losses in Porto Rico, and has recently been found to exist in Cuba, Florida and Louisiana, where the prospect of its spread is viewed with apprehension. It is of special interest in that there are indications that the infection may be distributed by a sucking insect allied to the froghopper. The primary symptom is the appearance of various degrees of light and dark-green spottings or streakings in the leaves. The disease is cumulative, and in the second year white opaque spots and streaks appear in addition to the markings already mentioned. At the same time or later canker of the stalk appears and severe stunting occurs.

22. The unidentified leaf-spotting on plots of D 3596 and B 1753 at St. Augustine, recorded by Williams, *Bulletin Department of Agriculture* xviii, pp. 77 and 80, simulates the first symptom of the mosaic disease and its nature is under investigation. In the period 1917–1919 no development in the direction of more serious symptoms was detected but a recent report is to the effect that the affection, whatever its nature may prove to be, is spreading to neighbouring plots. As the mosaic disease is easily introduced by cuttings great care should be exercised in importing new planting material, and introductions from places at all doubtful in this respect should be carried out only through the Department of Agriculture. There is no indication that the disease exists in connexion with froghopper blight. The need for caution is illustrated by the figures regarding the worst infested area in Porto Rico, in which ten mills have shown an average reduction of 40 per cent. in output of sugar. The disease can be controlled by elimination methods and by the selection of healthy material for planting, since fortunately the infection does not reside in the soil or in dead plant material.

23. Root Disease: *Type A*. The common type of root disease (as considered apart from complications with froghopper blight) arises from the invasion and destruction of the roots at any stage of their growth, accompanied or not, as the case may be, with the cementing of the dead leaf-sheaths round the shoots. It is prevalent in soils lacking in fertility or in which aeration is obstructed by poor tilth or saturation with water. Since each of these factors produces its own direct effect on the growth of the cane it is usually difficult to estimate the amount of the contribution of root disease to the general result. The belief that the effects produced by the fungus are considerable is based mainly on the constancy of its association with particular types of failure, during observations carried on for a long number of years and in many

countries, and is supported by the experimental evidence so far as it goes, though more of this is to be desired. The nature and characteristics of root disease of this type were somewhat fully discussed in last year's report. The point to be made in the present connexion is that the canes grown under its influence are typically stunted, with short joints, being thus very different from the weak and thin but rather long-jointed canes resulting from infestation with froghopper.

24. Root Disease: *Type B.* A more acute and definite form of root disease is produced when the fungus invades the lower joints of the stems. A field examined early in November and kept under observation later provided the best example of this type the writer has met with. It is situated on level ground in an open valley, the soil a fairly heavy brown loam in general but lighter on one margin. The crop consists of first ratoons of Hill Nos. 6 and 12. The soil gave evidence of being well worked and the drainage system appeared efficient. Pen manure had been applied to the plant canes, and sulphate of ammonia 2 cwt. to the acre in two applications to the present ratoons. The crop was well developed, its appearance suggesting that of good plant canes, and the indications were that the onset of the disease had been sudden and recent. There was comparatively little evidence of the presence of froghoppers. All the stools were exceedingly loose, and easy to push over; many of the canes were half-uprooted with their own weight. Very many large canes exhibited the basal joints in various stages of becoming reddened, shrunken, full of mycelium, dying and dead; the remaining joints continuing in sound condition until the severance of connexion with the root system took effect. The young shoots were dying upwards from infestation in the base, not downwards as in froghopper blight. A *Marasmius* species, with white caps up to half an inch in diameter and violet-black stalks, was fruiting abundantly from roots, root eyes, young shoots and basal joints.

25. No defect in the conditions which could be held responsible for this outbreak was visible to inspection. About the only feature that suggests a possibility of an explanation is that the reaction of the dressing of sulphate of ammonia may have brought about extreme depletion in some soil constituent, most probably lime, already near the minimum.

26. A similar infestation on a smaller scale was seen later forming a blighted patch in ratoons of B 156. The writer has on occasion met with disease of the same type on plant cane in Barbados, the fructifications there developed being referable to *Marasmius Sacchari.*

THE DISTRIBUTION OF FROGHOPPER BLIGHT IN 1919.

27. The third brood infestations of 1919 have been described as follows in the summary already issued. They represent a situation near the minimum of froghopper prevalence:—

(*a.*) A belt of infestation in the Naparimas which coincides closely with the occurrence, in bands and patches, of a particular type of red clay.

(*b.*) An area of several acres in the Northern sugar district, in which the soil, a fine silt, is closely compacted and probably sour.

(c.) Scattered small patches, mostly with no immediately recognisable defect in condition, but strictly local, usually distinctly related to the contour of the ground, and surrounded by large areas of healthy cultivation.

These infestations are of a type approaching in local numbers and severity the more general infestations of maximum froghopper years.

28. There is undoubtedly deep significance in the fact of the association between defects of soil condition and development of froghopper blight. The relation has been frequently noted as being, in general, characteristic of the affection in any year, but it is usually subject to rather striking exceptions. Reference was made to it, on these lines, in my report of last year. In the present season, when the froghopper has been reduced to its last strongholds, the association, as would be expected, is most definite.

29. A striking case was reported by Mr. Williams about the time I arrived and was later visited several times. This was a field of third ratoons on a slope, in which a rather large patch was completely blighted, having been heavily infested with second brood froghoppers. The soil of this patch was a red clay of putty-like consistency when moist, brick-like when dry. On the margins of the patch, where it bounded on friable black loam, there was a sudden change to relatively uninfested, and except for some leaf-spotting and young shoot injury, undamaged canes. *Marasmius* and *Odontia* were abundant on the blighted patch and were present in fair quantity in the surrounding parts of the field. On the upper margin of the blighted patch there was a shallow weedy oblong pond, and corresponding with its width a plainly defined strip of cane extended down the slope, across the middle of the red clay, in which the effects of the blight were much less severe, although the leaf spotting was well-marked. This effect is believed to be in some way due to the seepage from the pond.

30. The significance of the observations made on this case cannot as yet be fully explained, but it was valuable as affording a clear instance of the association of blight with soil conditions, and of the amelioration of these conditions by greater regularity in the supply of soil moisture. The latter observation may be considered as throwing some light on the experience of the Princes Town district, in which the climate is more uniform and froghopper infestations are less frequent and the damage is much less marked.

31. That the prevalence of froghopper is dependent on other conditions than the supply of its food-plant is self-evident when the discontinuous nature of its distribution is considered. There is a rapidly increasing liability to infestation in the progress of fields from plant canes to second or third ratoons. There is a similar increase in passing through the various grades of soil from friable black loam to sticky red clay, or the grades between good and poor tilth of any soil. But under any of these conditions a local infestation can occur, when at the same time the surrounding area, including fields of the same age and general character, may be free, not only from the consequence of attack, but from the presence of the insect in any but trifling numbers. The other

disparity that occurs, in the amount of damage consequent upon an infestation, appears to be sufficiently accounted for by the differing powers of resistance already explained.

32. The number of the factors involved is so large, and their outcome so often apparently contradictory, that only the patient correlation of evidence collected over a long period can provide definite knowledge concerning their individual effects and mode of action. The conclusions so far reached are general in their nature, but are believed to afford a sound basis for the recommendations as to agricultural practice put forward.

33. The measures prescribed have application against both root disease and froghopper, their effect in both cases being to increase the resistance of the plant and to make conditions less favourable for the carrying over and propagation of the parasite. They consist of the reduction in certain cases of the ratooning period, the maintenance of a high standard of preparation, cultivation, and drainage, the liberal use of organic manures, the application of adequate amounts of lime, and the practice of regular rotation of crops, matters which were discussed in detail in my previous report.

34. There is one practice which cannot be too often or too severely condemned from the point of view of pests and diseases, that of throwing out fields to grass, which crop being closely related to sugar-cane, harbours both root fungus and froghopper and does not afford the benefits of rotation. The matter is made worse when, as usually happens, the old cane stools persist and send up a crop of debilitated shoots. The stools in fields intended to be rested should be ploughed out, and it ought not to be difficult, with some initial cultivation, to establish a green crop which will protect the soil and maintain itself against grass and other weeds.

January 21, 1920.

REPORT ON IMPLEMENTAL TILLAGE AT ST. AUGUSTINE EXPERIMENT STATION, 1919.

By Joseph de Verteuil, F.I.C., F.C.S.,
Supt. of Field Experiments.

On the termination of his contract with the Waterloo Estates in February, 1919, the services of Mr. C. J. Barrilleaux formerly of the Audubon Park Sugar Experiment Station, Louisiana, were retained for six months by the Government to give demonstrations and conduct implemental tillage at St. Augustine Estate. On the expiration of this contract, Mr. Barrilleaux was asked to extend his appointment to the end of October so as to be able to give demonstrations on the different methods of using the implements for preparing land for cane planting.

Work was started on February 25, 1919 and consisted of:—

(*a.*) Cultivating growing canes.

(*b.*) Breaking and levelling land to reform beds.

(*c.*) Breaking and preparing land for planting canes.

At the request of His Excellency the Governor, the Superintendent of Field Experiments was entrusted with the care of keeping scientific records of the various operations performed.

IMPLEMENTS.

Pending the arrival from the United States of America of the implements ordered by the Department, Mr. J. J. Carlee, Attorney of the Waterloo Estates, was good enough to lend a set of his implements, for which the Department is very grateful.

The following were the implements imported and their cost landed in Port-of-Spain:—

From S. L. Allen & Co., Inc., Philadelphia, Pa., U.S.A.

Two No. 82 "E" horse-hoes	$ 15.53 each.
One Double Celery Hiller less leaf lifters or Double Mould Board plow	26.55

From the Moline Plow Co., Inc., Moline, Ill., U.S.A.

One Louisiana 4-mule breaking plow No. 12 with knife coulter and No. 5 gauge wheel with 2 extra shears	$ 32.98
Two Louisiana black land plow No. 9 with La Clevis knife coulter and gauge wheels with two extra shears	24.55 each.
Three famous pony, S.B. or "1 mule" plow with No. 5 gauge wheels and extra shears ...	12.99 each.

A harrow devised by Mr. Barrilleaux was made at the Government Farm at a total cost of $10.50. It consists of a frame 4 feet square made of 4 in. x 4 in. hard wood with two bars across of similar dimensions. 24 spikes made of ¾ inch square iron bars are fixed in the frame and cross bars at a distance of one foot. These spikes protrude five to six inches below the frame and are tapered off to a point. The chain for drawing the harrow is fixed on to one of the angles of the frame so that it works diagonally and is easily guided by means of a piece of rope tied to the opposite angle.

In working out the cost of implemental tillage the depreciation of the implements is placed at 3 cents per acre for the Horse hoe, Pony plough and harrows and 6 cents for the other implements. This is based on the assumption that the implements will work 100 acres per annum and last five years.

No allowance is made for depreciation of animals as generally the stock on estates is more than sufficient to perform this work out of crop when they would be idle. Moreover the extra feed given to the animals keeps them in better condition for the coming crop. It may, however, be mentioned that in the opinion of one of our leading sugar planters the life of mules working in ploughs throughout the year would be shortened by 3 to 4 years.

Two mules were purchased from the United States of America, but they only arrived in the colony at the beginning of May, meanwhile the work was performed with oxen.

AREA CULTIVATED.

Cultivating plant canes	9·25 acres.
Cultivating ratoons	19·13 ,,
Cultivating, Moulding and Sub-soiling ratoons ...	16·22 ,,
Breaking land, filling old drains and levelling to reform beds	3·73 ,,
Breaking land (first ploughing)	23·27 ,,
Total area worked	71·60 ,,

Between August 8 and October 15 (69 days) the following work was performed:—

Reploughing, filling drains and levelling to reform beds	11·16 acres.
Reploughing to plant canes	10·76 ,,
Harrowing with locally made harrow	8·20 ,,
Drilling with plough	10·00 ,,
Banking with Celery Hiller	10·00 ,,
Sub-soiling bottom of drills	10·00 ,,
Area re-worked	60·12 acres.

FEED OF ANIMALS.

During this period the oxen received on each working day an extra feed of 2 lb. oil meal, 2 lb. coconut meal and 4 lb. crushed corn on cob costing 26¼ cents per head. No extra feed was given to the mules, as they only worked in short spells and their work was comparatively light. Their daily ration was 7 lb. oats and 1 lb. bran costing 31¾ cents per day. Under estate conditions the extra feed of the mules would consist of about 6 lb. crushed grain and 1 lb. oilmeal costing 28 cents and this figure has been taken in compiling the results for this report.

CULTIVATING GROWING CANES.

Plant Canes. A field of 9¼ acres which had been planted in canes in October 1918, after the banks had been broken and the canes weeded by hand labour in January and February was worked as follows:—

Plant Canes.—Field 9, St. Augustine—9¼ Acres.

Description of work.	Number of		Cost of Labour.
	Labourers.	Animals.	
	Man days.	Animal days.	$ c.
Cultivating middles across beds with "one mule" plough; making two cuts. The work was performed in 11½ days of nine hours by one man, two boys and two oxen, each ox working half day ...	34·50	23·00	9.01
Pulverising lengthways with horse-hoe up and down. The work was performed in 8 days of nine hours by one man, two boys and two oxen, each ox working half day	24·00	16·03	6.80
Total for 9¼ acres	58·50	39·00	15.81
Per acre	6·32	4·22	1.71
Extra feed of 4·22 oxen at 26½ cents per ox ...	...	...	1.12
Depreciation of implements...	...	...	.06
Weeding by hand labour, 14·14 tasks per acre at 30 cents	14·14	...	4.24
Total per acre	20·46	4·22	7.13

The cost and the number of labourers required per acre to work these 9¼ acres by hand labour alone is shown below:—

Description of work.	Labourers.	Cost.
		$ c.
Forking 13·2 tasks at 40 cents	13·20	5.28
Weeding 16·5 tasks at 30 cents	16·50	4.95
Total per acre	29·70	10.23

From the above it will be seen that to plough and cultivate an acre of land in young plant canes by implements with oxen in one day it takes 6·32 labourers and 4·22 oxen at a cost of $2.89, as against $5 28 for forking by hand with 13·20 labourers—a saving of $2.39 and 6·88 labourers in favour of implemental tillage. It should be pointed out, however, that the land is not so completely tilled with implements as is the case with hand labour—on the other hand whereas it is comparatively easy to get the labourers for implemental tillage, it is more difficult to get sufficient forkers when they are needed. It has been assumed above that the forkers make a task a day, but as they usually make a task and a half the number of labourers required to fork an

acre would be 8·80, an advantage still of 2·48 labourers in favour of implemental tillage.

After the land has been forked it is left in a much rougher condition than when worked with implements and in the subsequent weeding it takes 2·36 labourers less to work an acre with an equivalent saving of 71 cents *i.e.* a total saving of $3.10 and from 4·84 to 9·24 labourers per acre.

If mules had been used instead of oxen, these 9¼ acres could have been worked in 9½ days by a man and a boy with one mule at a cost of $0·92 per acre. including depreciation of implements and extra feed of mules. This would mean a saving in favour of implemental tillage of $4·36 per acre and 12·42 or 7·02 labourers according as the forkers worked, one or one and a half task a day. To this must also be added the saving of 2·36 labourers and 71 cents per acre on the subsequent weeding.

Ratoons.—Cultivating Flat. An eleven acre field of which 6 acres were first ratoons and 5 acres were third ratoons was worked as shown in the table below. The canes were cut at the end of April and beginning of May. In order to work the land with implements the trash had first to be hauled in the drains and afterwards it was respread over the land and the drains cleaned by hand labour.

Ratoons.—Field 1, St. Augustine—11 Acres.

Description of work.	Number of		Cos of Labour.
	Labourers.	Animals.	
		Mules.	$
Cultivating middles lengthways with "one mule" plough; making two cuts. The work was performed in 4¾ days by a man and a boy with one mule	9·50	4·75	3.27
Pulverising lengthways with horse-hoe up and down. The work was performed in 5¼ days by a man and a boy with one mule...	10·50	5·25	3.08
Total for 11 acres	20·00	10·00	6.35
Per acre	1·82	0·91	0.58
Depreciation of implements...	...	...	.06
Hauling trash in drain by hand labour, 4·95 tasks per acre at 30 cents	4·95	...	1.48
Extra feed of mules at 28 cents	...	...	.25
Weeding unworked portion of land, cleaning cane stools, drains and respreading trash from drains by hand labour, 14·14 tasks per acre at 30 cents...	14·14	...	4.24
Total per acre	20·91	0·91	6.61

The horse-hoe was passed over the 5 acres of third ratoons a second and a third time at an interval of 15 days and at a total cost of about 44 cents per acre for each additional operation and this is likely to save a subsequent weeding.

The cost and number of labourers required per acre to work these eleven acres by hand is as follows:—

Description of work.	Labourers.	Cost.
		$ c.
Hauling trash—11 tasks at 30 cents	11·00	3.30
Forking and burying trash—13·2 tasks at 40 cents...	13·20	5.28
Total per acre	24·20	8.58

As will be seen from the tables above to work an acre of ratoon canes it takes 20·91 labourers and 0·91 mule at a cost of $6.81 as against 24·20 labourers at a cost of $8·58 by hand—a saving of 3·29 labourers and $1.97 per acre in favour of implemental tillage. If the forkers did a task and a half there would be a difference of 0·91 labourer in favour of hand labour, but as previously pointed out forkers are only available in limited numbers. A saving of 2·36 labourers and 71 cents per acre is also obtained on the subsequent weeding as mentioned under plant canes.

Ratoons.—Cultivating flat and moulding the Canes.—In Field 5 St. Augustine, 2nd ratoons, the canes were cut in April and 6·30 acres were worked as follows:—

2nd Ratoons—Field 5 St. Augustine—6·30 acres.

Description of work.	Number of		Cost of Labour.
	Labourers.	Animals.	
		Mules.	$ c.
Cultivating lengthways with "one mule" plough making two cuts. The work was performed in 3 days and half an hour by one man and a boy with one mule	6·11	3·06	2.45
Pulverising lengthways with horse-hoe up and down. The work was performed in 2 days 2½ hours by one man and a boy with one mule	4·58	2·29	1.47
Moulding with celery hiller or double mould board plough. The work was performed in one day 6½ hours by one man and a boy with one mule...	3·44	1·72	1.38
Subsoiling bottom of drills with horse-hoe up and down. The work was performed in 2 days 6 hours by a man and a boy with one mule ...	5·34	2·67	1.80
Total for 6·30 acres	19·47	9·74	7.10
Per acre	3·09	1·55	1.13
Depreciation of implements...	...	...	.15
Hauling trash in drain by hand labour, 3·87 tasks per acre at 30 cents	3·87	...	1.16
Extra feed of mules	...	...	.43
Weeding unworked portion of land, cleaning cane stools, drains and respreading trash from drains, 17·40 tasks per acre at 30 cents	17·40	...	5.22
Total per acre	24·36	1·55	8.09

The horse-hoe was passed a second time on June 27–28 at a total additional cost of 44 cents per acre.

The cost and number of labourers required per acre to work these 6·30 acres by hand is as follows:—

Description of work.	Labourers.	Cost.
		$ c.
Hauling trash—12·43 tasks at 30 cents	12·43	3.73
Forking and burying trash—14·52 tasks at 40 cents...	14·52	5.81
Total per acre	26·95	9.54

From the above it will be seen that notwithstanding the additional operations of moulding the canes and sub-soiling the drills it would take 2·59 labourers less and cost $1.45 less per acre to work with implements, to which must also be added 2·36 labourers and 71 cents per acre saved on the subsequent weeding as previously pointed out.

Breaking Land, Filling old Drains and Levelling to Reform Beds.

Part of Field 3 Valsayn, 2·73 acres, from which the canes were cut was worked in April as shown below. The small drains were not more than 2 feet deep and the surface of the beds fairly flat, so that no supplementary hand labour was required.

Breaking Land and Reforming Beds—Field 3 Valsayn—2·73 acres.

Description of work.	Number of		Cost of Labour.
	Labourers.	Animals.	
			$ c.
Ploughing and uprooting old cane stools with No. 9 "two mule" plough. The work was performed in 7 days by one man and 3 boys with 4 oxen ...	28·00	28·00	8.75
Reploughing to fill drains with No. 9 plough. This work was performed in 3 days by 1 man and 3 boys with 4 oxen	14·00	14·00	3.07
Harrowing and levelling with "spring teeth" harrow. The work was performed in 6 days by 1 man and 2 boys with 2 oxen	19·50	13·00	5.48
Total for 2·73 acres	61·50	55·00	17.30
Per acre	22·53	20·15	6.34
Depreciation of implements...	...	...	.09
Extra feed of oxen	...	...	5.34
Hauling trash in drains to clear beds for ploughing – 4·98 tasks at 30 cents	4·98	...	1.49
Total per acre	27·51	20·15	13.26

The cost and number of labourers required per acre to work these 2·73 acres is given in the table below:—

Description of work.	Labourers.	Cost.
		$ c.
Hauling trash—4·98 tasks at 30 cents '... ...	4·98	1.49
Stumping out cane-stools, filling drains and levelling—25·88 tasks at 40 cents	25·88	10.35
Total per acre	30·86	11.84

As the cost and number of labourers required to perform the preparatory work of hauling the trash into the drain to clear the land for the implements and hand labour are identical, the figures relating to this item need not be taken into consideration. It will then be seen that it takes 22·53 labourers at a cost of $11.77 to level off an acre of land with implements as against 25·88 or 17·25 labourers at a cost of $10.35 according as the men digging out the stools and levelling work one or one and a half tasks a day. When the work is done with implements the soil is left in better tilth, being more loose and friable, than when done by manual labour. In Field 3, St. Augustine the small drains were nearly 3 feet deep and the beds "turtle backed" so that a certain amount of supplementary hand labour was necessary. The whole field consists of 10·77 acres of which 0·61 acres was levelled exclusively by hand labour as a comparison. This field had previously been ploughed at the end of the dry season and the reploughing and levelling was done in September.

Reforming beds and levelling—Field 3, St. Augustine—10·16 acres.

Description of work.	Number of		Cost of Labour.
	Labourers.	Animals.	
			$ c.
Reploughing with Nos. 9 and 12 ploughs and filling drains. The work was performed in 20¾ days by a man and three boys with 4 and sometimes 6 oxen to each plough	83·00	96·00	28.14
Harrowing and levelling with Morton's ditcher, the spring teeth and local made harrow. The work was performed in 15¼ days	49·00	47·59	15.52
Total for 10·16 acres	132·00	143·50	43.66
Per acre	12·99	14·12	4.30
Depreciation of implements	..	...	.18
Extra feed of oxen	...	...	3.74
Supplementary hand labour...	1·34	...	.54
Total per acre	14·33	14·12	8.76

On 0·61 acres actually worked by hand labour it is calculated that 24 6 men would level an acre at a cost of $9.84, as the men only worked a task a day. This shows a gain of 10·27 labourers and $1.08 per acre in favour of the implements.

PLOUGHING OR BREAKING LAND AND PREPARING LAND FOR PLANTING CANES.

Ploughing or Breaking Land.—The first ploughing after the crops were reaped, of 23·27 acres planted partly in canes and partly in cotton was done during March, April, May and June as was found convenient. After ploughing, the land should have been planted with a cover crop of cow peas to be either turned in as a green dressing or cut at the flowering stage to be fed to the stock or stored in silos. Unfortunately it was only possible to obtain 200 lb. of cow peas locally. These were allowed to grow to seed for obtaining a further supply.

This ploughing was done partly with Nos. 9 and 12 ploughs in 55¼ days of nine hours by one man and three boys with four oxen working on an average 0·42 acres per day. The cost per acre works out at $2.92 for labour and a total of $5.50, including depreciation of implements and feed of animals.

Preparing Land for Planting Canes.—Field 4, St. Augustine consisting of 12·56 acres was ploughed in April-May after a cotton crop. In August-September 10·76 acres were reploughed, of which 2·56 acres were prepared by hand labour and the balance of the field 10 acres with implements for planting canes. The first and second ploughing cost $5.50 and $4.80 respectively per acre and as these operations were performed on the whole field there is no necessity to take them into consideration in ascertaining the difference in the cost of implemental and hand preparation.

Prepared with Implements—10 acres Field 4 St. Augustine.

Description of work.	Number of		Cost of Labour.
	Labourers.	Animals.	
			$ c.
Harrowing with local made harrow. The work was performed in 8⅝ days by one man and two boys with 4 oxen (on 2 days only two oxen worked)...	26·50	32·30	8.70
Drilling with pony plough. The work was done in 24½ days by one man and a boy with one mule...	49·10	24·50	19.20
*Banking with double mould board plough. The work was performed in 4½ days by a man and a boy with one mule	9·20	4·60	3.80
Subsoiling bottom of drills with horse-hoe. The work was performed in 4 days by a man and a boy with one mule	8·00	4·00	3.20
Total for 10 acres	92·80	65·40	34.90
Per acre	9·28	6·54	3.49
Depreciation of implements...	...	...	.15
Extra feed of oxen	...	...	.85
Extra feed of mules	...	...	.92
Total per acre	9·28	6·54	5.41

* Banking with the double mould board plough was necessary only on account of the desire to plant potatoes on the banks.

If oxen had been used for drilling with No. 9 or 12 plough it would have cost and taken the following number of labourers and animals.

Description of work.	Labourers.	Animals.	Cost of Labour.
			$ c.
Harrowing with local made harrow. The work was performed in 8¾ days by one man and 2 boys with 4 oxen (on 2 days only 2 oxen worked) ...	26·50	32·30	8.70
Drilling with No. 9 or 12 plough. The work was performed in 21⅝ days by a man and 3 boys with 4 and occasionally 6 oxen...	86·70	107·80	30.60
Banking with double mould board plough. The work was performed in 4½ days by a man and a boy with one mule	9·20	4·60	3.80
Subsoiling bottom of drills with horse-hoe. The work was performed in 4 days by a man and a boy with one mule	8·00	4·00	3.20
Total for 10 acres	130·40	148·70	46.30
Per acre	13·04	14·87	4·63
Depreciation of implements	...	...	·15
Extra feed of oxen	...	...	3.71
Extra feed of mules	...	...	.24
Total per acre	13·04	14·87	8.73

The cost and number of labourers required per acre to prepare the above 10 acres by hand labour alone is given below.

Description of work.	Labourers.	Cost.
		$ c.
Banking lengthways 3 banks to a bed=6,000 feet of banks at 15 cents per 100 feet	15·00	9.00
Forking bottom of drills, 4 to a bed=8,000 feet of drills at 4 cents per 140 feet	3·80	2.28
Total per acre	18·80	11.28

From the above tables it will be seen that when drilling is done with mules it takes 3·76 labourers and costs $3.32 less than with oxen.

Similarly for the whole work it takes 9·52 and 5·76 labourers and $5.87 and $2.55 less per acre when the drilling is done with mules and oxen respectively than by hand labour alone. This is based on the assumption that the hand labourers work a task and a half or for 60 cents a day. If they only worked a task per day there would be an additional saving of 9·40 labourers per acre in favour of implements.

GENERAL.

The figures in all of the foregoing tables in respect of implemental tillage are the results of what has actually been done and have not been calculated on what the best animals can do. No allowance have been made for time lost when animals were being broken in or when they worked badly. It is probable therefore that with well-trained animals more work can be done and at a cheaper cost. When it is stated that a certain work was performed in say 5 days, it is not meant to infer that it was done in 5 consecutive days but that the time occupied in performing the work amounted to 5 days work of 9 hours.

The advantages of implemental tillage are (1) the cost is lower, (2) fewer labourers are required to work an acre especially when cultivating with mules, (3) the kind of labour required is more easily obtained than that for working with hand labour alone and (4) with sufficient stock and implements a larger acreage can be worked in a given time.

In cultivating growing canes the land is not so thoroughly tilled by implements as by hand labour; on the other hand a better preparation for planting is obtained by the use of implements. Another important factor in favour of implemental tillage is that approximately two-thirds of the labourers required are young boys who might otherwise be idle. Incidentally they get a good training in the use of the implements and the handling of animals for later years.

It remains to be seen, however, whether better crops will be obtained from implemental tillage supplemented by hand labour as compared with manual labour alone. Experiments have been planned on ratoon canes in Field 2, but unfortunately on small plots, as all the fields are planted with several varieties of cane and no large area planted with a single variety was available. Another experiment has also been started in Field 4, to test the relative merits of preparing and tilling the land with implements supplemented by hand labour as against manual labour alone.

The actual account of work performed, the number of labourers and animals used with each implement, the average acreage worked per day,

together with the cost of labour, depreciation of implements, extra feed of animals and total cost per acre is given in the following table :—

Description of work performed and implements used.	Acreage worked.		Per acre.			
	Total.	Average per day.	Cost of labour.	Depreciation of implements.	Extra feed of oxen.	Total cost.
	Acres.	Acres.	$ c.	$ c.	$ c.	$ c.
Cultivating middles with "one mule" plough.						
(*a.*) One man and a boy with a mule ...	25·85	2·25	0.33	0.03	0.12	0.48
(*b.*) One man and 2 boys with 2 oxen, each ox working half day ...	9·25	0·80	0.97	0.03	0.66	1.66
(*c.*) One man and 2 boys with 2 yokes of oxen, each yoke working half day...	5·50	1·69	0.54	0.03	0.63	1.20
(*d.*) One man and 3 boys with 2 yokes of oxen working all day	4·00	1·69	0.81	0.03	0.66	1.50
Pulverising with No. 82 "E" horse-hoe.						
(*a.*) One man and a boy with a mule ...	59·15	2·25	0.29	0.03	0.12	0.44
(*b.*) One man and 2 boys with 2 oxen, each ox working half day ...	1·75	1·17	0.73	0.03	0.45	1.21
Banking with Celery Hiller.						
(*a.*) Moulding growing canes—one man and a boy with a mule... ...	16·22	3·24	0.24	0.06	0.09	0.39
(*b.*) Banking to plant canes—one man and a boy with a mule... ...	8·70	2·17	0.38	0.06	0.13	0.57
Subsoiling drills with No. 82 "E" horse-hoe.						
(*a.*) Cultivating growing canes—one man and a boy with a mule... ...	14·27	3·11	0.23	0.03	0.09	0.35
(*b.*) Preparing land for planting canes—One man and a boy with a mule ...	8·70	2·48	0.32	0.03	0.11	0.46
Ploughing with Nos. 9 and 12 ploughs.						
(*a.*) Dry season—One man and 3 boys with 4 oxen...	27·33	0·42	2.92	0.06	2.52	5.50
(*b.*) Rainy season—one man and 3 boys with 4 and occasionally 6 oxen ...	10·76	0·57	2.36	0.06	2.38	4.80
Harrowing and levelling land with "spring teeth" harrow.						
A man and a boy with 2 oxen ...	2·73	0·42	2.00	0.03	1.26	3.29
**Harrowing with "spring teeth" harrow.*						
A man and 3 boys with 4 oxen ...	1·33	0·84	1.47	0.03	1.26	2.76
**Harrowing with "local made" harrow.*						
A man and 2 boys with 4 and occasionally 2 oxen	8·20	1·13	0.87	0.03	0.85	1.75
Drilling to plant canes.						
(*a.*) With Nos. 9 and 12 ploughs—one man and 3 boys with 4 and occasionally 6 oxen	4·50	0·46	3.06	0.06	2.86	5.98
(*b.*) With pony plough—one man, a boy and one mule	5·50	0·41	1.92	0.03	0.69	2.64

* This implement is easily worked with two oxen but as the extra animals were on the spot when doing this work, they were utilised.

THE MOSAIC DISEASE OF SUGAR CANE IN TRINIDAD.

By C. B. Williams, M.A.,

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THE MOSAIC DISEASE.

In various parts of the world a serious disease or group of allied diseases of sugar cane is known under various names, all based on the typical condition of the leaves of the diseased plants. "Mosaic Disease" "Mottling Disease" or "Yellow Streak" are names in use in different countries. It has been recorded from Java, Argentine, Hawaii, Porto Rico, Cuba and more recently in Louisiana, St. Croix and Jamaica.

Diseased canes show an irregular streaking of the leaves with yellowish green, paler than the normal healthy colour, most obvious when the leaf is held up to the light. The intensity of the streaking may vary in different varieties of cane and according to the severity of the attack, from a few paler streaks on the normal green background to a condition when only a few streaks of healthy dark green colour remain on an otherwise pale washed-out looking leaf.

In some countries, and in some varieties of cane, this mottling of the leaf is accompanied by a longitudinal cankering of the canes, between the nodes, with light coloured streaks, and a drying up of the canes resulting in a considerable loss of weight.

The disease seldom kills the infected stool outright but it is reported to become gradually more severe each year the stool is ratooned.

Nothing is known of the cause of the disease. Neither fungus nor bacteria have been found after considerable search, and it has been suggested that it is due to some organism too small to be seen by the microscope.

Experiments carried out in Porto Rico indicate that every cutting taken from a diseased plant carries with it the infection, and none produce healthy plants.

In addition the disease is, in some unknown manner,* infectious and gradually spreads from diseased plants to healthy ones in the neighbourhood. The spread occurs more rapidly at certain times of the year and it is possible that it is due to transmission by some sucking insect.

In Porto Rico the disease was first recorded in 1916 and has spread with great rapidity over more than three-quarters of the area under cane. Ten factories in the diseased area are said to have experienced a reduction in output averaging nearly 40 per cent., while ten factories in the free area in the same period have slightly increased their yield.

* Experiments at Washington have now shown that transmission can be effected by the corn aphis.

It is estimated that for 1918 in Porto Rico the financial loss amounted to $2,500,000, making with losses for 1916 and 1917, a total of about, $3,500,000. The decrease in crop results primarily from reduction in tonnage.

In Hawaii the reduction in yield in diseased canes varies from 5 to 40 per cent. in different varieties.

In Louisiana the disease was only discovered in 1918 but evidence shows that it was introduced into the Experimental plots of the Audubon Park Sugar School some time shortly before 1914, as since that date "every point receiving seed (cuttings) from the station has become the centre of a larger or smaller infected area." "At the present time 97 per cent. of the plant canes at the station have the Mosaic Disease."

Preliminary observations in Louisiana indicate a loss reaching at least 12 per cent.

No cure is known; the only control methods being to destroy when possible every diseased stool, never to take cuttings for planting from diseased stools, to inspect at intervals all fields of young plant canes suspected to be infected, and to uproot all stools showing signs of the disease.

OCCURRENCE IN TRINIDAD.

Early in 1918 a plot of canes of the variety D. 3956 at the St. Augustine Experiment Station, was noticed to have the leaves streaked with pale yellowish green. A year later the same unusual appearance was apparent, if anything more pronounced, but nothing similar was noticed on the neighbouring beds.

Towards the end of 1919 I pointed out the condition to Mr. W. Nowell, Mycologist of the Imperial Department of Agriculture, who was in the colony, and we discussed the possibility of its being the Mosaic Disease. A little later a close search revealed the fact that many other varieties were infected to a greater or less degree, and as a precaution no further cuttings were sent out from the station.

Specimens, dried and in formalin, were sent to Mr. M. A. Taylor, Chief of the the Bureau of Plant Industry, United States Department of Agriculture, who replied in March, 1920, as follows:—

"Dr. E. W. Brandes, Pathologist in Sugar Plant Investigations, whom I asked to examine this material, advises me that there can be no question but that the dried and formalined specimens are affected by Sugar Cane Mosaic. He would not make this diagnosis solely on the dried material, but the leaves in formalin show the typical condition induced by the disease. The importance of prompt and thorough action with respect to its eradication, if it is not too firmly established, is considered by our pathologists to be very great. . . . . Dr. Brandes advises further that the cane varieties which you mention

being diseased in Trinidad are all included in his notes on observations in Porto Rico and Louisiana made during his trip to those regions last year. Furthermore all Trinidad seedlings, including T. 247, T. 24, T. 87, T. 83 and T. 211 are badly affected in Louisiana. Whether this indicates that these varieties were diseased when they reached Louisiana, or are especially susceptible and became quickly infected after arrival cannot be determined from the information available here."

Shortly before the receipt of this confirmation of our suspicions as to the identity of the disease, the situation had become much more serious in Trinidad by the discovery that many of the cuttings already sent out from the Experiment Station were infected and were producing diseased plants which would become centres of infection. A number of estates were visited in different parts of the island, where cuttings had been sent, and in nearly every case the disease was found to be present to a greater or less extent.

In April, 1920 the disease was proclaimed under the Plant Protection Ordinance (*Trinidad Royal Gazette*, April 15, 1920. p. 285) which gives the Inspectors under the Ordinance the right to enter estates for the purpose of searching for the disease, and of taking steps to destroy the infected plants if the owner of the canes does not do so after an order has been served upon him.

PRESENT SITUATION.

At present there are about fifty known points of infection in the island, which are being dealt with as rapidly as possible. Several have already been cleared as far as visible signs can be depended on. Nearly all of these points of infection can be traced to cuttings sent out from St. Augustine but there are a few the origin of which is uncertain. The most important of them is at River Estate where a number of infected stools have been found. Sugar cane experiments were carried out at River Estate by the Board of Agriculture before they were transferred to St. Augustine and it is possible that the occurrence of the disease at River Estate indicates that it was introduced into the island shortly before the transfer of plants from River Estate to St. Augustine, in 1914.

In the St. Augustine district a number of small farmers' plots seem to have become infected by the natural spread of the disease.

At the St. Augustine Experiment Station itself the disease was widespread and affected the following varieties in the proportions shown :—

TABLE I.

Mosaic Disease Infection at St. Augustine, July, 1920.

Variety.	Percentage Infection.	Variety.	Percentage Infection.	Variety.	Percentage Infection.
	%		%		%
Badilla ...	0·2	B. 60 ..	36·0	D. 109 ..	0·2–4·7
Bourbon ...	1·7–17·0	B. 67 ...	73·0	D. 115 ...	3·0
White Tanna.	0·8	B. 147 ...	free	D. 116 ...	41·0
		B. 156 ...	0·6–6·0	D. 145 ...	19·0
L. 218 ...	51·0	B. 208 ...	25·0	D. 366 ...	free
L. 253 ...	88·0	B. 347 ...	4·5	D. 504 ...	0·5
L. 511 ...	free	B. 1753 ...	17·0	D. 3956 ...	76·0
H. ? ...	1·0	B. 3390 ...	free		
H. 27 ...	15·0–25·0	B. 3412 ...	1·0		
H. 146 ...	18·0	B. 3922 ...	5·5–50·0		
H. 227 ...	1·0–3·0	B. 4578 ...	18·0		
		B. 4934 ...	0·3		
T. 39 ...	26 0	B. 6308 ...	0·2–1·0		
T. 75 ...	10·0–47·0	B. 6388 ...	0·2–10·0		
T. 202 ...	10·0–20·0	B. 6450 ...	7·0–82·0		
		B. 6835 ...	23·0		
M.P. 55 ...	2·8	B. 7176 ...	1·0		
		B. 7482 ...	2·0		
Ba. 6032 ...	1·2–5·4	B. 8600 ...	2·0		
Ba. 7924 ...	2·2–6·9	B. 8660 ...	1·2		
Ba. 8846 ...	2·8–28·0	B. 10650 ...	24·0–26·0		
		B. 14761 ...	1·2–7·0		
B.H. 10 (12)	10·0–53·0	B. 16536 ...	51·0–78·0		
B.S.F. 12 (24)	0·8–6·0	B. 16832 ...	free		
B.S.F. 12 (27)	1·9–16·0	B. 17380 ...	0·6–1·2		
B.S.F. 12 (34)	2·5–8·0	B. 18208 ...	1·2		

An attempt was made to estimate the damage done by the disease by sorting and weighing the diseased and healthy canes in twenty stools

of different varieties at St. Augustine in March, 1920. The results as obtained by Mr. J. de Verteuil are shown in Table II:

TABLE II.—Comparison of Diseased & Healthy Canes at St. Augustine Estate.

Plant Canes, Field 2, Valsayn—20 stools.

Variety.	Description.	Canes. Total. Number.	Weight.	Per cent.	Average weight.	Per cent. Loss on diseased cane.	Loss on plot.	Average weight per foot of ripe canes.
Ba. 6032	Healthy	132	796	68·4	6·03	...	...	·771
	Diseased	61	333	31·6	5·46	9·4	2·97	·688
B.H. 10 (12)	Healthy	180	963	74·1	5·35	...	...	·672
	Diseased	63	301	25·9	4·78	10·6	2·74	·631
B. 16536	Healthy	159	684	52·3	4·30	...	...	·655
	Diseased	145	426	47·7	2·94	31·6	15·07	·564
B. 14761	Healthy	172	613	91·5	3·56	...	...	·733
	Diseased	16	37	8·5	2·31	35·1	2·98	...
B. 6450	Healthy	104	307	49·1	2·95	...	...	·606
	Diseased	108	251	50·9	2·32	21·4	10·89	·540
B. 10650	Healthy	93	373	58·9	4·01	...	...	·889
	Diseased	65	255	41·1	3·92	2·2	·90	·788
B. 6388	Healthy	178	694	90·3	3·90	...	...	·689
	Diseased	19	60	9·7	3·16	19·0	1·84	...
B. 156	Healthy	283	982	96·6	3·47	...	...	·602
	Diseased	10	33	3·4	3·30	4·9	·16	...
First Ratoons, Field 1, St. Augustine—20 stools.								
Bourbon	Healthy	98	341	61·2	3·48	...	...	·643
	Diseased	62	179	38·8	2·89	16·9	6·56	·662
B. 16536	Healthy	73	189	27·9	2·59	...	..	·566
	Diseased	189	301	72·1	1·59	38·6	27·83	·457
B. 156	Healthy	284	644	80·0	2·27	...	...	·468
	Diseased	71	125	20·0	1·76	22·5	4·50	·423
B. 10650	Healthy	108	453	48·4	4·19	...	...	·763
	Diseased	115	480	51·6	4·17	·48	·25	·766
H. 146	Healthy	191	641	79·2	3·36	...	...	·671
	Diseased	50	180	20·8	3·60	...	...	·619
Third Ratoons, Field 1, St. Augustine—20 stools.								
D. 3956	Healthy	79	269	46·5	3·40	...	...	·782
	Diseased	91	285	53·5	3·13	7·9	4·25	·747
D. 116	Healthy	45	136	22·3	3·02	...	...	·569
	Diseased	157	449	77·7	2·86	5·3	4·11	·644
D. 145	Healthy	160	692	67·2	4·32	...	...	·893
	Diseased	78	295	32·8	3·78	12·5	4·10	·603
B. 208	Healthy	204	415	85·7	2·03	...	...	·572
	Diseased	34	63	14·3	1·85	8·9	1·26	...
B 1753	Healthy	258	449	86·0	1·74	...	...	·434
	Diseased	42	54	14·0	1·28	26·4	3·69	...

The percentage of infection varies from 3·4 per cent. in plant canes of B. 156 to 77·7 per cent. in third ratoons of D. 116.

The loss in diseased canes as compared with healthy varies from 38·6 per cent. in first ratoons of B. 16536 to 0·48 per cent. in first ratoons of B. 10650, while H. 146 even shows slight increase. In Table III the varieties in Table II are arranged in order of the damage suffered.

TABLE III.

Percentage loss.		*Variety.*		
38·6	...	B. 16536	...	1st Ratoons.
35·1	...	B. 14761	...	Plants.
31·6	...	B. 16536	...	Plants.
26·4	...	B. 1753	...	3rd Ratoons.
22·5	...	B. 156	...	1st Ratoons.
21·4	...	B. 6450	...	Plants.
19·0	...	B. 6388	...	Plants.
16·9	...	Bourbon	...	1st Ratoons.
12·5	...	D. 145	...	3rd Ratoons.
10·6	...	B.H. 10 (12)	...	Plants.
9·4	...	Ba. 6032	...	Plants.
8·9	...	B. 208	...	3rd Ratoons.
7·9	...	D. 3956	...	3rd Ratoons.
5·3	..	D. 116	...	3rd Ratoons.
4·9	...	B. 156	...	Plants.
2·2	..	B. 10650	...	Plants.
0·48	...	B. 10650	...	1st Ratoons.
Very slight increase	...	H. 146	...	1st Ratoons.

The actual loss on the plots tested varied from 0·25 per cent. in B. 10650 to 27·83 per cent. in B. 16536.

The cankering of the stem was very distinct in B. 16536 and B. 6450.

Experiments are now being carried on at St. Augustine to study the spread of the disease and to find at which time of the year it is most rapid. Cuttings from diseased and healthy canes are also being planted side by side to test the conclusion reached in Porto Rico that every cutting from a diseased plant is diseased.

ERADICATION AND CONTROL.

The only way known at present in which the Mosaic disease can be prevented from becoming a serious danger to the Trinidad sugar industry is by continual inspection and the continual destruction of all diseased stools.

It is found in Porto Rico that this is a practicable method of control whenever the infection does not exceed 25 per cent. When the infection is higher than this, the field should be replanted after the crop has been cut, with cuttings carefully selected from healthy stools.

Where the disease has become established the following routine is recommended by the United States Department of Agriculture (*Bulletin* 829):—

"It is suggested that the following schedule of inspection and rogning be put into operation: In the spring, just as soon as all the plants have sprouted, the field should be inspected by passing up and down the rows. All diseased stools should be pulled out of the ground and cast down between the rows. If this first inspection is carried out in a thorough manner the field will be completely freed from the disease provided no secondary infections are going on. Since there are as yet no certain means of determining the latter fact, a second inspection is essential. It should be made from 25 to 30 days after the first, a lapse of time sufficiently in excess of the incubation period for mosaic to insure recognition of the disease in plants inoculated prior to the first inspection. If no diseased plants are found during the second inspection, it can be assumed that secondary infection is not in operation and that the remaining plants will continue healthy. If diseased plants are found, however, it establishes the fact that secondary infections are going on. The field should be rogued as before, and a third inspection made after the same interval, *i.e.* 25 to 30 days. If the carriers remain active it may be necessary to repeat the process several times, and owing to the impossibility of recognising the disease in inoculated plants before the end of the incubation period it is certain that plants which have become infected just before the inspection is made will escape detection. This emphasizes the necessity for making the first inspection early, preferably before the leaf-hoppers or other sucking insects have appeared on the plants.

"This procedure may result in perfect control or eradication of the disease, or in partial control, the element of uncertainty being due to our inability to control the carriers. By it their activity can be rendered less effective by reducing the sources of inoculation to a minimum. It has effectually halted the progress of the disease into new territory in Porto Rico.

"In badly infected sections the problem is manifestly complicated. Where 25 to 60 per cent. or more of the plants in large fields are diseased, roguing is obviously out of the question.

"Such planting should be allowed to mature. Every stalk of it should be ground, however, and the stubble plowed up and killed."

Bulletin No. 22. Porto Rico Department of Agriculture (received April 10, 1920) by F. S. Earle, Expert in Cane Disease, gives the experience gained during 1919 in eradicating the disease:

"The results have uniformly been very favourable and they have been obtained at moderate cost. The object of this publication is to record these facts and bring them to the general knowledge of cane planters not only in Porto Rico but in other cane-growing countries, for it is now known that this disease exists in Santo Domingo, Hayti, Cuba Louisiana and all of the other cane-growing districts of the United States, besides Argentina, Egypt, Hawaii and all parts of the far East.

"The method of eradication consists in doing just two things, and of those one is equally important as the other. If seed must be taken

from a field that is partially diseased, then the selection must be made before the top is cut off. Once the leaves have been removed it is impossible to distinguish the earlier stages of the disease. Inspecting and sorting over the piles of cut seed is absolutely useless as far as this disease is concerned. Second, when the young cane is a foot high, the fields should be carefully inspected and all plants showing signs of disease should be pulled out. These may be either from overlooked infected seed or they may be incipient secondary infections. This inspection should be repeated at intervals of about ten days until no more cases are found. Most planters make the mistake of delaying this first inspection much too long, and of not repeating it sufficiently frequently. When the disease is active, success will depend entirely on the promptness and thoroughness with which this work is done. Every day that a diseased cane stands in the field adds to the chance of secondary infection. Then too, when a small cane is pulled the vacancy may be easily filled by planting a new seed piece. When the cane gets larger replanting must be done by dividing stools and this is much more expensive. After the cane closes further inspection is practically impossible.

"Ratoon fields should be treated exactly like new plantings. Digging out diseased stools is more expensive than pulling up recently planted seeds. When ratoon fields do not show more than 20 or 25 per cent. of infection if otherwise in good condition, it will pay to clear them up and replant them.

"Ordinarily if the percentage of disease is greater than this it will be best to plow them up and make a new planting. Whether to clean out a field of infected ratoons or to plow it up will naturally depend on the team force and seed cane available for making new plantings. Fields can often be seen with old diseased stubble sprouting and growing on the banks between the rows of young cane. The best possible seed will inevitably soon become infected under these conditions."

There is no doubt that the disease is a serious one, and if allowed to spread unchecked may cause enormous losses to the island. If taken in time, however, by the methods outlined above, it may be kept within bounds or even perhaps exterminated, and it is hoped that farmers, overseers and managers will do all that they can without delay to assist in preventing the spread of the disease and in destroying the centres of infection already unfortunately present.

July, 1920.

FORESTRY.

NOTE ON SOWING OF TEAK SEEDS IN TRINIDAD.

By C. S. Rogers,
Conservator of Forests.

Always sow Teak seeds in a spot fully exposed to the sun for the greater part of the day. Cover with not more than one inch of earth. If sown in nurseries each seed should be eight inches from any other.

Germination may begin in two or three weeks if the soil is moist. If the weather is dry and the seed beds are not watered it may be over a month before germination begins, but the seeds are better in the soil than stored in-doors. Germination may be hastened by placing the seeds in water for a few hours every second or third day for two weeks before sowing. In the intervals they should be exposed to the weather in the open. When germination begins about 25 per cent. may be expected to germinate in a month and a further 15 per cent. in the next six or eight weeks. Besides soaking in water no other special treatment is required. Sowing in April is recommended.

When the seedlings have put out two pairs of leaves besides the cotyledons or seed leaves it is advisable to pot them or transplant them into nurseries 15 to 18 inches apart.

As soon as the stem of the seedlings is six inches high the seedlings should be planted out, but they will suffer no injury if left until the stem is nine to twelve inches high. If put into bamboo pots, the pots should be large and the seedlings should not remain long in them. In any case the seedlings should be planted out during the year in which they were raised.

If Teak seeds are sown at stake where the trees are to grow three seeds should be sown at each stake not less than nine inches apart so as to allow of the extra seedlings being dug up for transplanting without injury to the one that is to remain. It is believed that Teak raised from seeds at the spot where the trees are to grow thrives better than when seedlings from nurseries are planted out, on account of absence of injury to the roots during transplanting.

A well drained soil is essential to the successful growth o Teak.

March 25, 1920.

AGRICULTURAL EDUCATION.

CANE FARMERS' PRIZE COMPETITION, 1919.

Report of the Judges.

The number of competitors selected by the Agricultural Adviser for examination were thirty-eight (38)—eighteen in District A (Tacarigua-Caroni) and twenty in District B (Couva-Chaguanas). Of this number one in District A, and two in District B, failed to meet the judges as advised and were accordingly disqualified. All of the others were present with the judges, each on his own farm.

The work and condition of every farm were very carefully inspected and all the peculiar circumstances of soil and locality considered. All the farmers were closely catechised to test the soundness of their practice and their grasp of the principles underlying the various operations incidental to sugar cane cultivation.

The answers and explanations given by the majority of the competitors warrant our declaring the competition a thorough success and productive of much benefit to the cane farmers and the sugar industry.

Among the items of interesting information gleaned during the course of the judging prominence must be given to the deserved popularity of the cane B. 347 (Burk). This seedling, it will be remembered, came into similar prominence in the 1918 competition in the Naparimas where soil and other conditions are very much different from those of this year's districts.

The high esteem in which many of the farmers on the heavy and the moderately fresh soils of the Wyaby, Charlieville and Cacandu Road sectors hold the old "Bourbon" is also worthy of remark, particularly when the fine showing of even ratoon crops seem to amply justify the confidence placed in the cane.

The D. 109 (Sweet Bee) is very popular in the Couva-Carapichaima sector.

THE DISTRICT.

The keen spirit of rivalry with which most of the competitors evidently worked is shown in both districts, by the first-prize winner in each case being attended by a prize-winning neighbour.

The work of District B (Couva-Chaguanas) on the whole has been somewhat better than that of District A (Tacarigua-Caroni), the average number of points gained by the first 13 competitors in each being respectively 82·1 and 81·6. When the standard of work of the prize-winners is considered and a comparison made between the districts the superiority of District B is very marked.

	Tillage.	*Cultivation.*	*General.*
District A	... 93 per cent.	100 per cent.	68 per cent.
District B	...100 „	100 „	78 „

The prize-winners' totals for the two districts average respectively 90 per cent. and 96 per cent.

THE COMPETITORS.

Thomas Pryce of Couva must be considered champion of the whole competition and deserves his success. Although a complete stranger to erudition, he has obtained full marks in tillage and cultivation.

Samuel Gilkes, a neighbour and close friend of Pryce, would have certainly given him a harder tussle had not illness handicapped him for some time.

Cyril Griffith who has tied with Gilkes for second place is of California and a mere lad.

A. B. Gobin of Chaguanas the winner of fourth place in District B has beaten the best man in District A by a mark.

Nabbie of Cane Farm, Tacarigua, has secured a comparatively easy victory in District A. Still his 93 marks are a creditable performance and he is to be congratulated.

Eleazer Tappin of El Socoro, San Juan has secured just one mark less than the first prize-winner. Barring a weakness in manuring, which cost him 5 marks, the work of this competitor was superior to that of his more successful rival in every respect.

Moorid of Cane Farm, Tacarigua, and Francis Carter of St. Augustine who tied for third place in District A have also done very good work.

Among those who have failed to make prize places the following are deserving of mention, and we may add sympathy to Medford in particular:—

Arthur Medford (90 marks) of Exchange, Couva who is a farmer of a high order. William Sutton of California and J. C. Foster of Macoya, Tunapuna, both of whom did very fine work as their marks (88 and 86 respectively) show.

RECOMMENDATIONS FOR PRIZES.

We beg to suggest that the prizes be awarded as follows:—

A.—Tacarigua-Caroni District.

First Prize of	$50.00 to	Nabbie ...	... (93 marks).
Second „	$35.00 to	Eleazer Tappin	... (92 marks).
2 Third Prizes of	$15.00 each to	Moorid	... (87 marks).
		Francis Carter	... (87 marks).

B.—Couva-Chaguanas District.

First Prize of	$50.00 to	Thomas Pryce	... (99 marks).
2 Second Prizes of	$27.50 each to	Samuel Gilkes	... (95 marks).
		Cyril Griffith	... (95 marks).
Fourth Prize of	$10.00 to	A. B. Gobin	... (94 marks).

(Sgd.) EDWIN E. JOHNSON,
C. McD. ROACH.

The districts for this competition were defined in *Bulletin Dept. Agr.* XVIII. 1919, 37; the rules were the same as for the 1918 competition.—*Bulln.* XVII. 1911. 49. The prizes were distributed to the successful competitors by His Excellency the Governor at the meeting of the Board of Agriculture on April 15, 1920.

CACAO PRIZE COMPETITION 1919-1920.—POOLE-RIO CLARO.

Report of the Judges.

We have the honour to report that the judging in the Cacao Prize Competition in the Poole-Rio Claro District commenced on Tuesday, April 20 and ended on Monday, April 26. During this period twenty cultivations were visited and judged. Twenty-two competitors were originally presented for judging, but two were absent.

After a careful comparison of the merits of each competitor's work, we were able to recommend that all the prizes in Class I and six in Class II be awarded to the thirteen competitors named on the attached list.

As a tie has occurred for the first place in Class II we beg to suggest that the first and second prizes in Class II, as also the seventh prize in the same class (which has not been awarded) be added together and divided equally between Bartholomew Williams and Samuel Carrington who have each obtained 95 marks. These two men have proved themselves to be the champions of the competition, having surpassed all the other competitors.

The average percentage of marks obtained by the prize-winners among the peasant proprietors is for Tillage 74·28 per cent., for Sanitation 59 per cent., and for General 70 per cent. These may be considered fair except in the case of Sanitation which is rather low. In the contractors class the following percentages have been obtained by the prize-winners:—Tillage 85 per cent., Sanitation 88·3 per cent. and General 72·5 per cent.; indicating that the contractors have done much better work than the proprietors.

It is worthy of note that the marks obtained for draining have been fairly high, two of the successful competitors got full marks and five reached as high as 95 per cent. Good drainage seems to be getting pretty general all over the district even on undulating lands.

In forking and manuring there is still much to be desired, as there has been a certain amount of prejudice against these operations nevertheless some of the prize-winners did remarkably well in Tillage. Sanitation is backward among the competitors as a whole, but it is gratifying to note that a few of the prize-winners obtained very high marks in this line, Samuel Carrington having reached 100 per cent., while five others reached 95 per cent.

We have been favourably impressed with the theoretical knowledge of the successful competitors. It is indeed pleasing to record that out of the thirteen prize-winners, five obtained full marks in theory and five reached 95 per cent.

We cannot speak too highly of the holdings of Jhooree Singh, Bartholomew Williams and Samuel Carrington. Each is in itself a demonstration plot, well worthy of admiration, and serves as an education to the neighbouring inhabitants. Jhooree Singh is deserving of special mention for his heavy manuring and good sanitation; Williams for good draining, manuring, and heavy mulching, also very good sanitation;

and Carrington for thorough and efficient sanitation, good forking and excellent all round work. Others worthy of note are Bheeman Seedarnee for specializing in seed selection and good all round work, and Neetoo for good forking and weeding. The winners of the second, third and fourth prizes in Class I and those of the fourth and fifth prizes in Class II did fairly good all round work, but did not excel in any particular branch.

Although this competition has been the first of its kind to be held in the district, we are of opinion that it has been a success.

As there are many persons eagerly awaiting the results of this competition and are anxious to enroll their entries for the next, we beg to suggest that the prize distribution be held in the district itself and the competition be repeated at least for a couple of years in the same district, with an extension of the boundaries (if possible), so as to include Mayaro and Guayaguayare.

(Sgd.) C. McD. ROACH.
L. MOTA.

PRIZE WINNERS.

Class I.—Peasant Proprietors.

Order.	Value of Prize.	Names.	Marks.	Nationality.	Acreage.	District.
1	$80.00	Jhoorce Singh ...	91	Trinidad born Indian	10	Poole.
2	60.00	Arjoon ...	80	,, ,, ...	10	Rio Claro.
3	40.00	D. E. Beggasse ...	73	Trinidadian ...	7	Poole.
4	30.00	Leonard Ragbir...	71	,, ...	12	Rio Claro.
5	20.00	Mitl. Nicholas ...	59	,, ...	6	Poole.
6	15.00	Suk. Seedarnee...	57	Trinidad born Indian	5	Rio Claro.
7	10.00	Neetoo ...	51	,, ,, ...	10	Poole.

Class II.—Contractors.

Order.	Value of Prize.	Names.	Marks.	Nationality.	Acreage.	District or Estate.
1	$55.00	Bart. Williams...	95	Trinidadian ...	5	Rio Claro estate.
2	55.00	Sam. Carrington	95	Barbadian ...	3	Rio Claro estate, Charuma.
3	30.00	Bhee. Seedarnee	90	Trinidad born Indian	3	Rio Claro.
4	20.00	Her. Absalom ...	87	Trinidadian ...	3	Rio Claro estate.
5	15.00	Seegobin ...	83	Trinidad born Indian	2½	St. Eme estate, Ecclesville.
6	10.00	Maxime Bain ...	51	Grenadian ...	5	Rio Claro.

PRIZE DISTRIBUTION.—RIO CLARO.

The regulations for this competition were given in the *Bulletin*. XVIII. 1919, 38.

The prizes were distributed by His Excellency the Acting Governor, the Hon. T. A. V. Best, C.M.G,, C.B.E., at Rio Claro on June 19, 1920.

REPORT BY THE DIRECTOR OF AGRICULTURE.

Mr. W. G. Freeman said:—Cacao Prize Competitions were started in 1911 as a method of practical agricultural education, the instruction taking place on the actual land of the peasant proprietor or contractor. They proved useful and since 1911 other competitions had also been held. Cane Farming, Vegetables, Rice and Tobacco growing and in addition to providing cost of the salaries of the Agricultural Advisers, their travelling, etc., the Board of Agriculture had given over $5,000 in cash prizes. The example of the Board had been followed by some estate owners, notably the Ste. Madeleine Sugar Company, whose prize distribution would take place during the following week.

Objects of the Competition.

The object of the Competitions was to encourage the good cultivation of cacao by peasant proprietors and contractors to help them to get better crops and so more money, to keep their trees in more healthy condition. The Agricultural Advisers—Mr. L. Mota in their district—came to them as friends ready to show practically to each on his own holdings what could be done. For example if draining is necessary, where the drains should be put, and how they should be dug, if canker were reducing the crop, how to recognize the disease, how to get rid of it, how to prune trees, how to fork the land, how to make the best of materials for manuring, mulching, etc. In order that the judging might be impartial and practical, the Board always tried to get a local planter to help, together with two of the Agricultural Advisers. In this competition Mr. Rostant had kindly asssisted and the Board of Agriculture was glad to learn from the report of the judges that good work had been done. The following prize winners are specially mentioned:—Two of the Contractors, Bartholomew Williams and Samuel Carrington are described as the champions of the Competition, and of the holdings of these two and of Jhoree Singh as well they say "We cannot speak too highly, each holding is in itself a demonstration plot." Bheeman Sedarnee is specially commended for good work in seed selection, and Neetoo for forking and weeding.

Improvements recommended.

The Judges also note your shortcomings. They report a prejudice against forking and draining. Well, some of you have visited River Estate and seen that the Department of Agriculture at any rate, practices what it preaches, I hope others of you will come also, and in any case that you will give a trial to suggested alterations in your methods. Try them on a part of your property and watch the results. Some of the most successful large planters in the colony, fork and drain and possibly you will find that what is good for them is good for you.

Food Crops.

Another matter on which you have often been advised, is not to plant every inch of your land up in cacao. Keep a part for food crops. Whilst cacao is high in price and crops good, you can perhaps afford to buy food, but when cacao drops, or crops are poor, you may not have the ready money and that often means borrowing at the shop, and too often leads to debt, and possible loss of your property. If you grow more ground provisions than you need for your own use, you can sell them, especially now that there is the Ground Provisions Depôt, offering a ready market without much trouble. Mr. Mota has told you all about this.

Credit Societies.

There will be times when you need money to carry out improvements, or to extend cultivation. In the past the small man was practically bound to go to the money lender and if unfortunate enough to meet with bad seasons and poor crops he stood chance of losing his property. Now there is a government system of Agricultural Credit Societies doing useful work in Trinidad and Tobago. There are 23 of those Societies at work with 1,350 members. Many districts have not formed one yet. This is one such district to make use of Credit Societies as a means of keeping free from the grip of the money lender. I have always spoken to you about these Societies: if you think they will be useful, make an effort to start one here at Rio Claro.

The Future.

The judges have recommended and the Board has drawn up plans for a continuation of the competitions not only to include Rio Claro and Poole but also Mayaro and Guayaguayare. Particulars of the new competition will soon be issued, and I hope a large number of you will enter. Everyone who works well and follows the advice given him, can gain a prize in the form of better crops and healthier trees, and some of you will get good money prizes as well. Prize Competitions, Credit Societies, are all part of a general scheme of the Government to improve the position of the peasantry of the Colony, and of the large estates as well. It is better for every one that there be a contented and prosperous peasantry, making a comfortable living out of the land, and looking forward not only to remaining there themselves but also of bringing up their children to live on the land. With improved prospects on the land, less people will be enticed away to try their luck in the towns or in other countries. The prosperity of the Colony depends very largely, on Agriculture, and for Agriculture a large country population is essential. To ensure this there must, under our present conditions be a prosperous peasantry working your own lands and providing the necessary assistance to the large estates. Your interests are bound up together and the Government by those Competitions is endeavouring to help all cultivators both large and small.

Mr. Lazarri, at the conclusion of the prize giving, moved a vote of thanks to His Excellency for coming such a long distance a fact which showed the great interest he took in the general welfare of the people and particularly the peasant proprietor.

The Governor's Advice.

His Excellency in reply thanked the assembly for their kind welcome, and intimated how extremely glad he was to be able to come and see for himself the fertile district of which he had heard so much. It was always a pleasure to a Governor or Acting Governor to see the country districts for himself. Mr. Freeman had given them good advice and he would like to emphasize it from the experience of one who had seen a great deal of agriculture in other places—that the peasant proprietors were the backbone of the colony and if they did not put their shoulders to the wheel Trinidad could not progress. The colony looked to them as practical men to make advancement. He would be the last to disparage their practical work, but at the same time they could learn much from those who had devoted their attention to the more scientific side of agriculture. Therefore, he asked them to lend an ear to the Department of Agriculture and Mr. Mota their Agricultural Adviser, because the advice they had to offer, would present the experience gathered from all over the world, and brought to their very doors. It was to them as practical men to make the best of what the Department was doing for them. They had lived and are still living in trying times which they hoped would never come again, although perhaps, it had affected them less than other people in other parts of the Empire. There was one lesson which the times had not failed to teach all of them and it was that no part of the Empire in future could with safety depend upon importation for its food supply. The prices of imported foodstuffs were still very high and he saw no prospect of their coming down in the near future; while at the same time there was no guarantee that the prices of the articles produced here would always remain as high as they were at present. Therefore they must look ahead and both grow and keep in the colony reserves of foodstuffs in case the condition of things should get worse and worse. As Mr. Freeman had already told them it was not wise to plant all their lands in cacao, but they should keep part of it in food crops. He hoped those competitions would be continued and that next year either Sir John Chancellor—who they knew took a keen interest in Agriculture—or himself would be there to give away the prizes, when he hoped to be able to see that more of them had entered for the competition than was the case in the present instance. He thanked them again for their very kind welcome.

METEOROLOGY.

RAINFALL RETURNS.—JANUARY TO MARCH, 1920.

Stations.	January.	February.	March.	Total.	Total corresponding period '19.
North-west District.	Ins.	Ins.	Ins.	Ins.	Ins.
St. Clair—Royal Botanic Gardens	1·39	1·06	·94	3·99	2·40
Port-of-Spain—Colonial Hospital	·37	1·04	·20	1·61	2·19
,, Royal Gaol...	·90	1·19	1·31	3·40	2·80
,, Constabulary Headquarters ...	·34	1·02	·64	2·00	2·21
St. Ann's—Reservoir	2·72	1·33	1·52	5·57	2·53
Maraval— ,, ...	1·64	1·82	2·18	5·64	2·38
,, Constabulary Station	1·43	2·07	2·35	5·85	3·23
Diego Martin—Constabulary Station	1·15	2·06	2·00	5·21	4·76
,, Waterworks	1·88	2·13	1·78	5·79	3·66
,, River estate	1·62	1·98	2·31	5·91	3·20
Fort George Signal Station	1·59	1·94	1·67	5·20	2·92
North Post ,, ...	·49	·78	1·26	2·53	3·04
Carenage Constabulary Station	3·45	1·69	3·39	8·53	4·86
Carrera Island Convict Depôt	·69	·36	·47	1·52	1·27
Chacachacare Lighthouse	·92	1·32	1·30	3·51	2·23
Santa Cruz—Maracas District.					
Santa Cruz—Constabulary Station	1·73	1·59	2·22	5·54	4·75
St. Joseph—Government Farm	·59	1·12	1·26	2·97	2·08
,, Constabulary Station	·46	·62	·80	1·88	1·09
Tunapuna—St. Augustine estate	·17	·83	1·06	2·06	1·68
Maracas—Government School	1·35	1·56	3·23	6.14	3·44
,, Ortinola estate	1·54	2·46	2·50	6·50	3·39
,, San José estate	1·94	2·01	1·41	5·36	2·74
Caura—Wardour estate	1·55	1·72	1·36	4·63	2 35
West Central District.					
Caroni—Frederick estate	2·20	2·93	2·04	7·17	5·11
Chaguanas—Constabulary Station	2·62	2·14	·97	5·73	2·28
,, Woodford Lodge estate	1·62	1·30	·59	3·51	2·58
Carapichaima—Waterloo estate	1·73	1·78	·51	4·02	2·15
,, McBean Cacao estate	1·98	2·04	·36	4·38	3·04
,, Friendship Hall estate... ...	1·99	2·32	·76	5·07	2·97
Couva—Exchange estate	1·01	1·20	·22	2·43	2·75
,, Brechin Castle estate	1·04	1·74	·50	3·28	4·14
,, Perseverance ,, ...	1·01	·85	·20	2·06	...
,, Camden ,, ...	1·42	1·21	·60	3·23	2·59
,, Milton ,, ...	2·14	2·02	·87	5·03	2·30
,, Spring ,, ...	2·53	1·96	·90	5·39	3·52
,, Constabulary Station	1·30	1·10	·32	2·72	3·17
,, Esperanza estate	1·43	·92	·19	2·54	3·53
Montserrat District.					
Brasso-Piedra—Mamoral estate	3·15	5·04	3·41	11·60	3·70
,, La Mariana estate	3·21	4·54	2·22	9·97	3·53
Montserrat—Constabulary Station	3·18	2·12	1·03	6·33	4·35
Brasso—La Vega estate	3·38	3·89	1·66	8·93	3·23
Tabaquite, Trelawne estate	3·10	3·87	2·22	9·19	...
Arima District.					
Arima—Warden's Office	·99	2·19	2·61	5·79	1·76
,, Torrecilla estate	1·63	2·91	3·36	7·90	2·44
,, Verdant Vale estate	2·04	3·55	...	...	4·12
San Rafael—Constabulary Station	2·01	4·19	3·54	9·74	4·79
Guanapo—Talparo estate	2·61	4·17	2·71	9·49	5·43
,, El Quemado estate	4·75	4·74	3·40	12·89	5·19
Tamana—Sta. Marta estate	6·13	5·62	3·58	15·33	5·99
,, La Carona estate	6·22	6·23	3·62	16·07	6·33
San Fernando & Princes Town District.					
Claxton's Bay—Forres Park estate	1·84	1·07	·21	3·12	1·90
Pointe-à-Pierre—Bonne Aventure estate ...	2·42	·72	·33	3·47	...
,, Concord estate	1·83	1·29	·49	3·61	1·14
,, Plein Palais estate	1·95	·76	·15	2·86	2·57
Naparima—Picton estate	2·82	2·17	·74	5·73	3·08
,, Usine St. Madeleine estate... ...	1·65	1·60	·95	4·20	3·62
,, La Fortunée estate	1·81	...	...	...	2·43
,, Tarouba estate	1·21	1·12	·16	2·49	3·41
,, Union Hall estate	2·00	2·79	·67	5·55	1·37

RAINFALL RETURNS—JANY. TO MARCH, 1920.—Contd.

Stations.	January.	February.	March.	Total.	Total corresponding period '19.
San Fernando and Princes Town District.—(Contd.)	Ins.	Ins.	Ins.	Ins.	Ins.
Naparima—Palmiste estate	2·50	2·28	·75	5·53	3·72
,, Lewisville House	2·83	2·21	·87	5·91	4·94
,, Hermitage estate	2·19	...	...	...	2·47
,, Petit Morne estate	1·83	2·0	...	...	3·49
Princes Town—Craignish estate	3·27	1·84	·48	5·59	3·45
,, Cedar Hill estate	2·30	1·72	·92	4·94	3·60
,, Williamsville estate	2·52	1·97	·75	5·24	3·97
,, Esmeralda estate	3·07	2·05	1·00	6·12	3·76
,, New Grant estate	3·62	1·46	·73	5·81	3·77
,, Constabulary Station	1·88	1·82	·45	4·15	2·96
,, La Retraite estate	4·99	3·94	1·87	10·80	5·49
,, Malgretoute estate	2·61	2·29	·95	5·88	2·68
Los Naranjos estate	5·86	1·67	1·20	8·73	4·38
Poole—El Rosario estate	5·24	3·83	...	...	3·99
South-west District.					
Oropuche—Constabulary Station	·86	1·03	·41	2·30	2·53
,, Pluck estate	3·54	1·80	...	...	4·12
Siparia—Constabulary Station	3·64	3·95	·64	8·23	2·48
,, Alta Gracia estate	3·77	4·05	·98	8·80	4·46
Guapo—Adventure estate	3·31	1·88	1·10	6·29	2·73
Point Fortin—Constabulary Station	3·79	2·76	1·16	7·71	3·27
Erin—La Ressource estate	3·21	2·18	·47	6·16	·94
La Union estate	5·00	2·78	·66	8·44	1·83
Industry estate	5·92	1·51	·86	8·29	2·18
Cedros—La Retraite estate	7·12	2·48	3·65	13·25	3·98
,, Beaulieu estate	3·68	2·43	...	...	2·23
,, Perseverance estate	6·07	1·66	3·45	11·18	2·65
,, St. Marie estate	6·12	2·05	3·21	11·38	3·42
,, Constabulary Station	6·16	2·03	3·83	12·02	4·00
,, St. Quintin estate	3·70	1·23	3·79	8·72	2·27
Icacos—Constance estate	1·37	2·42	3·23	7·02	1·00
Irois—Government School	5·16	4·17	2·69	12·02	4·27
South Coast.					
Moruga—Constabulary Station	4·13	4·77	·62	9·52	2·97
East Coast.					
Matura—La Juanita estate	3·05	6·08	5·64	14·77	4·59
Manzanilla—Constabulary Station	4·03	5·26	3·65	12·94	5.13
Sangre Grande—New Lands estate ..	4·06	7·18	1·85	13·09	4·96
,, Evasdale estate	4·45	5·18	3·66	13·29	6·61
,, Grosvenor estate	3·94	4·85	3·81	12·60	6·23
,, El Recundo estate	3·65	6·33	3·94	13·92	5·07
,, San Francisco estate	4·22	10·33	6·63	21·18	5·47
Mayaro—Constabulary Station	4·93	5·53	1·46	11·92	3·71
North Coast.					
Blanchisseuse—Constabulary Station	3·69	4·12	4·52	12·33	6·79
Grande Rivière—Mon Plaisir estate	4·16	6·52	5·72	16·40	5·73
Toco—Aragua House ...	2·45	4·00	3·44	9·89	3·71
,, Constabulary Station	1·52	2·69	2·74	6·95	3·21
Tobago.					
Tobago—Hermitage estate	2·23	2·66	4·13	9·02	6·77
,, King's Bay ,, ...	1·88	2·91	3·41	8·20	5·84
,, Roxburgh ,, ... ,,	2·17	3·43	3·84	9·44	5·59
,, Botanic Station	3·14	1·05	3·45	7·65	1·74
,, Government Farm	2·98	·45	2·44	5·87	1·23
,, Friendship estate	1·16	·76	3·22	5·14	...
,, Riversdale ,, ...	...	...	2·77	...	4·48
,, Bon Accord ,, ...	1·18	·29	...	...	...

(*Bulletin, Dept. Agriculture, T'dad & Tbgo.*, Vol. XIX. pp. 1–47. Issued Aug. 27, 1920).

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BULLETIN

OF THE

DEPARTMENT OF AGRICULTURE, TRINIDAD & TOBAGO.

Editor:
W. G. Freeman.

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TRINIDAD:
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Price: Six Pence.

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This Library can be consulted at the Head Office of the Department, St. Clair Experiment Station. It contains standard works on General Agriculture, Horticulture, Botany, etc., and books and periodicals dealing with Cacao, Sugar, Coconuts, Rubber, Cotton, Corn, Fruit, Tobacco, and other crops.

Department of Agriculture.

GOVERNMENT STUD ANIMALS.

The following are the arrangements for May, 1921, with regard to Stud animals of the Government Farms in Trinidad and Tobago.

Stallions.

Name.	*Class.*	*Where standing for Service.*	*Fee.*	*Groom's Fee.*
Nelsweep	Thorough-bred	Govt. Farm Tobago	$ 7.20	60c.
Quickmatch.	Thorough-bred	Union Hall Estate San Fernando	10.00	60c.
Sir Horry	Thor'gh-bred Hackney	Govt. Farm Trinidad	5.00	60c.
Rillington Spartan	Cleveland Bay	Govt. Farm ,,	5.00	60c.
Marat	Thorough-bred	Roxburgh, Tobago	5.00	60c.

Jack Donkeys.

Monarch	American Donkey	Govt. Farm, Trinidad	$ 5.00	60c.
President	Do. do.	... ...	5.00	60c.
Barbados Joe		At Esperanza Est., Arima	1.20	60c.

Bulls.

A.—At Government Farms.

TRINIDAD.		TOBAGO.	
Class.	*Fee.*	*Class.*	*Fee.*
2 Pure-bred Zebu	$ 1.20c.	1 Pure-bred Zebu	$1.00
1 Half-bred Red Poll	1.20c.	1 Half-bred Shorthorn	1.00
1 Cross-bred Holstein-Zebu	1.20c.	1 Half-bred Guernsey	1.00
1 Pure-bred Red Poll	2.40c.	1 ,, Red Poll	1.00

B.—At Public Pastures or Estates.

Place.	*Class.*
Queen's Park Savannah	1 Half-bred Shorthorn; 2 Half-bred Holsteins
Mucurapo Pasture	
St. Clair Expt. Station	1 Half-bred Shorthorn; 1 Three-Qtr. bred Zebu
St. Augustine Estate	1 Half-bred Zebu; 1 Half-bred Guernsey 1 Cross-bred Zebu-Guernsey.
River Estate	1 Half-bred Zebu;
San Fernando	1 Half-bred Jersey.
Arima	1 Half-bred Jersey.
Tobago, Friendship Est.	1 Half-bred Holstein

Pigs.

At Government Farm, Trinidad.

White Yorkshire, Poland China, Berkshire, Tamworth $1.00, and Attendant's Fee 25c.

At Government Farm, Tobago.

Berkshire	Fee 50c.
Large Black	50c.

POULTRY.

Government Farm, Trinidad.

Eggs of Barred Plymouth Rocks, Rhode Island Reds, White Leghorns, Brahmas and Rouen Ducks ...$1.00 per doz.
Great Kind Pigeons ... 60c. per pair.

Government Farm, Tobago.

Eggs of Plymouth Rocks, Black Minorcas, Rhode Island Reds 48c. per doz.
Also Cocks and Pullets of Plymouth Rocks and Rhode Island Reds.

DEPARTMENT OF AGRICULTURE.

Agricultural Credit Societies
under Ordinance No. 30, 1915.

Registrar.....W. G. Freeman, Director of Agriculture.
Inspector.....Jos. E. Sehbult.
Clerk.....Ashraff Hosein.

Registered Societies.

	Date of Registration.
Trinidad	
Diego Martin	... October 12, 1916.
Lothians	... April 4, 1919.
Malgretout	... April 30, 1919.
Petit Morne	... April 30, 1919.
Union Hall	... April 30, 1919.
Malgretout East Indian ...	.. May 26, 1919.
Picton	... May 30, 1919.
Petit Morne (Palmyra)	... June 13, 1919.
Tarouba (Ne Plus Ultra) ...	... June 13, 1919.
Union-Marabella	... July 10, 1919.
Harmony Hall	... July 10, 1919.
Williamsville East Indian ...	... July 10, 1919.
Indian Walk	... August 19, 1919.
Williamsville, West Indian ...	... September 11, 1919.
Plein Palais	... November 9, 1919.
Lengua	... November 9, 1919.
Peñal	... November 21, 1919.
Broomage	... August 11, 1920.
Cedar Hill	... August 11, 1920.
Trois Amis...	... August 11, 1920.
Monkey Town	... August 16, 1920.
Tobago.	
Pembroke	... June 18. 1917.
Scarborough	... April 11, 1918.
Delaford	... August 26, 1918.
Mason Hall...	... December 16, 1918.
Moriah	... December 16, 1918.
Charlotteville	... February 4, 1919.
Parlatuvier	... July 10, 1920.
Roxboro'	... October 23, 1920.
Les Coteaux...	... December 20, 1920.
Montgomery	... January 7, 1921.

Plant Protection Ordinance.

Chief Inspector.....C. F. Wood.

Inspectors.....F. W. Urich. F. D. Davies.
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C. M. Roach. L. A. Brunton.

Assistant Inspectors.....J. A. Pinder. R. H. Leacock
J. Blackman. Alfred H. Pena (Tempy.)
A. T. Warner.

Pests Proclaimed under the Ordinance.

Bird Vine ...	...June 25, 1912.	Cacao Beetle	...Sept. 16, 1918.
Bud Rot of Coconuts ..	do.	Rhinoceros Beetle ..	do.
Bleeding Stem Disease of Coconuts	...Nov. 26, 1912.	Gru Gru Beetle ...	do.
		Locusts	do.
Love Vine...	...July 26, 1915.	Mosaic Disease of Sugar Cane ...	...April 1, 1920.
Coconut Butterfly	.. Mar. 28, 1918.		
Parasol Ants	.. Sept. 16, 1918.		

Department of Agriculture.

NURSERY STOCK.

Cacao, Limes and any other plants required in large quantities should be ordered six months in advance. Address letters to the Superintendent, St. Clair Experiment Station, or to the Officer in Charge Botanic Station, Tobago.

Special quotations at St. Clair for Cacao, Coffee and Limes grown from selected seeds are as follows:—

Plants purchased in lots of 1 to 1,000 plants 3 cents per plant.	Delivered at Nurseries uncrated.
Plants purchased in lots of several thousands 2½ cents per plant.	
Plants purchased in lots up to 100 at 4 cents per plant.	Delivered at Railway Station, Port-of-Spain or Queen's Wharf, securely packed in open crates.
Plants purchased in lots up to 1,000 at $3.50 per 100.	
Plants purchased in lots of several thousands at $33.00 per 1,000.	

Tobago prices on application at the Botanic Station, Scarborough.

Budded Avocados select varieties at 12 cents, Budded Oranges at 24 cents and Grafted Mangos at 24 cents should also be booked at once.

Budded Cacao 12 cents each or in lots of over 100 at 8 cents.

Limes from beds 1½ cents per plant for lots over 100.

A stock is also kept of other fruit, ornamental and flowering trees, palms, etc., a full list of which can be obtained on application. Large orders must be booked six months previous to the date when the plants are required as large supplies are not kept on hand for casual demands.

SPRAYING CACAO, &c.

From September to November is the time for spraying cacao trees for the prevention of thrips and black rot; and early in the dry season for the algal disease, die back, and cacao beetles.

The Department has on hand a supply of bluestone, which is sold to planters at 12 cents per pound, also nicotine sulphate the best insecticide for thrips, which is sold at $14.50 per gallon.

Spraying Machines can also be hired in Trinidad or Tobago. Friend Pump, with two leads of hose and rods complete, $1.00 per week.

Barrel Pump with one lead of hose and rods, 50c. per week. Carriage to and fro extra.

Further information in regard to cost of spraying, etc., and applications for bluestone and nicotine sulphate should be made to

THE DIRECTOR, DEPARTMENT OF AGRICULTURE, PORT-OF-SPAIN.

PUBLICATIONS FOR SALE.

THE BULLETIN issued quarterly, price sixpence per number or two shillings per annum post free in the Colony. To other subscribers postage extra.

Vol. XVIII. 1919. Pt. 1.—Wither Tip of Limes (Illustrated); Yam Experiments 1918–19; Cultivation of Cotton; Nitrogen Content Cacao Soils; Supposed Cure for Froghoppers; Bedding Plants for Trinidad; Fungous Diseases of Roses (Illustrated); Prize Competitions 1918–19.

Vol. XVIII. Pt. 2.—Cane Farmers and Co-operation; Root Disease and Froghopper Blight; Control of Cacao Thrips; Rice Experiments, 1915–18; etc., etc.

Vol. XVIII. Pt. 3.—The Avocado in Trinidad and Tobago (Illustrated); Sugar-Cane Experiments 1917–19; Yams 1918–19.

Vol. XVIII. Pt. 4.—Root Disease of Cacao in Trinidad (Illustrated); Varieties of Cane under Estate Cultivation in Trinidad 1919; Durability Tests with inferior Local Woods; Tobago Vegetable Prize Competitions 1919; Reorganisation of the Board and Department of Agriculture; Development of the Economic Resources of the Empire, &c., &c.

Vol. XIX. 1920. Pt. 1.—The Trinidad Cane Farming Industry; Sugar Cane Blight in Trinidad; Froghopper Blight in Trinidad; Implemental Tillage; Mosaic Disease of Sugar Cane in Trinidad, &c., &c., &c.

OUR LOCAL FOODS: THEIR PRODUCTION AND USE, by W. G. Freeman, and R. O. Williams.—Price 3d.

THE DASHEEN: Its Uses and Culture.—Illustrated.—Price 3d.

THE AVOCADO IN TRINIDAD AND TOBAGO.—Illustrated.—Price 3d.

INSECTS AFFECTING VEGETABLES IN TRINIDAD AND TOBAGO, by F. W. Urich. Symptoms of pests, Treatment, Preparation of Insecticides, etc.—Illustrated.—Price 3d.

LIFE HISTORY AND CONTROL OF THE CACAO BEETLE, 3 coloured plates, by P. L. Guppy.—Price 6d.

INSECT NOTES FOR 1910–11. Miscellaneous Notes on Cacao Pests, by F. W. Urich.—Price 3d.

NOTES ON SOME INSECTS AFFECTING THE COCONUT PALM, one coloured plate by F. W. Urich and P. L. Guppy.—Price 3d.

REARING OF THE VERMILION FROGHOPPER EGG PARASITE, by F. W. Urich.—Price 1d.

THE SUGAR CANE FROGHOPPER, six plates (3 coloured), by F. W. Urich.—Price 9d.

THE FROGHOPPER EGG PARASITE AND ITS COLONIZATION IN CANE FIELDS, by F. W. Urich.—Price 1d.

THE MONGOOSE IN TRINIDAD AND METHODS OF DESTROYING IT, 2 plates, by F. W. Urich.—Price 3d.

CONTROL OF CACAO THRIPS. (Illustrated) by F. W. Urich.—Price 3d.

ANNUAL REPORTS, DEPARTMENT OF AGRICULTURE, 1916, 1917 & 1918.—Price 1s. 9d. each.

MEMOIR NO. 1 - FROGHOPPER-BLIGHT OF SUGAR-CANE IN TRINIDAD by C. B. Williams, M.A., F.E.S.—Price 2/6.

All publications can be obtained from the Head Office of the Department, St. Clair Experiment Station, post free within the Colony. The Bulletin is also on sale at Messrs. Muir, Marshall, and Davidson & Todd, Port-of-Spain.

ST. CLAIR EXPERIMENT STATION, TRINIDAD.

List of Plants for Sale.

(See p. vi.)

Common Name.	*Scientific Name.*
Fruit Trees 24c. each.	
Sweet orange	*Citrus aurantium.*
5c. each.	
Golden apple	*Spondias dulcis.*
Common rose apple	*Eugenia Jambos.*
Java plum	*E. Jambolana.*
Malacca apple	*E. malaccensis.*
Mammy apple	*Mammea americana.*
Sugar apple	*A. squamosa*
Sour sop	*A. muricata.*
Cashew	*Anacardium occidentale.*
Akee ...	*Blighia sapida.*
Pomegranate	*Punica granatum.*
Tamarinde des Indes	*Vangueria edulis*
Granadilla	*Passiflora quadrangularis.*
Queensland nut	*Macadamia ternifolia.*
Breadnut	*Artocarpus incisa* var.
Genip ...	*Melicocca bijuga.*
Barbados cherry	*Malpighia glabra.*
Large red guava	*Psidium Guajava.*
,, white ,,	*P.* var.
Gooseberry	*Phyllanthus disticha.*
Governor plum	*Flacourtia Ramontchi.*
Sapodilla	*Achras sapota.*
Hunterman's nut	*Omphalea triandra.*
Star apple	*Chrysophyllum Cainito.*
Papaw ...	*Carica Papaya.*
Tangerine (seedlings)	*Citrus nobilis* var.
Mandarin	*C. nobilis* var.
Mulberry	*Morus alba.*
$3.00 per 100 uncrated. 3.50 ,, crated.	
Lime	*Citrus medica* var. *acida.*
Beverage Plants.	
$3.00 per 100 uncrated. $3.50 per 100 crated and carted to City.	
Forastero cacao	*Theobroma Cacao* var.
Robusta coffee	*Coffee Robusta*
Liberian coffee	*C. Liberica.*
Abbeokuta coffee	*C. Abbeokuta.*
Kola nut	*Cola acuminata.* 5c. each.

Common Name.	*Scientific Name.*
Spices.	
12c.	
Cinnamon	*Cinnamomum Zeylanicum.*
5c.	
Nutmeg	*Myristica fragrans.*
8c.	
Tonka bean	*Dipteryx odorata.*
Rubber 60c. per 100.	
Para rubber	*Hevea brasiliensis.*
Drug 5c. each.	
Bitter wood	*Quassia amara.*
Timber Trees $3.00 per 100.	
British Honduras mahogany	*Swietenia macrophylla.*
5c. each.	
	Barringtonia speciosa.
	Cynometra trinitensis
Fern tree	*Jacaranda cærulea.*
Balsam of tolu	*Toluifera Balsamum.*
Pink poui	*Tabebuia* sp.
Balata	*Mimusops globosa.*
Divi-divi	*Cæsalpinia coriaria*
	Detarium senegalense.
	Swartzia grandiflora.
Fragrant acacia	*Acacia Farnesiana.*
	Mimusops Elengi.
Beef tree	*Terminalia arjuna.*
Flamboyante	*Poinciana regia.*
	Oroxylum indicum.
Shade and Decorative 5c. each.	
Apple blossom cassia	*Cassia javanica.*
Horse cassia	*Cassia grandis.*
	C. multijuga.
Jamaica mountain pride	*Spathelia simplex.*
Ceylon willow	*Ficus benjamina.*
Barbados pride (red)	*Poinciana pulcherrima.*
Barbados pride (yellow)	*P.* ,,
Almond	*Terminalia Catappa*
	Monodora tenuifolia.
	Browneа grandiflora.
	Bauhinia tomentosa.
	B. megalandra.
	Posoqueria longiflora

BULLETIN
OF THE
DEPARTMENT OF AGRICULTURE
Trinidad and Tobago.

PART 2.] 1921. [VOL. XIX.

NOTES.

Reorganization of the Department of Agriculture.

From September 1, 1920 the Department of Agriculture was placed on the new basis provided under Ordinance No. 29 of 1918, which gave effect to the scheme of reorganization laid by His Excellency the Governor before the Legislative Council in Council Paper No. 112 of 1918.—(See *Bull. Dept. Agr.* XVIII. 1919. 213–26).

The principal change involved is that the Board of Agriculture is re-constituted as a purely advisory body. The Government assumes responsibility for the provision in the Department of Agriculture of officers to replace the Entomologist, Mycologist, and Agricultural Advisers, previously maintained by the Board from funds derived from a special export tax on agricultural produce, now abolished.

A list of the posts established under the new system and of the officers at present appointed to occupy them will be found in another place. An innovation is made in the provision of Sugar and Cacao Agronomists, whose duties will be to study and advise upon the methods of cultivation to be applied in the two principal agricultural industries of the Colony. An Economic Botanist is also to be appointed, to arrange for research leading to the production of improved strains of cultivated plants, especially cacao and coconuts, and for the application of recent methods to agricultural experimentation.

Plans have been approved by His Excellency the Governor for the erection of a new building at the St. Clair Experiment Station to serve as headquarters for the Department. The cost will be met from the surplus funds of River and St. Augustine Estates, in addition to which a sum of £5,197 from the same source has been handed over to general revenue. A site for the building has been chosen and work was commenced in April 1921.

W.N.

The Mosaic Disease of Sugar Cane.

During the past three months a large amount of attention has been directed towards the reduction and if possible the extermination of the Mosaic Disease. Some of the Agricultural Advisers have been seconded for the work and special assistants employed. In the Naparimas and in most other outlying districts a considerable measure of success has been attained and there is every hope of extermination. In the district between San Juan and Tunapuna, however, the disease has obtained such a firm hold that with the present staff and arrangements there is

no prospect of control. In spite of the fact that over 10,000 stools have been destroyed—for which compensation amounting to over £200 has been paid—the disease continues, to spread more rapidly than it is destroyed. To secure the adoption of more effective measures during the favourable opportunity afforded by dry season of 1921 recommendations were made for a special campaign for which a special vote of £3,125 has been granted.

C.B.W.

The Sugar Cane Froghopper.

Owing to the late advent of the wet season in 1920, all the froghopper broods were considerably later than has been the case for many years. The first brood, which occurred at the beginning of August, did very little damage except in two small areas. The second brood at the beginning of October was however, much more widespread and considerable damage resulted in nearly all the sugar districts. In the Naparima district especially the relation of the blight to certain types of soils was particularly well marked. The third brood in December caused severe injury in several areas not previously damaged but on the whole less harm than that due to the second brood.

C.B.W.

Agricultural Credit Societies.

A joint meeting of the Agricultural Credit Societies of the Ste. Madeleine Company's Estates was held on August 7. 1920 at the Usine Ste. Madeleine. His Excellency the Acting Governor, Mr. T. A. V. Best presided.

Mr. G. A. Jones outlined the progress of the Credit Societies during the year. The number of Societies had increased from 11 to 16, the number of members from 758 to 1,113 and the outstanding loans from $17,700 to $65,125. The total working expense was 3½ cents per member. The average loan was $83 but one of $2,000 and one of $1,000 were made both of which were repaid in full. Cane cultivation accounted for 53·6 per cent. of the loans, purchase of land for 32 per cent., 21 per cent. was for the purchase of animals, 8 per cent. for erection of and repairs to houses and 14 per cent. for miscellaneous purposes, including rice and vegetable cultivation—less than 2 per cent. of the loaned money was not repaid when due.

The Director of Agriculture gave an address on some of the aspects of the Credit Societies. There were now thirty Credit Societies in Trinidad and Tobago with a total membership of 1,418. He emphasized the importance of prompt repayment of loans in order to build up the reputation, and hence the credit, of the Society with the Bank. Just as a reliable Government is able to borrow money easily so a reliable Credit Society is in the same position.

It is important for each Society to build up a reserve fund in order to be prepared for reasonable contingencies. When this has been done it will be possible to reduce the rate of interest charged, or to spend the surplus profits on something of use to the agricultural community of the district.

In spite of excellent results obtained by the prize-winners in the Cane Farmers' Competition organised by the Usine Ste. Madeleine Company, the average yield of the cane farmers of the country in general is very low; not more than ten to twelve tons per acre. Part of this is due to the farmers not having had financial assistance in order to bring a larger area into cultivation, to purchase agricultural implements or to buy stock to better the conditions under which they live. The Credit Societies will give an opportunity which did not exist for the farmer to get such improvements and at the same time he receives a useful training in managing his own money affairs and in accepting responsibility for himself and his neighbours.

Credit Societies are only just beginning in Trinidad and in some districts have had to fight against the influence of the money lender, but the progress has been satisfactory and they should be a lasting benefit to the agricultural welfare of the Colony.

Mr. Jarvis spoke on behalf of the Colonial Bank, which is responsible for the greater part of the loans to the Credit Societies in the Naparimas.

His Excellency the Acting Governor emphasized the great value of Credit Societies not only to the cane farmer but to all peasant proprietors and agricultural workers and guaranteed the continued interest of the Government in their progress and welfare.

Red Poll Cattle.

In view of the present policy of the Government of keeping Red Poll Bulls at the Stock Farm for breeding purposes, it may be interesting to give some particulars of the values of this breed both as a producer of both beef and milk in England and the United States.

Mr. Frank Nelson in the *Breeder's Gazette* for December 25, 1919 states that the breed originated in the Norfolk and Suffolk district of England and has never been crossed with any other breed. The great value of the breed is that it has been found possible in it to select for both beef and milk at the same time. In England Red Polls hold the carcass dressing percentage record (73·58 per cent.) over all other breeds, while in America fifty cows of one herd have a yearly average official butter-fat yield of 4·68 per cent.

To show how the dual nature of the breed can be developed, it is pointed out that "all the world's Red Poll butter-fat and milk records are held by one American herd," while "the 1917 Champion Red Poll Steer at the International show came indirectly from the same herd."

The *Live Stock Journal* of October 15, 1919 states that "The Sutton herd of Mr. Carlyle Smith which comprises typical dual-purpose Red Polls, includes a three year old heifer which has just yielded a ton of milk in six weeks. In another herd there is a cow, purchased at Gressenhall, which in five weeks and five days ending September 30 gave a ton of milk."

Mr. Nelson concludes that "the success of the Red Poll in the feed-lot and the slaughter tests, coupled with the winning of the first, second and third in the recent Royal Dairy Show of England emphasises anew the superior claims of the breed."

SUGAR.

SUMMARY OF A REPORT ON THE FROGHOPPER BLIGHT OF SUGAR CANE IN TRINIDAD.

By C. B. Williams, M.A.,
Sugar Cane Entomologist.

There has been published separately by the Department of Agriculture a Report on the Froghopper Blight of Sugar Cane in Trinidad. The summary of this report is printed below, as an outline of its contents and the conclusions reached will be of interest to many people who would find the complete report unnecessarily detailed.

The Report is published as *Memoir No. 1* of the Department of Agriculture, is fully illustrated and may be obtained on application at a price of 2/6.

INTRODUCTION.

The Sugar-cane cultivation of Trinidad covers an area of about 78 square miles, out of a total area of 1,750 for the island. The crop has varied from 38,000 tons to 71,000 tons in the past twenty-one years. The rainfall is about 64 inches, with a dry season from January to May and a wet season from May to December. The crop is cut during the dry season. Three or four crops are usually cut before replanting.

The growing canes have been subject for many years to outbreaks of a disease locally known as "Blight" or "Froghopper Blight," which consists essentially of a browning and drying up of the leaves and a check to the growth which may result in the total loss of the crop. The loss during the past fifteen years has probably averaged £50,000 per annum and in 1917–1918 reached about £300,000. The insect *Tomaspis saccharina*, the sugar-cane froghopper, is almost invariably found in abundance in the blighted fields, as well as various species of root fungi, and both have been held responsible in varying degrees for the damage.

Conditions similar to the froghopper blight were reported in 1863, but it was not until 1889 that the froghopper was discovered by Hart and its connection with the damage suspected. In 1906 a severe outbreak called attention to the subject once more and during the next three years, all of which were characterised by severe blight, various opinions were held as to the relative importance of the froghopper and root disease. In 1909 regular investigation was started by the Board of Agriculture and Rorer, Urich and Guppy studied the varied aspects of the problem. The life history of the froghopper was worked out, two egg-parasites were found, and the green muscardine fungus which destroys the adult, was cultivated on a large scale. In 1910 and 1912 Gough and Kershaw continued the investigations. The former discovered the Syrphid Fly, which destroys the nymphs, and the latter recommended the search for a more efficient parasite outside Trinidad.

During 1916 and 1917, I made a search for such parasites in British Guiana, Panama and Costa Rica. New froghoppers were found in all these countries, but the enemies were found to be the same as those already known in Trinidad. The range of the parasites is evidently

much greater than that of their hosts. In Panama a few specimens of a new egg-parasite were obtained but they died before any attempt could be made to breed them. In July 1917, owing to the great difficulty of carrying on the work single-handed and with the prevailing conditions of transport, I returned to Trinidad to study the pest in the island.

In 1918 and 1919, Nowell emphasized the relation between local infestations and the condition of the soil, and advocated the application of agricultural methods to the reduction of blight.

THE NATURE OF THE BLIGHT.

Damage usually first appears six weeks to two months after the beginning of the wet season and the canes stop growing, and the leaves wilt and are streaked with brown marks. After some weeks recovery sets in, usually to be followed by a second and occasionally a third attack at intervals of about two months.

From each puncture of the adult froghopper on the leaf an elongated area of injury spreads, at first pale and later brown. Increase in size of this spot may continue for as long as four or five weeks and, from an almost imperceptible point, the damaged area may reach five inches in length and a quarter of an inch in width forming a long discoloured streak on the leaf. The centre of this area finally dies completely If these streaks are numerous they may join up to form large dead areas on the leaf. It follows that the injury to the leaf, and so to the plant, may continue to increase after the brood of froghoppers has passed.

The stem is only indirectly damaged by loss of food from the damaged roots and leaves. The growing point is frequently stained with red internally, especially at the young nodes; small pockets of gum are sometimes found, and an unnatural brittleness frequently causes the cane to break off just above one of the upper nodes. The internodes or joints which should be increasing in length and width, remain shorter and thinner than usual and harden while still in this condition, recording on the growing cane the check that the plant has received. Thus from the lengths and widths of successive internodes on a fully grown cane past attacks can be determined. The shortening of the upper internodes causes the leaves to be crowded together in a fan-like arrangement. In addition the eyes near the top of the cane frequently send out shoots, and adventitious roots are developed from the joints near the ground.

The roots are damaged both by the sucking of the nymph, by the root fungi usually associated with blight, and by the unfavourable soil conditions nearly always found in fields liable to attack. The root system is poor and the plant can be pulled from the ground with comparative ease.

The blighted canes contain less sap than healthy ones, but often a higher sucrose percentage. The sucrose is said to be more easily inverted in sap from diseased canes, and the sap is frequently acid.

The different parts of the stool are usually damaged inversely as their size and vigour. The smallest shoots are killed, the medium sized ones severely checked, and the larger only slightly injured except in cases of severe continued damage.

As the brood passes the canes are able to send out undamaged leaves and gradual recovery sets in. This will vary according to the extent of the original injury. The length of time taken for a plant to produce a new set of leaves is however longer than the time between successive froghopper broods, and as a result the cane after one attack is in a weaker condition to withstand a second. This probably accounts for the greater damage caused by a second brood even when its numbers do not appear to be greater than the first.

The greatest intensity of the blight is about two to three weeks after the height of the froghopper brood, but the total damage varies greatly from year to year and from place to place.

Uncomplicated froghopper attack is distinguished from uncomplicated root disease by the presence of the brown streaks on the leaves. Froghopper injury is never confined to a few isolated stools as occasionally occurs in the case of root disease. Root disease further has not the periodic nature of froghopper blight. The blight resembles in symptoms the Sereh disease of the East, but does not become steadily worse each year as with the latter. The resemblance of the symptoms is largely accidental and Sereh does not occur in Trinidad. Certain fungi make discoloured spots on the leaves of the cane. The chief of these are the Eye-Spot (*Helminthosporium*) and the Ring-Spot (*Leptosphaeria*), but the marks are quite distinct from those of froghopper injury. The Eye-Spots are small, seldom more than half an inch in length, and have only been found up to the present on one variety of cane, D 109. The Ring-Spots are purplish-brown in colour with a paler centre and almost round, seldom exceeding half an inch in diameter. In the Mosaic Disease, recently discovered in Trinidad, the leaf is irregularly mottled with indistinct streaks which are pale from the first and never become darker than the healthy leaf.

HISTORY OF THE BLIGHT.

Blight, apparently similar to the present one, was recorded in 1862, 1869, 1878, and various years up to 1889 when the froghopper was first recognised as the probable cause. From about 1890 onwards for several years, the gradual degeneration of the Bourbon cane was taking place, largely due to Red Rot (*Colletotrichum*). No outstanding attacks appear to have occurred again until 1906, although a few slight local outbreaks are recorded in 1900.

In 1906 commenced a series of severe attacks which has continued with occasional intervals up to the present time. The relative severity of blight in these years is shown in a diagram, which indicates a recurrence of periods of severer blight at intervals of four or five years. The times of greatest damage were 1906–8, 1911–1912 and 1917–18.

The weather conditions for each year from 1906–1919 are summarised.

FROGHOPPERS IN OTHER COUNTRIES.

Tobago has its own species of froghopper, *Tomaspis carmodyi*, which however has done no damage.

In Grenada the Trinidad insect is known and in 1916 did severe damage in a few small areas.

From St. Vincent there is a single specimen of the Trinidad froghopper, in the collection of the British Museum, captured about 1890, but in December 1917 I made a close search in the southern half of the island and failed to find any.

No froghoppers have ever been found in Barbados, St. Lucia, Martinique, or the more northerly Lesser Antilles. Dominica has one species, *Tomaspis dominicana*, of which the habits are unknown.

In Cuba pastures and occasionally cane fields have been damaged by *Tomaspis bicincta*. In 1916 the loss due to damaged pastures in the province of Camingney was about £4,000.

No damage has been reported from Jamaica, but several species of froghoppers are known to occur there.

In Surinam *Tomaspis tristis* occasionally damages the canes. The nymphs are not root feeders but are found two or three feet above the ground on the cane and bases of the leaves.

In British Guiana *Tomaspis flavilatera* was known as a minor pest from 1909 to 1917 but the harm done was negligible. In 1918 however an extensive outbreak occurred in three different localities and severe damage was recorded. It is believed to have been related to certain climatic and soil conditions.

In Colombia *Tomaspis bogotensis* has for some years been recorded as damaging pastures.

In Panama *Tomaspis lepidior* has been mentioned as damaging cane and grass, but apparently to no great extent. A froghopper of the genus *Clastoptera* was found destroying the flowers of cacao.

In British Honduras damage was reported to sugar-cane by a froghopper in 1883, but no recent particulars are available.

In Mexico cane and pastures have been damaged for many years past by *Tomaspis postica*.

In Louisiana *Tomaspis bicincta* has been reported on cane without doing any serious damage

In the New York district grass is occasionally damaged by two species of *Philaenus*.

Roses and some pasture grasses in England and Jak and Cotton in India have also suffered from other species of froghoppers.

The text is given of the legislation in force in Barbados and St. Lucia to prevent the introduction of the froghopper.

THE FROGHOPPER.

The scientific name of the insect is *Tomaspis saccharina*. The name *Tomaspis varia* has been used in the past but there are reasons for not retaining it in use.

The species is only known from Trinidad, Grenada and possibly St. Vincent. It is almost certainly native to Trinidad and not an introduced insect.

The adult insect is about one-third of an inch in length, dark brown, with two transverse yellowish-brown bands on the wings. There is a light variety which has in addition the basal portions of the wings light in colour.

In the field the two sexes appear to be in almost equal proportions.

A short account of the anatomy of the insect is given, based chiefly on the work of Kershaw.

During the heat of the day the insects remain hidden at the base of the upper leaves of the canes. In the late afternoon and evening (earlier on cloudy days and later on bright days) they come up on to the leaves and start feeding. The males begin to fly at about dusk. Light traps examined every hour indicate that the greatest activity is from dusk to 10 p.m. In the early morning they gradually return to their hiding places in the axils of the leaves.

From 40–100 eggs are laid by each female, either in the dead partly decaying leaf sheaths near the ground or in the soil itself.

The egg is about one-thirtieth of an inch long, pale yellow in colour and pointed at each end. As it develops a black longitudinal streak appears at the head end. The egg stage lasts from two weeks to over six months according to the conditions of moisture. Many eggs from the second and third brood, however, do not appear to hatch until after the following dry season.

There are four nymph stages during which the insect increases in size and the wings are developed.

The nymphs suck the sap from the roots of the cane at and below the surface of the ground. They protect themselves with a white froth, which consists of the excretion of the alimentary canal in which air bubbles are formed by an arrangement of the breathing system. This froth is of considerable protection to the nymph from extremes of drought and moisture and also from various predaceous ants and other insects which are often abundant in the cane fields.

The froghopper feeds on sugar-cane, on almost all species of grass (*Gramineae*) and on some grass-like plants of the related order *Cyperaceae*. It has been reported damaging hill-rice, corn and pastures, but has never done any serious injury to them in Trinidad.

The nymph stages occupy five to seven weeks and the adult may live as long as a month. The complete cycle under normal wet season conditions takes slightly under two months.

The first flight of adults is at the end of June or during July, about seven weeks from the date of the first rains. The second brood is about two months later, usually in September, and the third may appear after a similar interval. Very occasionally a fourth brood appears about December. The later broods are usually less distinct in their limits than the earlier. During the dry season nearly all the froghoppers are in the egg stage, but occasional unexplained records are known of adults persisting through the dry season.

Four other froghoppers of the genus *Tomaspis* are known in Trinidad. *T. rubra* feeds on the Christmas Bush (*Eupatorium*). *T. pubescens* feeds on grass, chiefly in moist spots along river banks, and is an alternative host of some of the parasites of the sugar-cane froghopper. *T. guppyi* also feeds on grass but is very rare and local. An unidentified species is known only from two nymphs found on a creeper on a forest tree in the mountains. There are also species of the genus *Clastoptera* on Casuarina and Hibiscus, and *Cephisus* sp. feeding possibly on Immortelle.

THE ENEMIES OF THE FROGHOPPER.

The chief enemy of the eggs is the Vermilion Egg-parasite (*Oligosita giraulti*), a minute red Chalcid. Its life cycle is about thirty days and it can breed during most of the dry season when the froghopper itself is inactive. It is almost certainly native to Trinidad and is not likely to increase much above its present limits. It probably has some other host in Trinidad. Abroad it is known from British Guiana to Costa Rica on various species of froghoppers.

The Trash-Coloured Egg-Parasite (*Paraphelinus tomaspidis*) was recorded in 1913 as destroying froghopper eggs, but this habit has never been confirmed and it is doubtful if it is of any value as a control.

In Panama a new egg-parasite of the genus *Anagrus* was found.

Thrips of the genus *Haplothrips* and ants are known to destroy the eggs, and eggs are sometimes found filled with a fungus which may have killed them.

The nymph is eaten by some birds but the frothy covering seems to render them unpalatable to most. They have been found in the stomachs of the Boat-tail (*Quisqualus lugubris*), the Golden-head (*Agelaius icterocephalus*) and the Manicou-Bird (*Geothylpis aequinoctialis*).

The Syrphid fly is the most important enemy of the nymph. It lays its eggs in the froth of the froghopper, and the maggot, which hatches in about two days, destroys the nymphs by piercing their skin and sucking out the juices. One maggot may destroy 30–40 nymphs. The larval stage lasts nine or ten days and the pupa about the same time. The complete cycle takes about three weeks. In the moister parts of the island the fly breeds throughout the year, but in the cane fields it is not found in the dry season and is seldom common before the second or third brood of froghoppers. It ranges outside Trinidad from Mexico to Brazil on various species of froghoppers.

An attempt was made by Kershaw and Guppy in 1914 to breed large numbers of this fly through the dry season so that they could be liberated to destroy the first brood in the following year. Owing to the difficulty of obtaining, during the dry season, enough nymphs for the syrphid maggots to feed on, the work had to be abandoned.

Another parasite of the nymph is the Mermis worm, a Nematode which is occasionally found coiled up in the abdomen of the nymph or adult froghopper. It is not common and nothing is known of its life history or habits.

The Green Muscardine fungus is only rarely found on the nymphs in the field.

The adult froghopper has a long list of parasites and enemies. Seventeen different birds have been proved to eat adult froghoppers One of the most important of these is the Scissors-tail Fly-Catcher which migrates to Trinidad from the mainland of South America at the beginning of each wet season, arriving in May or June and leaving in October and November.

Lizards are an important enemy of the froghopper in uncultivated land but in the cane fields they are generally scarce, perhaps more so in Trinidad than elsewhere. This has been said to be due to the mongoose, but agricultural processes, particularly burning the trash, destroy many lizards.

Cultivation, and possibly also the mongoose, have had a similar effect in reducing the number of frogs and toads in the cane districts.

Two predaceous grasshoppers, *Xiphidium* and *Pflugis*, destroy small numbers of froghoppers, but both are commoner in the traces and abandoned land than among the canes.

Four species of ants have been found killing froghoppers in Trinidad and others are known in other countries. Ants sometimes do more harm than good by carrying off froghoppers that are infected with green muscardine.

On one occasion an adult of the small luminous beetle, known locally as the candle-fly or fire-fly (*Lampyridæ*) was reported eating an adult froghopper.

Several Soldier-Bugs (*Reduviidæ*) are known to destroy froghoppers in Trinidad and other countries. The Mexican Bug was one of these ; it was introduced by Urich but failed to establish itself. Owing to their varied food it is difficult to estimate the relative harm and good done by these insects.

Spiders, particularly the jumping spiders or *Attidæ*, destroy many adult froghoppers.

The green muscardine fungus is probably the most important natural agent in the control of the adult froghopper. Under favourable conditions the greater part of a brood may be killed by it. It is, however, rarely common on the first brood and with the later broods its prevalence depends on weather conditions.

Attempts to infect fields artificially have been made but so far the results have not been conclusive. The fungus can, with precautions, be readily produced in quantity by growing on sterilised rice or similar media. The spores so obtained are mixed with rice flour and spread on the fields by blowers, or the adults are attracted into the mixture by light traps. The success or failure of the individual experiment depends entirely on atmospheric conditions. In unfavourable weather even the natural infection dies out, while when conditions are suitable for its spread there is usually sufficient natural fungus present to start an epidemic. The cost of such treatment is however comparatively small and on most estates would be repaid by the saving of a few acres of cane. The method is worthy of further investigation.

The Empusa fungus kills the adult froghoppers and fastens them to the leaf of the cane in exposed situations usually some distance from the base of the leaf. It is much rarer than the green muscardine and has never been recorded before October. It can only be cultivated with difficulty and does not lend itself to artificial distribution. On occasion it has destroyed large numbers of froghoppers and infected specimens are killed more rapidly than by the green muscardine.

Hyper-parasites. Under this heading are included the animals which destroy the enemies of the froghopper and so allow it to increase.

The mongoose has been held responsible for the increase of the froghoppers by destroying their enemies. Comparisons of the food of the mongoose in districts where it has been long abundant with districts where it has only recently appeared, do not show any change of diet, which would be expected if it had been responsible for the extermination of birds, lizards, frogs and toads. Blight was known before the introduction of the mongoose and the outbreaks of recent years have not been correlated with the spread of this animal. The conclusion reached is that the mongoose, although doubtless undesirable, and possibly to a very limited extent contributing to recent outbreaks of pests, is not the *one* cause, nor is it even one of the most important causes, of the outbreaks of froghopper blight in Trinidad.

The mongoose eats a number of rats and these can climb and have been found destroying the nests of insect-eating birds.

Birds, lizards, ants, spiders and other general insectivorous enemies of the froghopper sometimes do harm by destroying its insect enemies.

The spider and grasshopper enemies of the froghopper are destroyed by fossorial wasps, while the former are also killed by an entomogenous fungus (*Gibellula*).

A worm believed to be parasitic, has been found in the pupa of a Syrphid fly.

In a figure an attempt has been made to show the relation of the froghopper to its parasites and hyper-parasites. In the centre the froghopper is shown and in the first ring round it all its natural enemies grouped according as they feed on the egg, nymph or adult. In the outermost ring are the hyper-parasites or enemies of the enemies, and in the intermediate ring are shown other hosts or foods of the parasites and hyper-parasites. The arrows indicate that the animal at the tail of the arrow destroys the animal at the head. A careful study of this diagram will show the extraordinary complexity of the relationships and the great difficulty of deciding whether any particular animal is desirable or undesirable.

THE CANE ROOT FUNGI.

Two distinct kinds of root fungi are found attacking the canes in Trinidad.

The *Marasmius* type mats together the lower sheaths of the cane with a white dried-paste-like mycelium and produces spores on small mushrooms. The *Odontia-Himantia* fungus mats the lower sheaths of the cane with a feathery mycelium and produces spores on a rough granular surface growth on the outside of the sheath.

Both these fungi can exist in a healthy field of canes living only on decaying vegetable matter and doing no harm. There is hardly a field in Trinidad where traces of one or the other cannot be found after a close search.

Under certain little understood conditions, particularly when the canes are suffering from other causes, these fungi become parasitic and invade the root and rootstock, causing greater or less destruction

according to the length of time the attack persists. Damage is usually most conspicuous in dry weather. If conditions become normal recovery takes place rapidly and diseased canes may throw out quite healthy shoots. Root disease is almost always more serious in ratoon canes than in those recently planted.

FACTORS INFLUENCING THE PREVALENCE OF BLIGHT.

Rainfall. It has been shown in a previous report that the distribution of the rainfall during the year has an important effect on blight.

(1) Alternation of wet and dry periods during the growth of the cane is an important factor in determining the prevalence of blight.

(2) A long dry season followed by unusually heavy rains in June and July is frequently connected with wide spread blight.

(3) The most important climatic condition however appears to be the severity of the "Indian Summer", a dry period in September or October. A severe Indian Summer is a general condition both of localities damaged by blight in one year and of years of widespread blight in one locality.

This effect is brought about in several different ways:

(1) The effect on the froghopper itself.
(2) The effect on its enemies.
(3) The effect on the cane.
(4) The effect on root disease of the cane.

(1) Except in damp localities, the conditions during the dry season are below the minimum moisture required for the froghopper to breed. With the first rains of the wet season all the eggs hatch and breeding starts. The dates of the broods are determined by the date of the first rains. The first brood is about 57 days after the beginning of the rains, and the second and third at successive intervals of about 58 days. The continuation of the rainfall late in the year does not cause the production of a fourth brood so frequently as might be expected, even when, as indicated by the large first brood of the following year, many eggs are present.

(2) The vermilion egg-parasite can carry on at a lower degree of moisture than that required by the froghopper, and has been captured during the dry season in places where the froghopper has ceased to breed. The Syrphid fly disappears in the dry season, and appears to require a higher minimum of moisture than the froghopper. The severe fires that occur in prolonged dry seasons destroy large numbers of the lizards, frogs, toads, spiders, etc. that feed on the froghoppers.

(3) The cane is checked by a severe drought during its growing period.

(4) The root fungus is always more severe in canes suffering from the effects of dry weather.

Contour. Low-lying districts are in general more liable to attack than hilly ones. In some cases the blight is worse at the top of a slope than at the bottom, in other cases the reverse is found. This is nearly always a question either of the distribution of different soils at different levels or of drainage and surface washing.

Soil. An outline is given of the chief types of soil which are found in the sugar districts of Trinidad. These soils are more uniform in the north and more confused and irregular in the south. Correspondingly we find the blight more uniformly widespread over large areas in the Northern districts and more irregular and patchy in the Southern districts.

A number of examples are given of the great influence of the soil. The red soils in the Naparimas are always more liable to damage than the black soils. Badly damaged parts of the field are always found to correspond to patches of heavier poorer soil. A diagram shows a very striking instance of the way in which the damaged fields on one estate have been confined to the red soil areas.

Chemical analysis of a number of soils of damaged and undamaged fields show that the undamaged fields are, on an average, alkaline or neutral in reaction, with a higher content of lime, carbon dioxide and humus. The damaged fields are neutral or acid with a lower percentage of lime, carbon, dioxide and humus, and possibly a higher relative amount of SO_3.

Drainage has considerable influence on the prevalence of blight, and in fields liable to damage the drainage should be improved wherever possible. A field in which the drainage had been improved in one-half showed a distinct line across the field between the unimproved part that was distinctly blighted and the improved part that was much less damaged.

Manuring. Pen manure is the most valuable natural manure in use in Trinidad and its effect on the condition of the soil is so beneficial that every effort should be made to increase the quantity available. Sheep manure from Venezuela and lagoon mud from the Oropuche Lagoon are also good, and fields treated with them are considerably improved and suffer less from blight.

Sulphate of Ammonia is the commonest artificial manure in use but the acid conditions found in the soils most liable to blight emphasizes the fact that this manure should not be used continuously on soils deficient in lime (as are most Trinidad soils) without counteracting the effect at intervals by heavy applications of lime.

The age of the Cane at the Time of the Attack has a very important effect. Plant canes in their first year are much less frequently attacked than ratoon canes. Second ratoons are usually more damaged than first ratoons.

There is some evidence that the ensuing crop of ratoons in a field cut earlier in the year is more damaged than in a field cut later. The canes are larger but a relatively greater increase in the number of froghoppers may take place.

Rotation. The system of replanting a field immediately after the old crop is very undesirable from the point of view of disease and insect control. Conditions are most suitable for the insects and diseases to pass on from one crop to the next. Abandoning the land to whatever grasses and bush may grow up is little better, as many insects, including the froghopper, persist in the grass and the abandoned plot is a source of danger to the surrounding fields.

Tillage. There is evidence that good cultivation, by loosening and aerating the soil, not only improves the cane but actually reduces the number of froghoppers present. Occasionally damage is reported following immediately on the use of implements, particularly sub-soil ploughs, but when one considers the time taken for the development of the greatest injury, it is usually seen that the damage in these canes would have appeared whether or not the implements had been used.

Variety. No variety of cane is immune, but a few are more resistant than others. "Uba" and "Badilla" are the most resistant, but are unfortunately not generally considered suitable for cultivation.

Presence of Pests and Diseases. As a general rule 20 froghoppers per stool will produce visible signs of damage, and 50 to 100 per stool will produce severe damage. Fields in poor condition suffer more from a small number of insects than better fields do from a larger infestation.

Root fungi are constantly found in blighted fields as well as various insect pests of cane which weaken the cane and make it less resistant to froghopper attacks.

Allowing for changes in season and age of plants a field attacked one year is more liable to be attacked in the following year than one previously free.

GENERAL PROBLEMS.

The question of the relative importance of the adult and nymph froghopper and of the root disease is discussed.

The froghopper is considered as the most important cause of the blight because of (1) its constant presence in blighted areas, (2) the constant presence of streaks on the leaves in severe blight, (3) the occurrence of blight in plant canes when no other complicating disease is present, (4) the variation in time of the first appearance of blight according to the date of the first brood, (5) the periodicity of the blight.

The adult is considered as more important than the nymph because the blight is never severe until the streaking of the leaves has developed and is at its worst shortly after the greatest flight of adults. Symptoms of blight have been produced in canes, which have never had nymphs, by caging on them a number of adults.

In addition several of the symptoms of blight, including in particular the narrowing of the cane, have been produced in normal canes by imitating the leaf destruction of adult froghoppers by removing the greater number of leaves from the cane.

The spread of injury in the leaf from the original point of infection indicates the possibility of some toxin or enzyme being introduced into the plant.

Root disease is considered as playing its most important part after the froghopper has damaged the cane and particularly after the second brood, when the damage may cease to be periodic and continue to increase entirely owing to the effect of root fungi.

The attacks of root disease follow on the froghopper attacks which are the prime cause of injury.

There is no definite evidence as yet that canes damaged by root fungi are more attractive to froghoppers. On the other hand the conditions which lead to root fungus attacks are nearly always those which allow the froghopper to breed more freely.

Influence of Environment. A study of Section IX indicates that the most important factor in determining the prevalence of blight is the humidity just above and just below the surface of the ground.

(1.) Extreme dryness in dry season tends to increase blight.
(2.) Moderate dryness in dry season tends to reduce blight.
(3.) Dry weather in wet season tends to increase blight.
(4.) Normal weather in wet season tends to reduce blight.
(5.) Very wet weather in wet season tends to increase blight.

In a Table an attempt is made to explain these facts by the known effect of moisture on the cane, the root fungi, the froghopper and its enemies.

It is shown that with excessive dryness both the froghopper and all its enemies are dormant, so that no reduction in numbers will take place. At a slightly higher grade of moisture the vermilion egg-parasite is able to breed and reduce the number of eggs. At the third grade the froghopper can breed and so outdistance the vermilion egg-parasite. At a still higher humidity both the syrphid fly and the green muscardine fungus come into play and reduce the froghopper, while the heaviest rains do not affect the froghopper, but reduce its enemies and have an injurious effect on the canes.

Size of Broods and Periodicity of attacks. There is no definite relation between the size of the broods in one year. Sometimes the first is the largest and sometimes the smallest. The second, is as a rule, that by which most damage is caused. Frequently the third brood is very small after a large and injurious second brood. More accurate study of conditions may lead to an explanation of these facts.

No adequate explanation is available to explain the periodic recurrence of severe blight at intervals of three or four years. It is possibly connected with the cycle of agricultural operations.

The froghopper appears to have been more serious within the last fifteen years than formerly. This is the case not only in Trinidad but in other countries and with other insects besides froghoppers. It is not considered that either the introduction of the mongoose or the development of seedling canes are responsible for this increase. It is more likely part of a wider influence of the spread of civilisation, population, and cultivation in a country which has not yet worked out for itself reliable rotational methods of agriculture to combat the disadvantages inherent in Man's artificial method of planting large areas with the same crop.

CONTROL.

With tropical crops, and particularly with sugar-cane, methods of prevention are more practicable with most pests than methods of cure. With the froghopper the most important preventative consists of getting the soil and the crop into such a condition that a less suitable environment for the breeding of the froghoppers is produced.

Soil Improvement. The drainage should be improved wherever practicable; on the flat lands the drains should be run as close together as is economically possible and they should be kept in working order even on lands temporarily abandoned.

Manuring. Nearly all lands in Trinidad require more pen manure and more lime. The shortage of labour should produce an increased demand for animal cultivation and these animals will produce pen manure. Artificial manures are best used in cases of blight only where the land is good, but suffering from an outbreak owing to temporary unfavourableness of other conditions.

Tillage. Every opportunity should be taken to improve the tilth and depth of the surface soil by careful tillage. Fields should when possible be laid out to correspond with soil changes so that the tillage necessary for one part will not be injurious to the other.

Selection of Varieties. There is so little difference in resistance between different varieties, with the exception of "Uba" and "Badilla", that the planter, unless he is willing to grow one of these two, is best guided in his choice by other circumstances than the prevention of disease.

Reduction of Ratooning. Only plant and 1st ratoon canes should be grown on lands which have shown themselves constantly liable to blight, until the soil can be worked up into a better condition by more frequent cultivation and manuring.

Rotation. This is is one of the most important methods of soil and cultivation improvement, which sooner or later Trinidad will be forced to adopt. Sugar countries in other parts of the world have already worked out systems and examples are given.

As rotation crops, pasture, corn, guinea grass, and upland rice have been suggested but, all being *Gramineæ*, they suffer from similar pests and the froghopper and root disease are not eliminated.

The best rotation crops are *Leguminosæ* of which many have been tried. Bengal beans, cow peas, and sword beans in particular have shown signs of being adapted to use as cover crops.

Among the non-leguminous crops, yams and sweet potatoes are the best, as they ensure good cultivation of the ground and produce a financial return.

On good lands a crop of peas, beans, or sweet potatoes could be grown between the cutting of the canes and replanting later in the same year.

On poorer lands a crop of yams, or beans followed by sweet potatoes could be grown after the cutting of the crop, and the field replanted as crop plants early the next year.

On the poorest land a crop of yams or cassava could be grown for the remainder of the year after cutting and a leguminous crop the following year, followed by the cane plants in the fall.

Direct Control. *Destruction of Eggs.* Removal of the dead leaves from the cane will remove many of the eggs, but the trash so removed must not be left in the fields but should be carried to the pens. The trashing to be of any value as a control must be done when the greatest numbers of eggs are in the trash, which is about ten days

after the height of a brood. Neglect of this will render the operation valueless. Trials have shown that there is little if any chance of the survival of eggs in trash carried to the pens and distributed as pen manure some months later.

Weeding has a similar but less important effect and to be of any use must be done at the same period.

Burning destroys a certain proportion of the eggs of the froghopper, but also many of its enemies and much good vegetable matter which would have formed humus. As little burning as possible should be carried out.

Spraying has been recommended but is not practicable.

The nymphs may be reduced by weeding and in some countries, but not in Trinidad, by flooding the land.

Spraying for nymphs has been recommended, but no reliable cheap liquid has yet been discovered. The cost of the method, even with a cheap spray, and the labour required to distribute it are much against its general adoption.

The nymphs can be crushed in their froth or hand collected by gangs of children, but both methods are expensive and only possible on a small scale.

The adult froghoppers are sometimes collected by hand, but this is laborious.

Spraying with kerosene emulsion has been recommended by Gough, but no field trials have ever been made.

Light traps catch large numbers of adults, but only about 1 per cent. of these are females. Bright lamps are but little more attractive than oil lamps, and green and red lights are found to attract fewer adults than white, and no greater percentage of females. Lights near the ground are more successful than if placed two to four feet up. Other insects are destroyed by the lamps, but on the whole more are injurious than useful. The light traps may be used for the spread of the green muscardine fungus, but the method suffers from the limitations due to the effect of weather on the spread of infection.

The adult froghoppers can be caught in very large numbers by the use of nets in the late evening and early morning when the adults are sitting on the grass and cane leaves. Nets have been designed drawn by mules in order to cover the ground rapidly in the limited time available. Experiments are being continued on this line.

Natural Enemies can be encouraged to a limited extent by providing trees for birds to nest in, and by stopping all unnecessary burning. At the same time the froghopper is a native insect and its enemies are probably on the average as efficient as they are ever likely to be.

If the search for new enemies in other countries is again carried out it must be recollected that it is a long and uncertain process. New enemies are more likely to be found outside Central America, and Africa is suggested as a likely place. At least two men should be engaged in such a search, as results will be obtained sooner and there is less likelihood of failure.

Several possible types of new enemies are indicated.

SUGAR CANE EXPERIMENTS 1918-20.

Trinidad Seedlings and Tests of Varieties.

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The report on sugar-cane experiments may be divided into two parts :—

(1.) Raising and testing of new seedlings.

(2.) Results of tests of varieties grown in plots.

RAISING AND TESTING OF NEW SEEDLINGS.

The work started in 1917, in connection with the raising of new sugar-cane seedlings, has been continued on the same lines as indicated in the report for 1917–19. (2)

Forty-three of the seedlings raised in 1917, which were selected for their combined field characters and analytical results for a second trial, have been planted out in small plots on November 4, 1919.

Seedlings raised in 1918.

Out of the seedlings raised and potted in 1918, 2,203 were planted out in the field between April and May, 1919. Of these, 244 or 12·1 per cent. were selected from their field characters for analytical test, and 162 or 8·0 per cent. have been selected for a second trial.

As in the previous year, it has been found that certain varieties are useless for raising new seedlings, and the detection of good parents seems to be of great importance, as will be seen below. With this object in view a larger number of parents will be selected for getting new seedlings.

Only three natural hybrids and seven self-fertilized seedlings were obtained.

(1.) Now Agricultural Chemist. (2.) *Bull. Dept. Agr.*, T. & T., XVIII. 1919, 136.

TABLE I.—SUGAR-CANE SEEDLINGS RAISED IN 1918.

PARENT.	Number of seedlings planted out in field.	Selected for testing from field characters.	Selected for further trial from field characters and analytical results.
B. 6388 ...	8	0 ...	0
Ba. 7924 ...	12	0 ...	0
B. 16536 ...	40	0 ..	0
M.P. 55 ..	8	1 = 12·5 per cent.	0
H. 27 ...	96	1 = 1·0 ,, ...	1 = 1·0 per cent.
B. 7482 ...	36	1 = 2·8 ,, ...	1 = 2·8 ,,
D. 109 ...	830	59 = 7·1 ,, ...	26 = 3·1 ,,
D. 625 ...	22	4 = 18·1 ,, ..	1 = 4·5 ,,
L. 511 ...	381	38 = 9·9 ,, ...	35 = 9·2 ,,
H. ?	264	49 = 18·5 ,, ..	33 = 12·5 ,,
B. 6835 ...	132	32 = 24·2 ,, ...	23 17·4 ,,
H. 146 ..	40	8 = 20·0 ,, ...	7 = 17·5 ,,
Bourbon ...	60	22 = 36·6 ,, ..	15 = 25·0 ,,
B. 6450 ...	64	24 = 37·5 ,, ...	16 = 25·0 ,,
H. 27 x H. ? ...	3 (N.H.)	1 = 33·3 ,, ...	1 = 33·3 ,,
H. ?	3 (S.F.)	1 = 33·3 ,, .	1 = 33·3 ,,
L. 511 ...	4 (S.F.).	3 = 75·0 ,, ..	2 = 50·0 ,,

N.H. means *natural hybrid*; S.F. means *self-fertilized* seedlings.

The following are the results of the seedlings raised in 1918, which have been selected for their combined field characters and analytical results, and are being kept for a further trial. They were planted out in the field from bamboo pots, between April 1, and May 23, 1919, at intervals of about a week, and were consequently 12 to 12½ months old when tested between April 12 and May 21, 1920. The seedlings planted out earliest developed into much finer stools than those planted later, and there appears to be a distinct advantage in the earlier planting, notwithstanding the loss which may occur from drought or depredations of the mole cricket. The rain-fall from April, 1919 to May 15, 1920 was 50·37 inches, but from March 15, to May 23, 1920 only 0·20 inches of rain fell, and during this period the seedlings made very little growth.

TABLE II.—SEEDLINGS RAISED IN 1918.—FIRST YEAR'S SELECTION.

Cane.	Parent.	Weight of Stool.	Average weight of Canes.	Juice.							
				Per cent. extracted.	Specific gravity.	Brix.	Percentage of			Quotient of purity.	Sucrose per gallon.
							Sucrose.	Glucose.	Non-Sugar.		
		Lb.	Lb.								Lb.
T. 651	H. 27 ..	91·5	3·3	68·6	1·0700	17·0	14·31	1·43	1·26	84·2	1·531
T. 741	D. 625 ..	159·5	8·0	65·7	1·0753	18·2	15·36	1·67	1·17	84·4	1·652
T. 745	B. 7482 ...	55·0	3·4	70·2	1·0775	18·7	16·68	1·51	0·51	89·2	1·797
T. 714	H. 146 ...	70·7	7·9	63·9	1·0779	18·8	14·98	1·67	2·15	79·7	1·615
T. 715	,, ...	97·0	4·8	69·7	1·0766	18·5	15·68	2·00	0·82	84·8	1·688
T. 717	,, ...	83·6	5·5	69·8	1·0770	18·6	15·96	2·00	0·64	85·8	1·719
T. 713	,, ...	71·9	6·5	67·7	1·0779	18·8	16·19	1·07	1·54	86·1	1·745
T. 716	,, ...	53·0	3·5	65·9	1·0775	18·7	17·16	1·02	0·52	91·8	1·849
T. 711	,, ...	67·4	2·9	64·7	1·0832	20·0	17·36	0·67	1·97	86·8	1·880
T. 718	,, ...	48·7	3·2	64·7	1·0859	20·6	19·04	1·06	0·50	92·4	2·067
T. 673	D. 109 ...	60·3	4·6	64·8	1·0722	17·5	14·58	1·72	1·20	83·3	1·563
T. 666	,, ...	73·5	3·3	64·1	1·0753	18·2	15·21	2·00	0·99	83·6	1·635
T. 663	,, ...	82·5	4·6	60·1	1·0744	18·0	15·27	1·37	1·36	84·8	1·641
T. 665	,, ...	55·0	3·9	64·8	1·0783	18·9	15·41	1·56	1·93	81·5	1·662
T. 658	,, ...	57·0	3·6	63·4	1·0801	19·3	15·48	2·00	1·82	80·2	1·672
T. 676	,, ...	55·7	3·3	61·2	1·0810	19·5	15·71	2·62	1·17	80·6	1·698
T. 707	,, ...	45·0	3·0	64·6	1·0757	18·3	15·98	1·47	0·85	87·3	1·719
T. 654	,, ...	40·2	3·6	63·7	1·0828	19·9	16·07	2·17	1·66	80·7	1·740
T. 664	,, ...	84·1	3·8	61·6	1·0788	19·0	16·27	1·16	1·57	85·6	1·755
T. 655	,, ...	46·7	4·2	64·8	1·0841	20·2	16·29	1·61	2·30	80·6	1·766
T. 693	,, ...	51·5	3·4	67·6	1·0766	18·5	16·50	1·51	0·48	89·2	1·776
T. 697	,, ...	47·0	2·5	57·8	1·0775	18·7	16·82	0·68	1·20	89·9	1·812
T. 702	,, ...	32·5	2·9	64·0	1·0788	19·0	16·90	1·28	0·82	89·0	1·823
T. 678	,, ...	36·6	2·4	63·1	1·0779	18·8	17·01	1·28	0·51	90·5	1·833
T. 683	,, ...	36·0	2·8	56·4	1·0815	19·6	17·24	1·39	0·97	88·0	1·864
T. 675	,, ...	47·0	2·2	63·0	1·0837	20·1	17·69	2·00	0·41	88·0	1·917
T. 677	,, ...	61·4	2·8	64·7	1·0837	20·1	17·69	2·00	0·41	88·0	1·917
T. 709	,, ...	37·5	2·9	66·2	1·0850	20·4	17·81	2·17	0·42	87·3	1·932
T. 687	,, ...	49·5	3·1	63·9	1·0841	20·2	18·02	1·85	0·33	89·2	1·953
T. 708	,, ...	89·5	2·8	67·7	1·0824	19·8	18·14	0·91	0·75	91·6	1·963
T. 657	,, ..	49·2	4·9	61·0	1·0882	21·1	18·05	0·64	2·41	85·5	1·964
T. 696	,, ...	50·0	2·9	63·4	1·0832	20·0	18·27	1·11	0·62	91·3	1·979
T. 667	,, .	107·0	5·3	68·3	1·0864	20·7	18·22	0·81	1·67	88·0	1·979
T. 662	,, ..	59·4	4·6	63·5	1·0877	21·0	18·39	0·94	1·67	87·6	2·000
T. 661	,, ...	36·0	4·5	66·1	1·0891	21·3	18·41	1·26	1·63	86·4	2·005
T. 668	,, ...	98·6	3·6	65·5	1·0855	20·5	18·71	0·69	1·10	91·3	2·031
T. 565	B. 6450 ...	93·5	6·9	67·0	1·0691	16·8	13·50	1·67	1·63	80·4	1·443
T. 566	,, .	100·3	5·3	67·6	1·0735	17·8	14·70	1·51	1·59	82·6	1·578
T. 569	,, ...	52·0	3·7	66·6	1·0775	18·7	15·47	1·35	1·88	82·7	1·667
T. 568	,, ...	86·4	5·1	65·2	1·0819	19·7	15·70	1·56	2·44	80·0	1·698
T. 558	,, ...	68·2	3·2	66·8	1·0779	18·8	16·33	1·31	1·16	86·9	1·760
T. 561	,, ...	57·0	5·7	63·4	1·0810	19·5	16·67	1·47	1·36	85·5	1·802
T. 571	,, ...	62·5	2·5	64·0	1·0779	18·8	17·01	0·96	0·83	90·5	1·833
T. 557	,, ...	85·5	3·9	61·1	1·0810	19·5	17·06	1·19	1·25	87·5	1·844
T. 572	,, ...	85·0	5·3	65·4	1·0779	18·8	17·25	1·16	0·39	91·7	1·859
T. 574	,, .	43·1	2·9	67·7	1·0801	19·3	17·22	0·98	1·10	89·2	1·860
T. 573	,, ...	51·5	3·0	65·4	1·0797	19·2	17·32	1·00	0·88	90·2	1·870
T. 578	,, ...	55·7	4·3	68·5	1·0801	19·3	17·31	1·22	0·77	89·7	1·870
T. 576	,, ...	42·7	3·3	67·7	1·0788	19·0	17·34	1·09	0·57	91·3	1·871
T. 564	,, ...	44·0	5·5	66·0	1·0832	20·0	17·46	0·59	1·95	87·3	1·891
T. 577	,, ...	55·2	3·7	66·3	1·0815	19·6	17·63	1·09	0·88	89·9	1·907
T. 575	,, ...	41·5	4·1	67·8	1·0850	20·4	18·10	1·39	0·91	88·7	1·964
T. 730	Bourbon ...	136·0	8·5	63·7	1·0665	16·2	12·65	2·17	1·38	78·1	1·349
T. 725	Bourbon ..	314·0	7·1	67·1	1·0730	17·7	13·74	2·17	1·79	77·6	1·474

TABLE II.—(*Contd.*)—SEEDLINGS RAISED IN 1918.—FIRST YEAR'S SELECTION.

CANE.	Parent.	Weight of Stool.	Average weight of Canes.	JUICE.							
				Per cent. extracted.	Specific gravity.	Brix.	Percentage of			Quotient of purity.	Sucrose per gallon.
							Sucrose.	Glucose.	Non-sugar.		
		Lb.	Lb.								Lb.
T. 736 ...	Bourbon ...	111·3	5·3	67·6	1·0704	17·1	13·77	1·43	1·90	80·5	1·474
T. 720 ...	,, ...	95·9	5·6	66·9	1·0722	17·5	14·58	1·31	1·61	83·3	1·563
T. 719 ...	,, ...	47·2	6·7	62·6	1·0713	17·3	14·73	1·60	0·97	85·1	1·578
T. 726 ...	,, ...	85·0	4·7	65·4	1·0730	17·7	15·20	1·35	1·15	85·8	1·631
T. 734 ...	,, ...	70·5	4·7	65·9	1·0735	17·8	15·43	0·78	1·59	87·8	1·656
T. 737 ...	,, ...	57·5	5·7	65·5	1·0757	18·3	15·74	0·75	1·81	86·0	1·693
T. 735 ...	,, ...	140·0	5·8	69·2	1·0770	18·6	15·77	1·06	1·77	84·8	1·698
T. 731 ...	,, ...	77·5	5·5	62·1	1·0788	19·0	16·03	1·00	1·97	84·4	1·729
T. 733 ...	,, ...	179·3	5·8	67·1	1·0797	19·2	16·11	0·75	2·34	83·9	1·739
T. 722 ...	,, ...	89·6	3·9	66·4	1·0788	19·0	16·51	0·91	1·58	86·9	1·781
T. 739 ...	,, ...	68·0	5·7	67·9	1·0837	20·1	17·69	1·19	1·22	88·6	1·917
T. 729 ...	,, ...	233·3	6·1	69·1	1·0828	19·9	18·18	0·63	1·09	91·3	1·968
T. 727 ...	,, ...	158·0	6·1	69·5	1·0852	20·0	18·51	0·54	0·95	92·5	2·005
T. 514 ...	H. ? ...	77·7	3·7	61·6	1·0753	18·2	14·97	1·43	1·80	82·2	1·610
T. 531 ...	,, ...	58·5	6·5	62·5	1·0735	17·8	15·09	0·83	1·88	84·8	1·629
T. 521 ...	,, ...	54·2	6·8	63·2	1·0788	19·0	15·93	0·60	2·47	83·8	1·718
T. 549 ...	,, ...	42·7	3·3	68·0	1·0748	18·1	16·28	0·92	0·90	89·9	1·750
T. 519 ...	,, ...	135·5	5·2	64·8	1·0783	18·9	16·23	0·53	2·14	85·9	1·750
T. 526 ...	,, ...	50·2	4·2	62·9	1·0801	19·3	16·64	1·16	1·50	86·2	1·797
T. 511 ...	,, ...	83·5	3·9	65·3	1·0815	19·6	16·76	1·00	1·84	85·5	1·812
T. 535 ...	,, ...	40·2	3·3	64·7	1·0819	19·7	16·85	1·72	1·13	85·5	1·823
T. 533 ...	,, ...	32·0	3·5	63·5	1·0766	18·5	17·13	0·61	0·76	92·6	1·844
T. 509 ...	,, ...	56·7	7·1	67·9	1·0801	19·3	17·07	1·02	1·21	88·4	1·844
T. 525 ...	,, ...	34·7	4·3	68·2	1·0864	20·7	17·02	2·17	1·51	82·2	1·849
T. 515 ...	,, ...	35·0	4·4	63·0	1·0815	19·6	17·10	1·11	1·39	87·2	1·849
T. 510 ...	,, ...	40·7	4·1	62·7	1·0810	19·5	17·15	0·53	1·82	87·9	1·854
T. 547 ...	,, ...	50·5	3·9	61·0	1·0783	18·9	17·20	0·85	0·85	91·0	1·855
T. 520 ...	,, ...	33·5	4·8	67·3	1·0846	20·3	17·19	1·33	1·78	84·7	1·864
T. 542 ...	,, ...	60·5	3·8	66·3	1·0801	19·3	17·27	1·14	0·89	89·5	1·865
T. 548 ...	,, ...	30·5	4·3	69·0	1·0801	19·3	17·36	0·89	1·05	89·9	1·875
T. 556 ...	,, ...	39·5	4·4	62·8	1·0815	19·6	17·05	1·85	0·70	87·0	1·893
T. 534 ...	,, ...	44·2	3·7	66·2	1·0801	19·3	17·60	0·60	1·10	91·2	1·901
T. 543 ...	,, ...	33·7	3·1	67·6	1·0828	19·9	17·70	1·09	1·11	88·9	1·916
T. 517 ...	,, ...	78·5	5·6	63·2	1·0837	20·1	17·74	0·70	1·66	88·2	1·922
T. 550 ...	,, ...	29·5	4·2	63·8	1·0832	20·0	17·98	1·28	0·74	89·9	1·947
T. 554 ...	,, ...	43·9	2·6	68·0	1·0832	20·0	17·98	0·96	1·06	89·9	1·947
T. 513 ...	,, ...	56·0	4·0	66·3	1·0855	20·5	17·94	0·88	1·68	87·5	1·947
T. 524 ...	,, ...	64·0	5·3	64·2	1·0873	20·9	18·11	1·07	1·72	86·6	1·969
T. 551 ...	,, ...	32·5	2·3	66·3	1·0832	20·0	18·27	0·81	0·92	91·3	1·979
T. 527 ...	,, ...	60·0	5·4	62·6	1·0855	20·5	18·52	0·89	1·09	90·3	2·010
T. 523 ...	,, ...	30·5	4·3	60·0	1·0909	21·7	18·86	1·55	1·28	86·9	2·057
T. 528 ...	,, ...	32·5	4·6	64·8	1·0891	21·3	19·13	0·86	1·31	89·8	2·083
T. 512 ...	,, ...	85·0	4·5	63·8	1·0904	21·6	19·54	1·06	1·00	90·5	2·131
T. 532 ...	,, ...	43·2	2·5	64·9	1·0864	20·7	19·80	0·56	0·34	95·6	2·151
T. 537 ...	,, ...	30·5	3·4	63·3	1·0900	21·5	19·74	0·69	1·07	91·8	2·152
T. 552 ...	,, ...	51·0	2·3	64·0	1·0918	21·9	20·57	0·73	0·60	93·9	2·246
T. 748 (S.F.) ...		79·0	5·6	64·1	1·0744	18·0	15·03	1·78	1·19	83·5	1·615
T. 747(N.H.)	H. ? x H. 27	36·0	5·1	63·4	1·0775	18·7	16·82	0·83	1·05	89·9	1·812
T. 630 ...	B. 6835 ...	76·5	4·8	66·8	1·0735	17·8	14·46	2·17	1·17	81·2	1·552
T. 632 ...	,, ...	79·4	6·1	63·3	1·0753	18·2	14·68	1·56	1·96	80·6	1·578
T. 634 ...	,, ...	73·1	4·9	63·6	1·0766	18·5	15·15	1·33	2·02	81·9	1·631
T. 629 ...	,, ...	72·9	5·6	68·3	1·0766	18·5	15·73	0·98	1·79	85·0	1·693
T. 622 ...	,, ...	147·5	7·4	65·7	1·0788	19·0	16·42	1·56	1·02	86·4	1·771
T. 631 ...	,, ...	88·5	6·3	68·5	1·0806	19·4	16·49	1·19	1·72	85·0	1·782

TABLE II.—(*Contd.*)—SEEDLINGS RAISED IN 1918.—FIRST YEAR'S SELECTION.

CANE.	PARENT.	Weight of Stool.	Average weight of Canes.	JUICE.							
				Per cent. extracted.	Specific gravity.	Brix.	Percentage of			Quotient of purity.	Sucrose per gallon.
							Sucrose.	Glucose.	Non-Sugar.		
		Lb.	Lb.								Lb.
T. 638	B. 6835	102·3	6·9	63·9	1·0806	19·4	16·87	1·60	0·93	86·9	1·823
T. 636	,,	71·8	4·8	65·8	1·0792	19·1	17·13	0·83	1·14	89·7	1·849
T. 621	,,	89·8	4·7	64·7	1·0828	19·9	17·08	1·43	1·39	85·8	1·849
T. 649	,,	52·5	3·6	66·6	1·0819	19·7	17·48	1·16	1·06	88·7	1·891
T. 627	,,	126·0	4·8	67·9	1·0810	19·5	17·59	1·06	0·85	90·2	1·901
T. 626	,,	33·7	5·6	69·8	1·0841	20·2	17·78	1·31	1·11	88·0	1·927
T. 643	,,	80·5	4·5	64·7	1·0824	19·8	17·81	0·87	1·12	89·9	1·928
T. 625	,,	42·2	3·5	67·0	1·0850	20·4	17·86	0·89	1·65	87·5	1·938
T. 647	,,	35·5	2·7	64·2	1·0837	20·1	18·03	1·14	0·93	89·7	1·954
T. 646	,,	40·0	4·0	68·3	1·0837	20·1	18·12	1·11	0·87	90·1	1·964
T. 637	,,	83·5	6·4	63·7	1·0841	20·2	18·40	1·02	0·78	91·1	1·995
T. 645	,,	72·5	5·2	67·1	1·0855	20·5	18·47	1·20	0·83	90·1	2·005
T. 640	,,	37·2	3·7	67·3	1·0877	21·0	19·02	0·96	1·02	90·6	2·069
T. 641	,,	31·7	5·3	65·5	1·0841	20·2	19·12	0·56	0·52	94·6	2·073
T. 650	,,	56·1	3·8	65·2	1·0868	20·8	19·51	0·55	0·74	93·8	2·120
T. 619	,,	81·4	3·9	68·5	1·0895	21·4	19·94	0·76	0·70	93·2	2·172
T. 635	,,	80·8	6·2	63·9	1·0900	21·5	20·21	0·34	0·95	94·0	2·203
T. 593	L. 511	40·5	6·7	66·8	1·0739	17·9	14·94	0·94	2·02	83·5	1·604
T. 599	,,	74·1	4·9	66·2	1·0770	18·6	15·09	1·47	2·04	81·1	1·625
T. 601	,,	100·2	5·3	70·0	1·0761	18·4	15·39	0·70	2·31	83·6	1·656
T. 605	,,	48·2	4·8	67·4	1·0806	19·4	15·76	1·06	2·58	81·2	1·703
T. 586	,,	64·8	3·8	61·9	1·0806	19·4	15·81	1·04	2·55	81·5	1·708
T. 585	,,	73·5	4·1	66·1	1·0797	19·2	15·97	1·31	1·92	83·2	1·724
T. 610	,,	74·0	3·1	65·2	1·0770	18·6	16·06	0·75	1·79	86·3	1·730
T. 600	,,	111·0	6·2	72·2	1·0775	18·7	16·15	1·11	1·44	86·4	1·740
T. 591	,,	81·5	4·5	67·4	1·0770	18·6	16·20	0·40	2·00	87·1	1·745
T. 595	,,	132·5	5·5	70·3	1·0766	18·6	16·40	1·16	0·94	88·6	1·766
T. 581	,,	67·0	4·5	68·2	1·0761	18·4	16·51	0·83	1·09	89·7	1·777
T. 604	,,	60·0	3·7	64·4	1·0806	19·4	16·54	1·06	1·80	85·2	1·787
T. 587	,,	41·0	5·9	66·6	1·0790	19·1	16·65	0·80	1·65	87·2	1·797
T. 606	,,	41·0	4·1	66·1	1·0797	19·2	16·79	0·54	1·87	87·4	1·813
T. 607	,,	78·5	6·6	67·0	1·0810	19·5	16·96	0·54	2·00	87·0	1·833
T. 588	,,	71·0	3·9	65·7	1·0810	19·5	17·25	0·61	1·64	88·5	1·865
T. 612	,,	61·8	4·7	66·3	1·0868	20·8	17·50	0·94	2·36	84·1	1·902
T. 592	,,	62·8	5·7	62·9	1·0824	19·8	17·57	0·68	1·55	88·7	1·902
T. 583	,,	61·5	4·4	64·6	1·0806	19·4	17·64	0·36	1·40	90·9	1·906
T. 584	,,	128·5	5·3	66·4	1·0859	20·6	17·65	0·85	2·10	85·7	1·917
T. 617	,,	44·0	4·0	66·6	1·0806	19·4	17·79	0·91	0·70	91·7	1·922
T. 594	,,	117·2	4·8	65·1	1·0810	19·5	17·83	0·71	0·96	91·3	1·927
T. 608	,,	61·4	5·6	69·6	1·0918	21·9	17·66	2·18	2·06	80·6	1·928
T. 598	,,	57·7	5·2	65·0	1·0850	20·4	17·86	0·49	2·05	87·5	1·938
T. 611	,,	44·2	4·0	67·5	1·0837	20·1	17·93	0·48	1·69	89·2	1·943
T. 596	,,	130·5	4·3	69·1	1·0837	20·1	17·93	0·68	1·49	89·2	1·943
T. 597	,,	41·7	4·2	63·6	1·0882	21·1	17·90	0·72	2·48	84·8	1·948
T. 590	,,	76·0	3·8	68·6	1·0864	20·7	18·70	0·66	1·34	90·3	2·031
T. 582	,,	76·7	4·8	67·0	1·0873	20·9	18·68	0·83	1·39	89·4	2·031
T. 589	,,	43·7	5·5	67·0	1·0891	21·3	19·23	0·85	1·22	90·3	2·094
T. 618	,,	23·0	3·3	63·3	1·0891	21·3	19·75	0·66	0·89	92·7	2·151
T. 603	,,	78·0	4·9	68·7	1·0918	21·9	19·99	0·69	1·22	91·3	2·182
T. 614	,,	65·5	3·6	65·8	1·0900	21·5	20·55	0·46	0·49	95·6	2·240
T. 609	,,	30·5	3·8	68·2	1·1000	23·7	20·83	0·84	2·03	87·9	2·291
T. 613	,,	47·5	2·5	66·2	1·0923	22·0	20·98	0·35	0·67	95·4	2·292
T. 749 (S.F.)	,,	53·5	4·4	64·6	1·0837	20·1	17·78	0·87	1·45	88·4	1·927
T. 759 (S.F.)	,,	45·2	3·8	65·9	1·0855	20·5	18·47	0·84	1·19	90·1	2·005

Although a few of these seedlings might appear hardly worthy of retention it is considered preferable, especially at the start to err on the side of leniency. Generally it will be seen from the above that the seedlings raised from the Bourbon gave the largest weight of canes and those from L. 511, B. 6835 and H.? the best juice. The seedlings raised in 1918 are much better than those of the previous year.

When the stools of these selected varieties have grown up, cuttings will be planted out in plots about October–November and grown in competition with standard varieties such as Bourbon, B. 156, Badilla or Ba. 6032. From the results obtained a further selection will be made, only those varieties which give very good results will be kept and planted in larger plots.

Seedlings raised in 1919.

About 12,000 seedlings were raised in 1919; of these over 4,530 were potted and 2,577 of the most vigorous planted out in the field during March and April, 1920. Unfortunately about 30 per cent. of these have been killed out by the very severe drought which started in the middle of March and has continued to June 15. A large number of supplies in bamboo pots are available, but the season is so far advanced that it is hardly possible for these to come to maturity by May next.

RESULTS OF TESTS OF VARIETIES.

With the exception of Fields 7 and 9, which were under the control of the St. Augustine Estate authorities, the canes under report were grown at the Experiment Station, St. Augustine, and consist of plant canes and first ratoons. Plant canes received an application of pen manure at the rate of 15 tons per acre. No manures were applied to ratoons and all the canes received ordinary estate cultivation.

During the period under review attacks from frog-hopper were practically nil and the cultivation suffered very little from root disease. A leaf disease which was observed about three years ago on D. 3956 has spread considerably and during the latter part of 1919 Mr. C. B. Williams Entomologist in charge of frog-hopper investigations, found that nearly 75 per cent. of the varieties grown at the Experiment Station were attacked. Specimens forwarded to the Bureau of Plant Pathology, U..S.A., have been identified by Dr. E. W. Brandes as the Mosaic disease of the sugar-cane. So far, the disease has not done much damage and the greatest care is being observed in its eradication which consists in digging out all cane stools affected.

The results obtained from plant canes are recorded in Tables III to VII those from the first ratoons in Tables VIII to X: Table XI gives the average results for plant canes and ratoons.

Information with regard to the date of planting, and testing of the juice is given at the head of the Tables.

Plant Canes.

The plant canes in Field 9 Valsayn, Table III, were 19½ months old when reaped. The greater part of the cultivation was cut in October for supplying plants to planters, only approximately half an acre being reserved for getting the tonnage of canes per acre and testing the quality of the juice.

Table III.—Plant Canes.

Date planted ... ... September 24, 1918 ... ... Field 9, Valsayn.

Date reaped and tested ... ... May 6, 1920 ... ... 19½ months old.

Rainfall ... ... September 24, 1918 to May 5, 1920 ... ... 67·42 inches.

Cane.	Area under cultivation.	Juice.								Per Acre.		
		Per cent. extracted.	Specific gravity.	Brix.	Percentage of			Quotient of purity.	Sucrose per gallon.	Canes.	Juice.	Sucrose in Juice.
					Sucrose.	Glucose.	Non-Sugar.					
	Sq. ft.								Lb.	Tons.	Gals.	Tons.
B.H. 10 (12)	5,610	66·6	1·0909	21·7	20·01	1·16	0·53	92·2	2·183	42·03	5,748	5·60
Ba. 7924	7,458	66·7	1·0828	19·9	18·23	0·78	0·89	91·6	1·974	36·36	5,018	4·42
L. 511	7,370	66·8	1·1014	24·0	22·89	0·38	0·73	95·4	2·521	24·08	3,271	3·68

The best results were obtained from B.H. 10 (12) with 5·60 tons of indicated sucrose in the juice, followed by Ba. 7924. The juice from L. 511 was of exceptionally good quality and contained over two and a half pounds of sucrose per gallon.

The results from the plant canes in Field 9, St. Augustine, are given in Table IV. These canes were planted in September, 1918 and tested on April 16, 1920 at approximately 19 months of age. The average yield for the whole field was 31·54 tons of canes per acre.

The highest results were obtained from B. 156 followed by the Badilla, T. 202, B. 6308 and D. 109, Ba. 6032 only occupies the seventh place on the list.

Table IV.—Plant Canes.

Date planted ... ... September, 1918 ... ... Field 9, St. Augustine.
Date reaped and tested ... ... April, 1920 ... ... 19 months old.
Rainfall... ... ... September 1, 1918 to March 31, 1920 ... ... 72·03 inches.

Cane.	Area under cultivation.	Juice.							Per Acre.		
		Per cent. extracted.	Specific gravity.	Brix.	Percentage of Sucrose.	Glucose.	Non-sugar.	Quotient of purity.	Sucrose per gallon.	Canes.	Juice.	Sucrose in juice.
	Sq. ft.*								Lb.	Tons*	Gals.	Tons.
B. 156	45 718	69·2	1·0806	19·4	17·02	1·56	0·82	87·7	1·839	37·46	5,373	4·41
Badilla	47,032	67·1	1·0914	21·8	20·14	1·00	0·66	92·4	2·198	29·20	4,021	3·94
T. 202	37,591	67·6	1·0810	19·5	17·64	1·31	0·55	90·5	1·907	32·97	4,618	3·93
B. 6308	46,197	68·4	1·0788	19·0	17·05	1·28	0·67	89·7	1·839	32·14	4,565	3·75
D. 109	34,255	68·6	1·0739	17·9	14·74	2·17	0·99	82·3	1·583	36·80	5,266	3·72
H. 227	23,299	69·3	1·0788	19·0	16·61	1·35	1·04	87·4	1·791	31·36	4,512	3·61
Ba. 6032	23,396	64·2	1·0761	18·4	16·41	1·11	0·88	89·2	1·766	31·14	4,161	3·28
B. 6450	45,305	68·1	1·0797	19·2	17·18	1·25	0·77	89·5	1·855	27·98	3,953	3·27
T. 75	41,272	67·8	1·0779	18·6	16·20	1·82	0·58	87·1	1·745	28·69	4,046	3·15
H. 27	11,649	68·1	1·0788	19·0	16·27	1·61	1·12	85·6	1·755	28·00	3,959	3·10
B. 3922	39,560	69·0	1·0730	17·7	14·86	1·78	1·06	83·9	1·594	29·01	4,179	2·97

* The figures in these columns were supplied by the Manager, St. Augustine Estate.

The plant canes in Field 2, Valsayn, Table V. were 17½ months old when reaped. The first place is occupied by B.H. 10 (12) followed by the Badilla, Ba. 6032 and B. 156. Four other varieties have given better results than the Bourbon viz.: B. 16536, B. 6388, B. 6308 and B. 10650. Owing to the very poor yield of canes obtained from B. 4934, B. 6450 and B. 14761 the average weight for the whole field is only 25·54 tons per acre.

TABLE V.—PLANT CANES.

Date planted ... ... October 10, 1918 ... ... Field 2, Valsayn.
Plants reaped and tested ... ... April 1, 1920 ... ... 17½ months old.
Rainfall ... ... October 10, 1918 to March 31, 1920 ... ... 65·52 inches.

CANE.	Area under cultivation.	JUICE.								PER ACRE.		
		Per cent. extracted.	Specific gravity.	Brix.	Percentage of Sucrose.	Glucose.	Non-sugar.	Quotient of purity.	Sucrose per gallon.	Canes.	Juice.	Sucrose in juice.
	Sq. ft.								Lb.	Tons.	Gals.	Tons.
B.H. 10 (12)	7,040	66·1	1·0841	20·2	17·97	1·26	0·97	89·0	1·948	37·74	5,151	4·48
Badilla	6,996	61·0	1·0932	22·2	20·58	0·80	0·82	92·7	2·250	33·93	4,241	4·26
Ba. 6032	7,040	66·6	1·0739	17·9	15·28	1·32	1·30	85·4	1·641	30·40	4,223	3·09
B. 156	7,062	66·2	1·0828	19·9	17·41	1·40	1·09	87·5	1·885	26·68	3,654	3·07
B. 16536	7,040	67·5	1·0766	18·5	15·87	1·75	0·88	85·8	1·708	26·37	3,703	2·82
B. 6388	7,062	69·5	1·0770	18·6	16·25	1·53	0·82	87·4	1·750	24·90	3,599	2·81
B. 6308	7,062	67·5	1·0792	19·1	17·38	1·14	0·58	91·0	1·876	23·21	3,252	2·72
B. 10650	7,062	70·9	1·0783	18·9	16·76	1·26	0·88	88·7	1·807	22·45	3,306	2·67
Bourbon	6,996	68·9	1·0739	17·9	15·18	1·53	1·19	84·8	1·630	25·14	3,613	2·63
B. 4934	7,036	65·8	1·0744	18·0	16·39	1·00	0·61	91·0	1·761	19·12	2,623	2·06
B. 17380	7,040	68·6	1·0647	15·8	12·67	1·88	1·25	80·2	1·349	20·96	3,025	1·82
B. 6450	7,062	69·0	1·0783	18·9	16·67	1·00	1·23	88·2	1·797	15·73	2,255	1·81
B. 14761	7,040	68·5	1·0700	17·0	14·27	1·58	1·15	83·9	1·527	15·85	2,273	1·55

Small plots of the latest introductions from Barbados were planted in Fields 4 and 7, Valsayn, on December 21, 1918 and reaped on May 8, 1920 at 16½ months of age. The results are given in Table VI.—B.S.F. 12 (27) and B.S.F. 12 (24) are likely to be useful introductions. B. 67 is apparently very susceptible to the Mosaic disease.

TABLE VI.—PLANT CANES.

Date planted ... ... December 21, 1918 ... ... Fields 4 and 7, Valsayn.
Date reaped and tested ... ... May 8, 1920 ... ... 16½ months old.
Rainfall ... ... December 21, 1918 to May 7, 1920 ... 52·96 inches.

CANE.	Area under cultivation.	JUICE.								PER ACRE.		
		Per cent. extracted.	Specific gravity.	Brix.	Percentage of Sucrose.	Glucose.	Non-Sugar.	Quotient of purity.	Sucrose per gallon.	Canes.	Juice.	Sucrose in juice.
	Sq. ft.								Lb.	Tons.	Gals.	Tons.
B.S.F. 12 (27)	3,454	66·7	1·0832	20·0	17·41	1·35	1·24	87·0	1·886	34·68	4,783	4·03
B.S.F. 12 (24)	3,630	70·0	1·0713	17·3	14·73	1·67	0·90	85·1	1·582	33·90	4,962	3·50
B. 67	4,070	67·6	1·0855	20·5	18·47	1·02	1·01	90·1	2·005	27·02	3,769	3·37
Ba. 8846	3,432	70·8	1·0704	17·1	14·60	1·56	0·94	85·4	1·563	25·86	3,831	2·67
B. 60	4,070	64·5	1·0918	21·9	20·38	0·33	1·19	93·0	2·225	14·85	1,965	1·95
B.S.F. 12 (34)	2,750	64·4	1·0824	19·8	16·51	2·50	0·79	83·4	1·737	9·70	1,293	1·03

Cuttings from the following seedlings raised by the St. Madeleine Sugar Co., Ltd. and of the Uba variety were obtained from Mr. C. Forbes Todd for trial at St. Augustine. They were planted in April, 1919 and reaped in May 1920 at approximately 13 months old. Generally they grew well up to February, but with the exception of the Uba they suffered considerably from the drought which set in March and none of the canes appear to have come to maturity when tested in May. These canes were planted in very light soil.

Table VII.—Plant Canes.

Date planted ... ... April 4, 1919 ... ... Fields 1 and 4, Valsayn.
Date reaped and tested ... ... May 11, 1920 ... ... 13 months old.
Rainfall ... ... April 1, 1919 to May 10 ,1920 ... 59·37 inches.

Cane.	Area under cultivation.	Juice.								Per Acre.		
		Per cent. extracted.	Specific gravity.	Brix.	Percentage of			Quotient of purity.	Sucrose per gallon.	Canes.	Juice.	Sucrose in juice.
					Sucrose.	Glucose.	Non-Sugar.					
	Sq. Ft.								Lb.	Tons.	Gals.	Tons.
Uba	3,300	66·3	1·0757	18·7	12·88	3·33	2·09	70·4	1·385	28·71	3,964	2·45
Q. Badilla U.	1,936	67·8	1·0810	19·5	16·77	2·08	0·65	86·0	1·813	20·81	2,924	2·37
Q. Badilla E.	1,958	69·5	1·0806	19·4	15·92	2·05	1·43	82·1	1·720	19·46	2,803	2·15
55 $\frac{A.R.}{N.}$ B.	1,716	65·7	1·0797	19·2	15·75	2·94	0·51	82·0	1·700	19·99	2,725	2·07
Q. Badilla C.	1,870	68·9	1·0678	16·5	12·04	2·81	1·65	73·0	1·286	24·17	3,493	2·00
26 $\frac{A.R.}{N.}$ B....	1,782	64·4	1·0695	16·9	13·23	2·72	0·95	78·3	1·415	17·42	2,350	1·48
Q. Badilla A.	3,014	63·9	1·0779	18·8	13·52	3·22	2·06	71·9	1·457	15·35	2,038	1·22
Q. Badilla D.	1,980	66·5	1·0753	18·2	14·26	2·94	1·00	78·3	1·533	9·90	1,371	0·94

The Uba was planted on May 23, 1919 and was therefore only 11½ months old when reaped and tested.

Ratoon Canes.

The first ratoons in Field 7, St. Augustine Estate, were reaped on March 26, 1920 at eleven months of age. An average yield of 19·20 tons of canes was obtained per acre and the results are given in Table VIII.

In this field four varieties have given better results than B. 156, viz. :—B. 6308, Badilla, B. 4934 and B. 6450. The juice from the Badilla was of very high quality containing over two and a quarter pounds of sucrose per gallon.

TABLE VIII.—FIRST RATOONS.

Date planted ... ...November 23, 1916—Field 7, St. Augustine. *Ratoons reaped and tested* ...March 26, 1920... ...11 months old.
Plants reaped and tested... April 26, 1919.—17½ months old. *Rainfall* ... ...May, 1919 to March, 1920...49·35 inches.

CANE.	Area under cultivation.	JUICE.								PER ACRE.		
		Per cent. extracted.	Specific gravity.	Brix.	Percentage of Sucrose.	Percentage of Glucose.	Percentage of Non-Sugar.	Quotient of purity.	Sucrose per gallon.	Canes.	Juice.	Sucrose in juice.
	*Sq. ft.								Lb.	Tons.	Gals.	Tons.
B. 6308	14,974	67·1	1·0824	19·8	18·29	1·04	0·47	92·4	1·980	24·54	3,408	3·01
Badilla	32,670	62·0	1·0936	22·3	21·29	0·57	0·44	95·5	2·328	20·35	2,584	2·68
B. 4934	15,246	62·1	1·0797	19·2	18·00	0·66	0·54	93·7	1·943	23·68	3,051	2·65
B. 6450	15,246	68·4	1·0722	17·5	15·21	1·32	0·97	86·9	1·631	23·57	3,389	2·47
B. 156	47,644	65·8	1·0828	19·9	17·94	1·40	0·56	90·1	1·942	19·62	2,671	2·31
D. 504	30,492	62·3	1·0885	20·5	18·95	1·09	0·46	92·4	2·063	18·80	2,410	2·22
B. 3922	15,246	66·0	1·0726	17·6	15·64	1·29	0·67	88·9	1·677	19·00	2,619	1·96
T. 202	14,974	63·9	1·0792	19·1	17·71	1·00	0·39	92·7	1·911	16·22	2,151	1·83
B. 1753	37,570	61·4	1·0726	17·6	15·15	1·58	0·87	86·1	1·625	17·45	2,238	1·62
T. 75	15,518	63·9	1·0775	18·7	16·68	1·16	0·86	89·2	1·797	9·72	1,291	1·03

* The figures in these columns were supplied by the Manager, St. Augustine Estate.

The results from the first ratoons in Field 1, St. Augustine, are recorded in Table IX. The canes from this plot were reaped as plant canes on April 30, 1919, being 17½ months old; as first ratoons they were cut at eleven and a half months of age. In this field there were twenty-four varieties under experiment, of which twenty-one varieties have given better results than the Bourbon. Six of these have also given better results than B. 156. B. 6388 with 33·00 tons of cane per acre comes first followed by H. ?, B. 14761, Ba. 6032, B. 18208, B. 10650, B. 156, &c., L. 511 and Badilla which come tenth and eleventh on the list have given juice of very high quality, containing over two and a third pounds of sucrose per gallon.

Table IX.—First Ratoons.

Date planted ... ...November 14, 1917—Field 1, St. Augustine. *Ratoons reaped and tested* ...April 14, 1920 ... ... 11½ months old.
Plants reaped and tested ...April 30, 1919 —17½ months old. *Rainfall* ... ...May 1, 1919 to April 13, 1920... 49·35 inches.

Cane.	Area under cultivation.	Juice.								Per Acre.		
		Per cent. extracted.	Specific gravity.	Brix.	Percentage of			Quotient of purity.	Sucrose per gallon.	Canes.	Juice.	Sucrose in Juice.
					Sucrose.	Glucose.	Non-Sugar.					
	Sq. ft.								Lb.	Tons.	Gals.	Tons.
B. 6388	11,110	69·1	1·0770	18·6	16·49	1·28	0·83	88·6	1·776	33·00	4,743	3·76
H. ?	10,736	64·9	1·0819	19·7	18·01	0·94	0·75	91·4	1·948	26·97	3,624	3·15
B. 14761	7,722	67·6	1·0815	19·6	17·97	1·06	0·57	91·7	1·943	25·73	3,602	3·12
Ba. 6032	11,220	62·9	1·0775	18·7	17·07	1·11	0·52	91·3	1·839	27·44	3,588	2·94
B. 18208	11,198	67·3	1·0824	19·8	18·14	1·09	0·57	91·6	1·963	22·17	3,088	2·71
B. 10650	9,152	70·8	1·0806	19·4	17·50	1·25	0·65	90·2	1·891	21·23	3,116	2·63
B. 156	11,088	67·3	1·0792	19·1	16·31	1·56	1·23	85·4	1·760	23·09	3,225	2·53
M.P. 55	5,216	68·2	1·0783	18·9	15·60	2·27	1·03	82·5	1·682	23·28	3,298	2·48
B. 6308	17,006	66·8	1·0810	19·5	18·26	0·85	0·39	93·6	1·974	19·21	2,659	2·34
L. 511	10,874	68·4	1·0950	22·6	21·31	0·55	0·74	94·3	2·333	15·87	2,220	2·31
Badilla	11,220	62·8	1·0964	22·9	21·43	0·70	0·77	93·6	2·349	16·55	2,123	2·22
H. 227	10,736	66·8	1·0797	19·2	16·79	1·35	1·06	87·4	1·813	19·38	2,686	2·17
H. 146	10,384	64·7	1·0837	20·1	17·88	1·39	0·83	88·9	1·938	18·68	2,498	2·16
B. 4934	11,110	62·0	1·0824	19·8	18·87	0·50	0·43	95·3	2·042	18·47	2,370	2·16
B. 7482	5,258	67·7	1·0815	19·6	17·82	1·06	0·72	90·9	1·927	17·81	2,497	2·15
B.N.H. 02 (1)	11,066	62·0	1·0783	18·9	17·39	1·11	0·40	92·0	1·875	19·93	2,567	2·15
D. 504	11,044	62·2	1·0837	20·1	17·16	1·72	1·22	85·4	1·860	20·06	2,579	2·14
B. 3922	11,088	63·8	1·0761	18·4	16·12	1·31	0·97	87·6	1·735	19·21	2,551	1·97
B. 16536	7,766	66·1	1·0766	18·5	15·77	1·72	1·01	85·2	1·698	18·16	2,497	1·89
H. 27	11,644	64·7	1·0841	20·2	17·54	1·35	1·31	86·8	1·901	15·28	2,043	1·73
B.N.H. 02 (5)	11,066	69·1	1·0779	18·8	16·67	1·51	0·62	88·7	1·797	13·09	1,880	1·51
Bourbon	11,220	68·0	1·0739	17·9	15·28	1·67	0·95	85·4	1·641	14·00	1,986	1·45
White Tanna	3,235	62·5	1·0824	19·8	16·75	1·56	1·49	84·6	1·813	12·96	1,676	1·36
B. 17380	9,768	66·2	1·0739	17·9	15·43	1·78	0·69	86·2	1·657	12·82	1,770	1·31

The first ratoons in Fields 8 and 9, Valsayn, were reaped on May 7, 1920 at 12½ to 13 months of age and gave an average yield of 22·87 tons of canes per acre, the juice from L. 511 was of very high quality containing 2·43 pounds of sucrose per gallon: that from B.H. 10 (12), Ba. 7924 and B 7482 was also of good quality and contained 2·20, 2·13 and 2·12 pounds of sucrose per gallon respectively.

The best results were obtained from B.H. 10 (12), Ba. 7924, M.P. 55 and L. 511 as will be seen in Table X.

TABLE X.—FIRST RATOONS.

Date planted { November 11, 1917 ..Field 8, Valsayn. / June 5, 1917 ...Field 9, Valsayn.
Plants reaped and tested { Field 8, April 15, 1919...17 months old. / Field 9, April 4, 1919...22 months old.
Ratoons reaped and tested ...May 6, 1920 ...12½ to 13 months old.
Rainfall April 4, 1919 to May 5, 1920 ... ...50·37 inches.

CANE.	Area under cultivation.	JUICE.								PER ACRE.		
		Per cent. extracted.	Specific gravity.	Brix.	Percentage of Sucrose.	Glucose.	Non-sugar.	Quotient of purity.	Sucrose per gallon.	Canes.	Juice.	Sucrose in juice.
	Sq. ft.								Lb.	Tons.	Gals.	Tons.
B.H. 10 (12)...	5,375	65·9	1·0932	22·2	20·20	1·51	0·49	91·0	2·208	30·90	4,172	4·11
Ba. 7924	6,250	65·1	1·0873	20·9	19·59	0·56	0·75	93·7	2·130	28·66	3,844	3·65
M.P. 55	12,801	68·7	1·0832	20·0	17·55	1·92	0·53	87·7	1·901	29·52	4,194	3·56
L. 511	4,334	66·3	1·0991	23·5	22·13	0·41	0·96	94·2	2·432	21·11	2,852	3·10
White Tanna	10,083	61·6	1·0846	20·3	17·58	1·47	1·25	86·6	1·907	25·56	3,252	2·77
M. $\frac{90}{03}$...	8,225	65·4	1·0713	17·3	15·41	1·22	0·67	99·1	1·651	22·71	3,105	2·29
B. 7482	3,840	67·8	1·0923	22·0	19·41	1·39	1·20	88·2	2·120	11·91	1,656	1·57
L. 218	4,238	66·2	1·0757	18·3	15·93	1·35	1·02	87·0	1·713	14·64	2,018	1·54
L. 253	4,212	67·3	1·0748	18·1	15·65	1·85	0·60	86·5	1·682	13·18	1,849	1·39

The average results of plant canes and first ratoons from Fields 8 and 9, Valsayn; 1 and 7, St. Augustine are given in Table XI. Four varieties have given better results as first ratoons than as plant canes, viz.:—B.H. 10 (12), Ba. 7924, M. 90^{03} and T. 202. Eight varieties have given better results than B. 156, and sixteen others are better than Bourbon. The highest results were obtained from B. 6388, B. 14761, Ba. 6032, M.P. 55, B.H. 10 (12), H.?, B. 6308, Ba. 7924, B. 156, L. 511, B. 10650, and Badilla—all of which have given an indicated yield of sucrose in the juice of over 3 tons per acre.

TABLE XI.—AVERAGE RESULTS OF PLANT CANES AND FIRST RATOONS.

Fields 8 and 9, Valsayn; 1 and 7, St. Augustine.

CANE.	Sucrose in Juice—Tons per Acre.		
	Plant Canes 1919.	1st Ratoons 1920.	Average for 2 years.
B. 6388	4·58	3·76	4·22
B. 14761	5·09	3·12	4·10
Ba. 6032	4·96	2·94	3·95
M.P. 55	4·72	3·02	3·87
B.H. 10 (12)	3·28	4·11	3·69
H. ?	4·19	3·15	3·67
B. 6308	4·30	2·67	3·48
Ba. 7924	3·31	3·65	3·48
B. 156	4·05	2·42	3·23
L. 511	3·67	2·70	3·18
B. 10650	3·46	2·63	3·04
Badilla	3·57	2·45	3·01
B. 18208	3·16	2·71	2·93
B. 6450	3·26	2·47	2·86
B. 16536	3·76	1·89	2·82
H. 146	3·27	2·16	2·71
D. 504	3·08	2·18	2·63
B.N.H. 02 (1)	3·10	2·15	2·62
B. 3922	3·04	1·96	2·50
B. 4934	2·55	2·41	2·48
B. 7482	2·97	1·86	2·41
White Tanna	2·67	2·06	2·36
H. 227	2·39	2·17	2·28
H. 27	2·79	1·73	2·26
Bourbon	3·03	1·45	2·24
M. 90^{03}	2·13	2·29	2·21
B. 1753	2·78	1·62	2·20
B.N.H. 02 (5)	2·71	1·51	2·13
B. 17380	2·47	1·31	1·89
L. 218	2·03	1·54	1·78
T. 202	1·72	1·83	1·77
L. 253	1·67	1·39	1·53
T. 75	1·36	1·03	1·19

BOTANICAL.

THE CACTI OF TRINIDAD.

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One of the most interesting experiences of my visit to Trinidad in 1920 was an investigation of the native cacti, which was greatly facilitated by Mr. W. G. Freeman, Director of Agriculture.

Professor Grisebach, in his *Flora of the British West Indies* published from 1859 to 1864 (the pages bearing his descriptions of *Cactaceae* were published in 1860) included only one species of the family from Trinidad, evidently having had few specimens before him.

In Mr. Hart's list of the specimens in the herbarium of the Royal Botanic Gardens, published in 1908, five determined species were recorded; recent collections have brought the representation of species up to a dozen.

Most of the kinds native to Trinidad and by far the greater number of individuals inhabit the dry Bocas Islands; there they are very abundant, especially at lower elevations, on Monos, Huevos and Chacachacare, reaching their greatest development numerically on Patos; they are frequent on Gasparee and on the north-western mainland coast. Three of the species grow here and there on trees or rocks over a large part of the mainland of Trinidad.

The species in the following paper not numbered are not native but are introduced ornamental plants.

1. **Pereskia Pereskia** (L.) Karsten [*Cactus Pereskia* L.; *Pereskia aculeata* Miller].

The Barbados or West Indian Gooseberry or Lemon Vine is a woody climber up to thirty feet in length, its branches bearing short recurved spines in pairs or rarely in threes, the lower part of the stem sometimes having some straight and slender spines. Its short-stalked leaves are ovate to lanceolate, entire-margined, two or three inches long, somewhat fleshy in texture. Its white, yellowish or pinkish flowers are in small clusters at the ends of twigs, and from an inch to nearly two inches broad. The edible berries, yellow to red, are somewhat more than half an inch in diameter.

The plant is commonly cultivated for its fruit in tropical America. I observed one climbing on a tree at Maqueripe, apparently wild and native.

Pereskia grandifolia Haworth, native of Brazil, a shrub often six feet high, armed with straight long slender spines, its leaves four to six inches long, its flowers rose-coloured, rarely white, is often planted for ornament and makes effective hedges. It has been confused with *P. Bleo* (H.B.K.) D.C. of Colombia and Panama.

2. Nopalea cochenillifera (L.) Salm-Dyck. [*Cactus cochenillifer* L. ; *Opuntia cochenillifera* Miller.]

The Cochineal Cactus is a plant sometimes twelve feet high, usually lower, often much branched, light or dull green, with flat, rather thin, oblong, spineless joints from six inches to over a foot long, often mistaken for leaves, but its real leaves are very small, awl-shaped, and fall away promptly after their appearance on the young joints; the joints bear small circular areoles containing minute barbed bristles (glochids) which also fall away, so that one can handle the older joints with impunity. The trunks of large plants are often six or eight inches thick at the base and sometimes bear short spines. The scarlet flowers are borne one at an areole on the edges or sides of the joints; the ovary is covered with low tubercles, bearing many glochids; the sepals and petals are erect, the inner petals embracing the stamens which protrude beyond them, and the very slender style projects beyond the stamens; the stigma has several narrow lobes; the red fruit is one to two inches long.

It is widely planted in Trinidad about houses and grows readily from detached joints. It is locally known as "Rachette." I observed a large colony near the ruins of a home on top of a bluff at Belleview which had spread into a thicket and is evidently increasing in size. The plant is widely distributed in tropical America, but its original home is unknown. Linnæus in 1753 attributed it to Jamaica, but it is not native in Jamaica now. Its joints are mucilaginous and used for poultices. According to Mr. W. E. Broadway the flattened stems are sliced into pieces and then applied as poultices in cases of inflammation, scalds, burns, &c. Much relief from pain is asserted to follow shortly after their application. A tea is also prepared from the same cactus for use in certain ailments.

3. Opuntia Boldinghii Britton and Rose.

Boldingh's Prickly Pear is a flat-jointed, nearly unarmed cactus, usually bushy-branched, becoming about six feet high with a short trunk-like base. The joints are dull green, six to eight inches long, obovate to elliptic, spineless or when young with a few short brown spines at the areoles and numerous short barbed bristles (glochids); joints of seedling plants bear some acicular spines. The leaves are minute and fugacious. The rose-coloured or salmon-pink flowers are borne singly at areoles mostly on the edges of the joints and are about an inch and a half broad when expanded, with blunt ascending or spreading petals; the plant is quite showy when in full bloom; the stamens are shorter than the petals, the style nearly white, the lobes of the stigma yellowish. The fruit is spineless and about an inch and a half long.

It inhabits banks and hillsides on Chacachacare and Patos Islands, where I observed it in March, 1920. It is the plant recorded by Mr. Hart, in his Herbarium List as *Opuntia Tuna*, collected by Finlay on Chacachacare April 20, 1866, but the real *Opuntia Tuna* is a quite different, very spiny, yellow-flowered species, known to me only from Jamaica, much confused by authors with the widely distributed coastal

West Indian *Opuntia Dillenii* which ranges south to Grenada. Mr. Broadway informs me that he collected *O. Boldinghii* on Patos, June 8, 1908. Previous to my studies on the Bocas Islands I knew the plant only from Curaçao and the northern coast of Venezuela.

Opuntia Ficus-Indica (L.) Miller, Tall Prickly Pear, sometimes fifteen feet high, with flat oblong or elliptic joints up to a foot and a half long, usually spineless, its yellow flowers three to four inches wide, its red or yellow edible fruit two to nearly four inches long, is widely planted near houses in Trinidad as in nearly all warm regions; its native home is unknown.

4. **Opuntia caribæa** Britton and Rose.

The Caribbean Prickly Pear is very different in habit and in aspect from the foregoing species. Its branches are round, slender, about half an inch in diameter and two to four inches long, the areoles bearing from one to three needle-like spines, about an inch long, with thin, paper-like sheaths. The fruit is red, about three-fourths of an inch in diameter.

All we know about the occurrence of this species on Trinidad is from a coloured drawing preserved in the herbarium of the Royal Gardens at Kew, sent from Trinidad by David Lockhart in 1825, which apparently represents this species, known otherwise from Margarita and the Venezuelan coast and in Haiti and Santo Domingo. I searched the Bocas Islands intensively for this interesting plant but failed to find it; perhaps it is tucked away in some dry valley or on some bank which I did not reach; possibly Lockhart's painting was made from a plant he received from elsewhere, but this seems unlikely.

5. **Cereus hexagonus** L. [*Cereus lepidotus* Salm-Dyck; *Cereus Northumberlandinus* Lamb.]

The Six-angled Cereus is the tallest cactus of Trinidad, often thirty feet high in its native haunts, becoming nearly twice that height when planted and fully developed without injury. There is now at least one immense one in Port-of-Spain and others may be seen in St. Joseph. Its stem and branches are columnar, leafless, the trunk sometimes over a foot in diameter near the ground, the upright or ascending branches composed of many green or bluish-green joints three or four inches thick, the upper ones mostly four-ribbed or four-angled, the lower six-ribbed or rarely seven-ribbed; transitions from four to six ribs may often be observed; the areoles of young joints are commonly merely felted, without spines, but those of old joints usually bear several (sometimes as many as ten) acicular, unequal brownish spines up to about two inches long; the flowers, borne one at an areole high up on the branches, are eight or ten inches long and often numerous; the ovary is nearly smooth, the perianth funnel-form, with lanceolate white inner segments and purplish outer ones, the tube slender. The fruit is ovoid, from two inches to five inches long, pale red with white or purplish edible pulp and many small black seeds.

It is frequent on the Bocas Islands and often conspicuous by its large size; on the Trinidad mainland I observed it near Chaguaramas

and Carenage, and also as an isolated colony on San Fernando Hill. Seedlings from specimens planted at St. Joseph have taken hold on the branches of Saman trees there in a very interesting manner, some of them now as much as eight feet high, the seeds evidently transported by birds which feed on the fruit of this cactus and of others. The species ranges in northern South America from the Guianas to Colombia and is widely planted in the West Indies and also in warm and tropical regions elsewhere.

6. **Cephalocereus Moritzianus** (Otto) Britton and Rose.

Moritz's Cephalocereus is an erect, leafless, rather stout cactus, sometimes thirty feet high, with columnar stems and branches. Its branches are nearly upright or somewhat ascending, often numerous, but plants growing in poor rocky soil are often unbranched: its joints are long, light green to rather dark green, from about two inches to about four inches in diameter with from seven to ten rather blunt ribs, with felted, spiny areoles half an inch apart or less, those of young joints bearing long white wool; the spines are from eight to about twelve in number, brownish, acicular, half an inch to an inch and a half long. The flowers which appear singly, for the most part at areoles on one side of the young joints near the top, are narrowly campanulate, greenish-purple without, from two inches to nearly three inches long, their outer segments rounded, the inner white and obtuse; the stamens are very numerous and shorter than the corolla; the style is slender and about as long as the corolla; the ovary is smooth, more or less enclosed in the white wool of the areoles. Its fruit is a depressed-globose, red-purple, smooth berry, two inches or somewhat less in diameter, containing many small black seeds.

This cactus grows on hills and cliffs at points on the north-western Trinidad mainland from Point Gourde to the Boca de Monos and is frequent on Gasparee, Monos, Huevos, Chacachacare and Patos Islands; also on the northern coast of Venezuela; perhaps also on Tobago. We observed and studied a very large barren colony on Chaçachacare near La Tinta Bay in April, and found a few fruits on Patos; specimens brought to New York flowered promptly in a greenhouse at the New York Botanical Garden.

7. **Cephalocereus Smithianus** Britton and Rose.

Major Smith's Cephalocereus is a slender and weak-stemmed, rather dark green, leafless cactus, simple or branched, sometimes fifteen feet long, often clambering, the branches from an inch to two inches thick, with about 9 low ribs. The areoles are close together, white-felted, but without any wool, and bear about twelve acicular spines, the central ones of old joints nearly two inches long, the radial ones much shorter, whitish when young, dark brown or blackish when old. The flowers are about three inches long, funnelform-campanulate, the somewhat curved tube bearing a few scales, the inner perianth-segments white. The red smooth ovoid fruit is about an inch and a half in diameter.

This plant is abundant along the path to the flag-pole on Patos Island, where I studied it in the company of Mr. Freeman and Professor Hazen, March 13, 1920, at which time we could find no fully developed

flowers, but Mr. Freeman caught sight of a bud. Complete botanical specimens showing flowers and fruit and notes upon them are desiderata. The species is otherwise known from the northern coast of Venezuela, where it was collected by Dr. J. N. Rose and Major Cornelius C. Smith, U. S. Army, in October, 1916. When flowers of the Patos plant are obtained they may be found to be somewhat smaller than specimens from Venezuela. We have included this species in the genus *Cephalocereus* with considerable hesitation; it is more slender and weaker than most species of the genus and its imperfectly known flowers indicate that it may be generically distinct.

8. **Acanthocereus pentagonus** (L.) Britton and Rose [*Cactus pentagonus* L. : *Cereus baxaniensis* Karw.]

The Arching Acanthocereus, despite its oldest name *pentagonus*, usually has three-angled leafless stems and branches; occasionally they are four-angled, rarely five-angled, but seedlings and young plants are commonly five-angled. Its branches are rather weak, arching or clambering, sometimes forming thickets or large colonies by rooting at the tips where these come to the ground, but the joints do not emit aerial roots. The sides of the joints are from an inch to about three inches wide, the ribs low-crenate, the areoles rather widely separated, bearing several green subulate or acicular spines half an inch to about two inches long, on old stems sometimes longer. The funnelform flowers are from five inches to eight inches long, borne one at an areole, toward the ends of the branches; the areoles of the ovary and flower-tube sometimes bear short acicular spines; the segments of the perianth are acuminate, the outer green, the inner white. The fruit is oblong, red and edible.

This cactus occurs frequently on Gasparee, Chacachacare and Patos Islands; we found it in bloom on Chacachacare on April 13. It probably grows on Monos also, but I did not see it there, nor on the Trinidad mainland. The species has a wide distribution, ranging naturally north in the Lesser Antilles to Guadeloupe and naturalized on St. Croix and St. Thomas; on the continental coasts it extends from Venezuela to Guatemala and southern Texas; it is abundant on the Keys of Florida and is recorded from Cuba. Races differ in size of stems, size of flowers and in armament.

9. **Lemaireocereus griseus** (Haworth) Britton and Rose [*Cereus griseus* Haworth; *Cereus chrysacanthus* Salm-Dyck.]

Known in Curaçao as Daatoe, we have found no English name for this large columnar-branched cactus, which grows abundantly on Patos, where I studied it with Mr. Freeman on March 13, 1920, finding it bearing both flowers and fruit. The plant reaches a height of some twenty-five feet, the short trunk often a foot or more in diameter, the usually numerous leafless branches nearly upright, dark green or somewhat glaucous, 8-ribbed to 10-ribbed, and from three to five inches in diameter; the areoles are rather close together on the ribs and bear several slender, grey spines up to about one and a half inches long, the armament being formidable. Its flowers, borne singly at areoles mostly high up, are short-funnelform, pinkish, a little less than three inches long, the thinner segments nearly white; the ovary bears numerous

small white-felted areoles which develop several acicular spines in ripening into the nearly globular purplish fruit, which is nearly two inches in diameter, with red, edible pulp.

From Patos, its most eastern known station, this cactus ranges along the Venezuelan coast, occurring on Margarita Island and on the Dutch Islands Aruba, Curaçao and Bonaire; it is cultivated in many parts of tropical America north to Mexico.

10. Hylocereus Lemairei (Hooker) Britton and Rose [*Cereus Lemairei* Hooker.]

Lemaire's Night-blooming Cereus climbs on trees or on rocks, sometimes attaining a length of twenty-five feet or more, often with numerous branches, and is devoid of leaves. Its joints are elongated, triangular in section, dull green in colour, their sides an inch and a half wide or less; they emit slender aerial roots at irregular intervals; the areoles, borne on the angles, are about an inch apart, slightly elevated, and bear two or three short, conic, brownish spines three or four lines long. The flowers, often numerous, open in the evening and wilt during the next morning; they are the largest of any of the native Trinidad cacti, seven to nine inches long and nearly as broad as long; the ovary and flower-tube are covered with thick, ovate, sometimes purple-margined scales; the outer segments of the perianth are lanceolate, yellowish-green, three or four inches long, less than half an inch wide, the inner ones bright white, broader than the outer and acute; the very numerous stamens are somewhat shorter than the perianth; the thick style is a little longer than the stamens and the narrow stigma-lobes are forked. The fruit is an oblong purplish berry about two and a half inches long, with white flesh and small black seeds.

This cactus is commonly seen on trees over much of the Trinidad mainland; we observed a plant in full bloom along the Tamana road in April, its flowers showing the characteristic forked stigma-lobes.

The same species, apparently, inhabits the Bocas Islands, there often growing upon rocks; at least the joints and the armament seem alike, but we did not see the Bocas Islands plants in flower.

11. Cactus cæsius (Wendland) Britton and Rose [*Melocactus cæsius* Wendland.]

This Turk's-cap or Melon Cactus is known to occur within Trinidad territory only on rocky hills on Patos Island, and was made known from that locality by Mr. R. O. Williams a few years ago; I collected it there with Mr. Freeman in March, 1920. The plant is nearly globular or somewhat higher than thick, leafless, from five inches to about seven inches in diameter, green with from ten to fifteen strong vertical ribs, their felted areoles bearing about ten stiff slightly recurved spines rather less than an inch in length, brown when young, greyish when old. When the plant reaches the flowering stage it produces on top a circular mass of white wool and brownish bristles, on which the attractive little pink flowers are borne; this elongates from year to year, becoming cylindric and, on strong individuals, as much as six inches long; and is technically called a cephalum. The flowers are salverform when fully expanded, the

tube deeply set in the wool of the cephalum, the segments narrow and few and there are a few short stamens. The fruit, which develops rapidly, is rose-pink, narrowly obovoid, about an inch long, and contains many minute black seeds.

From Patos, the most eastern known station, this cactus ranges westward along the Venezuelan coast into Colombia; it was first collected at La Guayra. The generic name *Cactus* is used for the Turk's-cap, the type of the genus being *Cactus Melocactus* Linnæus, endemic in Jamaica.

12. Epiphyllum Hookeri (Link & Otto) Haworth [*Phyllocactus Hookeri* Salm-Dyck; *Cereus Hookeri* Link & Otto.]

Hooker's Night-blooming Cereus grows on trees and cliffs here and there over much of the Trinidad mainland, often attaining a length of twenty feet or more, and freely branching; its flat, green, narrow, scalloped, leafless and spineless joints are one or two feet long and about three inches wide; rather fleshy but thin, and often erroneously regarded as leaves; they bear the flowers singly at areoles on their edges. The flowers are white, funnelform to nearly salverform, with a slender tube about six inches long and a limb about three inches broad, the segments narrow and thin; the tube bears a few distant scales; the long slender style is pink, the stigma-lobes yellow; the numerous stamens are white. The fruit of this cactus has not been described and we failed to find any; our best specimens were obtained on the Arcadia Estate.

This species occurs also on Tobago and presumably in Venezuela. It has been confused with *Epiphyllum Phyllanthus*, a South American plant, which has a flower with a much longer tube and a smaller limb.

13. Rhipsalis Cassutha Gærtner.

The String-cactus known in Trinidad as Mistletoe and Old Man's Beard is very different in aspect from any other plant of the family, except its immediate relatives, which inhabit Brazil, and is not usually thought of as a cactus. It grows on trees, sometimes on cliffs, hanging often in large masses with a usual length of two or three feet,* its round, very slender, smooth, unarmed, leafless, string-like stems repeatedly forked, only two or three lines in diameter, the ultimate branches often clustered or whorled and much shorter than the others. Seedling and young plants have short, bristly stems. The flowers, which are very small and greenish-white, appear at areoles along the sides of the branches, consisting of a few sepals, petals and stamens and one pistil: their structure agrees, however, with that of some other cactus flowers except in size and in the number of parts. The fruits are little globose white berries containing black seeds.

It is frequent on trees in Trinidad in relatively moist districts, especially abundant on Saman trees about Port-of-Spain and elsewhere, and is widely distributed through the West Indies, in northern South America and in Central America.

* In Trinidad this cactus frequently reaches a length of six feet and occasionally even 20 to 30 feet.—(Ed.)

VEGETABLES.

STORING SWEET POTATOES.

By L. A. Brunton,
Assistant Superintendent of St. Augustine Experiment Station.

An experiment in storing sweet potatoes was made last year at the Experiment Station, St. Augustine.

Two lots of potatoes, one of 400 pounds and one of 200 pounds, were stored separately on March 6 and 11 respectively, just after having been dug, the method employed being as follows:—

A flat level piece of ground was selected upon which a thick bedding, six inches in depth, of thoroughly dry banana leaves was spread; upon this the potatoes were heaped to form a cone, and covered with a layer of dried banana leaves six inches thick; finally the heap was covered with four inches of earth well beaten down and smoothed over. To ensure thorough drainage a trench was dug around the heap. For the purpose of ventilation a bamboo pipe was inserted in each heap, to allow the escape of heated air during the first fortnight, the projecting end being fitted with a plug.

On April 16 one month later both heaps were opened, when half the contents of the 400 pounds heap were found to be rotten, the sound potatoes being generally on the outside of the heap, these were repacked in layers, dry banana leaves being placed between each layer, recovered with dry trash and soil as before, and left for another month, when reopened on May 20 all the potatoes were rotten.

The potatoes of the 200 pounds heap, which was opened on the same dates, were, with a few exceptions, found to be sound; reopened a month later, on June 12 the potatoes were still in good condition, and when finally opened on July 8, four months after storing, although some root growth had taken place, they were still perfectly sound, palatable, potatoes, cooking dry and floury, and with an excellent flavour.

The loss in weight due to drying and the few which had rotted amounted to 40 per cent.

The rainfall at the Government Farm, St. Joseph, during the period of this experiment was as follows:—

March—1·26 inches.	May —0·20 inches.	To July 8th—2·04 inches.
April —Nil.	June —6·42 ,,	

It is therefore apparent that sweet potatoes can be stored for four months, provided the heaps are moderate in size, and the contents are kept from direct contact with the soil by a liberal covering of dry trash.

An experiment on a larger scale is in progress this year.

FORESTRY.

AN EXPERIMENT WITH A VIEW TO SEASONING STANDING TIMBER, AND TO OBTAIN AN EFFICIENT MEANS OF EXTERMINATING FOREST WEEDS.

By H. W. Moor,
Deputy Conservator of Forests.

The lack of seasoned local timber in the Colony, and the difficulty, on account of the high cost of labour and transport, of seasoning it without appreciably raising the already high initial cost of production, led the Forest Department to consider the question of artificially killing trees and seasoning them standing. The accepted method of girdling (known locally as "barking") the tree is not successful for all species and is particularly unsuitable in a tropical country on account of the large numbers of insects always ready to destroy any dead or partially dead vegetation.

The idea, originating in the "Indian Forester" for January 1918, of killing trees by an application of "Atlas Preservative" on an exposed ring of the cambium layer, resulted in an experiment, first on a small scale and later elaborated, with a view to —

(*a.*) Killing trees and seasoning them standing without exposing them to damage by insects and

(*b.*) Killing forest weeds without the initial cost of cutting and the ever recurring cost of removing fresh growth from the stools.

The first experiment involved 54 trees of miscellaneous species, on a site in the Southern Watershed Reserve, about half a mile to the west of the plantation ranch. The only large trees *i.e.* over 4 feet in girth treated were one Crappo, one Angelin and one Hog Plum. The others were small trees of the following species, viz.:—Mahoe, Bois Pois, Obie, Acurel, Bois Oise, Gommier, Guatecaire, Bois Canon, Wild Acoma, Sacky-sac, Wild Guava, Milk Wood, Redwood, Cooper-hoop, Laurier-Cyp, Gatia and Manac and Carat palms.

The treatment consisted of cutting out a ring, about nine inches in width, of bark only, and painting on the undiluted preservative with a brush. In the case of the palms a ring about one inch deep was cut. This experiment was carried out on the 20th of June 1918, early in the growing season, and on a very wet day; this latter condition, though apparently unfavourable, did not interfere with the result of the experiment. By the end of the following July, 19 trees were dead and most of the others showed signs of dying, by the end of August a further 27 were dead and by the end of October all but 5 trees had been killed and these 5 had dropped all their leaves and the bark was quite dry.

The species most susceptible to the poison were Mahoe, Bois Pois, Gommier, Bois Cannon, Obie, Acurel, Redwood, Angelin, Cooper-hoop and Gatia, and those most resistant were Guatecaire, Milk Wood and Hog Plum.

This and subsequent experiments made on several other species, including Saman and Immortelle, as well as on several kinds of vines have abundantly proved that "Atlas Preservative" when applied to even a narrow ring of the growing tissue, circulates with the sap and not only kills all species of vegetation but kills the root as well as the portion above ground, and is an ideal means of removing undesirable weeds. The preparation moreover is effective whether applied in the growing season or in the season of rest.

With regard to the object of seasoning timber standing, the experiments have not been an unqualified success, all immature trees with the exception of such species as Laurier-Cyp, Redwood and Wild Guava, and large soft wooded trees such as Hog Plum, Angelin and Immortelle are, even if treated, readily attacked by insects; on the other hand it appears that mature harder wooded trees such as Crappo, though normally attacked when felled green or killed by simple girdling, when treated, are only attacked in the sapwood, the heartwood being left untouched. The same appears to be the case with the Saman.

A large Crappo tree of over 6 feet in girth, treated in June 1918 was found dead early in the following August and was felled on the 21st of April 1920. At the cut the tree was found seasoned to within three inches from the centre, the cone of unseasoned wood extending to about 12 feet up the stem, the remaining wood being found dry and seasoned. This tree, of a species so notorious for cracking and splitting when felled green, was seasoned standing, and was felled, cross cut and shipped to Port-of-Spain as solid sound wood without any large cracks or shakes. Two years was apparently not quite sufficient for the complete seasoning of this tree, three years should therefore be considered the minimum time necessary.

The objects of the experiments have therefore been attained to the following extent:—

(*a.*) Mature trees of species normally somewhat resistant to insect attacks can be made immune from such attacks, and the wood seasoned standing in about three years, and

(*b.*) "Atlas Preservative" effectively kills all trees and plants to which it is applied.

With regard to (*b*) above, particular attention was paid to all growth, both large and small, surrounding the treated trees, and in all cases the Preservative had no effect on anything but the individual tree to which it was applied.

The results of the experiments described above may be of some use to those interested in timber operations and to Planters and others who seek an inexpensive means of removing superfluous shade or of exterminating undesirable weeds. One gallon of Preservative is sufficient to kill about 80 trees averaging two and a half feet in girth, and two men are able to poison 100 trees, if near together, in one day.

Though "Atlas Preservative" has been used throughout the experiments, there is no reason to believe that any other preparation of a similar nature may not prove as successful.

AGRICULTURAL EDUCATION.

TOBAGO CACAO PRIZE COMPETITION.

Report of the Judges.

We beg to submit the following report of our findings as judges of the Tobago Cacao Prize Competition for the period 1919–1920.

The competitors are divided into three classes, viz.: first, second and third, composed respectively of previous prize winners, new competitors, and contractors. There were 28 in all, 5 in class 1, 14 in class 2, and 9 in class 3. These were distributed throughout the island, except in the Sandy Point district where but little cacao is grown.

A period of five days was occupied in judging, which commenced on the 16th and concluded on the 24th of June. Great care has been taken in awarding marks, all factors have been carefully considered and it is hoped that our findings will prove satisfactory to all concerned.

Tables are attached giving in order of merit particulars of each competitor in his respective class.

All competitors in class I have attained a very high standard. On the whole their attainments have proved somewhat of a revelation to us and we think that the cultivations of the first three or four in this class as well as the first three in class II might with advantage be visited by planters in general, as typical examples of intensive cacao cultivation. The general run of class 3 competitors has been somewhat disappointing except the first two, Thomas Sharper and Alfred Smart.

A striking feature among the competitors of classes 1 and 2 is the strong tendency towards the no-shade principle, which in our opinion would be the correct one to adopt in Tobago, provided that such areas are properly protected from wind and intensive cultural methods are adhered to.

It is pleasing to note that all the competitors are fully alive to the material advantages to be gained by intensive cultivation and all speak in appreciative terms of the great benefits they have derived from the competition as a result of which the yields of their holdings have so quickly and materially increased. In many cases these yields have doubled and in one particular instance, that of Robert Douglas, the yield has risen from 6 bags in 1915–16 to 35 bags in 1919–20. Many other peasant proprietors throughout the Island, though not in the competition, but influenced by the good results obtained by competitors are adopting similar methods of cultivation, with the possibility that before very long the cacao production of Tobago, should be greatly enhanced as a direct result of the Cacao Prize Competition.

We have the honour to be, Sir,
Your obedient Servants,

(Sgd.) R. O'CONNOR,
F. D. DAVIES,
Judges.

June 25, 1920.

List of Prize Winners in the Tobago Cacao Prize Competition 1919-20.

CLASS I.—PREVIOUS PRIZE WINNERS.

Order of Merit.	Names.	District.	Acreage.	Marks.	Value of Prize.
					$ c.
1	C. H. Dann	Pembroke ...	10	99	25.00
2	Chas. E. McPherson ...	King's Bay ...	5	98	15.00

CLASS II.—NEW COMPETITORS.

1	Lucas Urquhart	Windsor ...	6	98	25.00
2	James E. McPherson ..	King's Bay ...	7	92	20.00
3	James Archer	do. ...	7	91	15.00
4	Zadock Waldron	Roxboro ...	5	88	10.00
5	Leoni Hercules	King's Bay ...	5	87	5.00

CLASS III.—CONTRACTORS.

1	Thomas Sharper	Englishman's Bay..	5	87	20.00
2	A. H. Smart	Parlatuvier ...	3	77	15.00
3	Titus Arthur	King's Bay ...	7	75	10.00
4	Frederick Patrick ...	Speyside ...	3	62	5.00
5	W. H. Cordner	do. ...	3	61	3.00

AGRICULTURAL LEGISLATION.

PRODUCE TAXATION ORDINANCE 1920.

TRINIDAD AND TOBAGO.

No. 53.—1920.

I ASSENT.

[L.S.]

J. R. CHANCELLOR,
Governor.

21st December, 1920.

AN ORDINANCE to provide for raising funds for certain purposes by the imposition of taxes on produce.

[*21st December, 1920.*]

BE it enacted by the Governor of Trinidad and Tobago with the advice and consent of the Legislative Council thereof as follows:—

Short title.

1. This Ordinance may be cited as the Produce Taxation Ordinance, 1920.

Interpretation.

2. In this Ordinance, unless the context otherwise requires:—

"Shipment" means shipment for exportation to places or parts beyond the limits of the Colony, and "shipped" has a corresponding meaning.

"Produce" means the kinds of produce specified in the schedule to this Ordinance, or any of them;

"The Collector" means the Collector of Customs.

Taxes on produce during 1921.

3.—(1.) Subject to the provisions of this Ordinance, there shall for the year nineteen hundred and twenty-one be charged, levied, and paid for the use of His Majesty for the purposes hereinafter mentioned the several taxes upon produce specified in the schedule to this Ordinance.

(2.) Such taxes shall, in the case of all the said kinds of produce except sugar, be payable only in the case of the shipment of such produce during the year nineteen hundred and twenty-one.

(3.) In the case of sugar, such taxes shall be payable on all sugar shipped for export during the year nineteen hundred and twenty-one, whether manufactured in that year or not, and also on all sugar manufactured in the island of Trinidad during the year nineteen hundred and twenty-one, whether exported or not.

(4.) No tax imposed by this Ordinance shall be payable on sugar manufactured in Tobago.

4. In the case of the shipment of produce, the taxes imposed by this Ordinance shall be payable at the time of the shipment by the exporter or his agent, who shall deliver to the Collector or Sub-Collector in Trinidad or to the officer performing the duties of the Collector in Tobago an account of the produce in such form and containing such particulars as the Governor may from time to time direct.

Weight or quantity of shipment to be declared.

5. The weight or quantity of every shipment of produce shall be declared by the exporter or his agent and the making or delivery of any false declaration shall be an offence punishable on summary conviction before a magistrate by a fine not exceeding one hundred pounds, or imprisonment with or without hard labour for any period not exceeding six months.

6. If such account as provided for in sections four and five is not delivered, or if the taxes payable in respect of such produce are not paid to the Collector, Sub-Collector or officer in Tobago aforesaid within twenty-four hours after the departure of the vessel in which the produce was shipped, or such further time not exceeding four days as the Collector may allow, the exporter thereof or his agent shall on summary conviction before a magistrate forfeit the amount of taxes payable, and, in addition, be liable to a fine not exceeding one hundred pounds.

Return of sugar manufactured.

7.—(1.) On or before the fifteenth day of January, nineteen hundred and twenty-two, the owner or manager of every sugar factory in Trinidad shall in respect of such factory make a return to the Receiver-General showing the amount of sugar manufactured in such factory during the twelve months ending on the thirty-first day of December nineteen hundred and twenty-one.

(2.) For the purpose of testing the accuracy of any return made to the Receiver-General under this section, or of obtaining information in case of failure to make a return, the Receiver-General or any person authorised by him may enter any premises, whether forming part of a factory or not, and examine all books, documents and papers referring to, or in any way connected with, the business of the factory for the purpose of testing the accuracy of the return or of obtaining information.

(3.) Any owner or manager of a sugar factory who :—

(*a.*) wilfully refuses or without lawful excuse neglects to make a return under this section ; or

(*b.*) wilfully makes or causes to be made any false return ; or

(*c.*) obstructs or impedes any person authorised as in this section mentioned in the exercise of any powers under this section; or

(*d.*) refuses or neglects to produce any books, documents or papers as aforesaid or refuses to answer or wilfully gives a false answer to any question necessary for testing the accuracy of any return or for obtaining information as to the amount of sugar manufactured in such factory;

shall on summary conviction before a magistrate be liable to a fine not exceeding one hundred pounds or to imprisonment with or without hard labour for any period not exceeding six months.

Payment of tax on sugar.

8.—(1.) On or before the thirty-first day of January nineteen hundred and twenty-two the owner or manager of every sugar factory in Trinidad shall pay to the Receiver-General the amount of the tax upon the sugar manufactured in such factory due under the provisions of this Ordinance up to and including the thirty-first day of December nineteen hundred and twenty-one; but after making due allowance for the taxes already paid in respect of the shipment by him of any such sugar.

(2.) If any sum due under the provisions of the preceding sub-section is not paid on or before the thirty-first day of January nineteen hundred and twenty-two, such owner or manager as aforesaid shall on summary conviction before a magistrate forfeit the amount of the sum due as aforesaid, and, in addition be liable to a fine not exceeding one hundred pounds.

Refund of overpayments. Ord. 40 1920.

9. The provisions of section twelve of the Customs Duties Ordinance, 1920, shall apply to the refund of overpayments made in respect of any tax paid under this Ordinance in respect of the shipment of any produce.

Appropriation.

10. All taxes received under this Ordinance shall be paid into the Treasury and carried in the books thereof to the credit of the General revenue of the Colony or of moneys applicable in aid of immigration as the case may be, and shall in the case of taxes carried to the credit of immigration be applied in aid of immigration, and to no other purpose whatsoever.

SCHEDULE.

Taxes on Produce.

	General Revenue.	In aid of Immigration.
	£ s. d.	s. d.
Sugar (including Local) (for every 1,000 lb.)	3 0	3 0
Rum and Bitters (for every 100 gallons)	1 5 0	5 0
Molasses (for every 100 gallons)	4 2	5 0
Syrup (for every 100 gallons)	16 8	6 3
Cocoa (including Foreign) (for every 100 lb.)	6½	1½
Coconuts (including Foreign) (for every 1,000 nuts)	3 4	4 6
Copra (for every 1,000 lb.)	10 0	4 6
Coffee (for every 100 lb.)	...	1
Cedar (for every cubic foot)	3	...

Passed in Council this tenth day of December, in the year of Our Lord one thousand nine hundred and twenty.

G. D. Owen,
Clerk of the Council.

AGRICULTURAL COLLEGE ORDINANCE, 1920.

TRINIDAD AND TOBAGO.

No. 57.—1920.

I ASSENT,

[L.S.]

J. R. CHANCELLOR,
Governor.

21st December, 1920.

AN ORDINANCE to raise by an additional tax on agricultural produce during the year 1921 a moiety of the Colony's contribution of £50,000 towards the cost of establishing a Tropical Agricultural College for the British West Indies.

[*21st December, 1920.*]

Preamble.

WHEREAS the Tropical Agricultural College Committee appointed by the Secretary of State for the Colonies was unanimously of opinion that steps should be taken at an early date to found a Tropical Agricultural College in the British West Indies, and recommended that the College should be established in Trinidad, provided that the Government of Trinidad and Tobago was prepared to afford adequate support and offer every reasonable facility:

And whereas on the ninth day of April nineteen hundred and twenty the Legislative Council passed the following resolution:—

"That this Council approves the recommendation of the Committee "appointed to consider the desirability of establishing a Tropical "Agricultural College in the West Indies that such a College "be established in Trinidad; and recommends that the initial "sum of £50,000 required for its establishment be raised by a "tax on Agricultural produce during the years 1921 and 1922."

And whereas the said resolution was communicated to the Secretary of State for the Colonies who has now decided that the Tropical Agricultural College shall be situated in Trinidad;

And whereas it is accordingly expedient that an additional tax be imposed on agricultural produce during the year 1921 in manner hereinafter appearing;

And whereas the taxes imposed by this Ordinance are estimated to produce the sum of £25,000;

Now, therefore, be it enacted by the Governor of Trinidad and Tobago with the advice and consent of the Legislative Council thereof as follows:—

Short title.

1. This Ordinance may be cited as the Agricultural College (Produce Tax) Ordinance, 1920.

Interpretation.

2. In this Ordinance, unless the context otherwise requires:—

"Shipment" means shipment for exportation to places or parts beyond the limits of the Colony, and "shipped" has a corresponding meaning.

"Produce" means the kinds of produce specified in the schedule to this Ordinance, or any of them;

"The Collector" means the Collector of Customs.

Taxes on produce during 1921.

3.—(1.) Subject to the provisions of this Ordinance, there shall for the year nineteen hundred and twenty-one be charged, levied and paid for the use of His Majesty for the purposes hereinafter mentioned the several taxes upon produce specified in the schedule to this Ordinance.

(2.) Such taxes shall, in the case of all the said kinds of produce except sugar, be payable only in the case of the shipment of such produce during the year nineteen hundred and twenty-one.

(3.) In the case of sugar, such taxes shall be payable on all sugar shipped for export during the year nineteen hundred and twenty-one, whether manufactured in that year or not, and also on all sugar manufactured in the island of Trinidad during the year nineteen hundred and twenty-one, whether exported or not.

(4.) No tax imposed by this Ordinance shall be payable on sugar manufactured in Tobago.

Application of proceeds of tax.

4. The entire proceeds of the taxes imposed by this Ordinance, whether more or less than twenty-five thousand pounds, shall be applied as a contribution towards the cost of establishing in Trinidad a Tropical Agricultural College for the British West Indies.

Payment of taxes on export.

5. In the case of the shipment of produce, the taxes imposed by this Ordinance shall be payable at the time of the shipment by the exporter or his agent who shall deliver to the Collector or Sub-Collector in Trinidad or to the officer performing the duties of the Collector in Tobago an account of the produce in such form and containing such particulars as the Governor may from time to time direct.

Weight or quantity of shipment to be declared.

6. The weight or quantity of every shipment of produce shall be declared by the exporter or his agent and the making or delivery of any false declaration shall be an offence punishable on summary conviction before a magistrate by a fine not exceeding one hundred pounds, or imprisonment with or without hard labour for any period not exceeding six months.

Penalty for not delivering account or paying tax.

7. If such account as provided for in sections five and six is not delivered, or if the taxes payable in respect of such produce are not paid to the Collector, Sub-Collector or officer in Tobago aforesaid within twenty-four hours after the departure of the vessel in which the produce was shipped, or such further time not exceeding four days as the Collector may allow, the exporter thereof or his agent shall on summary conviction before a magistrate forfeit the amount of taxes payable, and, in addition, be liable to a fine not exceeding one hundred pounds.

Payment of tax on sugar.

8.—(1.) On or before the thirty-first day of January nineteen hundred and twenty-two the owner or manager of every sugar factory in Trinidad shall pay to the Receiver-General the amount of the tax upon the sugar manufactured in such factory due under the provisions of this Ordinance up to and including the thirty-first day of December nineteen hundred and twenty-one; but after making due allowance for the taxes already paid in respect of the shipment by him of any such sugar.

(2.) If any sum due under the provisions of the preceding sub-section is not paid on or before the thirty-first day of January nineteen hundred and twenty-two, such owner or manager as aforesaid shall on summary conviction before a magistrate forfeit the amount of the sum due as aforesaid, and, in addition be liable to a fine not exceeding one hundred pounds.

Refund of overpayments. Ord. 40-1920.

9. The provisions of section twelve of the Customs Duties Ordinance, 1920, shall apply to the refund of overpayments made in respect of any tax paid under this Ordinance in respect of the shipment of any produce.

SCHEDULE.

TAXES ON PRODUCE.

	s.	d.
SUGAR:		
(for every 1,000 lb.)	2	3
SYRUP:		
(for every gallon)...	0	0½
COCOA:		
(for every 100 lb.)	0	4
COCONUTS:		
(for every 1,000 nuts)	1	0
COPRA:		
(for every 1,000 lb.)	3	0

Passed in Council this tenth day of December, in the year of Our Lord one thousand nine hundred and twenty.

G. D. OWEN,
Clerk of the Council.

METEOROLOGY.

RAINFALL FOR 9 MONTHS ENDING DECEMBER, 1920.

STATIONS.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total for 1920.	Total for corresponding period 1919.
North West District.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.
St. Clair—Royal Botanic Gardens ...	·28	·56	4·13	4·93	6·60	10·98	5·74	6·03	1·60	44·84	57·18
Port-of-Spain—Colonial Hospital ...	nil	·55	2·55	3·98	4·81	7·68	5·30	5·68	·85	33·01	45·32
,, Royal Gaol ...	·10	·74	3·77	4·62	4·90	9·17	*	*	*	...	55·80
,, Constabulary Headquarters ...	nil	·60	2·95	5·44	4·01	7·44	7·07	1·42	1·33	32·26	47·67
St. Ann's—Reservoir	·19	1·03	4·81	6·63	9·40	12·03	8·05	8·29	2·09	58·09	64·29
Maraval—Reservoir	·15	1·42	3·87	4·78	5·57	12·75	9·48	7·36	2·40	53·42	52·81
,, Constabulary Station ...	·02	·67	3·36	5·55	5·68	16·99	8·84	7·14	2·32	56·42	62·00
Diego Martin ,, ,, ...	·14	1·51	4·60	6·66	7·31	14·11	6·67	9·67	2·77	58·65	71·93
,, ,, Waterworks ...	·04	1·15	4·49	5·51	6·07	12·86	7·81	9·15	2·42	55·29	60·55
,, ,, River Estate ...	·02	·96	4·44	4·73	6·10	12·07	7·41	8·48	3·03	53·15	61·33
Fort George Signal Station ...	·64	·72	5·45	3·99	7·95	14·39	5·24	6·54	2·05	52·17	61·99
North Post ,, ...	·09	·24	2·79	2·28	3·40	7·36	6·34	5·71	3·56	34·30	47·70
Carenage Constabulary Station ...	·63	·12	7·58	7·52	5·33	17·54	5·59	10·21	5·52	68·57	66·50
Carrera Island Convict Depôt ...	·16	·17	·21	2·05	2·07	3·99	2·33	2·86	1·75	19·11	22·73
Chacachacare Light House ...	·16	·07	3·87	5·85	4·86	5·76	6·91	6·78	3·88	41·68	44·39
Santa Cruz—Maracas District.											
Santa Cruz Constabulary Station ...	·17	1·19	6·24	6·59	7·03	17·66	7·30	8·92	3·65	64·29	65·90
St. Joseph, Government Farm ...	nil	·20	6·42	7·99	2·90	8·95	6·27	5·98	2·13	43·81	55·24
St. Joseph Constabulary Station ...	nil	nil	4·38	3·37	1·06	3·80	10·11	15·19	·73	40·52	41·73
Tunapuna, St. Augustine Estate ...	nil	·22	6·13	7·11	3·45	8·22	4·58	8·18	2·52	42·47	49·99
Maracas—Government School ...	·18	1·24	4·38	8·30	5·38	18·26	6·38	9·26	4·19	63·71	64·97
,, Ortinola Estate ...	·17	·20	6·85	8·25	5·15	16·97	6·46	8·54	3·02	62·11	53·56
,, San José ,, ...	nil	·44	6·10	8·61	5·57	13·65	6·25	8·09	...	...	59·45
Caura, Wardour Estate	·08	·20	5·85	9·20	4·82	13·29	8·03	7·40	2·01	55·51	50·57
West Central District.											
Caroni, Frederick Estate	·32	·29	6·92	8·54	4·06	8·76	4·73	10·06	2·82	53·67	68·18
Chaguanas, Constabulary Station ...	·46	·40	6·22	8·91	3·78	9·75	8·41	11·39	3·75	58·80	55·15
Chaguanas, Woodford Lodge Estate ...	·31	·31	5·98	8·51	3·64	10·65	7·82	10·88	3·38	54·99	56·39
Carapichaima, Waterloo Estate ...	·23	·10	5·38	7·95	6·87	9·48	5·69	13·63	4·95	58·30	68·07

* Records missing.

RAINFALL FOR 9 MONTHS ENDING DECEMBER, 1920.—Continued.

Stations.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total for 1920.	Total for corresponding period 1919
West Central District.—Contd.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.
Carapichaima, McBean Cacao Estate ...	·46	·12	5·49	6·94	5·64	8·32	8·90	8·88	4·99	54·12	63·33
,, Friendship Hall Estate...	·50	·16	5·05	7·19	5·99	9·72	7·61	10·75	4·82	56·86	...
Couva, Exchange Estate ...	·31	·13	2·03	5·18	4·26	5·18	8·90	7·01	3·03	38·46	50·01
,, Brechin Castle ,, ...	·78	·17	3·94	6·45	7·96	8·80	7·97	7·98	4·00	51·33	60·00
,, Perseverance ,, ...	·45	·22	3·87	6·31	5·86	8·24	7·49	4·70	4·06	43·26	52·94
,, Camden ,, ...	·54	nil	2·04	5·31	4·44	6·26	6·07	5·25	3·33	36·47	50·96
,, Milton ,, ...	·59	·20	4·51	7·94	7·60	8·28	7·76	7·46	3·63	53·00	61·00
,, Spring ,, ...	·71	·23	3·28	4·74	5·63	7·93	6·51	7·71	2·81	44·94	62·01
,, Constabulary Station ...	·58	·13	3·65	6·09	6·37	7·97	8·47	8·01	2·88	46·87	50·31
,, Esperanza Estate	·42	nil	2·95	5·48	5·77	8·81	8·98	6·87	2·91	44·73	50·86
Montserrat District.											
Brasso Piedra, Mamoral Estate ...	1·35	·74	7·39	10·55	6·01	7·06	9·74	11·81	8·73	77·98	87·14
La Mariana ,, ...	1·29	·74	8·71	10·74	6·87	9·01	8·40	12·32	6·75	74·80	83·83
Montserrat, Constabulary Station ...	·59	·17	4·81	8·28	5·85	7·33	5·80	8·35	3·82	51·33	65·23
Brasso, La Vega Estate	·87	·63	9·59	11·94	6·65	10·63	9·62	10·47	5·70	75·03	81·37
Tabaquite, Trelawne Estate ...	·67	·64	8·02	9·78	6·67	9·14	7·83	10·68	4·94	67·86	
Arima District.											
Arima, Warden's Office	·11	·79	10·03	11·39	10·15	10·83	10·92	12·99	3·96	76·96	80·08
,, Torrecilla Estate	·45	1·23	12·19	15·89	6·39	10·29	11·38	13·35	4·86	83·93	92·41
,, Verdant Vale Estate ...	·37	1·38	10·85	14·57	7·74	7·13	9·87	11·51	3·93	75·78	70·66
San Rafael, Constabulary Station ...	·33	·72	12·34	15·65	5·69	10·62	12·55	20·05	6·66	94·35	91·64
Guanapo, Talparo Estate	·66	·61	8·37	10·85	7·09	8·35	10·15	17·45	5·98	79·00	85·34
,, El Quemado Estate ...	1·64	1·10	8·37	11·33	7·36	9·26	11·08	17·96	10·54	91·53	100·67
Tamana, Santa Marta Estate ...	1·49	2·44	8·55	12·78	8·87	11·52	13·93	19·79	9·64	104·34	106·45
,, La Corona Estate... ...	2·63	3·49	8·89	12·00	6·98	13·56	16·19	20·78	16·37	116·96	99·60

RAINFALL FOR 9 MONTHS ENDING DECEMBER, 1920.—Continued.

Stations.	April.	May.	June.	July.	August.	September.	October.	November	December.	Total for 1920.	Total for corresponding period 1919.
San Fernando & Princes Town District.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.
Claxton's Bay, Forres Park Estate ...	·31	nil	3·40	4·67	4·73	6·48	4·68	7·97	2·33	37·69	45·09
Pointe-à-Pierre, Concord Estate ..	·49	·18	4·50	8·34	7·14	9·49	5·21	6·69	3·51	49·16	44·94
,, ,, Plein Palais Estate ...	·65	nil	6·26	7·59	6·65	12·53	5·90	5·97	2·70	51·11	47·93
Naparima, Picton Estate	1·11	·15	5·85	7·47	8·31	10·16	9·57	7·48	2·66	58·49	57·02
,, Usine Ste. Madeleine Est...	1·04	·18	6·46	6·96	7·54	10·19	8·71	6·13	4·12	55·53	53·79
,, Tarouba Estate... ...	·66	nil	5·99	7·68	4·27	8·06	8·40	5·39	2·68	45·62	42·40
,, Union Hall Estate ...	·79	·08	7·40	8·59	10·58	8·56	5·98	5·30	4·60	57·43	52·44
,, Palmiste ,, ...	1·16	·23	7·12	8·66	9·17	10·59	5·91	6·22	4·29	58·88	60·90
,, Lewisville House ...	1·22	·10	8·57	8·38	8·83	9·25	7·11	6·82	3·08	59·27	61·31
Princes Town Craignish Estate ...	·68	nil	8·31	7·83	6·59	10·30	9·25	8·12	4·79	61·46	58·48
,, Cedar Hill Estate ...	1·05	·05	7·81	6·95	6·78	9·17	8·67	5·20	4·07	54·69	58·18
,, Williamsville Estate ...	1·17	·10	6·92	9·43	5·69	10·71	9·36	7·20	3·45	59·27	56·43
,, Esmeralda Estate ...	·52	·34	7·63	9·43	8·21	8·96	7·90	9·11	5·78	64·00	81·68
,, New Grant Estate ...	1·27	·11	8·95	9·29	5·47	8·41	8·58	6·53	4·85	59·27	68·14
,, Constabulary Station ...	·70	nil	7·14	4·71	5·36	5·33	7·33	5·30	2·42	42·44	47·99
,, La Retraite Estate ...	1·98	·49	10·87	13·08	8·91	9·51	8·83	10·66	5·77	80·90	83·45
,, Malgretoute ,, ...	1·41	nil	8·08	8·61	9·64	10·20	10·17	7·09	3·97	65·05	55·19
South-West District.											
Oropuche, Constabulary Station ...	·24	·05	2·36	3·32	2·91	3·78	1·55	3·21	1·86	21·58	24·32
Siparia, Constabulary Station ...	·21	·32	6·53	7·25	6·75	7·30	4·36	7·78	3·58	52·31	52·20
,, Alta Gracia Estate ...	·21	·22	6·56	8·95	10·02	8·72	4·95	7·87	5·12	61·42	64·88
Guapo, Adventure Estate ...	1·72	·33	7·07	6·86	6·83	6·44	5·57	8·68	4·61	54·40	47·81
Point Fortin—Constabulary Station ...	·62	·69	8·48	8·44	9·55	7·72	9·34	10·16	5·21	67·92	62·19
Erin, La Ressource Estate ...	·20	nil	6·23	5·59	3·53	4·61	2·23	5·64	4·15	38·34	40·11
,, La Union Estate	·47	·05	6·98	6·79	5·42	4·66	5·18	4·99	5·14	50·12	49·82
,, Industry Estate	·35	·05	6·90	7·05	6·62	4·88	5·44	6·43	4·63	50·64	49·49
Cedros, La Retraite Estate ...	1·22	1·42	9·87	8·21	6·56	9·84	7·76	6·63	5·80	70·56	66·76

RAINFALL FOR 9 MONTHS ENDING DECEMBER, 1920 —CONTINUED.

STATIONS.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total for 1920	Total for corresponding period 1919.
South-West District.—(Contd.)	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.
Cedros, Perseverance Estate ...	·32	1·42	9·49	4·82	6·44	2·87	3·67	11·56	4·44	56·24	52·06
,, Ste. Marie Estate	·42	·33	9·18	4·83	5·80	3·86	4·30	10·69	5·11	55·90	53·41
,, Constabulary Station ..	·66	·71	8·63	5·46	6·42	3·95	3·30	13·01	5·85	60·01	56·01
,, Ste. Quintin Estate ...	·45	·86	7·93	4·19	5·85	3·06	3·23	10·19	4·13	48·31	52·96
Icacos, Constance Estate ...	·35	1·05	5·01	4·33	5·78	2·88	2·94	...	...	...	...
Irois, Government School... ...	1·17	nil	6·96	7·89	7·45	8·38	6·71	7·71	4·27	62·56	61·40
South Coast.											
Moruga, Constabulary Station ...	1·00	·94	6·83	9·24	7·36	5·71	4·27	7·66	4·86	57·39	61·25
East Coast.											
Manzanilla, Constabulary Station ...	·34	·82	8·38	11·00	8·27	10·93	9·49	14·59	3·21	79·97	85·81
Sangre Grande, Evasdale Estate ..	·99	1·39	9·78	12·77	8·91	10·19	10·22	18·92	8·09	94·55	97·24
,, Grosvenor Estate	1·10	1·23	9·93	11·80	8·98	11·95	10·32	20·32	9·28	97·51	98·57
,, El Recundo Estate ...	·50	1·09	9·51	11·97	8·22	13·22	9·90	17·78	7·62	92·83	89·88
,, San Francisco Estate .	·87	2·30	9·02	12·34	6·11	12·62	12·15	18·82	7·31	102·72	109·71
Mayaro, Constabulary Station ...	·53	·45	6·65	6·58	4·85	9·77	9·17	6·39	5·45	61·76	68·79
North Coast.											
Blanchissense, Constabulary Station ...	·30	·35	6·97	9·85	6·95	9·54	10·75	10·67	8·53	76·24	70·84
Grande Rivière, Mon Plaisir Estate ...	1·36	1·81	11·13	12·97	8·68	10·87	20·20	12·54	8·80	104·76	110·00
Toco, Aragua House	·88	·66	8·10	11·25	7·04	7·62	13·03	9·69	4·68	72·84	81·10
,, Constabulary Station ...	·84	·44	6·71	6·38	4·90	6·23	10·53	8·28	2·41	53·67	69·14
Tobago.											
Tobago, Hermitage Estate ...	·78	3·30	7·82	14·88	5·21	15·87	5·21	15·77	2·92	80·78	98·54
,, King's Bay ,, ...	·34	1·78	6·98	9·82	4·17	9·13	5·99	9·20	2·30	57·91	76·31
,, Roxburgh ,, ...	·31	1·76	7·86	10·56	5·44	9·42	7·59	10·58	4·09	67·05	84·20
,, Botanic Station	·19	1·64	7·22	9·87	3·64	8·45	8·89	6·07	2·08	55·70	61·14
,, Government Farm ...	·18	·70	5·12	7·59	2·68	7·95	6·67	5·70	1·30	43·76	50·36
,, Friendship Estate... ..	·07	·80	5·07	7·47	2·35	7·84	5·86	7·89	4·90	44·39	...

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BULLETIN

OF THE

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Department of Agriculture.

GOVERNMENT STUD ANIMALS.

The following are the arrangements for September, and October, with regard to Stud animals of the Government Farms in Trinidad and Tobago.

Stallions.

Name.	*Class.*	*Where standing for Service.*	*Fee.*	*Groom's Fee.*
Nelsweep...	Thorough-bred	...Govt. Farm Tobago ...	$ 7.20	60c.
Quickmatch.	Thorough-bred	...Govt. Farm, Trinidad...	10.00	60c.
Rillington Spartan..	Cleveland Bay..	Govt. Farm ,, ...	5.00	60c.
Marat ...	Thorough-bred	...Roxburgh, Tobago ...	5.00	60c.

Jack Donkeys.

Monarch ...	American Donkey	...Govt. Farm, Trinidad...	$ 5.00	60c.
President ...	do. do.	... ,, Tobago ...	5.00	60c.
Barbados Joe	...	...Govt. Farm, Trinidad...	1.20	60c.

Bulls.

A.—At Government Farms.

TRINIDAD.		TOBAGO.	
Class.	*Fee.*	*Class.*	*Fee.*
2 Pure-bred Zebu ...	$ 1.20c.	1 Pure-bred Zebu ...	$1.00
1 Half-bred Red Poll ...	1.20c.	1 Half-bred Shorthorn ...	1.00
1 Cross-bred Holstein-Zebu	1.20c.	1 Half-bred Guernsey ...	1.00
1 Pure-bred Red Poll ...	2.40c.	1 ,, Red Poll ...	1.00

B.—At Public Pastures or Estates.

Place.	*Class.*
Queen's Park Savannah	1 Half-bred Shorthorn; 2 Half-bred Holsteins
Mucurapo Pasture	
St. Clair Expt. Station	1 Half-bred Shorthorn; 1 Three-Qtr. bred Zebu
St. Augustine Estate	1 Half-bred Zebu; 1 Half-bred Guernsey 1 Cross-bred Zebu-Guernsey.
River Estate	1 Half-bred Zebu;
San Fernando	1 Half-bred Jersey.
Arima	1 Half-bred Jersey.
Tobago, Friendship Est.	1 Half-bred Holstein

Pigs.

At Government Farm, Trinidad.

White Yorkshire, Poland China, Berkshire, $1.00, and Attendant's Fee 25c.

At Government Farm, Tobago.

Berkshire	...Fee 50c.
Large Black	... 50c.

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Government Farm, Trinidad.

Eggs of Barred Plymouth Rocks, Rhode Island Reds, White Leghorns, and Rouen Ducks ... ...$1.00 per doz.
Great Kind Pigeons ... ... 60c. per pair.

Government Farm, Tobago.

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Lothians	April 4, 1919.
Malgretout	April 30, 1919.
Petit Morne	April 30, 1919.
Union Hall	April 30, 1919.
Malgretout East Indian	May 26, 1919.
Picton	May 30, 1919.
Petit Morne (Palmyra)	June 13, 1919.
Tarouba (Ne Plus Ultra)	June 13, 1919.
Union-Marabella	July 10, 1919.
Harmony Hall	July 10, 1919.
Williamsville East Indian	July 10, 1919.
Indian Walk	August 19, 1919.
Williamsville, West Indian	September 11, 1919.
Plein Palais	November 9, 1919.
Lengua	November 9, 1919.
Peñal	November 21, 1919.
Broomage	August 11, 1920.
Cedar Hill	August 11, 1920.
Trois Amis	August 11, 1920.
Monkey Town	August 16, 1920.
Tobago.	
Pembroke	June 18, 1917.
Scarborough	April 11, 1918.
Delaford	August 26, 1918.
Mason Hall	December 16, 1918.
Moriah	December 16, 1918.
Charlotteville	February 4, 1919.
Parlatuvier	July 10, 1920.
Roxboro'	October 23, 1920.
Les Coteaux	December 20, 1920.
Montgomery	January 7, 1921.

Plant Protection Ordinance.

Chief Inspector.....C. F. Wood.

Inspectors.....W. Nowell. T. Boodansingh.
F. W. Urich. R. W. M. Leacock.
R. J. Link. F. D. Davies.
C. M. Roach. W. E. Broadway.
J. J. Beard. H. Meaden.
L. Mota. L. A. Brunton.

Assistant Inspectors.....J. A. Pinder. Alfred H. Pena (Tempy.)
J. Blackman. P. A. Mayers.
A. T. Warner. G. Hodge.

Pests Proclaimed under the Ordinance.

Bird Vine	June 25, 1912.	Cacao Beetle	Sept. 16, 1918.
Bud Rot of Cocoanuts	do.	Rhinoceros Beetle	do.
Bleeding Stem Disease of Cocoanuts	Nov. 26, 1912.	Gru Gru Beetle	do.
Love Vine	July 26, 1915.	Locusts	do.
Coconut Butterfly	Mar. 28, 1918.	Mosaic Disease of Sugar Cane	April 1, 1920.
Parasol Ants	Sept. 16, 1918.		

Department of Agriculture

NURSERY STOCK.

Cacao, Limes and any other plants required in large quantities should be ordered six months in advance. Address letters to the Curator, St. Clair Experiment Station, or to the Officer in Charge Botanic Station, Tobago.

Special quotations at St. Clair for Cacao, Coffee and Limes grown from selected seeds are as follows:—

Plants purchased in lots of 1 to 1,000 plants 3 cents per plant.	Delivered at Nurseries uncrated.
Plants purchased in lots of several thousands 2½ cents per plant.	
Plants purchased in lots up to 100 at 4 cents per plant.	Delivered at Railway Station, Port-of-Spain or Queen's Wharf, securely packed in open crates.
Plants purchased in lots up to 1,000 at $3.50 per 100.	
Plants purchased in lots of several thousands at $33.00 per 1.000	

Tobago prices on application at the Botanic Station, Scarborough.

Budded Avocados select varieties at 12 cents, Budded Oranges at 24 cents and Grafted Mangos at 24 cents should also be booked at once.

Budded Cacao 12 cents each or in lots of over 100 at 8 cents.

Limes from beds 1½ cents per plant for lots over 100.

A stock is also kept of other fruit, ornamental and flowering trees, palms, etc., a full list of which can be obtained on application. Large orders must be booked six months previous to the date when the plants are required as large supplies are not kept on hand for casual demands.

SPRAYING CACAO, &c.

From September to November is the time for spraying cacao trees for the prevention of thrips and black rot; and early in the dry season for the algal disease, die back, and cacao beetles.

The Department has on hand a supply of bluestone, which is sold to planters at 12 cents per pound, also nicotine sulphate the best insecticide for thrips, which is sold at $14.50 per gallon.

Spraying Machines can also be hired in Trinidad or Tobago. Friend Pump, with two leads of hose and rods complete, $1.00 per week.

Barrel Pump with one lead of hose and rods, 50c. per week. Carriage to and fro extra.

Further information in regard to cost of spraying, etc., and applications for bluestone and nicotine sulphate should be made to

THE DIRECTOR, DEPARTMENT OF AGRICULTURE, PORT-OF-SPAIN.

ST. CLAIR EXPERIMENT STATION, TRINIDAD.

List of Plants for Sale.

(*See* p. vi.)

Common Name.	*Scientific Name.*
Fruit Trees 24c. each.	
Sweet orange	*Citrus aurantium.*
5c. each.	
Golden apple	*Spondias dulcis.*
Common rose apple	*Eugenia Jambos.*
Java plum	*E. Jambolana.*
Malacca apple	*E. malaccensis.*
Mammy apple	*Mammea americana.*
Sugar apple	*A. squamosa*
Sour sop	*A. muricata.*
Cashew	*Anacardium occidentale.*
Akee ...	*Blighia sapida.*
Pomegranate	*Punica granatum.*
Tamarinde des Indes	*Vangueria edulis*
Granadilla	*Passiflora quadrangularis.*
Queensland nut	*Macadamia ternifolia.*
Breadnut	*Artocarpus incisa* var.
Genip ...	*Melicocca bijuga.*
Barbados cherry	*Malpighia glabra.*
Large red guava	*Psidium Guajaca.*
,, white ,,	*P.* var.
Gooseberry	*Phyllanthus districha.*
Governor plum	*Flacourtia Ramontchi.*
Sapodilla	*Achras sapota.*
Hunterman's nut	*Omphalea triandra.*
Star apple	*Chrysophyllum Cainito.*
Papaw ...	*Carica Papaya.*
Tangerine (seedlings)	*Citrus nobilis* var.
Mandarin	*C. nobilis* var.
Mulberry	*Morus alba.*
$3.00 per 100 uncrated. 3.50 ,, crated.	
Lime	*Citrus medica* var. *acida.*
Beverage Plants.	
$3.00 per 100 uncrated. $3.50 per 100 crated and carted to City.	
Forastero cacao	*Theobroma Cacao* var.
Robusta coffee	*Coffea robusta.*
Liberian coffee	*C. Liberica.*
Abbeokuta coffee	*C. Abbeokuta.*
Kola nut	*Cola acuminata.* 5c. each.

Common Name.	*Scientific Name.*
Spices.	
12c.	
Cinnamon	*Cinnamomum zeylanicum.*
5c.	
Nutmeg	*Myristica fragrans*
8c.	
Tonka bean	*Dipteryx odorata.*
Rubber 60c. per 100.	
Para rubber	*Hevea brasiliensis.*
Drug 5c. each.	
Bitter wood	*Quassia amara.*
Timber Trees $3.00 per 100.	
British Honduras mahogany	*Swietenia macrophylla.*
5c. each.	
	Barringtonia speciosa.
	Cynometra trinitensis
Fern tree	*Jacaranda caerulea.*
Balsam of tolu	*Toluifera Balsamum.*
Pink poui	*Tabebuia* sp.
Balata	*Mimusops globosa.*
Divi-divi	*Cæsalpinia coriaria*
	Detarium senegalense.
	Swartzia grandiflora.
Fragrant acacia	*Acacia Farnesiana*
	Mimusops Elengi.
Beef tree	*Terminalia arjuna.*
Flamboyante	*Poinciana regia.*
	Oroxylum indicum.
Shade and Decorative 5c. each.	
Apple blossom cassia	*Cassia javanica.*
Horse cassia	*Cassia grandis.*
	C. multijuga.
Jamaica mountain pride	*Spathelia simplex.*
Ceylon willow	*Ficus benjamina.*
Barbados pride (red)	*Poinciana pulcherrima.*
Barbados pride (yellow)	*P.* ,,
Almond	*Terminalia Catappa*
	Monodora tenuifolia.
	Brownea grandiflora.
	Bauhinia tomentosa.
	B. megalandra.
	Posoqueria longiflora

PUBLICATIONS FOR SALE.

The Bulletin issued quarterly, price sixpence per number or two shillings per annum post free in the Colony. To other subscribers postage extra.

Vol. XVIII. 1919. Pt. 1.—Wither Tip of Limes (Illustrated); Yam Experiments 1918–19; Cultivation of Cotton; Nitrogen Content Cacao Soils; Supposed Cure for Froghoppers; Bedding Plants for Trinidad; Fungous Diseases of Roses (Illustrated); Prize Competitions 1918–19.

Vol. XVIII. Pt. 2.—Cane Farmers and Co-operation; Root Disease and Froghopper Blight; Contro of Cacao Thrips; Rice Experiments, 1915–18; etc., etc.

Vol. XVIII. Pt. 3.—The Avocado in Trinidad and Tobago (Illustrated); Sugar-Cane Experiments 1917–19; Yams 1918–19.

Vol. XVIII. Pt. 4.—Root Disease of Cacao in Trinidad (Illustrated); Varieties of Cane under Estate Cultivation in Trinidad 1919; Durability Tests with inferior Local Woods; Tobago Vegetable Prize Competitions 1919; Reorganisation of the Board and Department of Agriculture; Development of the Economic Resources of the Empire, &c., &c.

Vol. XIX. Pt. 1.—The Trinidad Cane Farming Industry; Sugar Cane Blight in Trinidad; Froghopper Blight in Trinidad; Implemental Tillage; Mosaic Disease of Sugar Cane in Trinidad, &c., &c., &c.

Vol. XIX. Pt. 2.—Report on the Froghopper Blight of Sugar Cane in Trinidad; Trinidad Seedlings and Tests of Varieties; Cacti of Trinidad; Storing Sweet Potatoes; Seasoning Standing Timber, &c., &c.

Our Local Foods: Their Production and Use, by W. G. Freeman, and R. O. Williams.—Price 3d.

The Dasheen: Its Uses and Culture. Illustrated.—Price 3d.

The Avocado in Trinidad and Tobago.—Illustrated.—Price 3d.

Insects Affecting Vegetables in Trinidad and Tobago, by F. W. Urich. Symptoms of pests, Treatment, Preparation of Insecticides, etc.—Illustrated.—Price 3d.

Life History and Control of the Cacao Beetle, 3 coloured plates, by P. L. Guppy.—Price 6d.

Insect Notes for 1910–11. Miscellaneous Notes on Cacao Pests, by F. W. Urich.—Price 3d.

Notes on some Insects affecting the Coconut Palm, one coloured plate by F. W. Urich and P. L. Guppy.—Price 3d.

Rearing of the Vermilion Froghopper Egg Parasite, by F. W. Urich.—Price 1d.

The Sugar Cane Froghopper, six plates (3 coloured), by F. W. Urich.—Price 9d.

The Froghopper Egg Parasite and its Colonization in Cane Fields, by F. W. Urich.—Price 1d.

The Mongoose in Trinidad and methods of destroying it, 2 plates, by F. W. Urich.—Price 3d.

Control of Cacao Thrips. (Illustrated) by F. W. Urich.—Price 3d.

Annual Reports, Department of Agriculture, 1916, 1917 & 1918.—Price 1s. 9d. each.

Memoir No. 1 - Froghopper-Blight of Sugar-Cane in Trinidad by C. B. Williams, M.A., F.E.S.—Price 2/6. 9 plates (2 coloured) and 32 other illustrations.

All publications can be obtained from the Head Office of the Department, St. Clair Experiment Station, post free within the Colony. The Bulletin is also on sale at Messrs. Muir, Marshall, and Davidson & Todd, Port-of-Spain.

BULLETIN
OF THE
DEPARTMENT OF AGRICULTURE
Trinidad and Tobago.

PART 3.] 1921. [VOL. XIX.

NOTES.

Department Central Offices and Laboratories.

ON May 20, 1921, His Excellency Sir J. R. Chancellor, K.C.M.G., D.S.O., R.E., in the regretted absence of Lady Chancellor owing to illness, laid the foundation stone of the new building to contain the headquarters offices and laboratories of the Department of Agriculture.

The following account is taken, with slight alterations, from the *Port-of-Spain Gazette*:—

LAYING OF FOUNDATION STONE.

His Excellency the Governor later in the afternoon visited the St. Clair Experiment Station, and in the unavoidable absence of Lady Chancellor, laid the Foundation Stone of the new building of the Department of Agriculture. His Excellency was accompanied by his A.D.C. and Sir Norman Lamont, Bart.

Among those present at the ceremony were: Hon. A. G. and Mrs. Bell, Rev. Hammond, Mrs. Gerald Wight, Mr. L. de Verteuil, Mr. and Mrs. Hahn, Mr. and Mrs. T. H. Scott, Mr. and Mrs. C. S. Rogers, Captain and Mrs. S. A. Paige, Mr. and Mrs. A. Mendez, Messrs. Brinsley, Mr. and Mrs. Burke, and the following members of the Staff: The Director of Agriculture, Mr. and Mrs. Nowell, Mr. and Mrs. McInroy, Mr. and Mrs. Waby, Mr. and Mrs. F. W. Urich, Mr. J. E. Scheult, Mr. R. O'Connor, Miss. H. Scheult, Captain Metivier, Mr. C. F. Wood, Mr. and Mrs. L. A. Brunton.

The plans of the new building were on view in the grounds, and were much admired.

His Excellency and party arrived punctually at 5 o'clock.

Mr. Bell expressed his regret at the inability of Lady Chancellor to attend and especially so as he was sorry to learn that the absence was due to illness. He drew attention to the plans and asked His Excellency on behalf of Lady Chancellor to lay the stone of the new building for the Department of Agriculture, in the reorganization of which he had taken so much interest.

His Excellency also regretted the absence of Lady Chancellor, and made reference to the very poor building at present in use; adding that it was the only Department that would work under such conditions without grumbling. He expected to find in the members of the Agricultural Department more than the usual share of virtues. He

congratulated Mr. Bell, Mr. Hahn and the other assistants of the Public Works Department for the excellent plans.

His Excellency then laid the foundation stone. A silver trowel was also presented to His Excellency for Lady Chancellor. On the gift is inscribed :—

"This trowel was presented to Lady Chancellor, on the occasion of "her laying of the Foundation Stone of the Agricultural Department "Offices, Trinidad, on the 20th May, 1921."

Mr. Freeman thanked the Governor on behalf of the Department of Agriculture, Board of Agriculture and Agricultural Society, for laying the foundation stone for Lady Chancellor, whose absence he regretted. He felt sure that this building, which was needed very much, would enable the Department to do better work.

The gathering then dispersed.

On a marble tablet which is to be placed against the foundation stone, will be inscribed :—

"This Foundation Stone was laid on the 20th May, 1921, by Lady "Chancellor, while Lieut.-Colonel Sir John Chancellor, K.C.M.G., "D.S.O., R.E., was Governor of Trinidad and Tobago."

W. G. Freeman, B.Sc.L., Director of Agriculture. Archibald G. Bell, C.M.G., Director of Public Works.

Within the stone is placed a bottle, in which are inserted the following :—

The Port-of-Spain Gazette, of the 20th May, 1921; *The Trinidad Guardian*, of the 20th May, 1921, and a paper with the following inscription :—

"This building was designed and erected by the Public Works Depart- "ment. The whole work was under the direct charge of D. M. Hahn, "M. Inst. C.E.; M. Inst. M.E., Assistant Director of Public Works; "E. R. Gammon, assisting him as Architect and Draughtsman and "F. J. Horsford, Assistant Engineer as Builder."

The new building will be 140 feet in length, two storied, with a central block and two wings. It will contain the offices of the Director of Agriculture, Assistant Director, and Chief Clerk, the Mycological, Entomological and Chemical laboratories, with accommodation for the Economic Botanist and Government Veterinary Surgeon, also the Herbarium, and Library, rooms for the Curator, Chief Inspector, Plant Protection Ordinance and the general Clerical Staff.

The estimated cost of the building, which will be of concrete, is approximately £10,000, which is being met from the accumulated profits of River and St. Augustine Estates which are under the management of the Department.

Mr. C. B. Williams.

The Colony has suffered the loss of an exceptionally keen and zealous scientific worker, by the resignation of Mr. C. B. Williams, Sugar Cane Entomologist, to accept the post of a Senior Entomologist

in the Ministry of Agriculture, Egypt. Mr. Williams from 1916 was Entomologist in Charge of Froghopper Investigations working under the direction of a special Committee, (His Excellency the Governor, Hon. W. G. Kay and the Director of Agriculture). The expenses of the investigations were divided equally between the Government and the chief sugar estate proprietors who were represented on the Committee by Mr. Kay. Originally appointed for two years, Mr. Williams was reappointed for another two, and in 1920 the sugar proprietors expressed the hope that a permanent place would be found for Mr. Williams in the reorganized Department.

In Memoir No. 1 of the Department, recently published, Mr. Williams has brought together a valuable summary of the work of all earlier investigators and of his own on the Froghopper, which will be of the greatest service to future scientific workers, and to the sugar planters.

W.G.F.

Suggested introduction of Arriba Cacao.

The suggestion was made recently by Messrs. Rowntree & Co. that it would be worth while introducing Arriba (Guayaquil) Cacao into Trinidad. This variety of cacao is in special demand, having a characteristic spicy flavour, which makes it especially useful for certain purposes. The matter was discussed in detail but the feeling of the planters was adverse, it being urged against the proposal that there were few available areas in Trinidad where a new variety could be grown without being altered by crossing with existing varieties, also that there was the risk of introducing the Monilia disease from Ecuador. Advantage was taken of the presence in the Colony of Mr. S. K. Davies, Chemist to Messrs. Rowntree & Co., and he met the Cacao Committee of the Board of Agriculture which decided to recommend the experimental trial at River Estate of a few acres in Arriba Cacao, provided a guarantee could be given that the introduction would be free from any danger of introducing a fresh disease. Messrs. Rowntree, Cadbury and Fry jointly offered to contribute £100 towards the cost of the experiment, including the expenses of the Mycologist visiting Ecuador to secure disease-free material.

On the question coming before the Board of Agriculture, the earlier views, already referred to, prevailed, and it was decided not to make the experiment.

Progress Reports.

Presented to the Board of Agriculture on April 21, 1921.

Eradication of Mosaic Disease.

The campaign among the small holdings in the northern district is being vigorously pursued. The work is in the immediate charge of Mr. C. M. Roach, to whom great credit is due for organising and directing the labour force employed.

The number of farms in the infested district is in the neighbourhood of 1,700, and their acreage 1,250, of which at least 1,000 acres has to be worked over.

The principal centre of operations is established at San Juan, with subsidiary centres in charge of assistants at Curepe and Tunapuna. Eight drivers and about 100 labourers are at present employed.

The young canes on the whole area (totalling about 170 acres) have been examined once and are being worked over again as opportunity occurs. Those in the Curepe district have been rogued twice; those in the San Juan district three times. The last mentioned, amounting to about 50 acres, are regarded as being, for the present at least, free from the disease.

Stubble fields amounting to some 300 acres have been dealt with, either by roguing or clearing as the conditions required.

The total number of stools destroyed is 44,000, of which 6,000 were young canes. The cost of labour for this work has been approximately $1,500 and the amount of compensation to be paid according to scale is estimated at $885. For the proportion dealt with the expense is slightly under the estimate on which the grant of funds was based, and it is expected that with the experience which is being gained the cost of operation will be reduced.

The weather has not been favourable to the campaign. We had hoped for a definite dry season in which the spread of the disease would be entirely stopped, but the figures for the St. Augnstine Experiment Station show that the showers of March and April provided conditions under which the process of infection was to some extent resumed. Very much will depend on the time at which the rainy season proper begins. If this were to set in so early as to hamper reaping operations and cause fields to be left over to next crop the cost of operations would be increased and their effectiveness reduced.

So far the work may be regarded as well in hand and giving as much promise of success as can be expected at this stage.

It is pleasant to report that the farmers have taken our interference with their property in a good spirit, and serious opposition has in no case been met with.

W.N.

Implemental Tillage of Canes.

During 1920 experimental work has been proceeded with at St. Augustine Experiment Station in continuation of that previously reported (*Bull. Dept. Agr.* XIX. 1920. 19–29. The experiments have been made under the supervision of Mr. L. A. Brunton Assistant Superintendent of the Experiment Station. The following is a summary of the results obtained with canes.

Cultivation of Ratoons.—Equal areas of 9·29 acres were cultivated with mule drawn implements and by hand labour respectively. The cost with implements was $5.81 and by hand labour $9.15 per acre.

Actually a war increase of 40 per cent. was paid on the wages in both cases.

Implements.	Cost per acre.
	$ c.
Ploughing—2 cuts between rows, 1 man, 1 boy, 1 mule, 8½ days	0 91
Cultivating—horse hoe and drill harrow, 1 man, 1 boy, 1 mule, 7½ days	0 54
Depreciation implements	0 06
Extra feed for mule...	0 46
Hand labour—hauling and spreading trash, 12 tasks at 32c.	3 84
	$5 81

Hand Labour.	Cost per acre.
	$ c.
Hauling trash, 11 tasks at 32c.	3 52
Forking 13·2 tasks at 43c.	5 67
	$9 19

Plant Canes.—Equal areas 9·35 acres were cultivated at cost of $1.87 by implemental tillage, and $5.67 by hand labour.

Implemental Tillage.	Cost per acre.
	$ c.
Ploughing—1 man, 1 boy, 1 mule 10¾ days ...	1 06
Cultivating—1 man, 1 boy, 1 mule 4 days... ...	0 31
Depreciation implements	0 06
Extra Feed for mule	0 44
	$1 87
Hand Labour.	
Forking 13·2 tasks at 43c.	$5 67

Another set of experiments were made to test yields of the same varieties of cane on land prepared by implements and by hand.

	Tons per acre.	
	Implements.	Hand labour.
T. 75	35.79	25.68
B. 4934	32.66	26.36
D. 504	34.38	33.14
D. 109	33.30	29.91
B. 6308	32.55	27.09
Ba. 6032	34.74	29.45
B. 156	27.68	29.80

In every case except the last the yield of the ploughed plot was higher than that of the forked plot.

W.G.F.

Coconut Diseases.

The study of Coconut Palm Diseases has been continued in various parts of the Colony, including Moruga, Cedros, the North-eastern district, and the neighbourhood of Port-of-Spain.

The great difficulty of the investigation arises from the variety of the affections met with. A fresh locality, instead of affording further evidence bearing on the types already seen, frequently exhibits a new type of its own which is not easy to correlate with previous observations.

This statement refers particularly to the class of affections usually lumped together as "Bud Rot," which is nowadays revealed as too vague a term to carry any real significance. The putrefaction of the bud, which marks the death of the tree, may follow on a gradual or a rapid failure of the leaves beginning with those on the outside, like that which occurs in the Red-ring disease, or it may take place with very little visible preparation. In many cases the suggestion is strong that the bud rot is secondary in its nature, again as in red-ring disease, and that the cause of failure may have to be looked for in the soil or roots.

This, it will be remembered, was the conclusion reached by Stockdale and Rorer, except that they associated with root disease the symptoms of the red-ring disease, which we now recognise as distinct. With the cases of that affection removed however, there does remain an important residue of trees affected by what may prove to be a root disease or diseases. As regards bud rot proper, restricting the use of the term to actual infections in the crown of the tree, I should not be surprised to find that it is of comparatively rare occurrence. Cases do come to notice from time to time of infections among the leaf bases which respond, if taken in time, to local treatment. The type of bud-rot due to Phytophthora originally described from the East and recently by S. F. Ashby in Jamaica has not been met with here to any extent. Advantage was taken of Mr. Ashby's recent presence for a few days in the Colony to show him examples of the local affections. These he did not recognise as belonging to types studied by him in Jamaica.

Until a good deal of further attention has been given to the subject it will not be possible to advise with any degree of certainty as to the proper treatment of disease of the nature referred to. The policy of cutting down and burning the trees is a safeguard against infection from bud rot proper, but it is of no particular use so far as the disease may be due to an affection of the roots.

Experiments are in progress to determine with certainty the mode of infection in red-ring disease, which continues to cause heavy losses of young bearing trees in various parts of the Colony. Its distribution is very irregular, some estates appearing to be almost entirely free from it, in a way which suggests that the source of the seed nuts may be the deciding factor.

The "little leaf" disease is widely distributed and though nowhere very abundant attracts attention as one travels the roads of the Colony. This affection is curable at any stage, the treatment being to clean the crown, to open out as far as possible the bases of the central leaves and pour in a disinfectant. For this purpose dilute Jeyes' Fluid, or a dilute

solution of the juice from tobacco presses have been successfully used and probably the commercial extract of tobacco sold as Black-leaf 40 would also be effective.

A stem disease has recently been met with which results in the rind becoming infested with shot borer beetles and is more or less definitely associated with the production of tears of hard gum at various points on the surface. This affection seems to lead to gradual failure of the leaves, but one or two cases of at any rate partial recovery have been seen. An affection which may be the same as this was reported some time ago by a planter in Tobago. The nature of the disease remains to be discovered.

It might appear from this report that coconut diseases were seriously on the increase in the Colony. I do not think that this is necessarily the case except so far that there is a larger area under the crop, but rather that with advancing knowledge more discrimination is being applied to the cases which occur. At the same time it cannot be denied that losses which in the aggregate are very considerable are taking place, and in a few individual plantations are so heavy as to threaten the existence of coconut cultivation.

W.N.

Seedling Canes.

In 1917 it was decided that we should raise our own seedling canes instead of depending on other colonies for obtaining new varieties. The work started then has been continued yearly.

From the first batch of seedlings raised in 1917 and planted out in 1918 48 varieties were selected for their combined field characters and analytical results for further trial.

The detailed analytical results of these selected varieties have been published (*Bull. Dept. Agr.*, XVIII. 138). They show that the seedlings raised from the Bourbon gave the largest stools of canes, and those from H ? the richest juice. Five of the Bourbon seedlings gave stools weighing over 100 lb. each; the highest being 168 lb. and six gave juice containing more than 1¾ lb. of sucrose per gallon, and two of them more than 2lb. per gallon. Of these 48 varieties 44 were planted in plots of from 4 to 112 holes in November, 1919, but the results are not yet available as the canes will only be reaped and tested next month. In October last, after a second selection, 13 were considered sufficiently good from their field characters to be further propagated in plots.

The seedlings raised in 1918 were a much better set than those of the previous year and after the first analytical test had been made 162 varieties were considered sufficiently good to be propagated for further trial.

A large number of varieties were selected for raising the new seedlings of that year as it had been found from the results obtained in the previous year that certain varieties were absolutely useless as parents. The best results were obtained with B. 6450, the Bourbon, H. ?, B. 6835, and L. 511, a few promising seedlings were also obtained from D. 109. The seedlings raised from the Bourbon have again given the largest stools of cane, the best weighing 314 lb. and the next 233 lb.; the juice from the latter contained practically 2 lb. of sucrose per gallon. The

H.? seedlings gave stools of an average weight of only 40 to 50 lb., but the juice from seven of them contained over 2 lb. of sucrose per gallon and in one case practically 2¼ lb. per gallon. A good type of seedling has been obtained from B. 6835; stools of cane weighing from 70 to 80 lb. were by no means uncommon and in six instances the juice contained more than 2 lb. of sucrose per gallon. A fair number of promising seedlings were also raised from L. 511. The canes from the majority of the stools weighing over 70 lb. and in seven cases the juice contained more than 2 lb. of sugar per gallon.

During 1919 several thousand seedlings were again obtained and 2,400 of the most vigorous were planted out last year. Those showing good field characters will be submitted to analytical tests from next week, as they are now 13 months old and those that show a high sucrose content will be propagated by cuttings about October or November.

Another batch of seedlings was raised last year and nearly 4,000 plants have been planted out. Their growth has been quite good for this time of the year as the weather has been most favourable.

Altogether 9,643 new seedlings have been grown and planted out during the past four years. After a first selection, 210 of those raised in 1917 and 1918 have been planted out in plots and of these 141 are showing promising growth. Plot results from 44 of the seedlings raised in 1917 have been obtained and will be reported on later.

J. DE V.

The Mango Midge.

The young shoots and flower stalks of mangos are attacked by a small midge, the larvæ of which destroy young flowers and leaves. Occasionally this insect causes considerable injury; as a rule it is kept under control by natural enemies.

The female midge lays her eggs in the youngest flower and leaf buds; the young larvæ or maggots bore into the tissues and form small swellings in the centre of which they live by consuming the sap and eventually causing the young leaves and flowers to dry up and die; the stalks of the flowers are also affected and the injury manifests itself by small decayed spots through which injurious fungi can invade the plant. Development of the larvæ is rapid and in from 10 to 14 days they work their way out of the mango shoots and fall to the ground, which they enter and construct small cocoons of silk and particles of earth. Adults appear about a week later. The total cycle takes about 21 to 30 days. When the maggots are parasitized they cannot leave the shoots and the adult parasites issue from the swellings in the leaves and shoots.

As the adult flies are only one-sixteenth of an inch in length they are not easy to see; the habits of the larvæ in attacking the youngest shoots and feeding internally make the application of insecticidal or repellant sprays almost ineffective; the control that is indicated would be to prevent the larvæ entering the soil by covering the ground under the trees with white lime. The last "wet" dry season seemed favourable for the development of this pest. Investigations are still in progress.

F.W.U.

SUGAR.

SUGAR CANE PESTS & DISEASES IN TRINIDAD IN 1920.

By C. B. Williams, M.A., F.E.S.,
Sugar Cane Entomologist.

The following report gives an account of the principal diseases and pests of sugar cane observed in Trinidad during 1920 and the results of some experiments carried out in connection with them. In the case of the Froghopper the observations are to be taken as supplementing the information contained in my *Report on the Froghopper Blight of Sugar Cane in Trinidad* (*Memoir No. 1 Dept. Agr., T. & T.*, January, 1921), and in the case of the Mosaic Disease reference should be made to "The Mosaic Disease of Sugar Cane in Trinidad" (*Bull. Dept. Agr., T. & T.*, XIX. 1920 30–37).

THE WEATHER DURING 1920.

The dry season set in towards the end of December, 1919 but after about a month of dry weather, during which the canes stopped growing more general rains occurred and the season was exceptionally mild until the middle of March. In the second half of March however the weather became much drier and a severe drought set in which did not break until the middle of June.

The wet season which commenced about June 15 to 20, was unusually late in starting, but regular rains without floods or droughts occurred during the greater part of the year, and good growing weather for canes was experienced. September was unusually wet in the northern half of the island. The "Indian Summer" was noticeable but not serious in the first two weeks in October.

THE SUGAR CANE FROGHOPPER (*Tomaspis saccharina*).

Broods and Damage.

The first brood of froghoppers was at its height about the second week in August and did little damage except in the flat lands round the Guaracara river and one or two isolated areas in the Naparimas.

The second brood, about the first two weeks in October, did severe damage in a number of wide-spread areas. Most of the estates in the Naparimas had fields severely injured and some reported worse damage than ever before. In the Couva district blight was wide-spread and one estate recorded worse damage than ever before. In the north damage was not severe except in a few fields at Orange Grove.

The canes belonging to the farmers of the Usine Ste. Madeleine were in general less damaged than the estate canes of the same Company but large areas of farmers' canes in the Palmiste and Rambert village districts were badly damaged.

After the second brood considerable recovery set in and continued till the advent of the third brood about the first week in December. This brood caused severe injury in several areas not previously damaged but on the whole there was less damage than was caused by the second brood.

All the broods were unusually late this year; the second brood occurring almost at the same time as the third brood of some previous years.

Development of Injury.

A number of observations were made this year to determine more accurately the development of the injury to the leaves, both by watching carefully the development of individual punctures on the leaves and by observing the difference in time between the greatest abundance of froghoppers of one brood and the greatest visible blight. Some of the results were obtained early enough to be incorporated in my full report.

A known number of froghoppers were sleeved on four cane stalks on October 15–18, 1920 for one or two nights and then removed. On these plants one hundred and twenty-two streaks developed and the course of most of them was noted every three to six days.

During the first week most of the streaks remained pale and discoloured (Stage I see Report p. 21), but by the end of the week had begun to show the red discoloration at the point of injury (Stage II). This red discoloration continued to spread during the next ten days and by the end of the third week, most had the dead centre typical of Stage III. After this the injury continued to spread slowly till the death of the leaf.

Stage I. From 2nd to 7th day (some lasted as late as 15th—some ended as early as 4th).

Stage II. From 7th day (varying as above) to 18th day (some as early as 13th, others as late as 26th).

Stage III. From 18th day (varying as above) to death of leaf.

The 122 streaks which developed were produced by the equivalent of 50 adults sucking for one night, so that it will be seen that each adult is responsible for an average of $2\frac{1}{2}$ punctures per night.

The froghopper appears to prefer the leaves which have just unrolled as the following figures show:

Total punctures

on centre rolled leaf	13
on first (youngest) open leaf	41
on second leaf	22
on third leaf	13
on fourth leaf	11
on fifth leaf	12
on sixth leaf	1

Observations in the field indicate that the greatest damage is about three weeks after the height of the brood, provided that severe dry weather and consequent root disease development does not intervene. In normal cases the plant is able after this time to replace by new undamaged growth the loss due to the spread of injury, and recovery sets in.

Rainfall and Broods.

The dates of the brood correspond exactly to what would have been expected from the data given on p. 62 of my report. The first continued rains of the wet season started about June 15–18; the first brood was at its height about August 11; the second brood about October 8, and the third about

December 5. This gives the intervals as 56 days for the first brood, 58 days for the second brood, and 58 days for the third brood. (In my report the figures given are 57 days for the first brood and about 58 days for each of the other two).

Relation between Damage and Soil.

Observations made this year serve to emphasise strongly the relation between froghopper infestation and soil noted in my previous report (p. 109).

The infestation was, with a few exceptions, not sufficiently serious to take the best fields, so that the effects of soil differences were unusually well marked. A number of fields have been found where the soil changes correspond exactly to variation in infestation.

(*a.*) Field 24 E. Union Hall Estate has two ridges of heavy poor red soil in what is otherwise a fairly good field. Froghoppers attacked this field in the second brood and the damage was very much more severe on the ridges than in the hollows between them.

(*b.*) In 1917 Field 33, Taronba, was damaged on the slope of the hill, but was much better at the foot. Analysis showed the soil to be less acid and much richer in lime at the foot than the slope. This year the field alongside, which has a similar slope and flat parts was damaged in a manner exactly corresponding to that of Field 33 in 1917. There is no doubt that the same soil influences are at work.

(*c.*) Field No. 2 N. Union Hall, had in 1918 and 1919 a belt of damaged canes running diagonally across the field and up the slope. The canes on either side of this were in both years much less damaged. This year the field has been ploughed up and the exposed land shows a belt of red clay soil across a darker and more loamy soil, the red belt corresponding exactly to the previously observed limits of the damage.

(*d.*) On Cupar Grange Estate there were one or two spots of severe injury in an area of black soil, these spots being planted with Uba cane.

Inquiry showed that the soil in these places, although black, was so heavy and stiff that other varieties had failed to grow, and Uba had been planted as a last resort. Although Uba is known to be considerably resistant to froghopper attack the influence of the soil was so great that the damage was confined to the bad patches although surrounded by more attractive varieties of cane.

(*e.*) Field 102 Cedar Hill, consists of a long slope and a small flat area at the foot. The second brood of froghoppers in 1920 did considerable injury to the canes on the slope while those at the foot remained untouched and quite green. An examination of the soil in a ploughed field alongside which included the same slope and flat areas showed that the soil on the slope was a heavy red clay while that in the flat was much darker in colour and of a lighter texture.

(*f.*) The froghopper damage this year at Cedar Hill Estate was as great as in any previous year, but the fields damaged were without exception on the two belts of red soil as shown in the map of this estate in my previous report, p. 110.

(*g.*) In the Northern sugar district one field in an area of comparatively light soil was severely injured. I was informed by the

manager that this field had been known for many years as "Damn Rascal" field owing to the difficult nature of the soil.

Many more examples could be given of similar relations observed during the past year and there is little doubt that we have here a clue to possible control methods which cannot be ignored; at the same time exceptions do occur and this year on Petit Morne Estate there was severe damage on an area of black soils in apparently excellent condition and where injury had never before been observed.

Relation between Damage and Ratooning.

The greater liability of old ratoons to damage has been previously emphasised and two estates have recently adopted a policy of not growing second ratoons on the areas which had previously shown themselves liable to froghopper attack.

One of these estates escaped injury almost entirely in 1920. The other had a very severe attack throughout most of the estate even extending to plant canes. It is difficult to draw any conclusions from these two cases but they are not necessarily contradictory as it has been already shown that the relative differences between first and second ratoons is greatest when the infestation is slight (*i.e.* when other conditions are unfavourable to the froghopper).

It must also be remembered that one of the most important advantages of stopping old ratoons on lands liable to froghopper infestation is that more frequent replanting means more frequent cultivation of the land which will be gradually (but not suddenly) improved in texture and humus content.

Some other observations are more convincing. Thus on one estate in the north the worst damaged field was in fifth ratoons and all the damage on the estate was confined to canes older than first ratoons. In the south the flat lands of Harmony Hall had shown themselves in past years to be particularly liable to damage. Owing to an almost complete replanting in 1917 they had escaped damage in 1918 and 1919 as plants and first ratoons. This year instead of replanting, almost the whole area was left in second ratoons with the result that the damage was as severe as ever before. One or two fields of plant canes alone escaped, indicating what might have been obtained if the policy of dropping old ratoons had been adopted.

Empusa Fungus.

At the end of November and the first week in December, 1920 occurred the largest outbreak of *Empusa* fungus on froghoppers that I have ever seen.

This fungus appears to require a higher degree of moisture for its development than does the green-muscardine fungus, and in normal years is not found before October.

It is possible that the large outbreak this year was connected with the large third brood which was unusually late and also with the wet weather which was experienced in November.

Large numbers of infected froghoppers were found on Golconda, Craignish, and Cupar Grange Estates indicating a wide distribution in the Naparimas. On the latter estate several thousand specimens were

seen, in one case as many as twenty on one stool. The infection was at its height about December 1, but reduced rapidly with drier weather from this date and by December 10 there were not one-tenth as many infected specimens to be found.

Eighty-three infected specimens collected at random in the field on December 3 showed that fifty-eight were males and twenty-two females. This excess of males is exactly opposite to what is found in the green muscardine fungus which always infects a larger proportion of females.

THE MOSAIC DISEASE.

History and Present Situation.

At the time of the discovery of the Mosaic Disease in Trinidad, at the beginning of 1920, it was found to be confined to (1) an area of uncertain extent, mostly in farmers' canes, surrounding the Government Experiment Station at St. Augustine, where the disease had been distributed partly by natural spread, partly by sale of plants and partly by theft of diseased cuttings from the Station; and (2) about forty isolated localities throughout the country where diseased cuttings had been sent from the Station. The evidence then available indicated St. Augustine as the point of introduction of the disease and the only centre of infection.

Since then one estate has been found to be heavily infested both in nursery plants and old ratoons indicating that the disease has been present several years at least. On this estate the infection is more severe and widespread than at the Government Station and it is possible that it represents a second point of introduction. Seedling canes have been introduced into Trinidad by this estate for many years past but, as far as is known, only from Barbados, and the discovery of the disease in that island is so recent and localised that it seems improbable that it has been present there for more than a year or two.

Control work was started as soon as the disease was identified, but during the dry season of 1920, which was an excellent opportunity for destruction, the seriousness of the disease had not been realised by most people concerned. Owing to the apathetic attitude of most of the planters and the small staff available for the work very little was done before the wet season.

About a month after the wet season started the disease began to spread with considerable rapidity, particularly in the Northern Sugar district among small farmers' canes, and even with an increased number of men cutting out and destroying it was soon quite out of hand. The area infested was found to be larger than was at first suspected and no field could be visited frequently enough to prevent renewed infection from occurring, often greater than the infection originally found.

In the Naparimas and Couva districts, where most of the points of infection were in large estates, the situation did not become so bad, as when the nature of the disease was realised, greater and more frequent efforts were made to eradicate it. As a result nearly all the points of infection in the Naparimas have been greatly reduced. Four or five have been completely cleared and the remainder have been reduced from an average of about 100 diseased stools per inspection to less than 10,

The last inspection of diseased localities in the Naparimas, in December, 1920, resulted in only 550 diseased stools being found of which 380 were on one estate.

In October 1920 the Legislative Council voted £500 for compensation for small farmers for cane stools destroyed.

Over 40,000 stools were dug up and destroyed in the St. Augustine and St. Joseph districts between September and December, but it was then realised that much wider measures were necessary if there was to be any hope of extermination.

A new campaign was then planned for the dry season of 1921 (*Council Paper* No. 23 of 1921) and the Legislative Council has voted the sum of £3,000 for this purpose.

Effect on Cane Plant.

The most obvious symptom of the Mosaic disease is the irregular fading of the green colour of the leaves, but some care and experience is necessary to separate it from somewhat similar markings on leaves. The following critical points should be noted :—

1. The pale markings on the leaves in Mosaic disease are always more or less elongated in the direction of the length of the leaf.

Several varieties (particularly D. 1753) have normally, or abnormally, small almost square or rectangular pale areas on the leaves, the cause of which is at present unknown.

(2.) The pale areas in Mosaic disease are *pale green* to almost white. They are, except occasionally on older leaves (see below), the green of the healthy canes diluted but are *not* more yellowish or brownish as is the case of most other leaf spots.

(3.) Mosaic is always more distinct in plants that are otherwise healthy. If the cane is pale from drought or bad soil, the pale areas do not show so distinctly.

It follows that manuring, especially with nitrogen supplied artificially, so far from making any reduction in the disease actually makes it more distinct by emphasising the difference between the decolourised areas which remain pale, and the healthy areas which darken under this treatment.

(4.) Mosaic is *always* present more distinctly on the younger just unrolled leaves than on the older outer leaves.

It has been said that a leaf once open and healthy cannot develop the disease. Without admitting the truth of this statement, it is a fact that the outer leaves of a cane may be healthy and the inner diseased but never the reverse.

Thus in cases of doubt in determination of the disease the inner leaves should always be examined.

Quite contrary to the condition found in most varieties, and also to several printed statements that the mosaic diseased leaf never becomes brown, we find that in a few varieties the *older* infected leaves become finely mottled with yellowish and reddish brown specks which gradually increase in number until the death of the leaf.

This remarkable condition is very conspicuous and its presence on some of our varieties led us at first to doubt whether mosaic disease was the cause.

After a longer experience we find that there is no doubt as to its occurrence only in plants which show typical signs of mosaic disease in the younger leaves. Mr. Brandes of the U.S. Bureau of Plant Industry writes that they have observed it in a small number of varieties susceptible to mosaic disease in Louisiana.

Mr. Nowell has examined some of these leaves and found no trace of any fungus disease and the only alternative to its being a normal stage of mosaic in these varieties is that it might be due to some weakly parasitic bacterium which is unable to infect healthy leaves. It is hoped that this point will be investigated in the coming year. The condition is particularly conspicuous in the canes D. 3956 and D. 6450.

The cankering of the cane itself, *i.e.* the development of typically longitudinal white stripes extending from the nodes of the cane, followed in bad cases by shrinking of the internodes, is only found in canes that have been infected for some considerable time. It can however develop conspicuously in the first year of infection. It was mentioned in my previous report that it was particularly distinct in B. 16536 and B. 6450, and has recently been found well developed on "Congo Red." Few observations on this condition have been made as all infected canes found have been destroyed as soon as possible after infection.

The visible effect of mosaic disease on the health and growth of the plant varies considerably in different varieties. It is most distinct where the plants have been grown from infected cuttings. In one bed of T. 67 the infected plants, about six months old, were indistinguishable in size from the healthy ones, while in an adjacent bed of D. 109 the infected plants were without exception small and stunted and less than one-quarter of the average size of the healthy plants.

In an experiment plot of diseased and healthy plants of a number of varieties, the following differences were observed after four months growth :—

Variety.	*Effect of disease.*
T. 75	...Diseased distinctly smaller than healthy.
T. 395	...Diseased distinctly smaller than healthy.
T. 491	...Very slight difference.
B. 60	...Diseased average about 25 per cent. smaller than healthy.
B. 67	...Very slight difference.
B. 156	...Diseased distinctly smaller than healthy.
B.H. 1012	...Diseased noticeably smaller than healthy.
Ba. 6032	...Diseased slightly smaller than healthy.
D. 109	...Diseased at least 50 per cent. smaller than healthy.
D. 145	...Diseased slightly smaller than healthy.
Badilla	...Diseased very slightly smaller than healthy.

In the same plot the relative death rate of diseased and healthy canes was observed. It was found that thirteen out of 87 diseased

cuttings had failed to grow while only two out of the 79 healthy cuttings were dead. Further observations are needed to see if these results are significant.

Other Plants Infected.

A number of Trinidad plants have at times mottled leaves closely resembling the conditions produced by mosaic disease, but the sugar cane mosaic has so far only been found on corn (maize) and one local species of grass.

In the early part of August, 1920 Mr. C. M. Roach brought in a plant of corn-grass (*Manisurus exaltata*) with the terminal leaves affected in a manner exactly resembling mosaic disease. An attempt was made to grow the plant but it failed to re-establish itself.

On August 14 the same observer reported the occurrence of mosaic disease on corn in same small farmers' plots in the St. Augustine district. On September 8 I visited the locality and found, as reported, about 5 to 10 per cent. of the corn plants infected in a manner resembling mosaic disease.

The field in which the corn was planted was one from which cane had been recently dug out owing to mosaic disease. It was suggested that the corn plants had become infected from being planted in the holes from which the diseased cane stool had been removed (see below).

The symptoms of the disease differed in several ways from the typical sugar-cane mosaic. The pale areas on the leaf were smaller, more rectangular, and often crowded together in one part of the leaf while the rest of the leaf appeared quite healthy. In a few cases the outer leaves were infected while the inner leaves appeared quite healthy.

The field was visited again on October 8 and only a very few corn plants were found to be infected, although none had been dug out. It appeared as if many plants had recovered and thrown off all signs of the disease.

In view of these conflicting observations the question of the identity of the two diseases was left open, but a recent report by E. W. Brandes on mosaic disease of corn in the United States (*Journ. of Agricultural Research*. XIX, 1920. 517–522) leaves little doubt on the subject. Brandes describes in detail the symptoms which we observed, including the frequent recovery of the plant, and has been able to prove, by transferring the disease to cane by means of insects, the identity of the two infections.

Brandes further records the same disease on Guinea-corn (*Sorghum*) but this crop is not common in Trinidad and so far no mosaic disease has been discovered on it.

The presence of the mosaic disease on corn, although making the extermination of the disease more difficult in the wet season, is not very serious occurrence as there is no corn growing for at least three months in the dry season, so there is no danger of it carrying on the disease from one season to the next.

THE NATURAL SPREAD OF THE DISEASE.

Observations in the field in Trinidad during the year 1920 indicate that there was practically no spread of the infection from diseased to healthy plants during dry weather.

In one plot of about 360 stools at St. Augustine 68 plants were marked as diseased on March 3, 1920, and by July 14 only three additional plants were found to be infected. In another bed in which 14 stools out of about 360 were infected on March 30 there was only one fresh infection by July 14.

The wet season in 1920 was unusually late in starting and the first heavy rains fell about June 15 to 18, so that for about one month after the rains there was little visible spread.

This particular experiment was stopped at the end of July in an attempt to exterminate the disease from the Experiment Station, but field observation showed a rapid increase in the disease during August and September and after a period of rest there were slight indications of another increase about November. This latter is somewhat doubtful.

Further indications that the spread of the disease was in some way connected with moisture were found. Thus on one estate in the Couva district the greatest spread was found to have occurred along the banks of a small river.

On one estate in the Naparimas where the infected stools had been planted in long beds running down a slope and across a small flat moist area at the bottom of the slope, the original infection (due to planting infected cuttings) was evenly distributed on both slope and flat, but the secondary infection was considerably greater on the flat than on the slope,

Mr. C. M. Roach, who spent most of his time organising the control of the disease among farmers' canes in the St. Augustine district reported independently that he thought the disease more prevalent in hollows than on slopes.

Insect Transmission.

There now seems to be no doubt that the disease is spread from diseased to healthy plants chiefly, if not entirely, through the agency of insects. It remains to determine which insects are capable of transmitting the infection.

E. W. Brandes conclusively proved that in the United States *Aphis maidis* carries the infection (*Journ. Agric. Research*, 1920. XIX. 135). E. G. Smyth has obtained in Porto Rico less conclusive evidence that the disease can be carried by the cane fly (*Stenocranus saccharivorus*, the cane leaf scale (*Pulvinaria iceryi*), the yellow cane Aphis (*Sipha flava*) and a mealy bug (*Pseudococcus calceolariæ*) or *P. sacchari*). (*Journ. Dept. Agr. Porto Rico.* III. 83–116).

In Trinidad the insect carrier is still unknown. Aphids do not seem to exist on the sugar cane. I have not seen the leaf scale (*Pulvinaria*) and the cane fly (*Stenocranus*) is extremely rare.

The following common cane insects have been tested during the past six months by sleeving them on infected canes and then transferring to healthy stools.

The froghopper (*Tomaspis saccharina*).
Corn leaf hopper (*Peregrinus maidis*).
A Cane leaf hopper (*Tettigoriella laudata*).
A Cane membracid (*Cercsa vitulus* F. var. *minor* Fowl).

In no case was the disease transferred.

The only other common insect in the field which seems sufficiently abundant to account for the known spread is the mealy bug and experiments with this are proceeding.

Possibility of Spread through Ground.

The corn plants referred to above as infected with mosaic disease were planted in the holes from which diseased canes had been removed, and it was suggested by our inspector that they had become infected either from the soil or from small pieces of diseased roots which were left behind in the soil.

To test this 50 cane cuttings and 50 corn seeds were planted in holes from which diseased stools had been removed at the St. Augustine Experiment Station. A like number of cane and corn were planted as a control in holes in the same beds from which healthy canes had been removed.

In no case did the mosaic develop in the resulting corn or cane plants.

This suggests that there is little or no danger of infection by replanting in old holes.

THE DISTRIBUTION OF THE MOSAIC DISEASE IN THE PLANT.

It has been generally stated that all cuttings taken from a diseased plant will reproduce the disease.

This is practically true of plants which show symptoms of the disease in all stalks and have been infected for some time (*i.e.* those grown from infected cuttings).

Experiments made during the past year indicate however that when field infection takes place, the cane becomes infected from the growing point or leaves, and that it takes an appreciable time for the disease to descend the stalk to the ground level. The spread from one stalk to another in a stool is still more slow, and in many cases does not occur. Cane stools may be frequently found with one stalk well infected and the other stalks healthy.

In all probability in these cases there is no living underground connection between the different stalks in the stool.

The first experiment was designed to test the possibility of apparently healthy stalks in a diseased stool transmitting the disease. Top and bottom cuttings were taken from 34 diseased stalks and 27 healthy stalks, obtained from 25 recently infected stools showing both healthy and diseased stalks.

Every plant from the healthy cuttings came up healthy, although the original stools from which they came had diseased stalks.

Every *top* cutting from the diseased stalks came up diseased. Of the bottom cuttings there were twenty-three diseased, one healthy and three showing both diseased and healthy shoots. In two of these latter the diseased shoots were growing from the upper end of the cutting and the healthy shoots from lower down. In the third there were two diseased shoots growing from one side of the cutting and one apparently healthy shoot from the opposite side. This last shoot after having produced about half a dozen quite healthy leaves was showing doubtful traces of disease on the innermost leaves in the middle of February 1921.

These are apparently canes in which the "virus" of the disease had, owing to recent infection, not reached down the cane to the point at which the cuttings were taken.

It follows from the above that if recently infected stalks were cut off close to the ground it might be possible in some cases to prevent the infection from spreading to that part of the stool below the ground, which should then send up healthy shoots.

This was in distinct opposition to a suggestion made by Mr. C. M. Roach, who found that one of the worst infected fields belonging to a small farmer had been accidently burnt when commencing to grow and had been cut back to the ground. He believed that the new growth might be more heavily infested than the old.

To test between the two alternatives seven stools, which were recently infected with mosaic and contained diseased and healthy stalks, were cut down to the ground level on November 2. On December 18 (*i.e.* seven weeks later) the new growth was examined and in four stools was found to be entirely free from mosaic, while in the other three there were sixteen healthy shoots and seven diseased. On February 10, 1921 the four healthy stools were still without signs of disease. The results of this experiment were so unexpected that on December 23, 1920 50 stools with one or more shoots recently infected were cut down to ground level as before and allowed to grow. On February 10, 1921 (seven weeks later) the new growth was examined. Owing to carelessness on the part of some weeders only 34 stools grew, but of these 11 were quite healthy, the others including 16 definitely diseased and 7 doubtful.

These experiments are being continued with the addition of removing from each stool all diseased shoots as soon as they are noticed in order to see if by this means the stools to which the infection has reached below ground level can be eventually freed from the disease.

The value of these experiments lies in the fact that they indicate that it may be possible to keep mosaic disease under control towards the end of the year, without the wasteful and costly removal of whole stools from the ground, by more frequent removal of the diseased shoots.

Experiments are now being planned to test the possibility of poisoning the diseased shoots when cut to prevent new growth from these portions of the stool.

February, 1921.

STOCK.

THE DISEASES OF ANIMALS ORDINANCE.*

By H. V. M. Metivier, O.B.E., B.Sc. (Vet.), Lond., M.R.C.V.S.,
Government Veterinary Surgeon.

On June 1, 1921 the Diseases of Animals Ordinance came into operation by Proclamation, *Royal Gazette*, May 19, 1921. This bill consolidates Ordinances Nos. 153 and 154 relating to the importation and diseases of animals on the model of the diseases of animals Act 1894 of the Imperial Parliament. For the information of stock owners in the Colony and importers of animals into the Islands of Trinidad and Tobago, the Ordinance follows (pp. 129-138) together with the Regulations made under its sections 12 and 14 (pp. 139-154). These Regulations were published in the *Royal Gazette*, Volume 90, May, 1921.

THE ORDINANCE.

The Ordinance deals with:—

(*a.*) The following contagious and infectious diseases: Rinder Pest, Contagious Pleuro Pneumonia, Anthrax or Splenic Fever, Glanders, Foot and Mouth Disease, Sheep Pox, Sheep Scab, Foot-Rot, Tuberculosis, Swine Fever, Cow Pox, Rabies and Surra, and any other disease which the Governor may by Proclamation declare to be a disease within the meaning of the Ordinance.

(*b.*) Transit of Animals.

(*c.*) Importation of animals.

REGULATIONS UNDER THE ORDINANCE.

The Regulations made under section 12 of the Ordinance are divided into two parts:

Part I deals with contagious and infectious diseases.

Part II deals with the transit of animals.

The Regulations made under section 14 of the Ordinance deals with the importation of animals.

DISEASES DEALT WITH UNDER THE ORDINANCE.

The following account of the diseases which are at present the subject of administrative action by the Department of Agriculture has been prepared with the view of assisting stock-owners in the Colony to detect these diseases.

Under section 4 of the Ordinance it is clearly stated what should be done by any person having in his possession an animal suffering from contagious disease, namely that person is to report the fact to the Officer in charge of the nearest Constabulary Station, after having separated that animal from healthy ones.

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* N.B.—There is a special Ordinance dealing with dogs—Ordinance No. 14—1918: The sections of this Ordinance makes provision for (1) Licensing of Dogs, (2) Muzzling of Dogs, (3) Importation of Dogs, (4) Certain general provisions.

Regulations have been made under Section 18 of this Ordinance and they are published in *Royal Gazette* 1918-1300.

It is proposed to publish this Ordinance and the Regulations made under Section 18 in the next issue of the *Bulletin*.

H.V.M.M.

Rinderpest or Cattle Plague.

Definition: A contagious and eruptive fever due to an undiscovered infective agent.

Animals affected—Bovines, rarely seen in sheep.

Symptoms—In the early stages the temperature rises, there is loss of appetite, the animal is dull and the coat is staring A watery or mucous discharge flows from the eyes and nostrils. In the latter case there may be a slight amount of blood in the discharges. There are signs of colic and shivering is observed. Very often milk secretion diminishes or even stops. There is general depression and weakness. Continued snortings are observed. The bowels are at first constipated but in the latter stages diarrhœa often sets in, this is foul smelling and the dung is tinged with blood.

An eruption followed by distinct ulceration appears on the lips and tongue. Animals pine away rapidly and a fatal termination happens from 6–10 days after infection. It does not attack single animals in a herd, but spreads rapidly from one to another.

Post mortem—There is marked congestion and ulceration of the fourth stomach. The bowels are highly congested with a greyish deposit on the mucous membrane. The lymphatic glands are soft and of a dark colour. The flesh is of a dark colour—mahogany—putrefies rapidly, and should not be used for food.

Treatment—Slaughtering affected animals. Destruction of manures. Treatment of all contacts with Anti-Rinderpest Serum or with Serum and then with blood of affected animal—simultaneous method of vaccination.

Pleuro-Pneumonia or "Lung Sickness."

Definition—A contagious disease of the Lungs and Pleura caused by an infective agent.

Animals affected—Bovine animals.

Symptoms—There is loss of appetite, dullness, fever; a dry husky cough is marked especially when the animal is made to move about. In bad cases the breathing is very rapid and the movement of the flanks increased. The forelimbs remain wide apart and the head low with straining neck. Some animals are greatly emaciated but others appear to be in excellent condition. It does not follow that the latter are cured, they continue to infect others for a long time.

Post mortem—The lesions are chiefly confined to the lungs and pleura.

The chest cavity contains a yellow fluid. The lungs are very solid in parts and the surface is often yellow. The cut section of a piece of lung is marbled in red and yellow. The fibrous tissue lines (septa) are very broad and a yellow fluid exudes from the cut surface. At times the lungs are fixed to the ribs by a thick membrane.

Treatment—Isolation of all affected animals and slaughtering.

Anthrax or Splenic Fever.

Definition—A contagious disease caused by *Bacillus Anthracis*.

Animals affected—Human beings and all animals are liable to Anthrax. The disease is seen chiefly in cattle, pigs and sheep but not uncommonly in horses.

Symptoms—A beast which a short time before appeared to be well is found dead or in a dying condition. Frequently blood oozes from the nostril and anus. In cattle there are no typical symptoms, but in horses and pigs the region of the throat is often found to be swollen.

Post mortem—The carcase is swollen. Blood is found around the nostrils and anus. It is the height of folly on the part of any one to open an animal suspected to have died from Anthrax as he may thereby cause further infection of the premises. In cases of sudden death he should await a skilled opinion before disposing of the carcase. If however such a carcase is eviscerated, the lungs and glands are found to be congested. The spleen is very much enlarged, it is softer and darker than normal and its substance resembles tar. The blood is very dark in colour and does not clot.

Treatment—Isolation and vaccination of animals that have been in contact. In some cases the use of Anti-Anthrax Serum is recommended either alone or together with the vaccine.

Glanders and Farcy.

Definition—A contagious disease due to *Bacillus Mallei*. The disease is called Farcy when the lesions are confined to the skin, and glanders when symptoms are noticed on the nostrils (*Septum Nasi*), the sub-maxillary glands and the lungs.

Animals affected—The horse tribe is most commonly affected with glanders. Man not infrequently gets the disease from the horse by inoculation through a wound. The dog and the cat may be affected. The disease is never seen in cattle, sheep, goats and pigs.

Symptoms—Occult glanders can only be detected by the Mallein test, the animal affected showing no external symptoms. In typical cases the sub-maxillary glands are enlarged and hard and a greyish discharge is observed from one or both nostrils. Ulcers are seen inside the nasal cavity and characteristic cicatrices are seen.

In severe acute cases the temperature is raised several degrees and the animal shows distinct symptoms of respiratory disease. In chronic cases the temperature is not higher than normal.

In Farcy lymphatic cords appear on the skin and nodules which become ulcers appear on the course of these cords. The ulcers discharge a thick yellowish oily fluid. One or more limbs become swollen.

Post mortem—One sees the ulcers on the skin if Farcy has been present. Besides what one sees in the live animal one may also find ulceration of the throat and air passages. The most constant changes are however found in the lungs. In acute glanders small grey nodules about the size of a pin's head are seen all through the lung substance. In chronic cases the nodules in the lung may be hard and shot-like to the touch. Some of them are gritty due to calcification. The number of nodules in a lung varies from one to two hundred.

Treatment—Isolation of animals and Mallein tests. Slaughter affected animals.

N.B.—There is a disease known as Epizootic Lymphangitis or South African Farcy. In this condition there is cording of the lymphatics with buds along their course, but these buds contain thick rich pus and in this pus the organisms that cause the disease can easily be seen with the use of the microscope. Animals suffering from this disease do not react to Mallein.

This disease is contagious and it is proposed in the near future to have it included in the list of diseases in the Ordinance.

Foot and Mouth Disease.

Definition—A contagious and eruptive fever due to an undiscovered infective agent.

Animals affected—Cattle, sheep and pigs, but all animals and even human beings may suffer from it.

Symptoms—It is not a very fatal disease, but it spreads with alarming rapidity and stock lose condition to a marked extent when attacked. The temperature rises, there is marked salivation, lameness is present, and at times it is the first symptom. In cattle blebs are found on the lips and tongue, at times between the toes and on the teats of the cow. Milk, saliva, and the secretions of the vesicles are highly infectious.

Post mortem—Mucous membranes are congested. The pharynx, stomach and intestines blood tinged. The heart pale and lungs swollen.

Treatment—Isolation and slaughter of affected animals. Destruction of manure, bedding and all pen utensils.

Sheep Pox.

Definition—A contagious eruptive fever caused by an agent which is as yet undiscovered.

Animals affected—Only sheep are as a rule liable to contract this disease. Goats occasionally become affected as a result of contact with sheep affected with pox.

Symptoms—Sometimes the disease runs a very rapid course which ends fatally in a few days. This form is seen chiefly in lambs. The chief symptoms are those of fever, intoxication and paralysis. An eruption in the form of red spots appears on the membranes of the eyes and nose and on the hairless parts of the skin. In older sheep the disease begins by signs of serious illness, the temperature is high and there is loss of appetite. Eruptions appear on the mucous membranes of the nose, eyes and mouth and on the hairless parts of the skin—inside the thighs, elbows and under the belly. These eruptions start as pimples with a reddened base.

Post mortem—One finds the above described pimples and eruptions on the skin. The throat is inflamed and ulcerated. The cavities of the chest, heart sac and abdomen contain a reddish coloured fluid.

Treatment—Regulation of hygienic conditions is the essential factor to be considered. The animals should be given proper food and they are best out of doors. The early slaughter of severely affected animals is recommended.

Sheep Scab.

Definition—A disease of the skin caused by certain members of a class of small mites known as Acari.

Animals affected—Scab is popularly known in animals other than sheep as mange. In sheep three forms of scab are met with (1) Psoroptic scab—this is the common form, (2) Sarcoptic scab, (3) Symbiotic scab. The Sarcoptic parasite will live on other animals and on man : the other parasites live on man only for a few days causing temporary irritation.

Symptoms—The condition generally starts on the less woolly parts, and then spreads to all parts of the body. The animals rub themselves against fixed objects and show great signs of satisfaction when scratched with the hands. If the wool be parted the skin beneath is seen to be red in patches. Small pimples from which a thick fluid exudes are found on the skin. If animals are not treated they become emaciated and die of exhaustion.

Sarcoptic mange affects the head and ears. Symbiotic mange the lower parts of the limbs, but the symptoms are much less severe.

Treatment—All animals of an infected herd should be dipped or washed with a fluid which kills the mites.

Foot Rot.

Definition—Foot rot is a disease of sheep and is confined to the claws. The specific cause of foot rot still remains to be demonstrated although everything points to the Necrosis bacillus as the cause.

Animals affected—The Necrosis bacillus not infrequently affects other species of animals, chiefly however as a sporadic disease.

Symptoms—Large numbers of sheep are affected at once. The condition begins with lameness, which is at first slight, later becomes very intense. The coronet and the fetlock are found to be swollen. A fœtid discharge is found in the interdigital space. This discharge continues for a week or two and is succeeded by a cheesy exudation which is always offensive, moistens and macerates the horn, the skin, the tissues in the interdigital space and the region of the heels. The horn separates from the subjacent tissue. The patients are now very lame and remain lying for long periods. The animals frequently walk on the knees. Finally the claws are lost.

Treatment—Separate and isolate diseased animals in a scrupulously clean place and provide a dry bed. Avoid infested pastures and barns for the space of a year. A foot bath, in which some astringent preparation—solution of Copper sulphate—is placed should be attached to all barns and sheep driven through it once daily. Dressings can also be applied directly by hand to each sheep's feet.

Tuberculosis.

Definition—A contagious disease caused by the Tubercle Bacillus.

Animals affected—Human beings and most species of mammals and birds are liable to tuberculosis. Amongst the domesticated animals, cattle, particularly dairy cows, and swine are most frequently affected. Sheep extremely rarely.

Symptoms—Sometimes not characteristic, the disease being often of a mild chronic nature. In advanced cases there is usually emaciation, and a chronic cough. In cows lesions in the udder are sometimes present. One of the posterior quarters becomes the seat of a hard swelling of slow but steadily progressive growth—the swelling is as a rule painless. The milk from the affected quarter at first appears normal, then becomes thin and watery and later becomes flaked. Microscopic examination of milk from the diseased quarter shows the presence of tubercle bacilli. The disease can be detected during life by means of the tuberculin test.

Post mortem.—Nodules of varying size may be present in the lungs, liver, kidneys, in the lymphatic glands in various parts of the body, in the uterus, udder, pleura and peritoneum. These nodules are caseous and very often calcified.

Treatment—Tuberculin test and slaughter of all re-actors.

Swine Fever or Hog Cholera.

Definition—Contagious, eruptive disease caused by an invisible organism.

Animals affected—Swine.

Symptoms—The disease shows two forms, acute and chronic The acute form is seen chiefly in young pigs and terminates fatally in three days. Temperature is high, 103-104 or even higher. Breathing quick and the animals stagger if made to walk. A red rash appears on the belly, inside the thigh and the base of the tail. In chronic form the pigs are dull, they lie under cover and are disinclined to move. Appetite is lost, animals vomit; there is constipation at first, and then diarrhœa, which is as a rule blood tinged. Red patches appear later on as in the case of the acute form. There is paralysis of hind quarters. Temperature is high, 104-106. At times there are lung symptoms in which case the animals suffer from a short cough and the breathing is laboured. The animals die in from one week to three; they may however recover or drag on for two months or more in an emaciated condition.

Post mortem—There is general emaciation of the carcase, congestion of the connective tissues and of the glands, which are hypertrophied and red in colour. The stomach and intestines are highly congested and ulcers are seen on posterior portion of the intestine, around the junction of the ileum and cæcum. These ulcers are typical, their edges are

circular nd raised above the membrane. They are about the size of a three-pe.. piece and their centres are soft and often yellow or black in colour.

Treatment –Isolation of affected animals and slaughtering. In the United Kingdom splendid results are obtained by treatment with Anti-Hog Cholera Serum and then allowing animals so treated to mix with affected animals. They obtain a life long immunity in this way.

Cow Pox.

Definition—A virulent disease transmissible by accidental or intentional inoculation. The nature of the microbic agent which produces the disease is still unknown.

Animals affected—Bovine. It can be conveyed both to man and other domesticated animals.

Symptoms—Pustular eruptions usually appear on the udder in the case of cows and on the muzzle, nose and lips in the case of calves. In exceptional cases the pustules become generalised. The disease usually commences after an incubation period of 4–7 days with slight fever, diminished appetite, irregular rumination and weakness. During milking it is noted that the udder is sensitive, the milk is thinner and of a lower specific gravity. These pustules start as hard nodules about the size of peas and change in 2 to 3 days into vesicles filled with clear lymph. Towards the 7th and 8th day they become ripe, the contents of the vesicles become purulent and dry to scabs.

Treatment—No curative treatment can be laid down, the development of the disease being perfectly regular and tending to recovery. Simple hygienic precautions and cleanliness are sufficient to avoid complications due to suppuration.

Rabies.

Definition—An inoculable disease caused by a still undiscovered agent.

Animals infected—All animals including human beings may suffer from rabies, provided the virus is inoculated: it is chiefly by the dog that the disease is spread. In man the disease is known as Hydrophobia.

Symptoms—A change in the habits of the dog is first noticed; he hides in dark corners, snaps at persons, other animals and inanimate objects. A dog will wander away from home and run miles along a road; as a rule foaming from the mouth is marked and the animal will swallow pieces of stone, metal, wood, &c. Later on paralysis sets in, and the lower jaw is first affected, but in time it may become generalised. The saliva contains the virus and it has been proved that saliva is virulent three days before the animal shows symptoms of the disease.

Post mortem—There is congestion along various parts of the alimentary canal. The stomach may contain bits of wood, wire, stone and pieces of cloth if the animal is killed early, but as a rule the stomach is empty except for a variable quantity of blood stained mucus.

SURRA.

Definition—A Protozoan disease caused by *Trypanosoma Evansi*: it is transmitted by flies, Tabanidæ and Stomoxys.

Animals affected—Equidæ—horses, asses and mules also camels; less rarely in dogs and cattle.

Symptoms—The disease commences after an incubation of 4–13 days with fever, great languor and weakness; Nettle-rash like eruptions appear on the external genital organs, in the sub-maxillary region and on the lower abdomen. Fatal termination may result in the first days of the disease or the condition may last for some time with a fever-free period followed by one of high fever, the animals becoming more and more weakened and the mucous membranes becoming tinged yellow.

The course extends usually from 1 to 2 months, more rarely 1 to 2 weeks, or on the contrary 3 to 4 months, the febrile attacks becoming weaker in the later stages. The disease appears almost without exception to terminate in death.

Treatment—In fresh outbreaks it is advisable to select the infected animals with the aid of taking their temperature and blood examinations for the trypanosomes. Then adopt isolation and slaughter.

TRINIDAD AND TOBAGO.

No. 21.—1918.

I ASSENT,

[L.S.]

J. R. CHANCELLOR,
Governor.

November 19, 1918.

AN ORDINANCE to consolidate and amend the law relating to diseases of animals.

[By Proclamation.]

BE it enacted by the Governor of Trinidad and Tobago, with the advice and consent of the Legislative Council thereof as follows:—

Short title.

1. This Ordinance may be cited as the Diseases of Animals Ordinance, 1918.

Interpretation.

2. In this Ordinance, unless the context otherwise requires, the expression;

"Cattle" means bulls, cows, oxen, heifers and calves;

"Animal" means cattle, horses, mules, asses, sheep, swine, goats and dogs;

"Disease" means Rinderpest (that is to say, the disease commonly called cattle plague), contagious pleuro-pneumonia, anthrax, glanders, splenic fever, foot and mouth disease, variola ovina or sheep pox, sheep

scab, foot rot, tuberculosis, swine fever, variola vaccinia or cow pox, rabies and surra and any other disease which the Governor may from time to time by proclamation declare to be a disease within the meaning of this Ordinance;

"Diseased" means affected with disease;

"Suspected" means suspected of being diseased;

"Carcase" means the carcase of an animal and includes part of a carcase and the meat, bones, hide, skin, hoofs, horns, offal or other part of an animal, separately or otherwise, or any portion thereof;

"Fodder" means hay or other substance used or commonly used for food of animals;

"Litter" means straw or other substance commonly used for bedding or otherwise for or about animals;

"Foreign" applied to animals and things means brought to the Colony from any place outside the Colony;

"Constable" means a member of the Constabulary Force;

"Officer" means a Commissioned or non-Commissioned officer of the Constabulary Force;

"Government Veterinary Surgeon" means the Veterinary Surgeon appointed by the Governor to hold that office;

"Examiner" means the Examiner of animals imported into the Colony and includes an Assistant Examiner;

"Prescribed" means prescribed by regulations made under this Ordinance.

EXAMINERS.

Appointment of Examiners.

3.—(1.) The Governor may appoint an Examiner of animals imported into the Colony and such and so many Assistant Examiners as may, in the opinion of the Governor, be required for the purpose of carrying out the provisions of this Ordinance and of the regulations made thereunder.

(2.) The Examiner shall be a Veterinary Surgeon. Provided that the Governor may, if he thinks fit, temporarily appoint a Medical Practitioner, not being a Veterinary Surgeon, to act as Examiner.

(3.) The Examiner shall be paid such salary as the Governor with the consent of the Legislative Council may approve; and Assistant Examiners shall be paid by fees in the prescribed manner.

Segregation and notice to the police.

4.—(1.) Every person having in his possession or under his charge a diseased animal shall:—

(*a.*) as far as practicable, keep that animal separate from animals not so diseased, and

(*b.*) with all practicable speed, give notice of the fact of the animal being so diseased to the Officer in charge of the nearest Constabulary Station.

(2.) The Officer to whom such notice is given shall forthwith give information thereof to such person or authority as may be prescribed.

(3.) The Governor in Executive Council may make regulations as to the notice to be given to or by any person or authority in case of any particular disease, or in case of the illness of any animal, and for supplementing or varying, for these purposes, any of the provisions of this section.

Declaring place to be infected.

5.—(1.) It shall be lawful for the Governor in Executive Council, whenever it shall appear expedient so to do, by order to declare any part of the Colony to be infected with disease.

(2.) The Governor in Executive Council may from time to time if he shall think fit by order extend, contract or otherwise alter the limits of any infected area.

(3.) Any such order may be at any time revoked by the Governor in Executive Council.

Declaration of infected place by Government Veterinary Surgeon.

6.—(1.) When it appears to the Government Veterinary Surgeon that any disease exists in any stable, shed, field, pasture or other place, he shall forthwith make and sign a statement thereof.

(2.) He shall serve a notice, signed by him, of the statement on the occupier of that stable, shed, field, pasture or other place,

(3.) Thereupon that stable, shed, field, pasture or other place shall be and become an infected area subject to the determination and order of the Governor in Executive Council.

(4.) The Government Veterinary Surgeon shall with all practicable speed send copies of his statement and notice to the Governor in in Executive Council.

(5.) The Governor in Executive Council shall forthwith on receipt of such copies proceed to consider the same, and if satisfied that such course is expedient or necessary, shall by order determine and declare such place an infected area and prescribe the limits of the infected area, and may, if he thinks fit, include within those limits any lands or buildings adjoining or near to the stable, shed, field, pasture or other place to which the Government Veterinary Surgeon's statement relates.

(6.) If the Governor in Executive Council is not satisfied that such course is expedient or necessary, he shall by order determine and declare such place not an infected area, and thereupon, as from the time specified in that behalf in the order, the stable, shed, field, pasture or other place shall cease to be an infected area.

Slaughter of diseased or suspected animals.

7. The Governor in Executive Council may cause any diseased or suspected animal or any animal having been in the same stable, shed, pen, herd, or flock, or in contact with any diseased or suspected animal in any part of the Colony, whether declared to be an infected area or not, to be slaughtered in order to prevent the spread of the disease.

Compensation for animals slaughtered.

8. The Governor in Executive Council may award, for the compulsory slaughter of any animal under the provisions of this Ordinance, such compensation as may be thought fair, out of any funds provided for that purpose by the Legislative Council.

Burial of animal.

9. Any animal slaughtered under the provisions of this Ordinance, or which may die after becoming infected with disease, shall be destroyed, buried or otherwise disposed of as soon as possible in accordance with the orders of the Governor in Executive Council for the time being in force.

Straying of animals.

10. Where any part of the Colony is stated or declared to be an infected area, it shall not be lawful to allow any animal to be taken or moved or to stray into or out of such infected area otherwise than in the prescribed manner.

Exceptional Powers for Transit, &c.

General orders as to diseased animals

11. The Governor in Executive Council may prescribe such further or other provision as may be necessary or expedient respecting the case of animals found to be diseased or suspected.

(1.) While exposed for sale in any place; or

(2.) While placed in a stable, pen, lair or other place before exposure for sale; or

(3.) While in transit or in course of being moved by land or by water; or

(4.) While in a detention station provided for the purposes of this Ordinance; or

(5.) While being in a slaughter house or place where animals are slaughtered or are kept with a view to slaughter; or

(6.) While being on unenclosed land; or

Power to make regulations.

(7.) Generally, while being in a place not in the possession or occupation or under the control of the owner of such animal.

Disease and Movement Generally.

12. The Governor in Executive Council may make regulations—

(1) for prescribing and regulating the publication by placards, handbills or otherwise, in the immediate neighbourhood of a place or area declared infected, of the fact of such declaration;

(2) for prohibiting or regulating the movement of animals and persons into, within or out of an infected place or area;

(3) for prescribing and regulating the isolation or separation of animals being in an infected place or area;

(4) for prohibiting or regulating the removal of carcases, fodder, litter, utensils, pens, hurdles, dung or other things into, within or out of an infected place or area;

(5) for prescribing and regulating the destruction, burial, disposal or treatment of carcases, fodder, litter, utensils, pens, hurdles, dung or other things, being in an infected place or area, or removed thereout;

(6) for prescribing and regulating the cleansing and disinfection of infected places and areas or parts thereof;

(7) for prescribing and regulating the disinfection of the clothes of persons coming in contact with or employed about diseased or suspected animals, or being in an infected place, and the use of precautions against the spreading of disease by such persons;

(8) for prohibiting or regulating the digging up of carcases which have been buried;

(9) for prohibiting or regulating the exposure of diseased or suspected animals in markets or sale yards, or other public or private places, where animals are commonly exposed for sale, and the placing thereof in lairs or other places adjacent to or connected with markets, or where animals are commonly placed before exposure for sale;

(10) for prohibiting or regulating the sending or carrying of diseased or suspected animals, or of dung or other thing likely to spread disease, or the causing of the same to be sent or carried, on railways, rivers or inland navigation or in coasting vessels or otherwise;

(11) for prohibiting or regulating the carrying, leading or driving of diseased or suspected animals, or the causing them to be carried, led or driven on highways or thoroughfares or elsewhere;

(12) for prohibiting or regulating the placing or keeping of diseased or suspected animals on unenclosed lands or in fields or other places insufficiently fenced, or on the sides of highways;

(13) for prescribing and regulating the seizure, detention and disposal of diseased or suspected animals exposed carried, kept or otherwise dealt with in contravention of this Ordinance or of any regulation made thereunder, and for prescribing and regulating the liability of the owner or consignor or consignee of such animal to the expenses in connection with the seizure, detention and disposal thereof;

(14) for prescribing and regulating the destruction, burial, disposal or treatment of carcases of animals slaughtered by order of the Governor in Executive Council;

(15) for prohibiting or regulating the movement of animals, and the removal of carcases, fodder, litter, dung and other things, and for prescribing and regulatiag the isolation of animals newly purchased;

(16) for prescribing and regulating the issue and production of licences respecting movement and removal of animals and things;

(17) for prohibiting or regulating the holding of markets, exhibitions and sales of animals;

(18) for prescribing and regulating the cleansing and disinfection of places used for the holding of markets, exhibitions or sales of animals or for lairage of animals, and of yards, sheds, stables and other places used for animals;

(19) for prescribing and regulating the cleansing and disinfection of vessels, vehicles and pens and other places used for the carrying of animals for hire or purposes connected therewith;

(20) for prescribing modes of cleansing and disinfection;

(21) for prohibiting the conveyance of animals by any specified vessel to or from any port in the Colony for such time as the Governor in Executive Council may consider expedient;

(22) for insuring for animals carried by sea a proper supply of food and water and proper ventilation during the passage and on landing;

(23) for protecting them from unnecessary suffering during the passage and on landing;

(24) for protecting animals from unnecessary suffering during inland transit;

(25) for securing a proper supply of water and food to animals during any detention thereof;

(26) for prescribing and regulating the marking of animals;

(27) for prohibiting absolutely or conditionally, the use, for the carrying of animals or for any purpose connected therewith, of a vessel, vehicle, or pen or other place in respect whereof, or of the use whereof a penalty has been recovered from any person for an offence against this Ordinance;

(28) for prescribing and regulating the payment and recovery of expenses in respect of animals;

(29) for prescribing and regulating the form and mode of service or delivery of notices and other instruments;

(30) for extending, for all or any of the purposes of this Ordinance, the definition of disease in this Ordinance, so that the same shall for those purposes, or any of them, comprise any disease of animals in addition to the diseases mentioned in this Ordinance;

(31) for extending, for all or any of the purposes of this Ordinance the definition of animals in this Ordinance so that the same shall for those purposes or any of them comprise any kind of four-footed beasts, in addition to the animals mentioned in this Ordinance; and

(32) generally for the better execution of this Ordinance or for the purpose of in any manner preventing the spreading of disease.

Importation of Animals.

Regulations for prohibiting importation of animals.

13. The Governor in Executive Council may, for the purpose of preventing the introduction of disease into the Colony, make regulations for prohibiting the landing of animals or of any specified kind thereof, or of carcases, fodder, grain, litter, dung, or other thing brought from any specified country out of the Colony, or any specified part of any such country, and he shall prohibit the landing of such animals or carcases whenever he is not satisfied with respect to any such country or any specified part thereof, that having regard to the sanitary condition of the animals therein or imported therefrom, to the laws made by such country for the regulation of the importation and exportation of animals or carcases and for the prevention of the introduction or spreading of

disease, and to the administration of such laws, the circumstances are such as to afford reasonable security against the importation therefrom of diseased animals or carcases.

Regulation of ports.

14.—(1.) The Governor in Executive Council may make regulations for the following purposes, or any of them :—

(*a*) for prescribing the ports at which alone foreign animals may be landed ;

(*b*) for defining the limits of ports for the purposes of this Ordinance ;

(*c*) for defining parts of ports ;

(*d*) for prohibiting or regulating the movement of animals into, within, or out of a defined part of a port ;

(*e*) for prescribing and regulating the inspection and examination, and the mode, time and conditions of slaughter of animals in a defined part of a port ;

(*f*) for prescribing and regulating the disposal of animals, not being foreign animals, and being in a defined part of a port ;

(*g*) for regulating the removal of carcases, fodder, grain, litter, utensils, dung or other things into, within, or out of a defined part of a port, and the disposal thereof when likely to introduce or spread disease ;

(*h*) for prescribing and regulating the cleansing and disinfection of a defined part of a port or of parts thereof ;

(*i*) for prescribing and regulating the disinfection or destruction of things being in a defined part of a port or removed thereout ;

(*j*) for regulating the movement of persons into, within or out of a defined part of a port ;

(*k*) for prescribing and regulating the disinfection of the clothes of persons employed or being in a defined part of a port, and the use of precautions against the introduction or spreading by them of disease

(*l*) for prescribing and regulating the seizure and detention of any foreign animal, carcase, fodder, litter, dung or other thing whereby disease may be introduced or spread ; and

(*m*) generally for the better execution of this Ordinance in relation to foreign animals, carcases, fodder, litter, dung or other things, or for the purpose of in any manner preventing the introduction or spreading thereby of disease ;

(*n*) for prescribing the fees and expenses to be payable in or about the execution of the regulations under this section and the persons by whom the same are to be paid.

Offences and Legal Procedure.

Police to enforce Ordinance, &c.

15.—(1.) The members of the Constabulary Force shall execute and enforce this Ordinance and every regulation and Order of the Governor in Executive Council thereunder.

Powers of apprehension, &c.

(2.) Where a person is seen or found committing or is reasonably suspected of being engaged in committing an offence against this Ordinance or any regulation or Order of the Governor in Executive Council made thereunder, any Constable may without warrant stop and detain him, and if his name and address are not known to the Constable and he fails to give them to the satisfaction of the Constable, such Constable may, without warrant, apprehend him, and may, whether so stopping or detaining or apprehending the person or not, stop, detain and examine any animal, vehicle, boat or thing to which the offence or suspected offence relates, and require the same to be forthwith taken back to or into any place or district wherefrom or whereout it was unlawfully removed, and execute and enforce that requisition.

(3.) If any person obstructs or impedes a Constable in the execution of this Ordinance or of any regulation or Order of the Governor in Executive Council thereunder, or assists in any such obstructing or impeding, the Constable may without warrant apprehend the offender.

(4.) A person apprehended under this section shall be taken with all practicable speed before a magistrate to be dealt with according to law.

(5.) The foregoing provisions of this section respecting Constables extend and apply to any person called by them to their assistance.

General powers of Government Veterinary Surgeon.

16.—(1.) The Government Veterinary Surgeon may at any time enter any land or shed to which this Ordinance applies or other building or place wherein he has reasonable grounds for supposing :—

(*a*) that disease exists or has within fifty-six days existed ; or

(*b*) that the carcase of a diseased or suspected animal is or has been kept, or has been buried, destroyed or otherwise disposed of ; or

(*c*) that there is to be found any pen, place, vehicle or thing in respect whereof any person has on any occasion failed to comply with the provisions of this Ordinance, or of a regulation or Order of the Governor in Executive Council under this Ordinance ; or

(*d*.) that this Ordinance or a regulation or Order of the Governor in Executive Council under this Ordinance has not been or is not being complied with.

(2.) The Government Veterinary Surgeon may at any time enter any pen, vehicle, vessel or boat in which or in respect whereof he has reasonable grounds for supposing that this Ordinance or a regulation or Order of the Governor in Executive Council under this Ordinance has not been or is not being complied with.

(3.) The Government Veterinary Surgeon entering as hereinbefore by this section authorised shall if required by the owner or occupier or person in charge of the land, building, place, pen, vehicle, vessel or boat, state in writing his reasons for entering.

(4.) A certificate of the Government Veterinary Surgeon to the effect that an animal is or was affected with a disease specified in the certificate shall for the purposes of this Ordinance or of any regulation or Order of the Governor in Executive Council thereunder be conclusive evidence in all courts of justice of the matter certified.

Penalties for offences.

17. If any person is guilty of an offence against this Ordinance, he shall for every such offence be liable—

(*a*) to a penalty not exceeding £20; or

(*b*) if the offence is committed with respect to more than four animals, to a penalty not exceeding £5 for each animal; or

(*c*) where the offence is committed in relation to carcases, fodder, litter, dung or other thing (exclusive of animals), to a penalty not exceeding £10 in respect of every half ton in weight thereof after one half ton, in addition to the first penalty not exceeding £20.

General offences.

18. If any person without lawful authority or excuse, proof whereof shall lie on him, does any of the following things, he shall be guilty of an offence against this Ordinance:—

(*a*) if he does anything in contravention of this Ordinance or of a regulation or Order of the Governor in Executive Council under this Ordinance; or

(*b*) if, where required by this Ordinance or by a regulation or Order of the Governor in Executive Council under this Ordinance to keep an animal separate as far as practicable, or to give notice of disease with all practicable speed, he fails to do so; or

(*c*) if he fails to give, produce, observe or do any notice, license, rule or thing which by this Ordinance or by a regulation or Order of the Governor in Executive Council under this Ordinance he is required to give, produce, observe or do; or

(*d*) if he does anything which by this Ordinance or by regulation or Order of the Governor in Executive Council under this Ordinance is made or declared to be not lawful; or

(*e*) if he does or omits anything, the doing or omission whereof is declared by this Ordinance or by regulation or Order of the Governor in Executive Council under this Ordinance to be an offence by him under this Ordinance; or

(*f*) if he refuses to the Government Veterinary Surgeon or an Examiner acting in execution of this Ordinance, or of a regulation or Order of the Governor in Executive Council under this Ordinance admission to any land, building, place, vessel, pen, vehicle or boat which the Government Veterinary Surgeon or Examiner is entitled to enter or examine, or obstructs or impedes him in so entering or examining or otherwise in any respect obstructs or impedes the Government Veterinary Surgeon or an Examiner or constable or other officer in the execution of his duty, or assists in any such obstructing or impeding; or

(*g*) if he throws or places, or causes or suffers to be thrown or placed, into or in any river, stream, trench, navigation or other water, or into or in the sea within three miles of the shore, the carcase of an animal which has died of disease, or been slaughtered as diseased or suspected;

and on a further conviction within a period of twelve months for a second or subsequent offence against the same sub-section of this section he shall be liable in the discretion of the Court to be imprisoned for any term not exceeding six months, with or without hard labour, in lieu of the penalty to which he is liable under this Ordinance.

Procedure.

19. An offence under this Ordinance may be prosecuted and any penalty in respect thereof may be recovered and any fees, expenses or money made recoverable by this Ordinance or any regulation or order thereunder may be recovered before a magistrate in the manner provided by the Summary Conviction Offences (Procedure) Ordinance, 1918.

Burden of Proof.

20.—(1.) Where the owner or person in charge of an animal is charged with an offence against this Ordinance relative to disease or to any illness of the animal, he shall be presumed to have known of the existence of the disease or illness, unless and until he shows to the satisfaction of the Court that he had not knowledge thereof, and could not with reasonable diligence have obtained that knowledge.

(2.) Where a person is charged with an offence against this Ordinance in not having duly cleansed or disinfected any place, vessel, vehicle or thing belonging to him or under his charge, and a presumption against him on the part of the prosecution is raised, it shall lie on him to prove the due cleansing and disinfection thereof.

(3.) Every offence against this Ordinance shall be deemed to have been committed, and every cause of complaint or matter for summary proceeding under this Ordinance or regulation or Order of the Governor in Executive Council under this Ordinance shall be deemed to have arisen, either in any place where the same actually was committed or arose or in any place where the person charged or complained of or proceeded against happens to be at the time of the institution or commencement of the charge, complaint or proceeding.

REPEAL AND COMMENCEMENT.

Repeal.

21. The Animals Importation Ordinance (No. 153), the Contagious diseases (Animals) Ordinance (No. 154,) and the Contagious Diseases (Animals) Ordinance, 1905, are hereby repealed.

Commencement.

22. This Ordinance shall commence on a day to be fixed by the Governor by proclamation in the *Royal Gazette*.

Passed in Council this first day of November in the year of Our Lord one thousand nine hundred and eighteen.

J. M. FARFAN,
Acting Clerk of the Council.

J. R. CHANCELLOR,
Governor.

THE DISEASES OF ANIMALS ORDINANCE, 1918.

Regulations under section 12.

PART 1.

NOTICE AND PUBLICATION OF INFECTED PLACE OR AREA.

1.—(1.) When the Governor in Executive Council has declared a place to be infected with disease and prescribed the limits of the infected area, a notice in accordance with Form 1 in the schedule to these regulations shall be served on the owners and occupiers of all premises and lands to the infected area, and placards containing the wording of the notice shall be posted about the boundaries of the infected area.

(2.) When the Governor in Executive Council has declared a place to be no longer infected, a notice in accordance with Form 2 in the schedule to these regulations shall be served on the owners and occupiers of all premises and lands in the infected area, and placards containing the wording of the notice shall be posted about the boundaries of the infected area.

MOVEMENT OF ANIMALS.

2.—(1.) Animals shall not be moved, or allowed to stray, out of or into an infected place or area without an order in writing from the Government Veterinary Surgeon, except as expressly authorised by these regulations.

(2.) Any animal which is not diseased or suspected to be diseased may be moved out of an infected place or area to the nearest slaughter house for the purpose of being slaughtered forthwith or to some other premises not in the infected area, but in either case the animal must be accompanied with an order signed by the Government Veterinary Surgeon.

(3.) The occupier of an infected place shall prevent access of animals to any diseased or suspected animal or carcase or to any part of the premises which has been exposed to infection of disease from an animal or carcase.

MOVEMENT OF PERSONS.

3.—(1.) No person except the person tending the animal shall enter any field, shed or other place being part of an infected place, or area, in which a diseased or suspected animal is or has been recently kept, unless authorised in writing by the Government Veterinary Surgeon.

(2.) Every person upon leaving any such field, shed or other place shall thoroughly wash his hands with soap and water and disinfect his boots and clothes when the Government Veterinary Surgeon so orders.

(3.) A person tending a diseased or suspected animal shall not tend any animal not so diseased or suspected, except with the permission of the Government Veterinary Surgeon.

Movement of Carcases, Dung, Litter, Fodder, Etc.

4. No carcase, dung, litter, fodder, utensils, pens, hurdles, or other things shall be removed from an infected place or area except with the permission in writing of the Government Veterinary Surgeon.

Disposal of Carcases, Dung, Litter, Fodder, Etc.

5. A diseased carcase or the carcase of any diseased animal slaughtered by order of the Governor in Executive Council shall be disposed of as follows:

(1.) The carcase shall be destroyed by exposure to a high temperature upon the farm or premises upon which the carcase is or at the nearest suitable place for the purpose.

(2.) The carcase shall be disinfected and shall then be taken to the Detention Station and shall there be destroyed by exposure to a high temperature or by chemical agents.

(3.) When the circumstances do not permit of the disposal of the carcase by either of the foregoing methods the Government Veterinary Surgeon shall cause the carcase to be buried as soon as possible in its skin in some convenient or suitable place to which animals shall not have access, and which is removed from any dwelling house and at such a distance from any well or watercourse as will preclude any risk of the contamination of the water therein, the carcase being buried at a depth of not less than six feet below the surface of the earth and with a layer of lime not less than one foot deep below and above it. Where possible the place shall be the farm or premises upon which the animal died or was slaughtered.

(4.) In the case of Anthrax, before a carcase is moved for burial or destruction under this regulation, all the natural openings thereof shall be effectually plugged with tow or some suitable material soaked in a saturated solution of carbolic acid or other disinfectant equal in disinfective efficiency. In no case shall the skin or the carcase be cut nor shall anything be done to cause the effusion of blood except by the Government Veterinary Surgeon, and so far only as may be necessary for the purpose of microscopical or cultural examination.

(5.) The Government Veterinary Surgeon shall cause all dung, litter, fodder and other matter to be well mixed with quicklime and to be effectually removed from all animals or to be burnt or destroyed when it appears to him to be likely to spread disease.

Cleansing and Disinfection.

6. The Government Veterinary Surgeon whenever he considers it necessary shall cause to be cleansed and disinfected under his own directions or those of a competent person to be named by him, and in the mode provided by these Regulations:

(*a*.) All those parts of any shed, stable, building, field or other place in which a diseased animal has died or been slaughtered or has

been kept at the date of such death or slaughter, or any other shed, stable, building, field or other place in an infected place or area ;

(*b.*) Every utensil, pen, hurdle or other thing used for or about any diseased animal or carcase or any hurdle or thing aforesaid in any infected place or area ;

(*c.*) Every vessel, truck, van, cart, or other vehicle used for carrying any diseased animal or carcase or any vessel, truck, van or vehicle as aforesaid in any infected place or area.

Digging Up.

7. It shall not be lawful for any person, except with the permission of the Government Veterinary Surgeon, to dig up or cause to be dug up the carcase of any animal that has been buried, whether under these regulations or otherwise.

Holding of Markets, Sales of Animals, etc., in an Infected Area.

8.—(1.) No markets, exhibitions or sales of animals shall be held in an infected area except with the permission of the Governor in Executive Council.

(2.) Any market, exhibition or sale of animals held in an infected area may by order of the Governor in Executive Council be limited to animals intended for slaughter.

Prohibition of Exposure or Movement of Diseased and Suspected Animals.

9.—(1.) It shall not be lawful for any person :

(*a*) to expose a diseased or suspected animal in a market or a fair or in a sale yard or other public or private place where animals are commonly exposed for sale ; or

(*b*) to place a diseased or suspected animal in a lair or other place adjacent to or connected with a market or a fair or any place where animals are commonly placed before exposure for sale ; or

(*c*) to send or carry or cause to be sent or carried a diseased or suspected animal on a railway, river or inland navigation or in a coasting vessel ; or

(*d*) to carry, lead or drive or cause to be carried, led, or driven a diseased or suspected animal on a highway or thoroughfare ; or

(*e*) to place or keep a diseased or suspected animal on common or uninclosed land or in a field or place insufficiently fenced or in a field adjoining a highway, unless that field is so fenced or situate that animals therein cannot in any manner come in contact with animals passing along that highway or grazing on the sides thereof ; or

(*f*) to graze a diseased or suspected animal on pasture being on the side of a highway ; or

(*g*) to allow a diseased or suspected animal to stray on a highway or thoroughfare or on the sides thereof or to be on common or uninclosed land or in a field or place insufficiently fenced.

(2.) Notwithstanding anything in these Regulations, an animal exposed or otherwise dealt with in contravention of this regulation may be moved by order and under the direction of the Government Veterinary Surgeon to some convenient and isolated place.

Process of Seizure, &c.

10.—(1.) When in contravention of the last preceding section of these Regulations a diseased or suspected animal is exposed, driven, carried, kept or otherwise dealt with, in or on any market, fair, ground, sale yard, place of exhibition, lair, railway station, coasting vessel, common or uninclosed land, field, yard, farm yard or other place, the following provisions shall apply :—

(*a.*) The Government Veterinary Surgeon shall cause to be seized the diseased or suspected animal and also all animals in or on the market, fair, sale yard or other place as aforesaid which in his opinion have been exposed to infection by contact with the diseased or suspected animal ;

(*b.*) The Government Veterinary Surgeon shall cause all animals so seized to be moved to some convenient premises for such detention and isolation as he considers necessary ;

(*c.*) The Government Veterinary Surgeon shall cause as far as practicable all diseased or suspected animals to be kept separate during such movement and detention from animals not diseased or suspected ;

(*d.*) The Government Veterinary Surgeon shall serve a notice signed by him of the existence of disease on the owner of the premises to which the diseased, suspected, or incontact animals have been moved, and thereupon those premises shall become an infected place subject to the determination of the Governor in Executive Council ;

(*e.*) Any market, fair, sale yard, place of exhibition, railway station, vessel, common unenclosed land, field, yard, sty, farm yard or other such places shall not be used or be permitted to be used for animals by any market authority or the owner or the occupier of any such place until that portion of the market or other place aforesaid mentioned where the diseased or suspected animal was found has been as far as practicable cleansed and disinfected and a certificate to that effect has been given by the Government Veterinary Surgeon.

Food and Water during Detention.

11. The Government Veterinary Surgeon detaining any animal under these regulations shall cause it to be supplied with requisite food and water during its detention ; and the expenses incurred by him in respect thereof may be recovered from the person having charge of the animal or from its owner in any court of competent jurisdiction.

Marking of Animals.

12. In the case of any outbreak of disease, animals moved into or out of an infected place or area, shall, whenever the Government Veterinary

Surgeon so orders, be marked in such manner as specified by the Government Veterinary Surgeon, and the marking shall be at the expense of the owner.

Circulation of Notices.

13. The Department of Agriculture shall be responsible for the circulation of all notices and for the posting of all placards in accordance with these regulations.

Restriction on use of Vessels, Vehicles, &c.

14. The Government Veterinary Surgeon may absolutely or conditionally prohibit the use, for the carrying of animals or for any purpose connected therewith, of a vessel, vehicle, or pen or other place in respect whereof, or of the use whereof a penalty has been recovered from any person for an offence against the Diseases of Animals Ordinance, 1918, or these regulations.

Prescribed Method of Cleansing and Disinfection.

15.—(1.) The place or thing shall be, if the nature thereof so permits, be scraped and where necessary swept, and the scrapings, sweepings and all dung, sawdust, litter and other matter shall be effectually removed therefrom.

(2.) The place or thing or the part thereof required to be cleansed and disinfected shall be thoroughly washed with

(*a*) a 1 per cent. (minimum) solution of chloride of lime (containing not less than 30 per cent. available chlorine), or

(*b*) a 5 per cent. (minimum) solution of carbolic acid (containing not less than 95 per cent. solution of actual carbolic acid) followed by a thorough sprinkling with lime wash, or

(*c*) a disinfectant equal in disinfective efficiency to the above mentioned solution of carbolic acid followed by a thorough sprinkling with limewash.

(3.) The scrapings and sweepings and the dung, sawdust, litter and the matter removed under this regulation shall be burnt or otherwise destroyed or if destruction is not practicable be well mixed with quicklime and effectually removed from all animals.

Fees.

16. In the case of an outbreak of disease the Government Veterinary Surgeon shall use any Anti-serum, Vaccine, Antitoxin, Bacterial Filtrate or carry out any microscopical examination of blood, milk, skin scrapings or any other thing, when in his opinion, the use of the aforesaid mentioned preparations or the microscopical examination of such things are necessary in order to stop the spread of disease, and the following fees shall be paid to him by the owner of the animal:—

	s.	d.
For each dose of Mallein	4	0
,, ,, Tuberculin	4	0
,, ,, Anti-serum, Antitoxin, and Vaccine in all animals except sheep, pigs and goats...	5	0
,, ,, Anti-serum, &c., in sheep, pigs and goats	3	0
For Bacteriological work, examination of milk, &c. ...	5	0

Fees recovered in Court of Competent Jurisdiction.

17. All fees and all expenses for destruction of carcases and disinfection carried out under these regulations, shall be recoverable by action in any court of competent jurisdiction.

PART II.—(TRANSIT AND GENERAL).

Regulations under section 12, sub-sections (21)-(24).

Food and Water During Voyage.

1. Animals carried in a vessel coming into or going out of any port of the Colony for a voyage which on an average takes more than twenty-four hours shall be provided while on board with a sufficient amount of suitable food and water, and proper accommodation shall be provided on board for the storage of the food so that the same shall not be unduly exposed to the weather at sea.

Ventilation.

2. All parts of a vessel in which animals are carried shall be sufficiently and suitably ventilated. All such parts if below deck shall in addition to any ventilation obtained by means of the hatchways be provided with sufficient and suitable ventilators for the removal of foul air and for the admission of a proper supply of fresh air to the animals carried.

Separation of Mixed Consignments.

3. Calves, sheep, goats and swine if carried in the same pen with any head of cattle (other than a calf) or a horse, ass or mule shall be separated therefrom by a suitable partition, but this provision shall not apply to the consignee of a cow with its unweaned calf if they are separated from other animals.

Overcrowding.

4. The vessel shall not be overcrowded in any part or pen so as to cause injury or unnecessary suffering to the animals thereon.

Securing of Cattle.

5. All cattle shall while being carried on a vessel be securely tied by the head or neck.

Injured Animals.

6. If any animal on a vessel has a limb broken or is otherwise seriously injured, the master of the vessel shall forthwith cause that animal to be slaughtered unless he is satisfied that it can be kept alive and led away without cruelty. The person in charge of the animal shall forthwith report the injury to the master of the vessel.

Provision to be made at Unshipping Place.

7. At every place where animals are landed from vessels, provision shall be made to the satisfaction of the Government Veterinary Surgeon for the speedy and convenient landing of the animals and for a supply of water and food for them as soon as possible after landing.

Securing of Cattle in Railway Trucks.

8.—(1.) All bulls, whether polled or not, shall while being carried in a railway truck or other railway vehicle be securely tied by the head or neck.

(2) All horned stock carried in the same railway truck or other railway vehicle with a bull shall, unless separated therefrom by a suitable partition, be securely tied by the head or neck.

Carriage by Railway of Unfit Animals.

9. No animal shall be permitted by the owner thereof or his agent or any person in charge thereof to be carried by railway if owing to infirmity, illness, injury, fatigue or any other cause it cannot be carried without unnecessary suffering during the intended transit by railway.

Cows in Calf.

10. No cow shall be permitted by the owner thereof or his agent or any person in charge thereof to be carried by railway if the calving of the cow during the transit by railway is reasonably probable.

Separation of Mixed Consignments.

11. Calves, sheep, goats and swine if carried in the same railway truck or other railway vehicle with any head of cattle (other than a calf) or a horse, ass, or mule, shall be separated therefrom by a suitable partition, but this provision shall not apply to the conveyance of a cow with its unweaned calf, if they are separated from other animals.

SCHEDULE.

Form 1.

I hereby declare, in accordance with the Diseases of Animals Ordinance, No. 21 of 1918, under which this Notice is given, that owing to an outbreak of at situated in is an infected place and I hereby declare the following area to be an infected area, that is to say The movement of persons and animals, carcases, fodder, litter, dung, utensils and any such thing out of and into the said area shall be subject to the said Ordinance and the regulations made thereunder.

Date. Governor.

Form 2.

I hereby declare, in accordance with the Diseases of Animals Ordinance, No. 21 of 1918, under which this Notice is given, that the situated is no longer an infected place and the following area, that is to say is no longer an infected area, and the said Ordinance and the regulations made thereunder no longer apply to the said place and area.

Governor.

Made by the Governor in Executive Council this 12th day of May, 1921.

H. L. KNAGGS,
Clerk of the Council.

DISEASES OF ANIMALS ORDINANCE, 1918.

Regulations under Section 14.

PORTS FOR LANDING FOREIGN ANIMALS.

1. Foreign animals shall be landed at the following ports on arrival in this Colony:—

Port-of-Spain,

San Fernando,

Scarborough.

Foreign animals may not be landed at other ports except by special permission of the Governor on the recommendation of the Government Veterinary Surgeon through the Director of Agriculture.

LIMITS OF PORTS.

2.—(1.) The Port of Port-of-Spain shall be such part of the Gulf of Paria as is confined within a radius of three miles from the Customs House of Port-of-Spain.

(2.) The Port of San Fernando shall be such part of the Gulf of Paria as is confined within a radius of one and a quarter miles from the Customs House of San Fernando.

(3.) The Port of Scarborough shall be such part of Rockly Bay as is confined within a radius of one mile from the Customs House of Scarborough.

PARTS OF PORTS.

3.—(1.) The Port of Port-of-Spain shall be divided into the following parts for the purpose of these Regulations:—

(*a.*) Customs House.

(*b.*) Queen's Wharf.

(*c.*) St. Vincent Wharf.

(*d.*) The Landing Stage at Sea Lots attached to the Detention Station.

(*e.*) Any Quarantine Station used for Detention of Foreign Animals in Port-of-Spain.

(*f.*) The part of the Gulf of Paria included in the Port.

(2.) The Port of San Fernando shall be divided into the following parts for the purpose of these Regulations:—

(*a.*) San Fernando Wharf.

(*b.*) Any Quarantine Station used for Detention of Animals at San Fernando.

(*c.*) The part of the Gulf of Paria included in the Port.

(3.) The Port of Scarborough shall be divided into the following parts for the purpose of these Regulations:—

(*a.*) The Wharf of Scarborough.

(*b.*) Any Quarantine Station used for the detention of Animals in Scarborough.

(*c.*) The part of Rockly Bay included in the Port.

Inspection of Foreign Animals.

4. No foreign animal shall be landed or water borne for the purpose of being landed until such animal shall have been inspected by an Examiner of Animals.

Return by Master of Vessel.

5. The master of every vessel in which any animal shall be imported into this Colony shall deliver to the Examiner of Animals a return according to the Form A in the Schedule to these regulations, to be signed by such master, stating the name of the vessel, and her owner, the port of shipment, the number and description of Animals shipped on board of such vessel at such a port, the number and description of animals to be landed, the consignee or importer of such animals, the day of departure of vessel from such port of shipment, the port or ports, if any, at which such vessel may have entered or called during her voyage, the number and description of animals, if any, landed at every such port, the number of animals which may have died or been destroyed during the voyage, the day of the same being so lost or destroyed, and the cause of such loss or destruction of every such animal; and the Examiner of Animals shall keep all such Returns.

Certificate of Non-Infection.

6. If the Examiner shall on such inspection be satisfied that all the animals on board of such vessel are not infected with or labouring under disease he shall grant to the Master a certificate to that effect according to the Form B in the Schedule to these Regulations, and thereupon it shall be lawful to land the animals mentioned at the place mentioned in the Certificate.

Infected Animals and Incontacts.

7.—(1.) If the Examiner of Animals shall be of opinion that any foreign animal is labouring under or infected by disease he shall, if he shall see fit, make an order according to the Form C in the Schedule to these regulations, to be delivered to the master of such vessel, that such animal shall be destroyed.

(2.) It shall be lawful for the Examiner in any case if he shall see fit, to make an order according to the Form D in the schedule to these regulations, to be delivered to the master, that all animals on board of such vessel except such as the Examiner may have ordered or may order to be destroyed, shall be detained until the Examiner shall make order for their discharge, and such animals shall be detained on board of such vessel or may at the option of the master be landed at such wharf or quay and be detained at such place, as shall be allowed by such Examiner, to be named in such order.

Foreign Animals, during Detention.

8.—(1.) All animals so ordered to be detained shall during the time of their detention be subject to the inspection of the Examiner of Animals, and the Examiner may from time to time make order in writing according to Form C in the Schedule to these regulations to be delivered to the consignee that any animal so detained be destroyed.

(2.) In order to diagnose glanders in equidæ (horses, asses and mules), tuberculosis in cattle, tuberculosis of the udder in cows, sheep scab in sheep, and surra in equidæ (horses, asses and mules) the Government Veterinary Surgeon shall carry out tests when he considers it necessary, and the fees for such tests shall be as prescribed in these regulations and be payable to the Government Veterinary Surgeon by the consignee or importer of the animals.

(3.) The carcase of an animal that has died from anthrax or is suspected to have died from this disease during detention shall not be eviscerated until the examination of a blood smear from a vein of the external ear in the case of ruminants and of a smear of blood from a vein of the external ear or a smear from the gelatinous exudate about the throat in horses and pigs shall have been examined by the Government Veterinary Surgeon.

If such a diagnosis is positive the carcase shall be destroyed forthwith.

(4.) In order to stop the spread of disease during the detention of foreign animals the Government Veterinary Surgeon, may, when he considers this measure necessary, carry out methods of immunization in all animals that have been in contact with diseased animals. Fees as prescribed by these regulations for each dose of Anti-serum, Anti-Toxin, Bacterial filtrate or Vaccine shall be paid to the Government Veterinary Surgeon by the owner of the animals immunized.

(5.) Any medicines supplied by the Government or the City or Borough Council for the treatment of any animal under orders of the Examiner of Animals during detention shall be paid for by the owner of the animal at the rates specified in Government or Corporation contracts for the supply of such medicines to these authorities, or in the absence of any such contract at the current local prices of such medicines.

(6.) If the Examiner shall be satisfied that no foreign animal so detained has shown symptoms of disease during such period as he considers fit, he shall at the request of the owner of such animal grant a certificate to that effect, hereinafter called "A certificate of freedom from Disease" according to the Form E in the Schedule to these regulations, and thereupon such animals may be disposed of in such manner as the owner shall see fit.

Animals not being Foreign Animals.

9.—(1.) An animal not being a foreign animal may be landed at any of the aforesaid ports, with the exception of the landing stage attached to the Detention Station at Sea Lots, without being examined by an Examiner of Animals, and on landing may be disposed of in such a manner as the owner shall see fit.

(2.) An animal not being a foreign animal that has been in contact with a foreign animal or a carcase, or any dung, fodder, litter, fittings, pens, hurdles or any other thing landed at any of the said ports or moved away from such ports in contravention of these regulations shall for the purposes of these regulations be deemed to be a foreign animal and be dealt with in accordance with the orders of the Examiner of Animals.

(3.) In the case of an outbreak of disease among animals not being foreign animals arriving at any of the said ports, the Master shall notify the Harbour Authorities for the information of the Examiner of Animals, of the said outbreak of disease, and such animals may at the discretion of the Examiner of Animals be treated as Foreign Animals.

Evidence of Outbreak of Disease shall be sudden death of one or more of the animals—exception to be made in the case of accidents or sudden appearance of abnormalities in the habits of a third or more of the number of animals during the voyage or after the arrival of the vessel at a port.

PROHIBITION OF LANDING AND MOVING CARCASES, ETC., AND THE SEIZURE OF CARCASES, ETC.

10.- (1.) It shall not be lawful to land :

(*a*) A carcase of an animal which has died or been slaughtered on board a vessel while in port or during the voyage, or

(*b*) the dung, of any such animal, or

(*c*) any partly consumed or broken fodder that has been supplied to any such animal,

(*d*) any litter that has been supplied to any such animal, or

(*e*) any fittings, pens, hurdles, or utensils used for or about any such animals, unless they have been scraped and then thoroughly washed or scrubbed or scoured with water and subsequently disinfected in the manner prescribed in these regulations, unless the permission of the Examiner of Animals has been obtained.

(2.) It shall not be lawful to move about or out of any wharf or quay, landing stage, etc.

(*a*) the carcase of an animal that has died at any such part of a port.

(*b*) any offal, pen, horse-box, fodder, litter, dung, or manure belonging to such animal except with the permission of the Examiner of Animals.

All dung and manure shall before being so removed be disinfected to the satisfaction of the Examiner of Animals.

If the Examiner of Animals is of opinion that any carcase or thing as aforesaid may introduce disease, the same shall be destroyed or otherwise dealt with in accordance with the instructions of the Examiner of Animals.

(3.) The Collector of Customs, Porth Health Authorities, and City or Borough Council may seize and detain any carcase, dung, fodder, litter, fittings, pen, hurdles or utensils landed or moved about or out of any port in contravention of these regulations.

Any carcase or thing as aforesaid so seized shall be dealt with in accordance with the instruction of the Examiner of Animals.

Restriction on Access to Foreign Animals' Wharf.

11.—(1.) The Examiner of Animals shall direct the landing of foreign animals whenever he considers this measure necessary, and during the landing of foreign animals he may when he thinks fit allow only Customs Officers, Harbour Authorities, Port Health Officials, Officers of the City or Borough Council, lairagemen, persons employed in handling foreign animals on landing vessels and such other persons as may be specially authorised by him to be present, to be on any wharf, quay or landing place during the landing of such animals.

(2.) No persons other than those mentioned in this regulation shall when the Examiner so orders, assist to move about or out of any part of a port any foreign animals.

Disinfection.

12.—(*a*) The Examiner of Animals shall when he considers such a measure necessary, give orders to all such officials and other persons as aforesaid to disinfect themselves and their clothes in a manner specified in such order, and thereupon every such person shall disinfect himself and his clothes accordingly.

(*b*.) Any person other than those authorised to be present during the landing of foreign animals at any landing place or any one who moves or assists in the moving of animals in contravention of these regulations about or out of any port shall disinfect himself and his clothes in accordance with the Examiner of Animals' orders.

(2.) The Examiner of Animals may, when he considers such a measure necessary in order to stop the spread of disease, give orders that

(*a*) such parts, as he considers necessary, of any vessel that has come to a port with foreign animals, after the unloading of such animals, or

(*b*) any barge, boat or other landing vessels,

(*c*) any horse box or pen that has been occupied by animals,

(*d*) any landing bridge or other apparatus used for landing of vessels

shall be scraped and swept and then thoroughly washed or scrubbed or scoured with water and subsequently disinfected in the manner prescribed in these regulations.

(3.) All dung from any part of such vessel or landing vessel or barge or boat or horse-box or pen or anything used for or assisting in the landing of animals shall be mixed with quick lime and thereafter be destroyed with fire or be disposed of as the Examiner orders.

(4.) The Examiner of Animals may give notice in writing to Port Health Authorities, City or Borough Councils or Managers of any Quarantine Station forming part of any port requiring the cleansing and disinfection of any Wharf, Quay, Landing Stage or Detention Station, and when that notice shall have been given, that part of the Wharf, Quay, Landing Stage or Detention Station shall not be used for animals unless and until it has been cleaned and disinfected to the satisfaction of the Examiner of Animals.

Restriction of use of Landing Vessel.

13. All boats, barges or any other waterborne vehicle used for landing of animals shall not be used for any other purpose during the time of its being so appropriated when the Examiner of Animals considers this measure necessary.

Removal of Fittings, Hurdles, Pens, etc., from Foreign Animals' Wharf.

14.—(1.) The Examiner of Animals may, when he considers it necessary, issue orders that no fittings, hurdles, pens or utensils that have been used for or about animals and which have been landed from a vessel at a Foreign Animals' Wharf shall not be removed from such wharf unless they have been scraped and subsequently disinfected in the manner prescribed by these regulations and unless the permission of the Examiner of Animals for the removal thereof has been obtained.

(2.) If the Examiner is of opinion that any such thing as aforesaid mentioned may introduce disease, the same shall be destroyed or dealt with in accordance with the orders of the Examiner of Animals.

Method of Disinfection.

15.—(1.) The place or thing or the part thereof required to be disinfected shall be thoroughly washed with

(*a*) a one per cent. (minimum) solution of chloride of lime (containing not less than 30 per cent. available chloride), or

(*b*) a five per cent. (minimum) solution of carbolic acid (containing not less than 95 per cent. of actual carbolic acid) followed by a thorough sprinkling with limewash, or

(*c*) a disinfectant equal in disinfective efficiency to the above mentioned solution of carbolic acid followed by a thorough sprinkling with limewash.

(2.) The application of limewash shall not be compulsory as regards such parts of a vessel as are used for passengers or the crew.

Method of Destruction of Carcases.

16.—(1.) Any animal for the destruction whereof any order may be made shall be destroyed in such manner as the Examiner of Animals shall direct, and the carcase of every animal so destroyed or the carcase of any foreign animal that has died within any part of a port shall be disposed of in the following manner:

(*a*) in the case of a carcase on board of a ship, the carcase shall be taken out to sea and sunk at a distance of not less than five miles from the nearest part of the shore of the Colony.

(*b*) in the case of a carcase on a wharf, quay, landing stage or detention station, it shall be buried at a depth of six feet or burnt in accordance with the instructions of the Examiner of Animals.

A.—Fees.

17. Importation of Foreign Animals :—

	£	s.	d.
1. On first inspection—			
For every horse or mule		3	0
For every ass, bull, cow, ox, calf or dog... ...		1	0
For every pig, sheep, goat, deer			3
2. For a certificate of Non-Infection—			
(*a*) in the case of a vessel in which any horse, ass, mule, bull, cow or ox is imported, if not more than 5 animals are imported		5	0
If more than 5 animals are imported ...		10	0
(*b*) in the case of a vessel in which no horse, ass, mule, bull, cow or ox is imported, if not more than 5 animals		2	0
If more than 5		4	0
3. For every day on which animals in detention (other than dogs) shall be visited by the Examiner ...		10	0
4. For Examiner's visit to a dog in detention (to be paid on landing)		10	0
5. For certificate of freedom from disease after detention for animals (other than dogs) ...	1	0	0

The above fees shall be paid to the Collector of Customs with the exception of Nos. 3 and 5, which shall be paid to the Examiner of Animals.

B.—Overtime Fees.

The official hours of Inspection of Foreign Animals arriving in any port will be between :—

9 a.m. and 4 p.m. on week days.
9 a.m. and 1 p.m. on Saturdays.

The following overtime fees shall be paid to the Examiner of Animals by the consignee or importer of foreign animals.

	$ c.
Between sunrise and 9 a.m.	5.00
Between 4 p.m. and 7 p.m.	5.00
Between 7 p.m. and sunrise	10.00
On Saturdays between 1 p.m. and 7 p.m.	5.00
On Sundays and Bank Holidays between sunrise and 12 noon	5.00
From 12 noon onwards	10.00

C.—Fees for Mallein, Tuberculin or the use of Anti-Serum, Vaccine, Anti-Toxin, or Bacterial Filtrate, or Microscopic Examination of Blood, &c.

	s.	d.
For each dose of Mallein	4	0
,, Tuberculin	4	0
For each dose of Anti-serum, anti-toxin, vaccine, Bacterial filtrate, &c., in all animals except sheep, goats and swine	5	0
For sheep, goats and swine	3	0
For Bacteriological Examination of any blood smears, &c. ...	5	0

D.—Expenses.

All expenses which the Examiner shall certify to be reasonable, incurred in destroying any animal or carcase or hurdles or anything mentioned in these regulations and all expenses incurred in disinfecting any ship, landing vessel or wharf and for disinfecting any apparatus used for landing animals shall be paid by the owner of the animal or carcase or thing aforesaid which has been destroyed or the owner of the animal which has been the cause of such disinfection as the Examiner has ordered to be carried out, to the Port Health Authority, the Corporation or any other Authority or person who has carried out the destruction of the animal or the carcase or hurdle or thing aforesaid or who has carried out the disinfection under the instructions of the Examiner of Animals, when the Examiner of Animals considers it necessary.

General Power of Detention.

18. If it appears to the Collector of Customs with respect to any foreign animal, or with respect to any foreign carcase, fodder, litter, dung or other thing that disease may be thereby introduced, he may seize and detain the same, and he shall forthwith notify the facts to the Examiner of Animals, who may give such directions as he thinks fit either for the slaughter or destruction or the further detention thereof or for the delivery thereof to the owner on such conditions, if any, (including payment by the owner of expenses incurred in respect of detention thereof) as he thinks fit.

Examiners who are not Qualified Veterinary Surgeons.

19. Any Examiner of Animals not being a qualified Veterinary Surgeon shall report to the Director of Agriculture for the information of the Government Veterinary Surgeon whatever steps he shall have taken to check the introduction of disease at any port owing to the arrival of foreign animals that in his opinion are diseased or suspected to be so.

Recovery of Fees and Expenses.

20. All fees and expenses authorized by these regulations may be recovered by action in any court of competent jurisdiction.

SCHEDULE.

Form A.

Return to be made by Master of Vessel.

Name of Vessel.....

Name of Owner .. ..

Name of Master .. ..

Name of Consignee or Importer of Animals.....

Port of Shipment... .....

Day of departure of vessel from port of shipment.....

Number and description of Animals shipped at port of shipment.....

Name of port or ports touched at during voyage... .....

Number and description of Animals landed at any port so touched at } .....

Number of Animals lost or destroyed during voyage and cause and time of loss or destruction } .....

Number and description of Animals to be landed.....

Date..... .....

.....

Master.

FORM B.

Certificate of Non-Infection, allowing Animals to be landed.

I..... .....hereby certify that I have on the.....day of ..... inspected.....on board of the..... (..... master) imported from.....and that the same are not infected with or labouring under disease and I permit the same to be landed at..... .....

Date..... .....

Examiner of Animals.

FORM C.

Order for Destruction.

I.....hereby order that the animals hereinafter described, that is to say (*state number and description*) being certain of the animals imported in the ..... (.....master) be forthwith destroyed by (*state mode of destruction*) and that the carcase shall be disposed of as follows (*state method*).

Date..... .....

Examiner of Animals.

FORM D.

Order of Detention.

I.....hereby order that the animals hereinafter described imported in the..... (.....master) (with the exception of. ..... which I have ordered or hereby order to be destroyed) be detained until I make order for their discharge (*and if the master shall elect to land the animals, proceed as follows*): and at the request of the said master I do hereby allow the said animals to be landed at (*state wharf, quay, or other place*) and detain at (*describe the place where they are to be detained*).

Date..... .....

Examiner of Animals.

FORM E.

Certificate of Freedom from Disease.

I.....hereby certify that the following animals imported in the ..... (..... .....master) and which by my order of the..... day of.....were ordered to be detained and have been detained in (describe the place of detention) allotted by me as a place of detention, are not infected by disease and that there is no longer any fear of infection from same.

Date..... .....

Examiner of Animals.

Made by the Governor in Executive Council this 12th day of May, 1921.

H. KNAGGS,
Clerk of the Council.

(M.P. 2134/1918).

ROTATION SCHEME FOR A SMALL HOLDING.

By Captain A. H. Reid,
Agricultural Pupil. Ex-officers Training Scheme.

It has been conclusively proved in many countries that the intensive system of *petit culture* not only pays but pays handsomely and therefore when the excellent outlet for vegetable produce which exists in Port-of-Spain is taken into account there is no reason why this system should not also succeed in Trinidad.

A proper rotation of crops, combined with close tillage and a good manurial system, should so stimulate the natural fecundity of the soil that more produce should be obtained from a small holding managed upon intensive lines than from a far greater area cultivated upon the old haphazard principles. The results obtained from intensive culture by Messrs. J. de Verteuil and L. A. Brunton at St. Augustine Experiment Station and by the Revd. H. H. Morton at Tunapuna are more than encouraging and go far toward proving the practicability of the scheme under review.

Let us then imagine a small holding of nine acres, eight of which are under cultivation, while upon the remaining acre is erected the necessary buildings—stable, piggeries, fowl houses and shed. The cultivated land is divided into four plots of two acres each which are tilled according to the Rotation Table. This allows for a rotation of five crops in two years together with periods of rest during which the live stock is run upon the land enriching it by their presence.

At certain times the live stock is necessarily confined to the central or home enclosure but proper provision is made for collecting and preserving the manure produced at these periods for use in due season upon the land.

Among the items appearing under the heading of "Dead Stock" in the Financial Estimate is "Posts and Netting." Sufficient of this material should be provided to enclose two of the two acre plots so that the live stock can be run upon the land at the times indicated by the rotation scheme without inflicting possible injury to the rest of the cultivation. Pig manure is a valuable plant food especially in a country where farm or pen manure is so scarce, while the fowl droppings collected from the houses form one of the most powerful soil stimulants known. In fact it is so rich that it has to be mixed with a considerable quantity of loam before it can be used to the best advantage.

It is vital therefore to the success of the scheme that a sufficient number of live stock should be kept—certain of the crops are fed to them and their value is recovered through manure; any profit arising direct from the live stock is best regarded as incidental as the sole reason for keeping stock is manurial.

The soil of the holding should primarily be well broken up by deep ploughing—going over the ground two or three times at short intervals should be enough. Afterwards the tillage can be effectively and economically performed by one of the "Planet Cultivators" which are so useful for this class of work. The cultivator would be drawn by the mule which is provided for.

It is more than probable that after treatment of the soil in this fashion for two or three years the quantity of produce will shew a marked increase owing to the fact that the land is getting into better heart, while the quality of the vegetables should also tend to improve under this treatment combined with careful selection. Labour of course will be a heavy item—good men at good wages should alone be employed regularly. Possibly four men and a working foreman will prove sufficient with perhaps some extra help at seasonal times.

The location of the land is important, a good easily tilled site should be selected with a nice rich soil, easy of access and not too far from the market and if possible adjoining a river or other suitable water supply so that irrigation can be undertaken in a dry season.

The cost of starting such a venture may seem high; intensive cultivation is expensive but its returns are correspondingly high. It must not be thought however that this scheme provides a certain and pleasant path to prosperity, for it does not. Close application and personal supervision are required, there is the unknown factor of weather, the possibility of plant disease, market variations and a hundred and one other things to be considered, but with industry and ordinary fortune it should be possible to carry on at a substantial profit. And it should never be forgotten that the best dressing for any land whether in Trinidad or elsewhere is the human brain—properly applied.

ROTATION SCHEME.

	Plot "A" (2 Acres).		Plot "B" (2 Acres).		Plot "C" (2 Acres).		Plot "D" (2 Acres).	
	Crop.	Manure.	Crop.	Manure.	Crop.	Manure.	Crop.	Manure.
May ...	Yams ...	Artificial ...	Yams ...	Artificial ...	...	Fowls on land ...	...	Pigs on land.
June ...	Do. ...	...	do. ...	...	French Beans ...	...	Cabbage. Lettuce between rows.	...
July ...	Do. ...	...	do. ...	...	do. ...	...	do. ...	...
August ...	Do. ...	...	do. ...	...	do. ...	...	Black Eye peas	Droppings from Fowl pens.
September ...	Do. ...	...	do. ...	...	... ...	Fowls on land. Pen Manure (Pig)	do. ...	...
October ...	Do. ...	...	do. ...	...	Corn ...	...	do. ..	...
November ...	Do. ...	...	do. ...	...	do. ..	...	...	Fowls on land. Pen Manure (Pig)
December ...	Do. ...	...	do. ...	...	Corn. Cow Peas between rows.	...	Corn ...	...
January ...	Lifting Crop, &c.	Fowls on land. Pen Manure (Pig)	Lifting Crop, &c.	Pigs on land. Droppings from Fowl pens.	Corn ...	...	do. ...	...
February ...	Tomato. Radish, Turnip or Lettuce between rows.	...	Tomato. Radish, Turnip or Lettuce between rows.	...	...	Pigs feeding off Cow peas.	Corn. Cow peas between rows.	...
March ...	Do. ...	...	do. ...	...	Cabbage. Lettuce between rows.	...	Corn ...	...
April ...	Do. ...	...	do. ...	...	do. ...	...	...	Pigs feeding off Cow peas.
	Here follows "C" and "D" rotation.				Here follows "A" and "B" rotation.			

ESTIMATE OF PRODUCTION AND PROFIT.

Crop.	Acreage.	Estimated Yield.	Selling Price.	Total Value.	Cost of Production. Labour, Artificial Manure, &c.	Profit.	Remarks.
Yams ...	4	100,000 lb.	3c.	$ 3,000.00	$ 1,250.00	$ 1,750.00	See St. Augustine Experiments for data.
Tomatoes ...	4	70,000 lb.	6c.	4,200.00	1,500.00	2,700.00	The proper cultivation of this crop needs much labour and is therefore expensive. Tomatoes are usually valued at 12 cts. per lb. See Morton's Experiment for data.
Cabbage ..	4	10,000 head	12c. each	1,200.00	400.00	800.00	Cabbage usually sell for 24 cents each, retail.
French Beans..	2	10,000 lb.	4c.	400.00	200.00	200.00	This crop commands a ready sale.
Black Eye Peas	2	10,000 lb.	4c.	400.00	200.00	200.00	
Catch Crops Radish Turnips, Lettuce, &c.	8	20,000 lb.	4c.	800.00	200.00	600.00	Much incidental labour to these crops is performed during the cultivation of the main crop (See Rotation Scheme) and is necessarily charged to the main crop.
Corn ...	4	...	...	...	200 00		Corn and Cow peas are fed to stock and the value is recovered through manure (See Rotation Scheme) the value of which is hard to estimate but is a vital factor.
Cow Peas ...	4	...	...	...	100.00		
Pigs ...	...	50	$15	750.00	240.00	257.00	Pigs and Poultry are raised chiefly for their manurial value and monies arising from their sale are best considered as by products.
Fowls ... and	...	100 birds	$1				The mule used in cultivation is fed free from crops but his work and manure are not charged for.
Eggs ...	...	300 doz. eggs	24c. doz.	172.00	125.00		
				$10,922.00	$4,415.00	$6,507.00	Deduct ½ profit for unforeseen contingencies, bad seasons, etc., and a net profit of $3,253.50 remains.

ESTIMATE OF CAPITAL REQUIRED.

		$ c.
Live Stock	100 Fowls at $1	100.00
	25 Pigs at $20	500.00
	1 Mule at $250	250.00
Dead Stock	1 Cart	100.00
	Posts and Netting.	
	2 Units of 2 acres each ...	500.00
	Cultivators and Tools	250.00
Buildings. (Temporary)	Sties	250.00
	Fowl Houses	100.00
	Sheds	100.00
	Stable	100.00
Working Capital	... ...	1,000.00
		$3,250.00
	Say	£700 0 0

Note.—If £700 be borrowed at 7 per cent. it should not be too difficult to repay the sum in 2 years as follows (See profit in foregoing sheet):—

	£ s. d.
1st year—Interest on £700	49 0 0
Repayment of capital	350 0 0
	399 0 0
2nd year—Interest on £350	24 10 0
Repayment of capital	350 0 0
	£773 10 0

And in the following year £350 could be set aside for the provision of permanent buildings when materials, etc., should be considerably cheaper.

These estimates are based upon the factor of obtaining a 21 years lease at a fair rental of 9 acres of land with option of purchase at end of 7, 14, or 21 years at an agreed sum.

AGRICULTURAL EDUCATION.

CACAO PRIZE COMPETITION 1920-21—NARIVA AND MAYARO.

Report of the Judges.

We have the honour to report that fifty-six peasant proprietors and seventy-one contractors entered the competition; twenty-eight of the former and twenty seven of the latter worked up to January, the others dropped out for various reasons. Out of this number, nine of the former and eleven of the latter were selected for the final judging which began on April 18 and ended on April 22, 1921.

The average percentages of marks obtained by the prize winners are as follows:

	Tillage.	*Sanitation.*	*General.*
Class I ...	86·29	82·86	77·85
Class II ...	84·28	95·71	90·00

This result is not only excellent, but an improvement on last year's work. Contractors again showed a better class of work in all branches of the competition except forking and manuring.

Tillage. Draining on the whole was well done and maintained. Among the contractors Singh Ram, Puncham, Watts and Suroojnarine Maharaj obtained 100 per cent.; and Suenunnun, Walters and Phulsingh 90 per cent.; among the proprietors Racha obtained 100 per cent., Etwaria and Valdez 95 per cent., and George Samuel 90 per cent. We are pleased to be able to state that both classes of competitors realize the benefits to be derived from draining hilly portions of their holdings, a method which is not generally adopted.

Forking and manuring require more attention, yet much praise is due to Samuel, Racha, Etwaria and Valdez—proprietors, and Singh Ram, Suenunnun and Walters—contractors for the very good work done in these lines.

Sanitation. Speaking generally, sanitation, one holding only being excepted, was very good. We cannot recommend too highly the excellent work in this part of the competition of Singh Ram, Suenunnun, Puncham, Walters, Watts and Suroojnarine—contractors and George Samuel—proprietor.

Theory. All prize winners and one non-prize winner in Class II, as well as four of the prize winners in Class I obtained full marks; this speaks highly for the interest they take in their occupation.

A remarkable feature of this competition is that although two of the competitors are hard of hearing, three understand very little English and Singh Ram (Winner of the 1st prize in Class II) can neither speak nor understand English, every one of them took a lively interest in the work and have all won prizes.

Some of last year's prize winners have done much good by their example and advice, in encouraging their neighbours to do good work, as shown by the fact that many of this year's prize winners are the neighbours of last year's. Singh Ram, Suenunnun and Puncham are

near to Bheeman and Sukdeo Seedarnee who won prizes last year, Racha is near to Beggasse, Etwaria to Arjoon and Valdez to Nicholas.

All things considered, we are of opinion that this year's work is a distinct improvement on last year's, that the competition has been a success and should be held for a third time in this district.

(Sgd). FRANK S. MAINGOT.
J. J. BEARD.
L. MOTA.

PRIZE WINNERS.

Class I—Peasant Proprietors.

Order.	Value of Prize.	Name.	Marks.	Nationality.	Acreage.	District.
	$ c.					
1	80 00	George Samuel ...	96	Antiguan ...	7	Riverside Trace, Poole.
2	60 00	Racha... ..	95	East Indian ...	10	Do. do.
3	40 00	Etwaria	91	East Indian ...	14	Rio Claro.
4	30 00	Angustin Valdez ...	89	Trinidadian ...	10	San Pedro Trace, Poole.
5	20 00	Mohan Dass ...	78	Trinidad born Indian	11	Rio Claro.
6	15 00	M. A. Najab ...	70	Trinidad born Indian	6	Beharry Trace, Rio Claro.
7	10 00	Joseph Mathew ...	66	Trinidadian ...	8	San Pedro Trace, Poole.

Class II—Contractors.

						District or Estate.
1	60 00	Singh Ram ...	99	East Indian ...	3	Charuma, Rio Claro.
2	45 00	Albert F. Seunnunun ..	96	Trinidad born Indian	3	Do. do.
3	30 00	Nathaniel Walters ...	89	Trinidadian ...	3	Helvetia Estate, Poole.
4	20 00	Alexander Watts ...	88	Trinidadian ...	5	El Guaynapo Estate, Rio Claro.
5	15 00	Puncham	87	Trinidad born Indian	3	Charuma, Rio Claro.
6	10 00	Suroojnarine Maharaj..	80	East Indian ...	3	Rio Claro.
7	5 00	Phulsingh	73	East Indian ...	3	Mayaro Road, Rio Claro.

Prize Distribution—Rio Claro.

The Regulations for this Competition were similar to those published in *Bulletin XVIII, 1919, 38* the only difference being that this year's competition extended over a larger area than that of 1919–20 as it included the countries of Nariva and Mayaro.

The prizes were distributed by His Excellency the Acting Governor, the Hon. T. A. V. Best, C.M.G., O.B E., at Rio Claro on July 9, 1921.

REPORT BY THE DIRECTOR OF AGRICULTURE.

Mr. W. G. Freeman said:—A little more than a year ago, His Excellency the Hon'ble T. A. V. Best, then as now Acting Governor of the Colony, came here to distribute the prizes in the Cacao Prize

Competition of 1919–1920. The judges recommended that another competition be held in the same district, and Mr. Best expressed the hope that this would be done and that Sir John Chancellor or himself would be here to give away the prizes.

To-day's gathering is a proof that last year's hopes have been fulfilled.

The recommendations of the judges were adopted; prizes of the total value of $460.00 were again offered; these you have worked well for and won, and His Excellency the Acting Governor has kindly come again to Rio Claro to present them to you personally.

These competitions, which are held not only for cacao cultivators, but also for cane farmers, ground provision and rice growers, were started ten years ago as a means of helping the peasantry of the Colony to get better results from their holdings. There is no charge for entering the competition, and the Agricultural Adviser comes to you on your own properties, and gives you advice and practical help, also free of any expense.

Agriculture is the industry on which the prosperity of the Colony mainly depends. For the colony to reach its full measure of prosperity it is necessary that each agriculturist, large or small, shall be making good use of his land. In Trinidad it is possible for a large number of cultivators to get much better results than they do, .eg., in cacao, healthier trees, larger crops, more profit.

This is of particular importance at present. We are passing through a period when owing to causes over which we have no control, the price of cacao is very low. So low that it leaves but little profit for the cultivator who is free from debt and can produce his crop fairly cheaply, and leaves none, or even results in a loss, on properties encumbered with debt or expensive to work. The present period of depression follows one of abnormally high prices, but in too many cases no advantage was taken of them to prepare for bad times; and many owners now have to stop really necessary work in order to keep their expenditure within their means.

It is very necessary that the peasant proprietor should do everything within his power to increase his next year's crop, and to improve his trees and the conditions under which they grow so that they may give him larger crops in years to come. It is the work of the Agricultural Advisers to help the peasantry to do this.

Three important things, commonly neglected in Trinidad by the smaller proprietors in particular, are tillage of the soil, manuring, and care of the health of their trees. Those of you who have visited the Department cacao estate at River have seen how much attention is given to tillage—forking the soil. Last year your judges reported that in this district you had a prejudice against forking *i.e.* not only did you not think it a good thing, but you even apparently thought it was a bad thing to do. This year they do not refer to any prejudice, but they still say that forking requires more attention. You doubtless have often heard of the wonderful results obtained on some properties in Grenada. These results are largely due to the careful attention given to forking, and manuring.

The Grenadian cultivates his soil well because he has found that it pays. If those of you who have not tried it yet will only do so, I feel sure you will find it pay and will then continue the practice. I hope that by the work of the Agricultural Advisers the Trinidad peasant proprietors will attain a reputation as good cultivators equal to that of the Grenadians.

The judges also state that manuring needs more attention. This does not mean that you are recommended to spend a lot of money on artificial manures but that you should make full use of the available supplies of pen manure, trimmings of bush, and waste organic material of all kinds. Bury—not deeply—in the soil all dead animal and plant material you can. It will rot and form a richer soil, and also one that will not crack, and dry so quickly in seasons of drought. At River Estate pen manure from the stables is carefully stored in a pit; the liquid manure, usually allowed to run away, is collected in another pit, and carted out to be applied to nurseries and backward trees; all waste material from the yard, even sawdust and shavings is put out in the fields. Most of you can do things like this for yourselves at very little expense, and you will find that it pays.

Drainage, particularly of hilly lands, is often either neglected or badly done. I am glad to notice that an improvement has evidently been effected. Last year the judges said you had a prejudice against draining. This year they say that on the whole it was well done, and that both peasant proprietors and contractors "realised the benefits to be derived from draining hilly portions of their holdings, a method which is not generally adopted."

Care of the health or sanitation is just as important for a cacao tree as for man or any other living being. Considerable improvements have been made, but still more can be effected. Learn to recognise canker and how to get rid of it, also root disease, and deal promptly with cacao beetles and do not allow them nearly to ruin your properties as they have been allowed, by neglect, to do in some parts of Trinidad. Most of these very desirable improvements, which will bring you in larger crops and more money, can be done without much expense. All that is necessary is knowledge—to know what to do, and industry to do it. The Government wishes to help you as much as it can and has provided an Agricultural Adviser for this district—the Counties of Nariva and Mayaro. Mr. Mota has been with you now for four years; you know him well and I feel sure that you have found him always ready and anxious to do his best for you, and most of you have also found that the help given you is good. We began in 1911 with only two Agricultural Advisers, or Inspectors as they were then called. The number was increased to three but this year we have already six, and shall soon have seven, so that the peasantry in all parts of the Colony can be reached by them. This of course costs a good deal of money. Altogether the salaries of the Advisers, their travelling allowances, and the amount spent on prizes in the competitions are a charge of £2,310 in the Estimates of the Department of Agriculture. This money is all spent for the direct benefit of the peasantry of the Colony. I mention these facts to show

you that the Government is helping you. It remains for you to take full advantage of the help provided and put it to practical use.

Another point to which I directed attention last year is that of growing food crops. I said then "Keep a part of your land for food crops. Whilst cacao is high in price and crops good you can perhaps afford to buy food, but when cacao drops or crops are poor, you may not have the ready money and that often means borrowing at the shop and too often leads to debt and possible loss of your property." This is a year when cacao has dropped in price, and those of you who have grown food crops will be very thankful for them in the period between now and October when the next cacao crop will begin to come in. If you have grown more than you want for your own use you will have no difficulty in selling them. To assist you in such matters the Government as you know started a Ground Provisions Depôt in Port-of-Spain in 1917. It began in a small way but has grown, and for the six months ending with June 30 last its sales were $26,057 an average of $4,343 a month. All that is necessary for you is to send your produce by rail, with a printed ticket which you can get from the Collector of your station, and an order for the full value of your consignment, payable by your own Collector, will be sent you promptly.

A contented and prosperous peasantry free from the oppression of the money lender is an important asset in the welfare of the Colony.

These competitions, as part of the work of the Department of Agriculture, are intended to help you to be more prosperous than you are. Some of you have profited by the assistance offered you and it is pleasing to note from the judges' report that those living near previous prize winners have followed their example, worked hard this year, and become prize winners themselves. I trust this year's prize winners will cause their neighbours in turn to become better cultivators, and so the standard of the whole district will gradually be raised to the advantage of each cultivator personally and of the Colony as a whole.

The Certificates and prize money were then distributed by the Acting Governor.

THE GOVERNOR'S ADDRESS.

His Excellency said it was a great pleasure to be with them again and he hoped he would have the pleasure of returning at some future date. It was very gratifying to him to listen to the very interesting and satisfactory report of the judges on the recent competition; it showed that these competitions were doing very useful work. He hoped that at the next competition there would be a prize winner from Guayaguayare. He did not propose speaking at any length as he felt sure that they were all looking forward to listening to the Band. He wished them the best of luck and hoped to be back soon.

VOTE OF THANKS.

Mr. A. Lazarri moved a vote of thanks to His Excellency the Acting Governor, he said that they all fully appreciated the interest that the Government showed in the peasant proprietors and contractors and had every reason to expect even better results next year.

METEOROLOGY.

RAINFALL RETURN FOR 6 MONTHS ENDING JUNE, 1921.

STATIONS.	January.	February.	March.	April.	May.	June.	January to June, 1921.	January to June, 1920.
North West District.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.
St. Clair—Royal Botanic Gardens	2·43	1·60	5·03	3·68	1·43	9·91	24·08	8·96
Port-of-Spain—Colonial Hospital	1·98	1·57	2·67	3·75	·55	8·09	18·61	4·71
,, Constabulary Headquarters	nil.	4·36	2·00	3·50	2·20	9·04	21·10	5·55
St. Ann's—Reservoir	2·82	2·50	3·87	4·10	3·29	7·82	24·40	11·60
Maraval—Reservoir	1·56	2·26	3·75	3·31	2·99	10·10	23·97	11·08
,, Constabulary Station	2·89	1·42	4·53	1·81	2·55	8·81	22·01	9·90
Diego Martin ,, ,, ...	2·29	2·29	7·75	2·27	3·07	9·83	27·50	11·46
,, ,, Waterworks	2·05	1·93	6·37	2·37	2·61	7·61	22·94	11·47
,, ,, River Estate	1·89	1·89	6·87	2·13	2·28	6·95	22·01	11·33
Fort George Signal Station	2·35	2·91	5·34	2·91	3·18	10·26	26·95	12·01
North Post ,, ...	1·55	·85	3·39	·77	1·62	4·75	12·93	5·65
Carenage Constabulary Station	2·52	3·09	6·78	3·55	2·94	14·29	33·17	16·86
Carrera Island Convict Depôt	·66	1·01	1·30	·88	·59	3·94	8·38	4·06
Chacachacare Light House	1·42	2·32	3·57	1·19	1·51	8·11	18·12	7·64
Santa Cruz—Maracas District.								
Santa Cruz Constabulary Station	2·50	2·73	4·94	3·12	3·42	11·31	28·02	13·14
St. Joseph, Government Farm	1·56	2·09	3·56	2·59	3·23	15·02	28·05	9·59
St. Joseph Constabulary Station	3·35	·54	3·12	2·09	1·11	7·88	18·09	6·26
Tunapuna, St. Augustine Estate	1·00	1·02	4·01	2·06	3·41	15·02	26·52	8·41
Maracas—Government School	2·65	2·14	4·75	2·08	4·02	13·10	28·74	11·94
,, Ortinola Estate	2·69	2·45	3·98	2·17	2·63	12·02	25·94	13·72
Caura, Wardour Estate	2·48	2·47	3·46	2·66	2·73	13·09	26·89	10·76
,, El Manacal ,, ...	4·15	4·70	12·05	5·17	2·33	17·25	45·65	...
,, La Florida ,, ...	2·93	2·94	4·42	2·45	2·84	17·85	33·43	...
,, La Concordia ,, ...	2·96	2·57	3·86	2·52	2·41	15·43	29·75	...
West Central District.								
Caroni, Frederick Estate	1·95	1·09	3·44	1·82	2·58	13 11	23·99	14·70
Chaguanas, Constabulary Station	·78	1·75	2·77	4·55	4·10	13·90	27·85	12·81
Chaguanas, Woodford Lodge Estate	·96	1·55	2·77	4·10	3·74	12·82	25·94	10·11

RAINFALL RETURN FOR 6 MONTHS ENDING JUNE, 1921.—Continued.

Stations.	January.	February.	March.	April.	May.	June.	January to June, 1921.	January to June, 1920.
West Central District.—Contd.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.
Carapichaima, Waterloo Estate	1·77	1·55	4·19	4·67	2·38	9·28	23·84	9·73
,, McBean Cacao Estate	·98	1·96	2·97	4·37	2·50	9·64	22·42	10·45
,, Friendship Hall Estate...	1·61	1·91	2·50	3·92	2·83	10·00	22·77	10·78
Couva, Exchange Estate	1·28	·88	2·44	3·81	2·36	8·85	19·62	4·90
,, Brechin Castle ,, ...	1·26	1·75	2·99	3·24	3·10	10·75	23·09	8·17
,, Perseverance ,, ...	1·09	1·27	3·52	1·94	1·67	9·05	18·54	...
,, Milton ,, ...	2·04	1·50	2·33	3·54	4·07	10·67	24·15	10·33
,, Spring ,, ...	2·39	1·77	2·52	3·45	4·03	10·51	24·67	9·61
,, Constabulary Station	1·26	1·21	2·90	3·54	2·73	9·04	20·68	7·08
,, Esperanza Estate	·88	·99	1·89	3·13	1·78	7·96	16·63	5·91
Montserrat District.								
Brasso Piedra, Mamoral Estate	3·82	3·68	3·42	6·14	4·97	17·42	39·45	21·08
,, La Mariana ,, ...	3·80	3·37	3·36	5·45	6·45	14·87	37·30	20·71
Montserrat, Constabulary Station	2·15	1·24	2·88	4·21	1·94	9·70	22·12	11·90
Brasso, La Vega Estate	3·53	3·50	3·37	5·72	5·78	16·71	38·61	20·02
Tabaquite, Trelawne Estate	3·64	2·18	4·19	6·45	5·70	12·31	34·47	18·82
Arima District.								
Arima, Warden's Office	2·19	·30	5·66	1·75	4·51	14·20	28·61	16·72
,, Torrecilla Estate	3·71	3·37	5·34	3·28	4·81	22·14	42·65	21·77
,, Verdant Vale Estate	4·15	3·64	5·84	3·32	4·07	21·38	42·40	21·03
San Rafael, Constabulary Station	3·56	4·20	5·80	4·30	6·20	19·23	43·29	23·13
Guanapo, Talparo Estate	2·07	3·40	3·17	6·31	4·48	19·33	38·76	19·13
,, El Quemado Estate	4·62	3·93	5·52	8·00	6·06	20·72	48·85	24·00
Tamana, Santa Marta Estate	6·02	5·03	9·50	12·38	6·18	26·13	55·24	27·81
,, La Corona Estate...	6·42	4·55	7·97	10·57	6·25	19·18	54·94	31·08

RAINFALL RETURN FOR 6 MONTHS ENDING JUNE, 1921.—Continued.

Stations.	January.	February.	March.	April.	May.	June.	January to June, 1921.	January to June, 1920.
San Fernando & Princes Town District.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.
Claxton's Bay, Forres Park Estate	1·54	·91	2·33	4·85	2·50	6·60	18·73	6·83
Pointe-à-Pierre, Concord Estate	2·46	1·71	1·87	4·85	1·78	.	...	8·78
,, ,, Plein Palais Estate	1·85	1·90	2·00	2·65	2·01	5·85	16·26	9·77
Naparima, Picton Estate	2·33	1·84	3·10	2·98	3·26	7·28	20·79	12·84
,, Usine Ste. Madeleine Est...	1·95	2·18	3·48	4·52	3·85	6·98	22·96	11·88
,, La Fortunée Estate	1·60	1·51	2·70	3·24	2·27	6·48	17·80	...
,, Tarouba Estate...	1·75	1·88	3·93	3·11	2·33	5·14	18·14	9·14
,, Union Hall Estate	1·59	1·27	2·57	3·91	2·49	6·81	18·64	13·82
,, Palmiste ,, ...	1·91	2·30	4·10	4·37	2·01	7·92	22·61	14·04
,, Lewisville House	1·98	2·56	3·55	5·67	2·84	6·39	22·96	15·80
,, Hermitage Estate	1·53	1·46	2·28	3·29	3·00	6·10	17·66	...
,, Petit Morne Estate	2·08	1·65	2·92	3·49	...	...	...	...
Princes Town Craignish Estate	2·76	2·68	3·00	3·60	2·47	9·11	23·62	14·58
,, Cedar Hill Estate	1·90	2·05	2·92	2·77	3·30	6·70	19·64	13·85
,, Williamsville Estate	3·00	2·01	2·58	3·05	2·60	7·45	20·69	13·43
,, Esmeralda Estate	2·94	2·99	3·02	4·77	2·21	10·65	26·58	14·61
,, New Grant Estate	3·41	...	3·54	5·38	3·06	10·10	...	16·14
,, Constabulary Station	1·71	2·08	1·99	2·95	1·21	8·02	17·96	11·99
,, La Retraite Estate	4·94	5·35	4·49	6·14	5·60	13·70	38·22	24·14
,, Malgretoute ,, ...	2·31	3·19	2·87	3·61	4·51	7·69	24·18	15·37
South-West District.								
Oropuche, Constabulary Station	·58	·46	1·48	·49	1·48	3·29	7·78	4·95
,, Pluck Estate	2·64	..	3·82	...	...	...	...	...
Siparia, Constabulary Station	2·25	1·43	4·01	4·96	·90	7·70	21·25	15·29
,, Alta Gracia Estate	2·78	1·88	4·53	5·01	1·54	7·89	23·63	15·79
Guapo, Adventure Estate	3·04	2·62	3·55	1·95	4·25	3·59	19·00	15·41
Point Fortin—Constabulary Station	4·93	4·51	4·44	3·50	5·30	6·32	29·00	17·50
Erin, La Ressource Estate	2·58	1·10	2·32	2·42	2·21	3·04	13·67	12·59
,, La Union Estate	3·55	1·79	3·86	2·92	3·15	5·76	21·03	15·94
,, Industry Estate	4·18	1·61	3·59	3·79	3·21	6·50	22·88	15·59
Cedros, La Retraite Estate	4·84	5·64	6·37	10·53	4·94	5·95	38·27	25·76

RAINFALL RETURN FOR 6 MONTHS ENDING JUNE, 1921.—Continued.

Stations.	January.	February.	March.	April.	May.	June.	January to June, 1921.	January to June, 1920.
South-West District.—(Contd.)	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.
Cedros, Perseverance Estate	8·01	2·40	3·36	3·61	1·97	4·88	24·23	22·41
,, Ste. Marie Estate	5·82	2·73	5·25	3·47	1·72	4·57	23·56	21·31
,, Constabulary Station	7·50	2·24	10·43	3·58	2·35	4·53	30·63	22·02
,, Ste. Quintin Estate	7·89	2·36	4·00	3·89	1·65	7·20	26·99	17·66
Icacos, Constance Estate	5·18	1·75	3·17	2·85	1·50	5·85	20·30	13·43
Irois, Government School...	3·39	4·58	4·04	4·75	1·89	5·84	24·49	20·15
South Coast.								
Moruga, Constabulary Station	3·94	3·24	2·96	3·28	5·18	11·26	29·86	18·29
East Coast.								
Matura, La Juanita Estate	5·12	5·70	9·47	5·43	6·66	20·35	52·73	29·88
Manzanilla, Constabulary Station	3·95	2·64	3·59	8·37	3·17	25·09	46·81	22·48
Sangre Grande, Evasdale Estate	5·31	4·84	7·39	7·26	5·98	20·87	51·65	25·45
,, Grosvenor Estate	5·46	3·71	7·25	7·99	5·29	19·34	49·04	24·86
,, El Recundo Estate	4·93	3·05	5·25	7·35	3·97	16·75	41·30	25·02
,, San Francisco Estate	5·91	3·57	7·56	8·95	4·72	19·88	50·99	33·37
Mayaro, Constabulary Station	2·40	1·92	3·69	5·10	8·40	10·80	32·31	19·55
North Coast.								
Blanchisseuse, Constabulary Station	6·82	4·10	10·07	5·45	1·05	14·15	41·64	19·95
,, Avondale Estate	5·73	5·23	10·62	4·08	2·40	16·18	44·24	...
Grande Rivière, Mon Plaisir Estate	5·10	5·00	13·03	6·79	5·40	16·42	51·74	30·70
Toco, Aragua House	3·16	3·01	7·62	3·95	3·29	14·64	35·67	19·53
,, Constabulary Station	2·46	1·85	6·55	2·67	2·57	12·52	28·62	14·94
Tobago.								
Tobago, Hermitage Estate	4·03	4·73	10·55	·78	5·89	20·15	46·13	20·92
,, King's Bay ,, ...	2·65	4·31	7·84	3·13	2·84	15·04	35·81	17·30
,, Roxburgh ,, ...	2·69	4·58	8·29	3·73	3·11	14·85	37·25	19·37
,, Botanic Station	2·12	2·28	4·53	1·08	1·91	7·20	19·12	16·70
,, Government Farm	1·66	1·19	2·21	·50	1·32	6·98	13·86	11·87
,, Friendship Estate...	1·92	2·02	4·52	1·05	1·54	7·80	18·85	11·08

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ST. CLAIR EXPERIMENT STATION, TRINIDAD.

List of Plants for Sale.

(*See* p. vi.)

Common Name.	*Scientific Name.*
Fruit Trees 24c. each.	
Sweet orange	*Citrus aurantium.*
5c. each.	
Golden apple	*Spondias dulcis.*
Common rose apple	*Eugenia Jambos.*
Java plum	*E. Jambolana.*
Malacca apple	*E. malaccensis.*
Mammy apple	*Mammea americana.*
Sugar apple	*A. squamosa*
Sour sop	*A. muricata.*
Cashew	*Anacardium occidentale.*
Akee ...	*Blighia sapida.*
Pomegranate	*Punica granatum.*
Tamarinde des Indes	*Vangueria edulis*
Granadilla	*Passiflora quadrangularis.*
Queensland nut	*Macadamia ternifolia.*
Breadnut	*Artocarpus incisa* var.
Genip ...	*Melicocca bijuga.*
Barbados cherry	*Malpighia glabra.*
Large red guava	*Psidium Guajava.*
do. white do.	*P.* var.
Gooseberry	*Phyllanthus disticha.*
Governor plum	*Flacourtia Ramontchi.*
Sapodilla	*Achras sapota.*
Hunterman's nut	*Omphalea triandra.*
Star apple	*Chrysophyllum Cainito.*
Papaw ...	*Carica Papaya.*
Tangerine (seedlings)	*Citrus nobilis* var.
Mandarin	*C. nobilis* var.
Mulberry	*Morus alba.*
$3.00 per 100 unerated. 3.50 do. crated.	
Lime	*Citrus medica* var. *acida.*
Beverage Plants.	
$3.00 per 100 unerated. $3.50 per 100 crated and carted to City.	
Forastero cacao	*Theobroma Cacao* var.
Robusta coffee	*Coffee robusta*
Liberian coffee	*C. Liberica.*
Abbeokuta coffee	*C. Abbeokuta.*
Kola nut	*Cola acuminata.*
5c. each.	

Common Name.	*Scientific Name.*
Spices.	
12c.	
Cinnamon	*Cinnamomum zeylanicum.*
5c.	
Nutmeg	*Myristica fragrans*
8c.	
Tonka bean	*Dipteryx odorata.*
Rubber 60c. per 100.	
Para rubber	*Hevea brasiliensis.*
Drug 5c. each.	
Bitter wood	*Quassia amara.*
Timber Trees $3.00 per 100.	
British Honduras mahogany	*Swietenia macrophylla.*
5c. each.	
	Barringtonia speciosa.
	Cynometra trinitensis
Fern tree	*Jacaranda cærulea.*
Balsam of tolu	*Toluifera Balsamum.*
Pink poui	*Tabebuia* sp.
Balata	*Mimusops globosa.*
Divi-divi	*Cæsalpinia coriaria*
	Detarium senegalense.
	Swartzia grandiflora.
Fragrant acacia	*Acacia Farnesiana*
	Mimusops Elengi.
Beef tree	*Terminalia arjuna.*
Flamboyante	*Poinciana regia.*
	Oroxylum indicum.
Shade and Decorative 5c. each.	
Apple blossom cassia	*Cassia javanica.*
Horse cassia	*Cassia grandis.*
	C. multijuga.
Jamaica mountain pride	*Spathelia simplex.*
Ceylon willow	*Ficus benjamina.*
Barbados pride (red)	*Poinciana pulcherrima.*
Barbados pride (yellow)	*P. do.*
Almond	*Terminalia Catappa*
	Monodora tenuifolia.
	Brownea grandiflora.
	Bauhinia tomentosa.
	B. megalandra.
	Posoqueria longiflora

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PLANT DISEASES AND PESTS.

PLANT PROTECTION LEGISLATION IN TRINIDAD.

With Notes by WM. NOWELL, D.I.C., Assistant Director of Agriculture and Pathologist; and F. W. URICH, F.E.S., C.M.Z.S., Entomologist.

THE re-organisation of the Department of Agriculture of Trinidad and Tobago, which took effect from September 1920, has made it possible, by bringing together an adequate staff under one direction, to improve and extend the application of the powers made available under the Plant Protection Ordinance of the Colony.

In the following pages the text of the present Ordinance and of the various proclamations and regulations now in force based upon this and previous Ordinances is given together with notes on the pests and diseases proclaimed.

The Plant Protection Ordinance, No. 29-1919.

An Ordinance for the prevention and eradication of Diseases and Pests affecting vegetation.

December 17, 1919.

BE it enacted by the Governor of Trinidad and Tobago with the advice and consent of the Legislative Council thereof as follows :—

1. This Ordinance may be cited as the Plant Protection Ordinance, 1919. Short title.

2. In this Ordinance, unless the context otherwise requires :—

The expression " Disease " means any disease affecting trees, shrubs or herbs caused by or consisting in the presence of any pathogenical animal or vegetable organism which the Governor may by proclamation from time to time declare to be a disease within the meaning of this Ordinance : Interpretation.

The expression " Pest " includes any parasitical, epiphytal or other animal or vegetable organism, and also any insect or other invertebrate animal (in whatever stage of existence such insect or animal may be)

affecting or injurious to trees, shrubs or herbs, which the Governor may by proclamation from time to time declare to be a pest within the meaning of this Ordinance;

The expression "Diseased" means affected with disease;

The expression "Tree," "Shrub," and "Herb" respectively include the fruit or other product of any tree, shrub or herb and the roots, trunks, stems, branches, fruits, leaves or other parts thereof or any parts severed from any tree, shrub or herb, including emptied pods or husks;

The expression "Vegetable organism" means any vegetable organism in whatever stage of existence such vegetable organism may be;

The expression "Animal organism" means any animal organism in whatever stage of existence such animal organism may be;

The expression "Occupier" means the person in actual occupation of any land or building, or if there is no such person, then the expression means the person entitled to possession thereof;

The expression "Owner" means the person who is for the time being entitled to receive the rent of any land, or who if the same were let to a tenant at a rack rent would be entitled to receive such rent. Neither His Majesty the King nor the Governor as Intendant of Crown Lands is included in the expression "owner";

The expression "Director of Agriculture" means the Director of the Department of Agriculture;

The expression "Chief Inspector" means a chief inspector appointed under this Ordinance;

The expression "Inspector" means any inspector appointed under this Ordinance, and includes an assistant inspector;

The expression "Nursery" means any land or premises whereon are grown or kept any trees, shrubs or herbs intended for sale or distribution;

The expression "Inspection Grounds" means such lots of land as may from time to time be set apart by the Governor for the purposes of this Ordinance.

Appointment of Inspectors.

3. The Governor may from time to time appoint some qualified person as Chief Inspector under this Ordinance, and also such other qualified persons as may be necessary as inspectors and assistant inspectors under him.

Inspection grounds.

4. The Governor may from time to time rent or lease land for the purposes of this Ordinance, and may set apart such land and also any Crown land for use as inspection grounds or for any other purpose which he may deem necessary to further the objects of this Ordinance.

Prohibition of importation of plants, etc.

5.—(1.) The Governor may from time to time by proclamation prohibit the importation into the Colony of any plants, parts of plants, seeds, fruits, soil or any class of goods, packages, coverings, or other articles or things named and specified in such proclamation.

(2.) The Governor may from time to time by proclamation order that the plants, parts of plants, seeds, fruits, soil, or any class of goods,

packages, coverings, or other articles or things named or specified in such proclamation shall not be imported into the Colony except upon such conditions as may be specified in such proclamation.

Seizure.

6. Every plant, article or thing imported into this Colony in contravention of any proclamation under this Ordinance, or of any of the conditions imposed thereby may be seized by any officer of Customs or by the Chief Inspector or any inspector and shall thereupon become forfeited to His Majesty and may be destroyed or otherwise dealt with as the Governor may direct.

Nurseries—registration of.

7. Every nursery shall be registered by the owner or occupier thereof at the office of the Chief Inspector on or before the first day of May in each year.

Inspection of nurseries.

8. Every nursery shall be inspected at least twice a year by the Chief Inspector or by an inspector appointed by him to fulfil that duty, and at such other times as the Chief Inspector shall deem necessary.

Quarantine nurseries.

9. The Chief Inspector or any inspector may declare under quarantine any nursery or such part of any nursery as lies within twenty yards of any tree, shrub or herb which he finds infected by disease, or infested with pests, or within thirty yards if such infected or infested tree, shrub or herb is over ten feet in height; and such area shall be held and deemed to be under quarantine accordingly.

Quarantine of nurseries—contravention of.

10. A quarantine declared under the last preceding section shall remain in force until the Chief Inspector shall have given to the owner or occupier of the nursery affected his written certificate to the effect that the trees, shrubs and herbs within such quarantined area are free from disease and pest, and during such period of quarantine it shall not be lawful for any person to remove or cause to be removed from such nursery any tree, shrub or herb or any parts thereof or any soil, manure, plant cases, wrappings or packing materials from the quarantined area.

Examination of quarantined nurseries.

11. Any owner or occupier of a nursery having his nursery or any part thereof thus placed under quarantine may upon application to the Chief Inspector have his nursery examined free of charge to determine whether or not he has been successful in eradicating the disease or pest.

Plantations—power to enter.

12. The Chief Inspector or any inspector may at all reasonable times enter without notice (with or without assistants as may to the person making entry seem fit) upon any nurseries, land or plantations or into any building or part of any building not being a dwelling house for the purpose of searching for and examining any animal or vegetable organism or any diseased or pest-infested tree, shrub or herb or any soil, manure, plant cases, wrappings or packing materials, and may remain thereon or therein so long as may be reasonably necessary for any such purpose.

Procedure for eradication of diseases and pests.

13. The Chief Inspector or any inspector authorised by him in writing for that purpose may issue an order in writing in the form in the Schedule hereto (1) to the occupier, or if there be no occupier, to the

(1) Not reprinted.

owner of any nursery, land or plantation, directing him to take within a definite time from the service upon him of such order to be specified therein all such measures as may be necessary for the eradication of or for the prevention of the spread of any disease or pest, including in such measures the total destruction if necessary of any trees, shrubs or herbs whether infected by any disease or infested with any pest or not.

Procedure when occupier is absent.

14. If there is no occupier on any land, service of any order under this Ordinance may be made by affixing the same in some conspicuous part of the land.

Non-compliance with order.

15. If any owner or occupier shall fail to comply with the directions contained in any order, any inspector may with or without assistants enter upon such land and take such steps as may be necessary for properly and effectively carrying such order into execution.

Expenses.

16. The expenses incurred by the Chief Inspector or any inspector in carrying into effect any order made under this Ordinance shall be paid by the party in default.

Such expenses shall be recoverable as a debt which until paid shall be a first charge on the land affected by the order, and payment thereof may be enforced forthwith in the manner provided by the Lands and Buildings Taxes Ordinance, 1919.

Provided always that it shall be lawful for the Governor to dispense with the payment of such expenses in cases where owing to the party in default being in needy circumstances, or for any other reason, the Governor thinks fit so to do.

Compensation.

17. It shall be lawful for the Governor out of moneys voted for that purpose by the Legislative Council to make grants by way of compensation or partial compensation to occupiers and to owners (according to their respective interests) in respect of healthy trees, shrubs or herbs, destroyed in order to prevent the increase of any disease or pest or the spread of any disease or pest into adjoining lands.

Protection of persons acting under Ordinance.

18. No inspector or other person authorized under the provisions hereof shall be deemed a trespasser by reason of any entry or destruction or action taken or thing done under this Ordinance, or be liable for any damages occasioned by carrying out any of the provisions of this Ordinance, unless the same were occasioned maliciously and without reasonable and probable cause.

Informality not to invalidate proceedings.

19. Proceedings taken under this Ordinance shall not be rendered void by reason of any informality in any order or notice made or given.

Offences.

20. Every person shall be guilty of an offence against this Ordinance who—

(*a*) In any manner obstructs or impedes any person in the execution of any of the powers conferred by this Ordinance;

(*b*) Refuses or neglects to comply with or acts in contravention of any of the provisions of this Ordinance or the terms of any proclamation issued thereunder or any regulations made or any order given in pursuance thereof respectively; or

(*c*) Introduces any disease or pest into any cultivation, unless he proves to the satisfaction of the Magistrate that such introduction was accidental and not due to neglect or malice.

Punishment.

21. If any person is guilty of an offence against this Ordinance he shall for every such offence be liable on summary conviction before a Magistrate to a fine not exceeding twenty pounds. This liability shall be in addition to the liability for civil claims which may be made against such person.

Regulations.

22. The Governor in Executive Council may make regulations for all or any of the following purposes, namely:—

(*a*) For regulating or prohibiting the removal from any nursery, inspection ground, plantation or place or the transference or conveyance from any part of the Colony to any other part thereof of any trees, shrubs or herbs, soil, manure, straw or packing material;

(*b*) For securing the detention and examination of any tree, shrub or herb and of any soil, manure, straw or packing material, which is suspected to be diseased or pest-infested and of boxes, baskets, pots, packages and cases which are suspected to contain or to have contained diseased or pest-infested trees, shrubs or herbs or to harbour or to be infected by disease or infested with pest;

(*c*) For securing the effectual treatment of diseased trees, shrubs and herbs and the effectual eradication of diseases and pests, and for the supply of chemicals, appliances and other means whereby such treatment or eradication may be facilitated;

(*d*) For defining the duties of inspectors and of the Chief Inspector under this Ordinance;

(*e*) For regulating the work to be done in inspection grounds;

(*f*) For regulating the manner in which requests are to be made by occupiers to the Chief Inspector; and

(*g*) Generally for carrying into effect the provisions of this Ordinance.

Evidence.

23. The production of a copy of the *Royal Gazette* containing a copy of any proclamation purporting to be made under this Ordinance shall be *primâ facie* evidence in all Courts and for all purposes whatever of the due making and tenor of such proclamation.

Repeal.
Ordinances 38-1911, 37-1916, 5-1917.

24. The Plant Protection Ordinance, 1911, the Plant Protection (Amendment) Ordinance, 1916, and the Plant Protection (Amendment) Ordinance, 1917 are hereby repealed.

Proclamation of Pests and Diseases.

The following proclamation recently issued has replaced those previously made, and contains all the pests and diseases at present brought under the operation of the Ordinance. The Stem-bleeding Disease of Coconuts has been removed from the list.

PROCLAMATION NO. 56 OF 1921.

Whereas by Section 2 of the Plant Protection Ordinance, 1919, it is among other things provided that the expression "Disease" means any disease affecting trees, shrubs or herbs caused by or consisting in the presence of any pathogenical animal or vegetable organism which the Governor may by proclamation from time to time declare to be a disease within the meaning of the said Ordinance; and that the expression "Pest" includes any parasitical, epiphytal or other animal or vegetable organism, and also any insect or other invertebrate animal (in whatever stage of existence such insect or animal may be) affecting or injurious to trees, shrubs or herbs, which the Governor may by proclamation from time to time declare to be a pest within the meaning of the said Ordinance;

And whereas it is expedient to declare the diseases and pests hereunder mentioned to be diseases and pests respectively within the meaning of the said Ordinance;

Now, therefore, I Thomas Alexander Vans Best, Acting Governor as aforesaid, do hereby declare Bud-rot disease, Red Ring disease and Little-leaf disease of the Coconut palm; Mosaic disease of the Sugar-cane; and Blossom-blight and Wither-tip of the Lime tree, to be diseases within the meaning of the said Ordinance; and the Bird Vine, the Love Vine, the Coconut butterfly (*Brassolis Sophorae*), the Parasol ant, the Cacao beetle, the Locust, the Gru-gru beetle (*Rhynchophorus palmarum*) and the Rhinoceros beetle (*Strategus aloeus*) to be pests within the meaning of the said Ordinance.

The proclamations Nos. 36 of 1907, 30 and 49 of 1912, 50 of 1915, 37 and 85 of 1918, 20 of 1920 and 45 of 1921 are hereby revoked.

Notes on the Proclaimed Diseases and Pests.

BUD-ROT DISEASE OF COCONUT.

Bud-rot of coconuts is a much-discussed and apparently common disease about which very little is definitely known. The confusion that exists is without doubt due, in great part, to the fact that the heart of the coconut palm, consisting of a large amount of very tender tissue, is naturally the first part to undergo secondary decay when the tree is dying from any cause. Owing to its enclosed situation this decay is usually of a putrid bacterial type, which cannot be distinguished from true bud-rot disease due to direct infection. Such disease undoubtedly exists, but in the present state of our knowledge is only recognisable by its infectious nature. Losses due to red-ring disease, and probably also undescribed root diseases, are often attributed to bud-rot owing to the occurrence of secondary putrefaction of the bud as a conspicuous symptom.

Infectious bud-rot itself is of uncertain origin. In part it has been shown to be caused by a fungus of the genus *Phytophthora*, but the more common type in the West Indies appears to be due to one or more species of bacteria. The safest plan is to treat all cases of failure, not definitely assignable to other causes, as due to infectious bud-rot.

There are two fairly distinct types recognizable. In one the infection is central, and the heart leaf or leaves dry up while all or many of the outer leaves are still healthy in appearance. In the other the infection begins among the outer leaf-bases and works inwards towards the centre. The former type cannot be treated, as the bud is destroyed before the attack is noticed ; the latter type sometimes responds to treatment. Firing the top is not recommended, as the scorched tissues attract beetles which often kill the tree. A safer method is to tie a quantity of copper sulphate in a piece of sacking and fasten it so that its solution in rain water runs down among the leaf-bases. This is more popular than spraying with Bordeaux mixture, which is probably the best remedy if it can be carried out and repeated from time to time.

RED RING DISEASE OF COCONUT.

The disease for which the above name is now used was first described from Trinidad in 1905. It was usually known as root disease until 1918 when it was found to be due to a nematode worm related to the hook-worm which affects man. The adult worm measures only $\frac{1}{25}$ inch in length but is present in the affected tree in countless numbers. The infestation has its principal seat in the stem but extends to the bases of the leaves and at a somewhat late stage to the spongy tissues of the roots.

The disease is easily confused with bud-rot as in its latest stages the heart generally undergoes secondary putrefaction causing the central shoot to fall over.

The failure of the tree is marked by a progressive yellowing and browning of the leaves in order of age, commencing at the tip of each leaf reached in the process. In its early stages the discoloration is indistinguishable from that which accompanies the natural dying off of the old leaves, especially where this is accelerated from any cause. The difference becomes apparent however when leaves in full vigour and even those not fully expanded are involved. The shedding of green nuts is one of the first symptoms of this disease, as also of bud-rot.

When the stem of an affected tree is cut across a well-marked red ring 1 to 1½ inches wide beginning one to two inches from the outside is found. It is densest near the base of the tree and broken into more or less scattered dots as the leaves are approached. The leaf bases when split open show a somewhat similar discoloration. Infested roots have the loose cortical tissue discoloured yellow, pink or red

The evidence so far obtained goes to show that infection begins in the crown and extends downward and it is assumed that the worms from infested soil travel upwards on the outside of the stem when it is in a moist condition, and enter about the bases of the leaves. Infection can be artificially produced with great readiness by dropping a fragment of infested tissue into the axil of a leaf, and the infestation so produced is identical with that found in naturally infected trees.

It is rare for trees to show signs of infection at less than four to five years of age. In the great majority of cases the trees develop the disease during the bearing of the first few crops of nuts. After this stage the trees begin to grow out of their susceptibility to infection and where development is normal cases are rare in trees beyond the age of ten years. No influence on liability to the disease appears to arise from any variation in soil or other external conditions.

The earliest cases which occur in a field are few and scattered and may be supposed to arise from infected nuts, though there is as yet no proof of this. Later cases are mostly grouped around those first to appear and are obviously due to infection from them. The losses from a severe infestation may amount to 30 per cent. before the period of immunity is reached.

The cure of the disease is regarded as impossible. The measures which have been suggested for its prevention are at present in process of trial on an extensive scale. An obvious precaution is to destroy the infested trees immediately upon their condition becoming recognisable. They should not be cut down but should be dug out, which is almost as readily done, and then burnt or at least thoroughly charred as soon as sufficient dry fuel is available for the purpose. It is worth considerable expenditure to tackle the early cases in this way in view of the disastrous effects which often follow their neglect. Observation shows that it should also be worth while to isolate threatened trees by cross trenches connecting the drains which usually run between the rows. A further measure which is undergoing tests is the painting of a band of crude oil about a foot wide round the stem with the object of stopping the ascent of the worms by providing a surface upon which moisture will not lodge.

LITTLE-LEAF DISEASE OF COCONUTS.

This affection of the coconut palm is now for the first time proclaimed under the Ordinance. It is common in a scattered way in both Trinidad and Tobago, being often conspicuous on roadside trees. Recently a district was inspected in which the distribution of the disease had assumed epidemic proportions.

The most obvious character of the disease as seen in these islands is that after its onset the leaves come out smaller and smaller in size until in the end, if no recovery takes place, they are reduced to a ridiculous little crown of aborted stumps not more than 1–2 feet long, which may be borne at the end of a stem perhaps 20–30 feet high.

Examination of the central shoot and bud reveals the young leaves with brown necrosed spots and patches on the folded leaflets and on the surface of the leaf-stalk. As the leaves expand the leaf-stalks develop a russeted or corky surface, which later becomes hard and woody, more or less raised and mis-shapen and exhibits well marked cracks. The unyielding nature of the leaves so affected causes those which follow to be more and more severely deformed, and in the later stages the leaflets either do not expand or are almost entirely aborted, and the rachis or mid-rib itself is reduced to a pointed stump.

Trees of all ages are liable to be affected. Cases are fairly common in fields of young trees, and even very old trees are subject to attack. Conditions in respect of soil and moisture appear to have little influence.

Affected trees occasionally show some degree of recovery, but this is usually intermittent and the end result in nearly all untreated cases is death.

The causation of the disease is now under investigation. In the first trace of the lesions, found among the embryonic leaves of the bud, a species of yeast is conspicuous, accompanied, in some cases at least, by a rod-like bacterium.

The disease is one which responds readily to treatment, even at an advanced stage. A method adopted with complete success is to relieve the constriction of the central part of the shoot by slitting the strainers and forcing the leaves apart, and then pouring a disinfectant fluid into the heart. Tobacco juice is very effective, and apparently any of the ordinary commercial disinfectants such as Jeye's or Kreso, if applied in weak solutions that will not seriously burn the tissues, serve the purpose very well.

MOSAIC DISEASE OF SUGAR-CANE.

The Mosaic diseases form a peculiar and well-marked group of highly infectious diseases affecting in each instance closely related plants. There are well known mosaic diseases of tomato, tobacco, and Irish potato. The name has reference to the irregularity of distribution of the green colour of the leaves which is the most obvious character of this class of affection. No causative organism can be detected in these diseases, but the juice in all cases conveys infection, often with great readiness.

Sugar-cane mosaic became generally known in consequence of a severe epidemic which began to develop in Porto Rico about 1916. The disease had previously existed for many years in several localities in the East, especially in Java, where it was known as yellow stripe, and was not regarded very seriously owing to the powers of resistance of the local cane varieties. The disease is now known to occur in the Western Hemisphere in Louisiana, Florida and adjoining States, in Jamaica, Cuba, Santo Domingo, Porto Rico, Barbados, Trinidad and the Argentine.

The disease was first recognised in Trinidad in 1920, when it was found to be abundantly distributed at the St. Augustine Experiment Station and its neighbourhood, from the outskirts of Port-of-Spain to Tunapuna. Many small centres of infection had also been established in the island by cuttings sent out from St. Augustine.

The first symptom of sugar-cane mosaic appears on the leaves in the form of pale, more or less elongated spots or streaks, difficult to describe but usually easy to recognise. A useful distinction from various un-related types of spotting which occur is that in mosaic the youngest leaves are always affected. Later symptoms appear on the stems, consisting of discoloured or water-soaked patches or streaks which in the more susceptible varieties become sunken and cracked, causing the cane to dry out and lose greatly in weight.

During prolonged dry weather no spread of the disease is noticeable, but subsequent to the first month or two of the wet season fresh infections occur with a frequency that varies greatly according to period and locality. Transmission is believed to be due to an insect carrier, not yet recognised.

Cuttings from infected canes reproduce the disease and afford the means of its extension over large areas and transmission over long distances.

With the exception of Uba no cane variety grown in Trinidad is known to be immune from mosaic, but here as elsewhere there appear to be somewhat wide differences in susceptibility to infection and in resistance to the more serious effects of infestation. These effects have not been allowed to develop to any great extent in Trinidad, but there is evidence enough to show that in the less resistant varieties they have a severity comparable with that reported from Porto Rico.

The discovery of the disease in the island was followed by efforts on the part of the Department of Agriculture to effect its eradication, and these are being steadily pursued. Infested districts are regularly inspected and in the case of small farmers compensation has been paid for the stools destroyed and new plants supplied free. As sufficient time has now been given for the education of the grower to recognise and deal with the disease it is proposed that future work will consist of inspection and where necessary the issue of orders under the Plant Protection Ordinance.

ANTHRACNOSE (BLOSSOM-BLIGHT AND WITHER-TIP) OF LIME.

This highly infectious fungus disease occurs on the lime (both common and spineless) and on some varieties of lemon. No other Citrus species or other plant is known to be susceptible. Infection is confined to the young and tender organs of the plant, *i.e.* the tips of new shoots, buds and flowers, and recently set fruits, The parts attacked are mostly killed. The leaves which survive and develop on the infected shoots show more or less deformity due to the injuries received in the tender state, and fruits which survive infection show large or small corky spots or cankers for the same reason.

The causative organism is the fungus *Gloeosporium limetticolum* Clausen. Its one-celled oblong spores form a pinkish coating on the affected parts and are probably distributed by air currents, rain, birds and insects. There is evidence which seems to show that infection has been carried from one district to another on full-grown lime fruits.

The disease is generally distributed over Trinidad, and even exists on an isolated tree on the highest point of the island of Chacachacare. In Tobago it has apparently been present for some years, confined to one isolated plantation, but has recently escaped from this situation and begun to spread rapidly in its neighbourhood. The disease has been proclaimed for the purposes of an attempt at eradication in Tobago. There is nothing to be gained by action under the Ordinance in Trinidad.

As regards other countries the disease occurs in British Guiana, is well-known in Cuba and Florida, and from accounts seen may be present in Jamaica. It has not so far been found in other islands of the Lesser Antilles, and no limes or lemons from Trinidad should on any account be sent there or to any tropical country.

It is possible to control the disease by spraying with Bordeaux mixture or preferably lime sulphur solution at the times when a flush of new growth or blossom takes place. The habit of the lime is so irregular in this respect that frequent applications are necessary for full protection, and the value of the produce is too small to cover the cost of materials and labour.

A theory has been put forward based on some local observations that the losses from the disease are greatly reduced by the provision of shade trees. Against this must be placed the fact that in cases seen of limes planted fairly extensively among cacao and between rows of coconuts the influence of the disease has been exerted to the full.

The only visible hope of establishing a citric acid industry in the Colony in the presence of this disease lies in the search for immune varieties. An Indian lime is at present under test, and seeds of other varieties have been obtained with due precautions from the Philippine Islands. One of these is stated to be immune to ' wither-tip,' but it is not known whether the fungus concerned is identical with ours.

BIRD VINE, MISTLETOE, VAGE, KAKA-ZOUÉZO.

These are the local names applied generally to several shrubby plants of the Natural Order *Loranthaceæ*, allied to the mistletoe of Europe. These plants are semi-parasitic on the branches of trees, penetrating the wood with their root-suckers and drawing upon the sap of the host for their supply of water and of substances raised in solution from the soil. They are not completely parasitic since they possess green leaves and manufacture their own supply of sugar or starch.

Of the numerous species which occur a few are pests of cultivated trees, and of these *Struthanthus dichotrianthus* is by far the most troublesome, occurring on a wide range of hosts and having external running roots which enable it to spread quickly among the branches and to establish many points of connection and food supply with the wood. It is the only one to which the name of vine is at all appropriate, as other species are bushy in form with only one attachment.

The fruits of these plants are enveloped in a sticky mucilage, and their distribution is mainly effected by birds which eat the berries and reject the seeds or void them in their excrement.

The remedy adopted is the severance of the branch to which the parasite is attached.

LOVE VINE.

The flowering plant commonly known as love vine is one of a genus of parasites of the Natural Order *Convolvulaceæ*, known in England as dodders. The local representative is *Cuscuta americana* L. The seed germinates on the ground and sends out a thread-like shoot the tip of which circles in search of a living support. When a suitable connection is effected the love vine loses its attachment to the soil and proceeds to develop among the twigs of its host, twining about them and forming small suckers at numerous points of contact. These establish connection with the conducting tissues of the host and draw from it the whole of the nourishment required, since this plant, unlike bird-vine, has no green leaves of its own.

Love vine is particularly common in Trinidad on Hibiscus hedges, and has a very wide range of hosts among shrubs and small trees. On crop-plants it is perhaps most often seen on cassava, and occasionally occurs on citrus trees and cacao. As a pest, apart from doing damage to hedges, it is not of much importance.

Love vine is an annual plant, and dies out when fruiting is completed. It is often destroyed by one or more parasitic fungi in the wet season. It is reproduced by seed, and also grows readily from any fragment. Children often aid its spread by throwing it about.

The treatment usually adopted is the cutting out and burning or burying of the infested branches. The parasite can also be destroyed by spraying with Cooper's Cattle Dip. 1½ ounces to the gallon. This burns the leaves of the host but on Hibiscus hedges at any rate does no permanent damage. The hedge should be trimmed low before spraying.

A parasitic plant which closely resembles the common love vine in habit, though belonging to a totally different Natural Order, is *Cassytha americana* (*Lauraceæ*). This is usually found on uncultivated plants and is not regarded as a pest. It is distinguishable from love vine by its more wiry stems and duller greenish yellow colour.

THE COCONUT BUTTERFLY.

The caterpillars of the coconut butterfly *Brassolis sophorae* become serious pests only occasionally when their natural enemies decrease in numbers. The egg parasites are the most important, the Tachina flies which issue from the pupæ being next in usefulness.

In *Circular No. 5* coloured figures of all stages of the butterfly will be found. The butterflies are rarely seen as they usually only come out at dusk and fly high and fast. The characteristic damage done to the coconut leaves by the caterpillars is the best indication of an attack. In feeding the caterpillars eat off all the green part and leave the entire mid-rib. The bare mid-ribs are generally conspicuous. The caterpillars are gregarious and during the day are to be found in a 'nest' formed either by spinning several leaves together or made in the crown of the tree among the bases of the fronds and spikes. The caterpillars only feed at night.

Control.—The most important measure is to be always on the look-out for the characteristic damage to the leaves; when this is recent the nest will not be very far off and it can then be cut off and destroyed. Only in cases of severe infestation will it be possible to collect egg masses, pupæ or emerging adults.

For further information see *Circular No. 5* Board of Agriculture "Preliminary Notes on some insects Affecting the Coconut Palm."—(*Price 3d.*)

PARASOL ANTS.

Under this heading two species of leaf-cutting ants are dealt with *Atta cephalotes* or the 'Bachack' and *Atta octospinosa* or the 'Parasol Ant' of Trinidad and the 'Pot Ant' of Tobago.

Bachacks (*A. cephalotes*) are the most injurious species and are generally found on cacao estates and uncultivated land bordering them, they live in large communities in the ground and a so-called nest consists of a collection of small chambers connected by tunnels. If left undisturbed a nest will persist for many years and will gradually expand, until it may cover quite a large area. Nests from six to twenty feet across are of common occurrence. All nests however begin with one chamber and one exit hole. Large nests have from fifty to sixty exits, but as a rule not all are used by the ants.

The ants are reddish brown and 'soldiers' are always present. The queens are darker than the workers and measure about one inch in length; workers or foragers vary in size from one-eighth to three-fourths of an inch. Stiff clay soils are preferred by the ants.

Parasol or Pot Ants (*A. octospinosa*) do not live in communities like the Bachacks and the nest generally consists of only one chamber in the ground. These ants also make use of any cavities in walls, under rotten logs of wood, tubs and flower pots; provided moisture conditions are suitable they will take advantage of any dark and quiet corner in field or garden.

Parasol ants are not of much importance on estates, they are more injurious about gardens.

The queens are half an inch long and reddish brown in colour; there are no 'soldiers' and the workers vary from a little over a quarter to one-eighth of an inch in length.

The two species differ in feeding habits: *Atta cephalotes* seems to confine itself mostly to leaves, but *Atta octospinosa* will take flowers of different kinds in addition to young leaves as well as the skin of ripe cocao pods.

Control.—Nests may be destroyed by the use of carbon bisulphide when very big or by means of cyanide of potassium or sodium when small. The most favourable time for dealing with nests is at the end of the dry season just before the rains set in and before the winged ants swarm. In using carbon bisulphide for large nests select only the exits in use by the ants and stop up all other holes with wet earth. Pour into each hole a measured quantity of carbon bisulphide (from a half to one fluid ounce is enough) and allow a little time for the gas to diffuse in the nest; explode at the mouth of one hole with a match and cover all other holes with wet earth immediately after the explosion in order to put out the fire and confine the fumes. If this is not done a large portion of the gas will be burned and the efficiency of the treatment lessened thereby.

For small nests of Bachacks and Parasol Ants use cyanide of potassium, one ounce in a gallon of water or crush the same quantity of cyanide and bury in the nest. Carbon bisulphide and cyanide will damage the roots of growing plants.

THE CACAO BEETLE.

The Cacao beetle (*Steirastoma depressum*) is sufficiently well known to need no description, but fig. 1 represents an adult and fig. 2 B the larva or 'worm' as it is commonly called here. The principal damage is done by the worms, young trees suffering most from them. The beetles gnaw the young branches for the purpose of feeding on the bark; the scars which they leave, illustrated in fig. 3, 2 *, do not damage the tree materially but serve the purpose of indicating where beetles are active and where the worms are to be searched for and destroyed. Feeding and egg laying generally proceed together. Occasionally beetles are found feeding on ripe cacao pods on the trees and on broken pods in the heaps, but this habit is rather rare. Both beetles and worms are more active during dry weather: excessive rain keeps them down. The beetles like sunshine, remaining dormant in

Fig. 1.

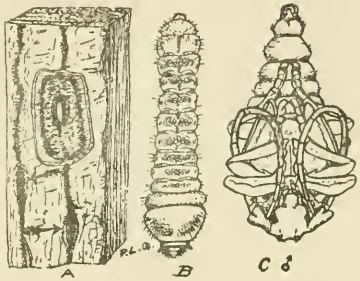

Fig. 2.

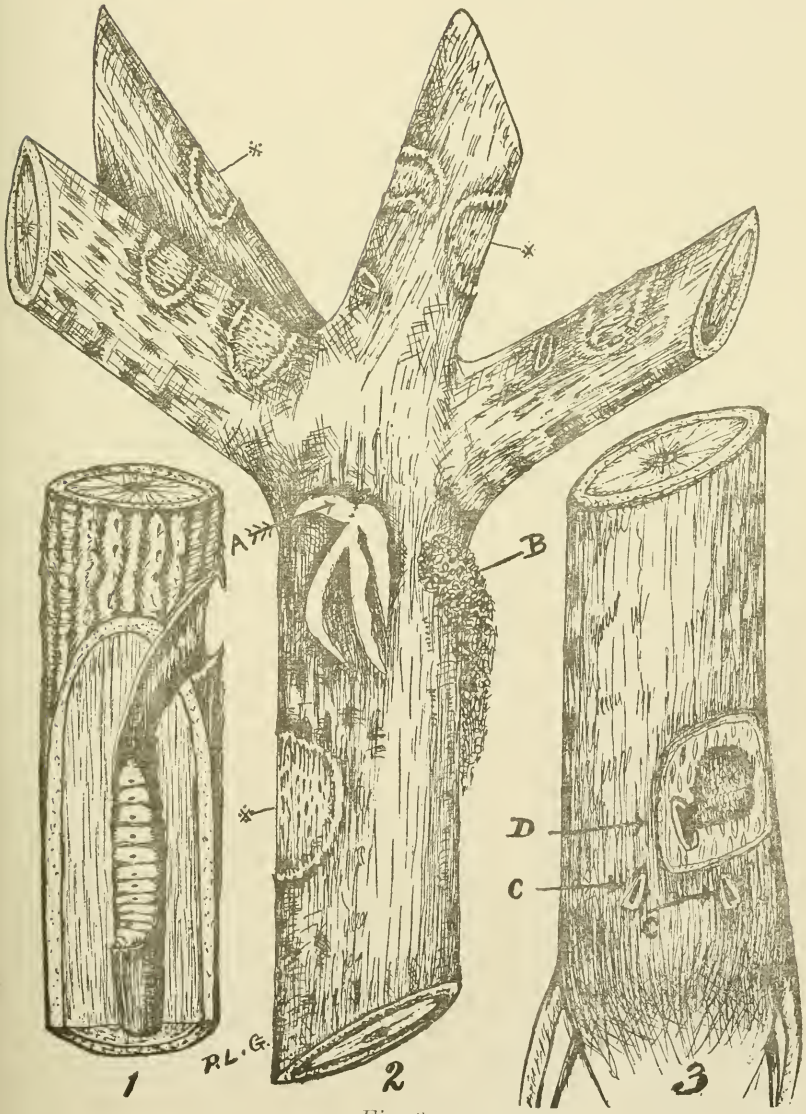

Fig. 3.

THE CACAO BEETLE. (pp. 182-3.)

EXPLANATION OF FIGURES.

FIG. 1. CACAO BEETLE.—Adult female, natural size. Colour grey with black markings.

FIG. 2. CACAO BEETLE.

A. Section of stem showing egg and egg chamber, the outer surface of bark has been removed.

B. Larva or worm. Colour: head light brown, body white.

C. Pupa of a male beetle. Colour white.

All figures natural size.

FIG. 3. CACAO BEETLE.

1. Section of branch showing larva in pupal chamber, the larva lives in the bark of the branch and enters woody part when about to turn into a pupa.

2.—A. Arrow points to old and abandoned tunnels in bark of stem.

B. Excrement and sawdust issuing from tunnel of larva, the best indication of larva in a tree.

* Feeding marks of adult beetles.

3.—C. Egg pit.

D. Burrow in bark of newly hatched larva.

All figures natural size.

Fig. 4.

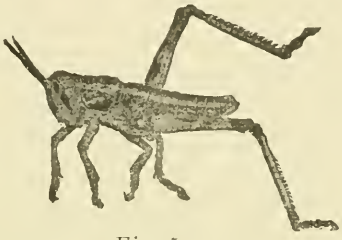

Fig. 5.

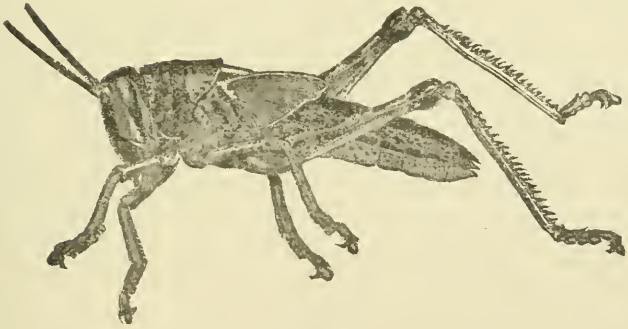

Fig. 6.

SOUTH AMERICAN LOCUST. Figs. 4, 5 & 6. (p. 183.)

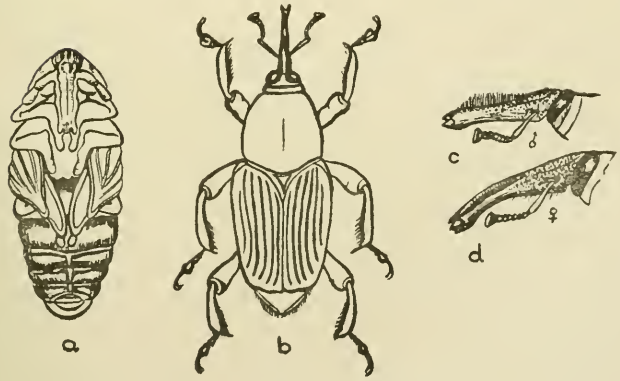

Fig. 7.

PALM WEEVIL or GRU-GRU WORM. (p. 184.)

EXPLANATION OF FIGURES.

Fig. 4. The Venezuelan Migratory Locust *Schistocerca paranensis*.—Adult female. Colour fawny yellow with black markings.

Natural size.

Fig. 5. Venezuelan Migratory Locust.—Hopper or immature stage. Colour reddish yellow with black markings.

Slightly enlarged.

Fig. 6. Venezuelan Migratory Locust.—Hopper stage just before moulting to the adult stage.

Fig. 7. Palm Weevil *Rhynchophorus palmarum*.

a. Pupa—colour rusty brown.

b. Adult female beetle—colour shining black.

c. Proboscis and head of adult male beetle lateral view.

d. Do. do. female do.

All figures natural size.

dull weather. The larvæ or worms tunnel under the bark of the trees and consume the cambium as they move about in their tunnels. These tunnels have no fixed direction, but they generally run in spirals round the stem of the tree, and branches are often completely ringed. As the worm moves along in its tunnel it leaves behind it excrement and chips of wood and bark; some of this waste exudes from the tunnels and betrays the whereabouts of a worm, see fig. 3, 2 B. The larva is the most destructive stage of the beetle it lasts for about seventy-five days. When ready to turn into a pupa see fig. 2 C the larva bores in the woody part of the tree and forms a small cell in which it undergoes its transformation in twelve to fourteen days, see fig. 3, 1.

Control.—Shade, both overhead and ground, keeps away beetles. Spraying branches with arsenate of lead or white lime will prevent beetles eating the bark and laying eggs in it, The regular use of "traps" consisting of short lengths of branches with the bark on of the "Wild Chataigne" tree *Pachira aquatica* will attract adults and prevent them from going on the cacao.

The most important control measure is the destruction of the worms and pupæ in the trees. Young cacao trees especially should be regularly examined and all worms and pupæ removed; dead or dying branches which are sure to contain pupæ and larvæ are to be cut off and burnt. All wounds made in cutting out worms should be dressed with crude oil, a thick mixture of white lime or white lead paint. Beetles always prefer to lay in trees that have been attacked and will invariably return to them if the dressing is omitted. The jorquets or forks of the trees are favourite places. In districts where cacao beetles are numerous all branches from trimming operations should be buried.

A full description with coloured plates of the cacao beetle and methods of control will be found in *Circular No. 1* Board of Agriculture: "The Life History and Control of the Cacao Beetle." (Price 6d.)

LOCUSTS.

Several insects come under the term locusts; some of our local species occasionally get away from their natural enemies and small sporadic attacks take place. The locust that is most to be feared however comes from Venezuela and is the South American migratory locust *Schistocerca paranensis*. Fig. 4 represents an adult or flying stage of this species and figs. 5 and 6 show the hopper or crawling stages of the same species.

Both flying and hopper stages cause damage by devouring most of our cultivated plants and many wild ones as well. They are very prolific and arrive in great numbers.

Control.—The flying and hopper stages can be poisoned by the use of bran mash which they eat, or the vegetation on which they feed can be sprayed with arsenite of soda. If the adults deposit eggs, which they do in loose soil the egg capsules can be dug up and destroyed. Newly hatched hoppers can be surrounded and burnt.

Further particulars will be found in *Circular 13* Board of Agriculture; "Locusts and Methods of Destroying them."

THE PALM WEEVIL OR GRU-GRU WORM.

The Palm Weevil *Rhynchophorus palmarum* see fig. 7 is more or less a secondary pest, attacking as a rule palms that are suffering from fungoid, bacterial or nematode diseases. It is however attracted to healthy trees when they have been scorched by fire or have been cut or bruised.

The larvæ, see fig. 8 destroy the internal tissues in the act of burrowing and feeding. The weevils possibly serve as transmitters of infection from one tree to another.

Control.—The larvæ are internal feeders and when discovered in palms not suffering from any disease should be cut out and the wound dressed with crude oil or tar.

All palms felled on account of disease or other reasons should be disposed of by burning to avoid promiscucus breeding of larvæ in them. Cuts and bruises on the trees should always be dressed with crude oil or tar.

For further particulars see *Circular No. 5* Board of Agriculture: "Preliminary Notes on some Insects affecting the Coconut Palm." (Price 3d.)

THE RHINOCEROS BEETLE.

The Rhinoceros Beetle (*Strategus aloeus*) of Trinidad is not to be confounded with the Rhinoceros Beetle of the East which is an entirely distinct insect with quite different habits and methods of attack.

Fig. 10 represents male and female beetles of the Trinidad Rhinoceros Beetle. The damage is done by the adult insects. Only young palms are attacked as a rule; the very youngest being preferred. By means of its powerful front legs the beetle burrows down into the ground near the young palm and when it has reached beneath the coconut it works its way upwards through the fibre into the heart of the plant and destroys it by tearing it and feeding on it. Often two beetles are found in a hole where they remain for some days. The holes made by the beetles near the plant are about an inch in diameter and resemble small crab holes.

The Rhinoceros Beetle is a pest mainly in recently cleared lands.

Control.—The beetles in the holes can be killed by pouring in some crude oil or carbon bisulphide, the former being preferable. The larvæ see fig. 11 live in rotting trunks of trees and in old manure heaps; by cutting up and scattering all rotting wood, and frequently turning over the manure heaps the larvæ can be killed.

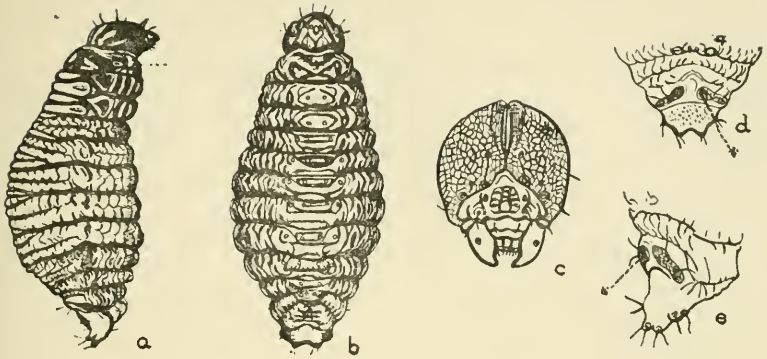

Fig. 8.

PALM WEEVIL or GRU-GRU WORM. (p. 184.)

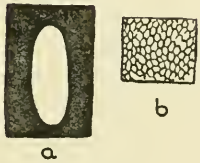

Fig. 9.

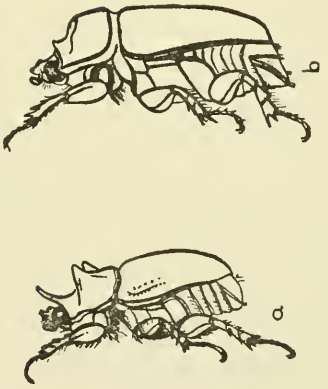

Fig. 10.

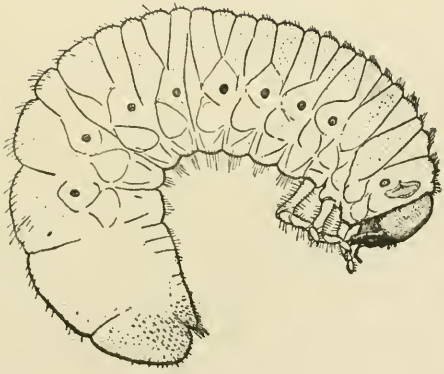

Fig. 11.

RHINOCEROS BEETLE (p. 184.)

EXPLANATION OF FIGURES.

Fig. 8. Palm Weevil.

a. Larva lateral view, colour : body white, head brown. Natural size.

b. Larva ventral view.

c. Head point view enlarged.

d. Dorsal view of posterior segments of larva.

* Points to spiracles.

e. Lateral view of above. Both figures slightly enlarged.

Fig. 9. Palm Weevil.

a. Outline of egg enlarged.

b. Pattern on surface of egg, highly enlarged.

Fig. 10. Rhinoceros Beetle, *Strategers ulæus*.

a. Male beetle.

b. Female beetle. Colour of both dark chestnut brown. Both figures slightly reduced.

Fig. 11. Rhinoceros Beetle.

Larval stage of beetle slightly reduced, colour body white, head chestnut brown.

Proclamations concerning Plant Importation.

IMPORTATION OF CACAO PLANTS AND CACAO BEANS FROM SOUTH AMERICA.

Proclamation No. 58 of 1920.

Whereas by Section 5 of the Plant Protection Ordinance, 1919, power is hereby given to the Governor to prohibit by proclamation the importation into this Colony of plants, parts of plants, seeds, fruits, soil, or any class of goods, packages, coverings or other articles or things named and specified in such proclamation and also to order that the same things shall not be imported into the Colony except upon such conditions as may be specified in such proclamation;

Now, therefore, I, John Robert Chancellor, Governor as aforesaid, do hereby prohibit the importation into this Colony from any part of the mainland of South America of cacao plants or portions thereof and of cacao beans except cured cacao beans from Venezuela and Colombia.

The Proclamation No. 13 of 1905 is hereby revoked.

IMPORTATION OF COTTON SEED, SEED COTTON, AND GINNED COTTON.

Proclamation No. 75 of 1920.

Whereas by Section 5 of the Plant Protection Ordinance, 1919, it is enacted that the Governor may from time to time by Proclamation prohibit the importation into the Colony of any plants, parts of plants, seeds, fruits, soil, or any class of goods, packages, coverings, or other articles or things named and specified in such proclamation, and may also by proclamation order that the plants, parts of plants, seeds, fruits, soil, or any class of goods, packages, coverings, or other articles or things named or specified in such proclamation shall not be imported into the Colony except upon such conditions as may be specified in such proclamation.

And whereas it is expedient to take steps to prevent the introduction into the Colony of the Pink Boll Worm of Cotton;

Now, therefore, I, John Robert Chancellor, Governor as aforesaid, do hereby prohibit the importation into the Colony of cotton seed, seed cotton, and ginned cotton, except under a permit issued by the Director of Agriculture;

Proclamation No. 4 of 1918 is hereby revoked.

NOTE: *In consequence of a resolution passed at a meeting of the Board of Agriculture held September 21, 1921, the Governor on the recommendation of the Director of Agriculture decided that in order to avoid the introduction of Pink Boll Worm no permit under the Proclamation would be issued for importations of cotton seed, seed cotton or ginned cotton, in transit or otherwise, from any part of the mainland of South America.*

CONTROL AND INSPECTION OF PLANT IMPORTS.

Proclamation No. 43 of 1921.

Whereas by Section 5 of the Plant Protection Ordinance, 1919, it is enacted that the Governor may from time to time by Proclamation prohibit the importation into the Colony of any plants, parts of plants, seeds, fruits, soil, or any class of goods, packages, coverings, or other articles or things named and specified in such proclamation, and may also by proclamation order that the plants, parts of plants, seeds, fruits, soil, or any class of goods, packages, coverings, or other articles or things named and specified in such proclamation shall not be imported into the Colony except under such conditions as may be specified in such proclamation;

And whereas for the purpose of protecting the agricultural interests of the Colony against the introduction of pests and diseases of plants it is expedient that imported plants be subject to inspection.

Now, therefore, I, Thomas Alexander Vans Best, Acting Governor as aforesaid, do hereby order and declare as follows:—

(1) All plants, seeds, bulbs, cuttings or other parts of plants intended for propagation imported into the Colony of Trinidad and Tobago excepting material imported through the Post Office shall be declared as such to the Collector of Customs or his Officers in Port-of-Spain, San Fernando or Scarborough, which shall be the only ports authorized for the entry of such material;

(2) The Collector of Customs or his Officers shall detain all such material until the Director of Agriculture or an Officer authorized by him for the purpose has issued a permit for such material to be brought into the Colony or has ordered it to be otherwise disposed of. It shall be the duty of the Customs Officer in charge of such material to attach thereto a tag showing the name of the owner or consignee, the port of shipment and the name of the vessel, and notify the Department of Agriculture by telephone or otherwise as soon as possible after its arrival. In the event of an Officer of the Department of Agriculture taking charge of any such material for treatment or destruction he shall give the Officer of Customs in charge a receipt for same;

(3) If the Postmaster-General or his Officers know or have reason to believe that any postal matter received from abroad contains any such material as above specified in (1) then such package shall be delivered to the Director of Agriculture for inspection and the delivery of any such postal package at the office of the Department of Agriculture and its return to the Post Office shall be acknowledged in each case by a receipt signed on behalf of the Director of Agriculture and of the Postmaster-General respectively;

(4) The Director of Agriculture, or an Officer authorized by him for the purpose, may order all or part of any material imported as above specified and any soil, covering, packing material, or other article or thing which may be assumed to have been in contact with it, to be destroyed disinfected or treated in any manner he may prescribe and may further order that such material be planted in a quarantine station under his control or in such a situation as he may for purposes of inspection direct;

(5) Plant material as specified in (1) above landed at Port-of-Spain from abroad and intended for transhipment to Tobago shall be dealt with for the purposes of this Proclamation as material imported through Port-of-Spain;

(6) The importation into the Colony from any source of material for intended propagation of the following plants will only be allowed under a permit previously obtained from the Director of Agriculture, who may refuse such a permit or attach thereto such conditions as seen to him desirable, viz.:—

Citrus Plants; Sugar-Cane; Coffee; Banana and Plantain; Cacao; Cotton; Coconut; and Hevea.

(7) Proclamations No. 35 of 1911 and No. 38 of 1900 are hereby repealed.

Regulations affecting Movement of Plants within the Colony.

CONVEYANCE OF PLANTS FROM TRINIDAD TO TOBAGO.

Regulation made by the Governor in Executive Council under Section 22 of the Plant Protection Ordinance, 1919, (Sept. 1, 1921).

The following plant materials may not be moved from Trinidad to Tobago without a licence previously obtained from the Director of Agriculture:—

Plantain and Banana Suckers;
Growing Cacao plants;
Growing Lime plants;
Lime Fruits;
Sugar-cane and Sugar-cane plants.

CONVEYANCE OF LIME PLANTS AND LIME FRUITS IN TOBAGO.

Regulation made by the Governor in Executive Council under Section 22 of the Plant Protection Ordinance 1919, (Oct. 27, 1921).

The removal of Lime trees or plants, or any part thereof, or Lime fruits from the District of Tobago bounded on the North by the Sea, on the South by the Main Ridge, on the East by St. Rose and on the West by Mt. Dillon West boundary is hereby prohibited until further notice.

SUGAR.

SUGAR CANE EXPERIMENTS 1919-21.

Trinidad Seedlings and Tests of Varieties, and some observations on Loss due to Mosaic Disease.

By Joseph de Verteuil, F.I.C., F.C.S., Agricultural Chemist, and L. A. Brunton, Assistant Superintendent, St. Augustine Experiment Station.

This report is divided into three parts :—

(1) Raising and testing of new Trinidad seedlings.
(2) Testing of varieties grown in plots.
(3) Mosaic Disease Observations.

Raising and Testing of New Trinidad Seedlings.

The work started in 1917 in connection with the raising of new sugar-cane seedlings has been continued on the lines indicated in the report for 1917-19. (2)

Ten out of the forty-three seedlings raised in 1917, which were selected for a second trial and planted out in small plots on November 4, 1919, have been discarded owing to not having maintained their good field characters of the first year. These varieties grew very badly and were generally susceptible to disease. The results of the thirty-three varieties which were allowed to grow to maturity will be found under Table VI.

One hundred and twenty-nine of the seedlings raised in 1918, which were selected for their combined field characters and analytical results for a second trial, were planted out in small plots, in Field 12, on October 25, 1920.

TRINIDAD SEEDLINGS RAISED IN 1919.

Out of the seedlings raised and potted in 1919, 2,409 were planted out in the field during February and March, 1920. Unfortunately a very severe period of drought followed the planting out of these seedlings—only 22 parts of rain having been recorded during April and May at St. Augustine—with the result that about 20 per cent. of the weaker plants died. These blanks were replaced in June with plants which had been kept in bamboo pots, but they were very backward when the reaping season arrived, whereas, the seedlings which were planted out early, generally grew into very fair stools. Of the seedlings originally planted out, 180 or 7·5 per cent. were selected from their field characters for analytical test and 58 or 2·4 per cent. have been selected for a second trial.

(2) *Bull. Dept. Agr.*, Trinidad and Tobago, *XVIII*, 1919, 136.

Good and Bad Parent Plants.

As in previous years, it has been found that certain varieties are useless for raising new seedlings, and the detection of good parents seems to be of great importance as will be seen below.

One hundred and forty-four *natural hybrids* and sixty-four *self fertilised* seedlings were obtained.

Table I.—Trinidad Seedlings Raised in 1919.
Comparative results from various parent canes.

Parent.	Number of seedlings planted out in field.	Selected for testing from field characters.	Selected for further trial from field characters and analytical results.
H. 27 ..	36	0	0
B. 6308 ...	16	1 = 6·2 per cent.	0
D. 116 ...	20	1 = 5·0 do.	0
B. 156 ...	188	3 = 1·6 do.	0
Ba. 7924 ...	188	15 = 8·0 do.	0
D. 109 ...	480	56 = 11·7 do.	4 = 0·8 per cent.
M.P. 55 ...	56	2 = 3·6 do.	1 = 1·8 do.
T. 75 ...	96	2 = 2·1 do.	2 = 2·1 do.
Badilla ...	44	5 = 11·4 do.	1 = 2·3 do.
H.? (1) ..	601	35 = 5·8 do.	18 = 3·0 do.
L. 511 ...	476	37 = 7·8 do.	25 = 5·2 do.
D. 109 x H.? ..	144 (N.H.)	9 = 6·2 do.	5 = 3·5 do.
D. 109 ...	64 (S.F.)	14 = 21·9 do.	2 = 3·1 do.

N.H. means *Natural Hybrid*; S.F. means *Self-fertilised* seedlings.

From the above it will be seen that none of the seedlings raised from H. 27, B. 6308, D. 116, B. 156, and Ba. 7924 gave juice of sufficiently good quality to warrant their being kept for further trial. The best results were again obtained from H. ? and L. 511. No seedlings were obtained from B. 6450, B. 6835, or the Bourbon; from all of which promising seedlings had been raised in the previous year. The two first did not arrow at St. Augustine and the seed from the Bourbon was not fertile, although obtained from several districts of the island.

First Selection of 1919 Seedlings.

The following are the results of the seedlings raised in 1919, which have been selected for their combined field characters and analytical results, and are being kept for a further trial. They were planted out in the field from bamboo pots during February and March, 1920, and were consequently 13 to 14 months old when tested between April 28 and May 25, 1921. The rainfall from March 1, 1920 to April 30, 1921, was 51·27 inches. Only 0·22 inches of rain fell from March 15, to May 31, 1920, so that the seedlings had a bad start. On the other hand 8·24 inches of rain were registered during February, March and April, 1921, and the seedlings were growing during this period instead of maturing with the result that the quality of the juice was comparatively poorer than if they had been through a normal dry season.

(1) A Hawaiian cane of which the number was lost on the journey when first introduced.

TABLE II.—TRINIDAD SEEDLINGS RAISED IN 1919.—FIRST YEAR'S SELECTION.

CANE.	Parent.	Weight of Stool.	Average weight of Canes.	JUICE.							
				Per cent. extracted.	Specific gravity.	Brix.	Percentage of			Quotient of purity.	Sucrose per gallon.
							Sucrose.	Glucose.	Non-Sugar.		
		Lb.	Lb.								Lb.
T. 988	M.P. 55..	87·0	3·5	66·6	1·0717	17·4	14·29	1·61	1·50	82·1	1·531
T. 872	Badilla ...	46·5	2·0	66·9	1·0753	18·2	16·38	1·06	0·76	90·0	1·761
T. 984	T. 75 ...	46·7	3·6	63·2	1·0717	17·4	15·55	1·25	0·60	89·4	1·666
T. 985	do. ...	63·0	3·5	58·9	1·0748	18·1	15·65	1·35	1·10	86·4	1·682
T. 974	D. 109 ...	86·5	3·6	64·3	1·0735	17·8	15·58	1·78	0·44	87·5	1·672
T. 976	do. ...	45·5	5·0	64·4	1·0730	17·7	16·02	1·39	0·29	90·5	1·719
T. 929	do ...	69·0	3·1	65·4	1·0770	18·6	16·15	1·72	0·73	86·8	1·739
T. 965	do. .	66·7	1·7	60·2	1·0770	18·6	16·54	1·67	0·39	88·9	1·781
T. 991 (S.F.)	do. ...	125·5	5·2	65·8	1·0722	17·5	14·67	1·92	0·91	83·8	1·573
T. 1002(S.F.)	do. ...	87·8	2·8	62·5	1·0761	18·4	15·39	1·31	1·70	83·6	1·656
T. 860 (C.F.)	D. 109XH.?	87·5	4·0	65·8	1·0704	17·1	15·04	1·16	0·90	87·9	1·610
T. 866 (C.F.)	do. ...	148·5	5·3	63·9	1·0766	18·5	15·68	1·00	1·82	84·8	1·688
T. 865 (C.F.)	do. ...	88·0	7·3	58·7	1·0761	18·4	16·17	0·78	1·45	87·9	1·740
T. 864 (C.F.)	do. ...	99·5	5·5	64·4	1·0801	19·3	16·73	0·54	2·03	86·7	1·807
T. 861 (C.F.)	do. ...	83·0	3·4	64·6	1·0801	19·3	17·41	1·11	0·78	90·2	1·880
T. 829	H. ? ...	125·4	7·4	66·6	1·0682	16·6	13·75	2·13	0·72	82·8	1·469
T. 840	do. ...	120·2	6·3	68·5	1·0695	16·9	13·78	2·33	0·79	81·5	1·474
T. 825	do. ...	94·5	6·7	68·4	1·0691	16·8	14·13	1·63	1·04	84·1	1·510
T. 854	do. ...	103·6	3·1	63·3	1·0704	17·1	14·45	1·69	0·96	84·5	1·547
T. 858	do. ..	101·2	6·7	68·4	1·0691	16·8	14·57	1·40	0·83	86·7	1·558
T. 831	do. ...	137·5	5·3	61·4	1·0726	17·6	14·72	0·86	2·02	83·6	1·579
T. 830	do. ...	165·5	4·5	66·3	1·0722	17·5	14·82	1·16	1·42	84·7	1·589
T. 837	do. ...	71·5	5·5	64·6	1·0726	17·6	15·01	1·53	1·06	84·7	1·610
T. 842	do. ...	90·0	5·0	67·9	1·0717	17·4	15·21	1·32	0·87	87·4	1·630
T. 826	do. ...	93·4	3·9	65·1	1·0739	17·9	15·33	1·48	1·09	85·6	1·646
T. 841	do. ...	101·9	5·4	63·3	1·0739	17·7	15·34	1·96	0·40	86·7	1·646
T. 846	do. ...	97·5	3·5	67·3	1·0744	18·0	15·37	1·96	0·67	85·4	1·651
T. 843	do. .	84·5	4·2	66·4	1·0735	17·8	15·58	1·44	0·79	87·5	1·672
T. 827	do. ...	102·7	9·2	66·8	1·0748	18·1	15·70	1·16	1·24	86·7	1·687
T. 838	do. ...	110·9	7·4	65·8	1·0722	17·5	16·08	0·72	0·70	91·9	1·724
T. 856	do. ...	65·6	4·4	63·7	1·0753	18·2	16·67	0·96	0·57	91·6	1·792
T. 847	do. ...	78·1	4·6	68·2	1·0761	18·4	16·94	1·19	0·27	92·1	1·822
T. 853	do. .	98·2	4·7	70·7	1·0855	20·5	18·81	0·98	0·71	91·7	2·042
T. 900	L. 511 ...	148·5	3·7	67·4	1·0691	16·8	14·03	1·92	0·85	83·5	1·500
T. 899	do. .	128·2	4·7	67·5	1·0722	17·5	14·72	1·92	0·86	84·7	1·579
T. 896	do. ..	109·3	3·8	65·5	1·0700	17·0	14·85	1·47	0·68	87·3	1·589
T. 920	do. ...	87·5	3·6	67·4	1·0735	17·8	15·33	1·85	0·62	86·1	1·646
T. 910	do. ...	137·5	4·9	68·3	1·0730	17·7	15·68	1·31	0·71	88·6	1·682
T. 916	do. .	83·2	6·4	68·7	1·0753	18·2	16·08	1·43	0·69	88·3	1·729
T. 923	do. ...	46·4	2·4	70·7	1·0761	18·4	16·07	1·67	0·66	87·5	1·729
T. 892	do. ...	98·5	3·5	65·1	1·0753	18·2	16·18	1·31	0·71	88·9	1·740
T. 914	do. ...	106·5	6·6	70·1	1·0753	18·2	16·42	1·11	0·67	90·2	1·766
T. 918	do. ...	59·2	4·9	61·7	1·0761	18·4	16·46	1·09	0·85	89·4	1·771
T. 904	do. ...	84·5	5·3	66·4	1·0766	18·5	16·50	1·28	0·72	89·2	1·776
T. 917	do. ...	63·6	3·3	71·1	1·0775	18·7	16·82	1·28	0·60	89·9	1·812
T. 912	do. ...	81·6	5·4	67·4	1·0779	18·8	16·91	1·47	0·42	89·9	1·824
T. 905	do. ...	92·0	6·6	65·2	1·0792	19·1	17·04	1·56	0·50	89·2	1·839
T. 919	do. ...	63·0	3·9	66·1	1·0779	18·8	17·11	0·76	0·93	91·0	1·844
T. 926	do. ...	80·5	4·0	67·2	1·0788	19·0	17·29	1·00	0·71	91·0	1·865
T. 894	do. ...	108·5	4·0	68·5	1·0792	19·1	17·38	0·86	0·86	91·0	1·876
T. 915	do. ...	51·5	2·1	67·2	1·0797	19·2	17·51	0·94	0·75	91·2	1·890
T. 906	do. ...	63·5	2·9	64·0	1·0797	19·2	17·56	1·25	0·39	91·4	1·896
T. 902	do. ...	102·4	4·9	67·8	1·0792	19·1	17·62	0·94	0·54	92·2	1·901
T. 927	do. ...	55·5	5·0	70·8	1·0810	19·5	17·59	1·09	0·82	90·2	1·901
T. 909	do. ...	86·0	3·1	66·4	1·0810	19·3	17·89	0·94	0·47	92·7	1·932
T. 891	do. ...	56·7	2·7	67·8	1·0824	19·8	17·86	1·06	0·88	90·2	1·933
T. 893	do. ...	77·2	4·0	65·9	1·0832	20·0	18·27	0·88	0·85	91·3	1·979
T. 911	do. ..	65·5	3·1	67·6	1·0864	20·7	19·56	0·76	0·38	94·5	2·125

Although a few of these seedlings might appear hardly worthy of retention it is considered preferable, especially for the first year's selection to err on the side of leniency. It will be seen from the above that the bulk of the good seedlings were raised from H.? and L. 511.

When the stools of these selected varieties have grown up, cuttings will be planted out in plots about October–November and grown in competition with standard varieties, such as Bourbon, B. 156, Badilla, or Ba. 6032. From the results obtained a further selection will be made, only those varieties which give very good results will be kept and planted in larger plots.

SEEDLINGS RAISED IN 1920.

About 15,000 seedlings were raised in 1920; of these over 6,000 were potted and 4,016 of the most vigorous planted out in the field during March and April 1921. The weather has been favourable and the young seedlings have made very good growth.

RE-SELECTION OF SEEDLINGS RAISED IN 1918.

After the seedlings, raised in 1917, had been cut for testing, all the stools were dug out. Those which had been selected for a further trial were divided into two or three according to their size and replanted in a convenient spot, where they could be watered with the object of getting cuttings for planting out in plots. This is the method followed in Barbados, but at St. Augustine it did not give very good results. Accordingly, the following season, after the seedlings had been cut for testing, the stools were allowed to remain on the spot and ratoon. This has proved to be much more satisfactory and in addition it has enabled us to make a second selection, as follows: The seedlings which did not grow sufficiently strong to warrant their being tested in the first year but which grew into large stools as ratoons were, this year, sampled and the juice analysed, with the result that several canes which would otherwise have been rejected, will be given a trial from cuttings. By this method, care being taken to leave the small shoots which are not fit for testing, a larger number of cuttings are obtained from the selected stools for planting out in plots at the end of the year. Moreover, this may lead to finding a good ratooning cane.

The results from this selection are given in the following table.

TABLE III.—TRINIDAD SEEDLINGS RAISED IN 1918.—SELECTED FROM THE RATOON STOOL.

CANE.	Parent.	Weight of Stool.	Average weight of Canes.	JUICE.								
				Per cent. extracted.	Specific gravity.	Brix.	Percentage of			Quotient of purity.	Sucrose per gallon.
							Sucrose.	Glucose.	Non-Sugar.		
		Lb.	Lb.								Lb.
T. 648 ...	B. 6835 ...	133·5	5·1	65·6	1·0775	18·7	16·29	1·48	0·93	87·1	1·755
T. 723 ...	Bourbon...	257·8	5·6	68·1	1·0779	18·8	16·43	1·22	1·15	87·4	1·771
T. 821 ...	B. 7482 ...	80·0	3·3	67·6	1·0815	19·6	17·87	1·00	0·73	91·2	1·933
T. 791 ...	D. 109 ..	145·9	3·1	65·3	1·0801	19·3	16·69	1·36	1·25	86·5	1·803
T. 800 ...	do. ...	58·4	2·4	67·4	1·0828	19·9	18·62	0·56	0·72	93·6	2·062
T. 516 ...	H. ? ...	72·0	3·6	67·5	1·0753	18·2	16·38	0·61	1·21	90·0	1·761
T. 751 ...	do. ...	102·5	6·0	66·5	1·0792	19·1	16·94	0·84	1·32	88·7	1·828
T. 752 ...	do. ...	79·0	3·0	66·0	1·0792	19·1	17·13	0·96	1·01	89·7	1·849
T. 755 ...	do. ...	82·5	2·9	66·8	1·0797	19·2	17·56	1·04	0·60	91·4	1·896
T. 760 ...	do. ...	86·2	3·2	65·8	1·0868	20·8	18·74	1·14	0·92	90·1	2·037
T. 773 ...	L. 511 ...	180·3	5·1	68·7	1·0783	18·9	15·80	1·32	1·78	83·6	1·704
T. 765 ...	do. ...	156·7	5·2	67·6	1·0757	18·3	16·56	0·33	1·41	90·5	1·781
T. 775 ...	do. ...	96·9	3·9	67·9	1·0788	19·0	17·09	0·44	1·47	89·9	1·844
T. 764 ...	do. ...	89·8	3·3	66·6	1·0788	19·0	17·14	0·35	1·51	90·2	1·849
T. 780 ...	do. ...	76·8	2·8	65·7	1·0783	18·9	17·25	1·04	0·61	91·2	1·860
T. 769 ...	do. ...	220·0	4·0	67·4	1·0788	19·0	17·29	0·61	1·10	91·0	1·865
T. 774 ...	do. ...	62·8	3·6	69·4	1·0801	19·3	17·55	0·44	1·31	90·9	1·895
T. 768 ...	do. ...	112·7	4·2	66·5	1·0819	19·7	17·72	0·92	1·06	89·9	1·917
T. 770 ...	do. ...	78·9	3·4	68·4	1·0806	19·4	18·03	0·35	1·02	92·9	1·948
T. 779 ...	do. ...	87·3	2·8	65·2	1·0806	19·4	18·22	0·66	0·52	93·8	1·969
T. 778 ...	do. ...	172·2	3·2	67·2	1·0815	19·6	18·40	0·70	0·50	93·9	1·990
T. 777 ..	do. ...	99·0	4·5	70·3	1·0859	20·6	18·95	0·44	1·21	92·0	2·058
T. 776 ...	do. ...	66·0	3·7	67·6	1·0882	21·1	19·96	0·27	0·87	94·6	2 172

From the preceding table it will be seen that a fair number of varieties which had not grown into large stools as seedlings, have developed into good stools as ratoons and that their juice was of very fair quality. In making this selection a higher standard, both as regards the weight of canes from the stool and the quality of the juice, is adopted than that for the first year's selection of seedlings. It will be observed that seedlings raised from H.? and L. 511 have again given the bulk of the selected varieties.

Results of Tests of Varieties.

The canes under report were grown at the Experiment Station, St. Augustine, as plant canes, first and second ratoons. Plant canes receive an application of pen manure at the rate of 15 tons per acre; no manures were applied to ratoons. The canes received ordinary estate cultivation. Mechanical tillage *i.e.* passing the small plough and cultivator between the cane stools, is performed in the early stages of growth. After the canes have grown too tall to be worked by implements manual labour is substituted.

During the period under review great care has been taken to eradicate the Mosaic disease. Each field was systematically examined at least once a month, all cane stools which showed signs of the disease were dug out and removed from the field. This to a large extent explains the comparatively small yield obtained this year from the majority of the fields, but the disease has been greatly reduced at the Experiment Station. The number of diseased stools dug out and the percentage affected for plant canes and ratoons is given under Table XVI. Froghoppers were again comparatively few and the cultivation suffered very little from root disease.

The results obtained from plant canes are recorded in Tables IV to VII, those from the first ratoons in Tables VIII to XI; Tables XII and XIII give the results for the second ratoons, and Tables XIV and XV the average results for plant canes and ratoons.

Information with regard to the date of planting and testing of the juice is given at the head of the Tables.

IMPLEMENTAL AND HAND TILLAGE.

COMPARATIVE RESULTS WITH CERTAIN VARIETIES OF PLANT CANES.

The canes in Field 14, (see Table IV), were planted during the latter part of September and beginning of October 1919, tested on March 31 and April 1, 1921 and reaped during April 1921, when eighteen to nineteen months old. Eight varieties were grown in duplicate plots of approximately one quarter of an acre each. In one plot the land was prepared and subsequently cultivated by manual labour, in the other the land was prepared and cultivated by animal drawn implements until the canes were too big. The plot of Ba.6032, worked with implements, was approximately three-quarters of an acre and those of B. 156 and B. 6308 slightly more than one and a quarter acre each. Duplicate samples of canes were taken from each plot, the juice from each tested separately and the average of the two results recorded. The field and analytical results are given below.

Table IV.—Plant Canes.—Implemental *v.* Hand Tillage.

Date planted ... ... September-October, 1919 ... ... Field 14.
Plants reaped and tested ... ... April, 1921 ... ... 18 to 19 months old.
Rainfall... ... ... October 1, 1919, to March 31, 1921 ... ... 69·51 inches.

H. Worked by hand entirely. I. Implemental Tillage.

Cane.	Area under cultivation.	Juice.								Per Acre.		
		Per cent. extracted.	Specific gravity.	Brix.	Percentage of Sucrose.	Percentage of Glucose.	Percentage of Non-sugar.	Quotient of purity.	Sucrose per gallon.	Canes.	Juice.	Sucrose in juice.
	Sq. ft.								Lb.	Tons.	Gals.	Tons.
D. 504 (H)	11,418	63·9	1·0766	18·5	16·71	1·36	0·43	90·3	1·799	33·33	4,431	3·56
do. (*I)	11,418	64·8	1·0775	18·7	16·58	1·40	0·72	88·7	1·786	34·48	4,653	3·71
T. 75 (H)	9,880	64·4	1·0806	19·4	17·56	1·02	0·82	90·5	1·897	25·79	3,443	2·91
do. (*I)	11,440	66·6	1·0761	18·4	15·68	1·58	1·14	85·2	1·687	35·84	4,969	3·74
B. 6308 (H)	11,396	66·5	1·0755	18·7	16·94	1·02	0·74	90·6	1·822	27·23	3,771	3·07
do. (I)	56,782	69·0	1·0761	18·4	16·48	1·34	0·58	89·6	1·773	31·46	4,518	3·58
B. 4934 (H)	11,440	64·5	1·0753	18·2	16·83	0·61	0·76	92·5	1·810	26·56	3,569	2·88
do. (I)	11,418	64·4	1·0739	17·9	16·34	0·88	0·68	91·3	1·755	32·86	4,414	3·46
B. 156 (H)	11,308	68·1	1·0717	17·4	15·11	1·72	0·57	86·8	1·619	29·95	4,263	3·08
do. (I)	56,540	68·8	1·0704	17·1	14.31	1·74	1·05	83·7	1·532	31·30	4,506	3·08
Badilla (H)	11,308	63·6	1·0909	21·7	20·53	0·57	0·60	94·6	2·240	22·10	2,886	2·89
do. (I)	11,308	62·6	1·0918	21·9	20·70	0·64	0.56	94·5	2·260	24·31	3,122	3·15
Ba. 6032 (H)	11,352	65.9	1·0700	17·0	15·04	1·18	0·78	88·5	1·609	29·64	4,089	2·94
do. (I)	33,946	66·4	1·0669	16·3	13·72	1·49	1·09	84·2	1·464	33·25	4,635	3·03
D. 109 (H)	11,396	66·9	1·0700	17·0	14·14	2·10	0·76	83·2	1·513	30·10	4,215	2·85
do. (I)	11,396	67·0	1·0687	16·7	13·62	2·25	0·83	81·5	1·455	33·49	4,703	3·05

* The juice of these varieties was tested on one sample only.

From the preceding it will be seen that a larger tonnage of canes per acre was obtained for each variety from the plots worked with implements than from canes cultivated by manual labour alone. On the other hand, with the exception of the Badilla, the quality of the juice was slightly better from the plots worked by hand compared with that from the implemental tillage plots, for each variety respectively. This was to be expected as generally, the larger the tonnage of canes the poorer is the quality of the juice. This is well exemplified in the case of T. 75, where the juice from the plot which yielded 35 tons was distinctly inferior to that of the plot giving only 25 tons of canes per acre. If, however, these two factors viz.: (1) percentage of sucrose in juice and (2) tonnage of canes per acre are combined together there is more indicated sucrose in the juice per acre from the plots worked by implements than from those worked by manual labour alone. The advantage is clearly in favour of implemental tillage, especially when it is remembered that it costs much less. (1.)

EXPERIMENT WITH DRAINS AT VARIOUS DISTANCES.

Another experiment was carried out at the opposite end of this field to ascertain whether it was necessary to continue the usual system of draining the land every 22 feet. The soil in this field and at the Experiment Station generally is a sandy loam and naturally porous. The necessity of having drains 22 feet apart was not very apparent and the following experiment was made. Approximately two and a half acres were ploughed flat and marked off into three sections having frontages of 110, 44 and 66 feet respectively. The land was plough-drilled and planted with cuttings of Badilla at distances of 5 feet by 5 feet leaving the space necessary for putting in the usual drain every 22 feet in the first section and a dividing drain between the 44 and 66 feet plots. The plots were similarly treated and the canes reaped and weighed separately on April 28, 1921.

The following results were obtained :—

1. Plot with frontage of 110 feet with drains every 22 feet gave 24·79 tons of canes per acre.
2. Plot with frontage of 44 feet with drain on either side gave 27·18 tons of canes per acre.
3. Plot with frontage of 66 feet with drain on either side gave 27·83 tons of canes per acre.

The results indicate that under the conditions at St. Augustine it is unnecessary to have drains every 22 feet or even every 44 feet as the best return was obtained from the plot with the drains 66 feet apart. It should be mentioned, however, that the rainfall for the seven months from June 1 to December 31, 1920 was only 40·19 inches against an average of 47·14 for the previous three years. This season (1921–22), on the other hand, the rainfall has been unusually heavy and it will be very interesting to see how the yields compare when the canes are reaped as first ratoons.

NEWLY INTRODUCED AND OTHER VARIETIES.

Twenty-one varieties were planted in Field 13 in October, 1919, including the most recent introductions from Barbados. The canes were sampled and the juice tested on May 10, 1921, but owing to difficulties in delivering the canes they were only reaped at the end of May and beginning of June being then 19 months of age.

(1.) *See Bull. Dept. Agr.* T. & T., XIX. 1920, 19

The highest results were obtained from H. ?, followed by D. 109, B.S.F. 12 (34), B. 60, Badilla, B.H. 10 (12), B. 156 and B.S.F. 12 (27). Ba. 6032 and B. 6308 only occupy the tenth and eleventh places. B. 6450 and the Bourbon have given very poor returns. During the past two or three years, the latter has been going from bad to worse and it is with the greatest difficulty that a plot can be established notwithstanding that cuttings are obtained from comparatively new lands where it still grows fairly well.

The best juice was, as usual, obtained from L. 511 and the Badilla. H.? B.H. 10 (12), B. 60, B.S.F. 12 (34) and B. 156 have also given juice of good quality.

TABLE V.—NEWLY INTRODUCED AND OTHER VARIETIES.—PLANT CANES.

Date planted ... ... October-November, 1919 ... ... Field 13.
Plants reaped and tested ... ... May–June, 1921 ... ... 19 months old.
Rainfall ... ... November 1, 1919, to May 31, 1921 ... ... 69·76 inches.

CANE.	Area under cultivation.	JUICE.								PER ACRE.		
		Per cent. extracted.	Specific gravity.	Brix.	Percentage of Sucrose.	Percentage of Glucose.	Percentage of Non-sugar.	Quotient of purity.	Sucrose per gallon.	Canes.	Juice.	Sucrose in juice.
	Sq. ft.								Lb.	Tons.	Gals.	Tons.
H. ?	9,042	64·9	1·0819	19·7	17·91	0·86	0·93	90·9	1·938	35·11	4,718	4·13
D. 109	10,406	64·4	1·0761	18·4	15·30	2·38	0·72	83·1	1·646	34·48	4,622	3·40
B.S.F. 12 (34)	3,509	66·8	1·0824	19·8	17·52	1·67	0·61	88·5	1·896	28·40	3,926	3·32
B. 60	5,170	68·7	1·0806	19·4	17·74	0·94	0·72	91·4	1·917	25·80	3,674	3·14
Badilla	17,952	62·8	1·0882	21·1	19·34	1·02	0·74	91·6	2·104	25·17	3,254	3·06
B. H. 10 (12)	40,128	66·9	1·0824	19·8	17·86	1·51	0·43	90·2	1·933	25·39	3,515	3·03
B. 156	10,142	64·9	1·0788	19·0	17·00	1·47	0·53	89·5	1·834	26·04	3,509	2·87
B.S.F. 12 (27)	37,312	70·2	1·0739	17·9	14·99	1·85	1·06	83·7	1·610	26·08	3,819	2·74
B.S.F. 12 (24)	11,372	69·5	1·0753	18·2	16·04	1·51	0·65	88·1	1·725	22·46	3,252	2·50
Ba. 6032	39,160	65·8	1·0726	17·6	15·54	1·28	0·78	88·3	1·667	24·36	3,347	2·49
B. 6308	18,392	63·2	1·0761	18·4	16·17	1·51	0·72	87·9	1·740	23·89	3,143	2·44
B. 347	9,086	68·6	1·0713	17·3	13·71	2·08	1·51	79·2	1·469	25·23	3,619	2·37
B. 6388	9,438	68·5	1·0726	17·6	14·96	1·92	0·72	85·0	1·605	20·65	2,954	2·12
Ba. 7924	9,680	67·6	1·0730	17·7	15·39	1·56	0·75	86·9	1·651	20·14	2,842	2·09
L. 511	20,372	66·9	1·0886	21·2	19·57	0·86	0·77	92·3	2·131	15·21	2,094	1·99
B. 4934	9,130	66·0	1·0744	18·0	16·44	1·09	0·47	91·3	1·766	17·83	2,453	1·93
B. 67	5,170	68·0	1·0775	18·7	16·39	1·72	0·59	87·6	1·766	17·27	2,441	1·92
B. 14761	9,636	65·9	1·0792	19·1	16·80	1·43	0·87	87·9	1·813	14·35	1,963	1·59
B. 6450	9,482	68·3	1·0748	18·1	15·80	1·43	0·87	87·3	1·698	13·84	1,970	1·49
Bourbon	9,592	70·1	1·0730	17·7	14·86	1·85	0·99	83·9	1·594	10·05	1,471	1·05
Ba. 8846	9,900	68·6	1·0792	19·1	16·72	1·61	0·77	87·5	1·804	8·74	1,244	1·00

NEW TRINIDAD SEEDLINGS. FIRST RESULTS FROM PLOTS.

The first plot results of the new Trinidad seedlings raised in 1917 are given in Table VI. A larger number of stools were planted than recorded under the head "number of stools reaped" but several were cut at the end of October, 1920, in obtaining cuttings to plant new plots and a few were dug out as they showed signs of the Mosaic disease. The plots were planted on November 4, 1919. The canes were sampled and the juice tested at the end of May, 1921, but they were not reaped until fifteen days later at approximately 19 months of age. The best results were obtained from T. 362, T. 455, and T. 301, all of which have given a yield per acre of over 50 tons of canes containing more than 6 tons of sucrose. T. 489, T. 373, T. 452, T. 499, T. 487, T. 491, T. 412, T. 496, T. 438 and T. 372 have also given good results with an indicated yield of sucrose of over 4 tons per acre.

TABLE VI.—NEW TRINIDAD SEEDLINGS: PLOTS OF PLANT CANES.

Date planted ... ... November 4, 1919 ... ... Field 13.
Date reaped and tested ... ... June 16, 1921 ... ... 19 months old.
Rainfall ... ... November 1, 1919 to June 15, 1921 ... 79·32 inches.

CANE.	No. of stools reaped.	JUICE.								PER ACRE.		
		Per cent. extracted.	Specific gravity.	Brix.	Percentage of Sucrose.	Percentage of Glucose.	Percentage of Non-Sugar.	Quotient of purity.	Sucrose per gallon.	Canes.	Juice.	Sucrose in juice.
									Lb.	Tons.	Gals.	Tons.
T. 362	3	68·2	1·0819	19·7	17·53	1·43	0·77	89·0	1·896	59·76	8,438	7·14
T. 455	9	64·6	1·0855	20·5	18·42	1·22	0·86	89·8	1·999	52·90	7,052	6·25
T. 301	42	69·7	1·0748	18·1	16·14	1·51	0·45	89·2	1·735	55·16	8,013	6·21
T. 489	12	65·3	1·0735	17·8	15·33	1·78	0·69	86·1	1·646	49·50	6,745	4·96
T. 373	16	70·4	1·0757	18·3	16·17	1·39	0·74	88·4	1·739	40·84	5,987	4·65
T. 452	10	67·2	1·0783	18·9	16·47	1·78	0·65	87·1	1·776	41·58	5,804	4·60
T. 499	27	69·7	1·0717	17·4	14·53	2·27	0·60	83·5	1·557	44·76	6,521	4·53
T. 487	12	63·2	1·0797	19·2	17·51	1·19	0·50	91·2	1·890	39·60	5,192	4·38
T. 491	11	66·2	1·0709	17·2	14·35	2·08	0·77	83·4	1·537	45·07	6,241	4·28
T. 412	4	61·8	1·0797	19·2	17·32	1·43	0·45	90·2	1·870	39·60	5,077	4·24
T. 496	11	67·9	1·0832	20·0	18·71	0·86	0·43	93·5	2·027	33·30	4,676	4·23
T. 348	3	69·3	1·0730	17·7	15·05	1·78	0·87	85·0	1·615	39·84	5,764	4·15
T. 372	13	69·2	1·0739	17·9	15·43	1·78	0·62	86·2	1·657	38·13	5,504	4·07
T. 503	7	65·4	1·0730	17·7	15·24	2·00	0·46	86·1	1·635	39·70	5,420	3·96

TABLE VI.—(*Contd.*)—NEW TRINIDAD SEEDLINGS: PLOTS OF PLANT CANES.

Date planted ... ... November 4, 1919 ... ... Field 13.
Date reaped and tested ... ... June 16, 1921 ... ... 19 months old.
Rainfall ... ... November 1, 1919 to June 15, 1921 ... ... 79·32 inches.

CANE.	No. of stools reaped.	JUICE.								PER ACRE.		
		Per cent. extracted.	Specific gravity.	Brix.	Percentage of Sucrose.	Glucose.	Non-Sugar.	Quotient of purity.	Sucrose per gallon.	Canes.	Juice.	Sucrose in Juice.
									Lb.	Tons.	Gals.	Tons.
T. 303	34	67·5	1·0766	18·5	16·16	1·61	0·73	87·3	1·740	36·09	5,068	3·94
T. 381	7	67·9	1·0775	18·7	16·78	1·47	0·45	89·7	1·808	34·03	4,803	3·88
T. 329	7	68·6	1·0748	18·1	16·53	1·04	0·53	91·3	1·777	34·03	4,865	3·86
T. 407	11	62·0	1·0806	19·4	17·84	0·82	0·74	91·9	1·928	34·26	4,403	3·79
T. 368	12	69·5	1·0748	18·1	14·54	1·85	1·71	80·3	1·563	36·30	5,258	3·67
T. 406	16	64·1	1·0806	19·4	17·55	1·14	0·71	90·4	1·896	28·46	3,782	3·20
T. 356	3	66·6	1·0722	17·5	14·67	1·85	0·98	83·8	1·573	33·20	4,515	3·17
T. 399	12	65·1	1·0687	16·7	14·19	1·56	0·95	85·0	1,516	33·00	4,606	3·12
T. 420	7	59·8	1·0770	18·6	16·54	1·09	0·97	88·9	1·781	31·19	3,879	3·08
T. 320	28	70·0	1·0713	17·3	14·44	2·00	0·86	83·5	1·547	27·58	4,037	2·79
T. 502	15	70·0	1·0691	16·8	13·01	2·17	1·62	77·4	1·391	30·40	4,459	2·77
T. 424	7	65·0	1·0700	17·0	14·75	1·22	1·03	86·8	1·578	25·52	3,473	2·45
T. 459	24	65·2	1·0735	17·8	15·48	1·78	0·54	87·0	1·662	23·92	3,254	2·41
T. 360	21	68·3	1·0735	17·8	14·75	2·00	1·05	82·9	1·583	23·59	3,362	2·37
T. 402	15	66·9	1·0739	17·9	15·43	1·51	0·96	86·2	1·657	22·47	3,135	2·32
T. 408	12	59·7	1·0695	16·9	14·37	1·78	0·75	85·0	1·537	26·40	3,301	2·26
T. 370	4	66·6	1·0713	17·3	14·78	1·61	0·91	85·5	1·583	19·80	2,757	1·95
T. 488	11	70·1	1·0779	18·8	17·11	1·19	0·50	91·0	1·844	16·23	2,364	1·95
T. 422	19	69·8	1·0709	17·2	14·69	1·72	0·79	85·4	1·573	17·73	2,588	1·82

COMPARISON OF B. 156 AND Ba. 6032 AS "SPRING" PLANTS.

On June 26, 1920, approximately three acres were planted in Field 18 with B. 156 and Ba. 6032 to test the relative value of these two varieties as "Spring" plants. The canes were reaped and tested on July 1, 1921 at 12 months of age. It will be seen (Table VII) that better results were obtained from B. 156, both as regards tonnage per acre and percentage of sucrose in the juice, than from Ba. 6032. The poor quality of the juice is due to the large amount of rain which fell during June 15·02 inches having been recorded for that month.

Table VII.—B. 156, Ba. 6032 AS SPRING PLANTS.

Date planted ... ... June 26, 1920 ... ... Fields 18.

Plants reaped and tested ... ... July 1, 1921 ... ... 12 months old.

Rainfall ... ... June, 25 1920 to June 30, 1921 ... 63·17 inches.

Cane.	Area under cultivation.	Juice.								Per Acre.		
		Per cent. extracted.	Specific gravity.	Brix.	Percentage of			Quotient of purity.	Sucrose per gallon.	Canes.	Juice.	Sucrose in juice.
					Sucrose.	Glucose.	Non-Sugar.					
	Sq. Ft.								Lb.	Tons.	Gals.	Tons.
B. 156	86,025	68·0	1·0652	15·9	13·89	1·04	0·97	87·3	1·479	21·61	3,090	2·04
Ba. 6032	39,213	68·0	1·0514	12·7	10·21	1·23	1·26	80·4	1·073	18·58	2,692	1·29

RATOON CANES.

The first ratoons in Field 2, were reaped on June 14, 1921, at thirteen months of age. An average yield of 18·99 tons of canes were obtained per acre and the results are given in Table VIII. In this field there were only three varieties: L. 511 giving the best results, followed by B.H. 10 (12).

TABLE VIII.—FIRST RATOONS.

Date planted ... ...September 24, 1918—Field 2.
Plants reaped and tested...May 6, 1920.—19½ months old.
Ratoons reaped and tested ...June 14, 1921... ...13 months old.
Rainfall ... ...May 7, 1920 to June 13, 1921...63·59 inches.

CANE.	Area under cultivation.	JUICE.								PER ACRE.		
		Per cent. extracted.	Specific gravity.	Brix.	Percentage of			Quotient of purity.	Sucrose per gallon.	Canes.	Juice.	Sucrose in juice.
					Sucrose.	Glucose.	Non-Sugar.					
	Sq. ft.								Lb.	Tons.	Gals.	Tons.
L. 511	12,698	66·4	1·0959	22·8	21·63	0·43	0·74	94·9	2·370	16·89	2,292	2·42
B.H. 10 (12)	40,258	67·1	1·0761	18·4	16·41	1·29	0·70	89·2	1·766	19·53	2,728	2·15
Ba. 7924	14,894	64·2	1·0722	17·5	15·55	1·00	0·95	88·8	1·667	19·30	2,588	1·92

The results from the first ratoons in Field 19 are recorded in Table IX. The canes from this plot were reaped as plant canes in April 1920, being 19 months old; as ratoons they were cut in March at eleven months of age and they gave an average yield of 19·34 tons of canes per acre. In this field there were eleven varieties under experiment, of which five have given better results than D. 109 and B. 156. The best results were obtained from B. 6308, B. 6450, Badilla, H. 227 and Ba. 6032. The poor return from T. 75 is due to the very large amount of stools attacked with the mosaic disease, which had to be dug out.

Table IX.—First Ratoons.

Date planted ... ...September, 1918—Field 19. *Ratoons reaped and tested* ..March, 1921 ... ... 11 months old.
Plants reaped and tested ...April, 1920—19 months old. *Rainfall* ... ...May 1, 1920 to February 28, 1921... 44·49 inches.

Cane.	Area under cultivation.	Juice.								Per Acre.		
		Per cent. extracted.	Specific gravity.	Brix.	Percentage of Sucrose.	Percentage of Glucose.	Percentage of Non-Sugar.	Quotient of purity.	Sucrose per gallon.	Canes.	Juice.	Sucrose in Juice.
	Sq. ft.								Lb.	Tons.	Gals.	Tons.
B. 6308	46,197	67·0	1·0753	18·2	16·32	1·32	0·36	89·6	1·755	22·94	3,202	2·51
B. 6450	45,305	69·2	1·0766	18·5	16·69	1·26	0·55	90·3	1·797	20·80	2,995	2·40
Badilla	25,032	61·2	1·0891	21·3	19·85	0·96	0·49	93·2	2·162	17·92	2,256	2·18
H. 227	23,299	66·9	1·0739	17·9	15·47	1·63	0·80	86·4	1·661	19·89	2,775	2·06
Ba. 6032	23,396	63·8	1·0687	16·7	14·40	1·40	0·90	86·2	1·539	22·34	2,987	2·05
D. 109	34,255	67·4	1·0678	16·5	13·12	2·33	1·05	79·5	1·401	22·08	3,122	1·95
B. 156	23,718	67·6	1·0695	16·9	13·93	1·81	1·16	82·4	1·490	20·59	2,915	1·94
B. 3922	39,560	67·8	1·0695	16·9	14·47	1·81	0·62	85·6	1·547	17·44	2,476	1·71
T. 202	37,591	67·2	1·0753	18·2	15·80	1·69	0·71	86·8	1·699	15·09	2,112	1·60
H. 27	11,649	65·6	1·0722	17·5	14·28	1·96	1·26	81·6	1·531	15·00	2,056	1·40
T. 75	41,272	64·3	1·0722	17·5	14·58	1·96	0·96	83·3	1·563	9·95	1,337	0·93

The first ratoons in Field 9 were reaped on March 24, 1921 at 13¾ months of age and gave an average yield of only 12·34 tons of canes per acre. As plant canes this field was reaped on April 1, 1920, giving an average yield of 25·54 tons of canes per acre. These poor yields are due chiefly to the prevalence of mosaic disease. It was the field most seriously affected at the Experiment Station. After the plant canes were cut, the field was kept under strict supervision and every stool which showed signs of the disease was dug out. Two varieties, B. 6450 and B. 16536, were so badly affected that the whole plots were stumped and the stools removed from the field. On the other hand, only three stools of B. 6308, one each of B. 156 and Badilla and none of B. 4934 were affected by the mosaic disease. It will be seen from the table below that these four varieties have given the best results in the following order; Badilla, B. 4934, B. 6308 and B. 156. The very poor yield from the Bourbon is also in a great measure due to root disease.

Table X.—First Ratoons.

Date planted .. ... October 10, 1918 . ... Field 9.
Plants reaped and tested... ... April 1, 1920 ... ... 17½ months old.
Ratoons reaped and tested ... March 24, 1921 ... ... 11¾ months old.
Rainfall ... ... April 1, 1920 to March 23, 1921 ... ... 45·71 inches.

Cane.	Area under cultivation.	Juice.								Per Acre.		
		Per cent. extracted.	Specific gravity.	Brix.	Percentage of Sucrose.	Glucose.	Non-sugar.	Quotient of purity.	Sucrose per gallon.	Canes.	Juice.	Sucrose in juice.
	Sq. ft.								Lb.	Tons.	Gals.	Tons.
Badilla	6,996	59·1	1·0950	22·6	20·89	0·79	0·92	92·4	2·287	17·74	2,145	2·19
B. 4934	7,062	63·6	1·0779	18·8	17·01	1·04	0·75	90·5	1·833	18·97	2,507	2·05
B. 6308	7,062	66·8	1·0783	18·9	16·76	1·44	0·70	88·7	1·807	18·27	2,535	2·04
B. 156	7,062	63·6	1·0819	19·7	17·67	1·19	0·84	89·7	1·912	13·72	1,807	1·54
B.H. 10 (12)...	7,040	64·1	1·0828	19·9	17·90	1·26	0·74	89·9	1·938	10·75	1,425	1·23
B. 10650	7,062	66·8	1·0748	18·1	15·95	1·29	0·86	88·1	1·714	10·87	1,513	1·16
B. 14761	7,040	62·5	1·0810	19·5	17·35	0·98	1·17	89·0	1·875	9·82	1,272	1·06
Ba. 6032	28,138	62·4	1·0643	15·7	13·07	1·53	1·10	83·2	1·391	12·09	1,588	0·99
B. 6388	7,062	65·5	1·0704	17·1	14·02	2·04	1·04	82·0	1·501	10·25	1,405	0·94
B. 17380	7,040	66·1	1·0660	16·1	12·90	1·75	1·45	80·1	1·375	9·90	1,375	0·84
Bourbon	6,996	66·5	1·0630	15·4	11·57	2·13	1·70	75·1	1·230	4·12	577	0·32

ST. MADELEINE AND NEW BARBADOS SEEDLINGS.—FIRST RATOONS.

The first ratoon results of the seedlings raised by the Ste. Madeleine Sugar Co., Ltd., and of the latest introductions from Barbados are given in Table XI. The canes were reaped on June 16, 1921, at 13 months of age and gave an average yield of 23·23 tons of canes per acre. The juice was of comparatively poor quality owing to the large amount of rain which fell during the three weeks previous to their being tested. B.S.F. 12 (24) and B. 60 have both given very good field returns and they come at the top of the table followed by Q. Badilla U and 55 $\frac{AR}{N}$B.

TABLE XI.—ST. MADELEINE AND NEW BARBADOS SEEDLINGS.—FIRST RATOONS.

Date planted	December 21, 1918	Field 5.	
Plants reaped and tested	May 8, 1920	16½ months old.	
Ratoons reaped and tested ...	June 16, 1921	13 months old.	
Rainfall	May 9, 1920 to June 15, 1921	63·43 inches.	

CANE.	Area under cultivation.	JUICE. Per cent. extracted.	Specific gravity.	Brix.	Percentage of Sucrose.	Glucose.	Non-sugar.	Quotient of purity.	Sucrose per gallon.	PER ACRE. Canes.	Juice.	Sucrose in Juice.
	Sq. ft.								Lb.	Tons.	Gals.	Tons.
B. S. F. 12 (24)	4,180	68·9	1·0739	17·9	14·84	1·65	1·41	82·9	1·594	35·56	5,110	3·64
B. 60	4,070	67·5	1·0748	18·1	16·33	0·76	1·01	90·2	1·755	31·57	4,441	3·48
Q. Badilla U.	2,530	69·1	1·0700	17·0	14·36	1·26	1·38	84·5	1·536	28·84	4,172	2·86
55 $\frac{AR}{N}$ B.	3,168	66·5	1·0713	17·3	14·54	1·73	1·03	84·0	1·558	24·92	3,465	2·41
26 $\frac{AR}{N}$ B.	1,694	65·6	1·0621	15·2	11·67	2·67	0·86	76·8	1·239	26·03	3,643	2·01
Q. Badilla E.	2,838	70·0	1·0704	17·1	14·89	1·20	1·01	87·1	1·594	17·65	2,585	1·84
Q. Badilla A.	2,124	63·0	1·0609	14·9	11·59	1·92	1·39	77·8	1·229	20·51	2,728	1·50
Q. Badilla D.	2,200	68·1	1·0674	16·4	13·86	2·00	0·54	84·6	1·479	14·60	2,086	1·38
Q. Badilla C.	2,728	66·6	1·0531	13·1	8·90	2·67	1·53	67·9	0·937	21·16	2,997	1·25
Ba. 8846	4,202	67·7	1·0652	15·9	13·20	1·85	0·85	83·0	1·406	13·61	1,937	1·21
B. S. F. 12 (27)	4,224	65·2	1·0587	14·4	10·38	2·27	1·75	72·1	1·099	17·79	2,454	1·20

SECOND RATOONS.

The second ratoons in Field 17 were reaped on June 24, 1921 at fifteen months of age. An average yield of 13·41 tons of canes was obtained per acre and the results are given in Table XII. In this field B. 3922, B. 1753, and B. 6450 were heavily hit by the mosaic disease and a large number of stools were dug out. On the other hand, the Badilla plot was free and only 1, 2 and 3 stools had to be dug out from the plots of B. 6308, B. 4934 and D. 504 respectively. Six varieties have given better results than B. 156, viz:—B. 6308, B. 6450, B. 4934, D. 504, T. 202 and B. 1753.

TABLE XII.—SECOND RATOONS.

Date planted	November 11, 1917	Field 17.	
Plants reaped and tested... ...	April 26, 1919	17½	months old.
1st Ratoons reaped and tested ...	March 26, 1920	11	months old.
2nd Ratoons reaped and tested ...	June 24, 1921	15	months old.
Rainfall	March 27, 1920 to June 23, 1921	67·31	inches.

Cane.	Area under cultivation.	Juice.								Per Acre.		
		Per cent. extracted.	Specific gravity.	Brix.	Percentage of			Quotient of purity.	Sucrose per gallon.	Cane.	Juice.	Sucrose in Juice.
					Sucrose.	Glucose.	Non-sugar.					
	Sq. ft.								Lb.	Tons.	Gals.	Tons.
B. 6308	14,974	64·8	1·0744	18·0	16·15	0·80	1·05	89·7	1·735	18·94	2,559	1·98
B. 6450	15,246	68·1	1·0669	16·3	13·43	1·60	1·27	82·4	1·391	21·11	3,018	1·87
B. 4934	15,246	62·1	1·0713	17·3	15·85	0·80	0·65	91·6	1·698	16·50	2,142	1·62
D. 504	30,492	61·7	1·0717	17·4	14·97	1·65	0·78	86·0	1·604	15·82	2,040	1·46
T. 202	14,974	62·0	1·0801	19·3	17·65	1·07	0·58	91·5	1·906	12·07	1,552	1·32
B. 1753	37,570	63·1	1·0713	17·3	14·64	1·60	1·06	84·6	1·568	13·85	1,827	1·28
B. 156	47,644	62·1	1·0739	17·9	15·72	1·41	0·77	87·8	1·688	13·02	1,686	1·27
Badilla	32,670	58·1	1·0837	20·1	18·41	0·96	0·73	91·6	1·995	11·55	1,387	1·23
B. 3922	15,246	63·3	1·0757	18·3	16·80	0·81	0·69	91·8	1·807	7·39	974	0·78

The results from the second ratoons in Field 2 are recorded in Table XIII. The canes from this plot were reaped on June 15, 1921, at thirteen months of age and they gave an average yield of 18·31 tons of canes per acre. The highest results were obtained from M.P. 55 followed by L. 511 and White Tanna. Plots of L. 218 and L. 253 had to be completely destroyed as they were badly affected with the mosaic disease whereas none of the stools of L. 511 were affected.

TABLE XIII.—SECOND RATOONS.

Date planted	June 5, 1917	Field 2.	
Plants reaped and tested... ...	April 4, 1919	22 months old.	
1st Ratoons reaped and tested ...	May 6, 1920	12½ to 13 months old.	
2nd Ratoons reaped and tested ...	June 10, 1921	13 months old.	
Rainfall	May 7, 1920 to June 9, 1921	50·00 inches.	

CANE.	Area under cultivation.	JUICE.								PER ACRE.		
		Per cent. extracted.	Specific gravity.	Brix.	Percentage of			Quotient of purity.	Sucrose per gallon.	Canes.	Juice.	Sucrose in Juice.
					Sucrose.	Glucose.	Non-sugar.					
	Sq. ft.								Lb.	Tons.	Gals.	Tons.
M.P. 55	12,801	67·7	1·0691	16·8	13·79	1·92	1·09	82·1	1·474	22·93	3,252	2·14
L. 511	7,194	65·1	1·0832	20·0	18·75	0·56	0·69	93·7	2·031	13·93	1,875	1·70
White Tanna	11,499	62·2	1·0717	17·4	14·92	1·32	1·16	85·7	1·599	18·13	2,357	1·68
M. 90[03]	8,225	63·6	1·0600	14·7	11·80	1·78	1·12	80·3	1·251	15·23	2,047	1·14

AVERAGE RESULTS, PLANT CANES, FIRST AND SECOND RATOONS.

The average results of plant canes, first and second ratoons from Fields 2 and 17 are given in Table XIV. The best yields were obtained from M.P. 55, B. 6308, L. 511, B. 156 and B. 6450, all of which show an average of over 2½ tons of indicated sucrose in the juice per acre. The Badilla comes next, followed by D. 504, B. 4934 and White Tanna with an average of over two tons of indicated sucrose in the juice per acre. T. 202 comes last but it should be mentioned that it was in an unfavourable situation being partially overshaded by the trees of a neighbouring property.

TABLE XIV.—AVERAGE RESULTS OF PLANT CANES, FIRST AND SECOND RATOONS.

Fields 2 and 17.

CANE.	Sucrose in Juice—Tons per Acre.			
	Plant Canes, 1919.	First Ratoons, 1920.	Second Ratoons, 1921.	Average for 3 years.
M. P. 55	4·72	3·02	2·14	3·29
B. 6308	4·30	2·67	1·98	2·98
L. 511	3·67	2·70	1·70	2·69
B. 156	4·05	2·42	1·27	2·58
B. 6450	3·26	2·47	1·87	2·53
Badilla	3·57	2·45	1·23	2·42
D. 504	3·08	2·18	1·46	2·24
B. 4934	2·55	2·41	1·62	2·19
White Tanna ..	2·67	2·06	1·68	2·14
B. 3922	3·04	1·96	0·78	1·93
P. 1753	2·78	1·62	1·28	1·89
M. $90^{0\,3}$	2·13	2·29	1·14	1·85
T. 202	1·72	1 83	1·32	1·62

AVERAGE RESULTS, PLANT CANES AND FIRST RATOONS.

Table XV gives the average results of plant canes and first ratoons from fields 2, 19, 9 and 5. Two varieties B. S. F. 12 (24) and B. 60 have given better results as first ratoons than as plant canes; with the exception of B. 17380 and B. 14761 all the varieties have done better than the Bourbon which practically died out after the first crop of canes had been cut. Nine varieties have given higher results than B. 156 viz :—B. S. F. 12 (24), B. H. 10 (12), Ba. 7924, Badilla, L. 511, D. 109, H. 227, T. 202 and B. 6308, all of which show an indicated yield of sucrose of over two and three quarter tons per acre. B. 60, B.S.F. 12 (27), B. 6450, Ba. 6032, B. 3922, H. 27, B. 4934 and T. 75, come next with an indicated yield of sucrose of over two tons per acre.

TABLE XV.—AVERAGE RESULTS OF PLANT CANES AND FIRST RATOONS.

Fields 2, 19, 9 and 5.

CANE.	Sucrose in Juice—Tons per Acre.		
	Plant Canes, 1920.	First Ratoons, 1921.	Average for 2 years.
B. S. F. 12 (24)	3·50	3·64	3·57
H. 10 (12)	5·04	1·69	3·36
Ba. 7924	4·42	1·92	3·17
Badilla	4·10	2·18	3·14
L. 511	3·68	2·42	3·05
D. 109	3·72	1·95	2·83
H. 227	3·61	2·06	2·83
T. 202	3·93	1·60	2·76
B. 6308	3·23	2·27	2·75
B. 156	3·74	1·74	2·74
B. 60	1·95	3·48	2·71
B. S. F. 12 (27)	4·03	1·23	2·63
B. 6450	2·54	2·40	2·47
Ba. 6032	3·18	1·52	2·35
B. 3922	2·97	1·71	2·34
H. 27	3·10	1·40	2·25
B. 4934	2·06	2·05	2·05
T. 75	3·15	0·93	2·04
Ba. 8846	2·67	1·21	1·94
B. 10650	2·67	1·16	1·91
B. 6388	2·81	0·94	1·87
Bourbon	2·63	0·32	1·47
B. 17380	1·82	0·84	1·33
B. 14761	1·55	1·06	1·30

Mosaic Disease.

It was stated at the beginning of this report that frequent and systematic inspections were made from the time the canes were cut last year with the object of detecting and rooting up any cane stools which showed signs of the mosaic disease. This campaign has apparently been very successful in controlling and eradicating the disease. At the time of writing—thirteen months after the work was started—there are comparatively few diseased stools to be found at the Experiment Station.

The following Table gives the acreage under cultivation, the number and percentage of stools dug out, for the chief varieties grown at the Experiment Station, from plant canes, first and second ratoons respectively. It is not only interesting but also useful in showing which are the varieties least susceptible to the mosaic disease.

In the case of the first and second ratoons no diseased stools had been dug out in previous years, *i.e.* when these plots were plant canes and first ratoons, so that the figures show the infestation over a period of two and three years respectively.

TABLE XVI.—SUSCEPTIBILITY, OF THE CHIEF VARIETIES OF CANE AT THE EXPERIMENT STATION, TO MOSAIC DISEASE.

CANE.	Plant Canes, 1921.			First Ratoons, 1921.			Second Ratoons, 1921.			Average percentage of stools dug out for Plant Canes, First and Second Ratoons.
	Acreage under cultivation.	Stools dug out.		Acreage under cultivation.	Stools dug out.		Acreage under cultivation.	Stools dug out.		
		Number.	Per cent.		Number	Per cent.		Number	Per cent.	
B. 4934	·73	1	·1	·16	0	0	·60	2	·2	·1
Badilla	6·79	97	0·9	·73	1	·1	1·01	0	0	·8
L. 511	·47	3	·4	·29	9	1·9	·41	7	1·1	1·0
B. 6308	1·99	58	1·8	1·22	22	1·1	·73	11	·9	1·4
B. 156	4·77	229	3·0	·71	64	5·7	1·35	55	2·6	3·2
B. 14761	·22	·26	7·5	·16	48	18·9	·18	13	4·5	9·8
Ba. 6032	2·86	492	10·8	1·18	309	16·5	·26	18	4·4	12·0

TABLE XVI—(*continued*).

CANE.	Plant Canes, 1921.			First Ratoons, 1921.			Second Ratoons, 1921.			Average percentage of stools dug out for Plant Canes, First and Second Ratoons.
	Acreage under cultivation.	Stools dug out.		Acreage under cultivation.	Stools dug out.		Acreage under cultivation.	Stools dug out.		
		Number.	Per cent.		Number.	Per cent.		Number	Per cent.	
B. 6388	·22	51	14·6	·16	46	18·1	·25	80	20·2	17·7
Bourbon	·22	83	23·8	·15	24	10·1	·26	112	27·2	21·9
H. 27	·15	4	1·7	·27	145	33·9	·25	83	20·9	21·9
B. 6450	·22	134	38·4	1·20	600	31·5	·35	170	29·5	32·2
T. 75	·49	192	24·7	·95	1,074	71·4	·36	186	32·6	50·9
D. 109	2·24	86	2·4	·79	44	3·5	...	...	...	2·7
Ba. 7924	·22	82	23·5	·34	54	10·0	...	...	...	15·3
B. S. F. 12 (24)	·26	63	15·3	·09	38	26·6	...	...	...	18·2
B. S. F. 12 (27)	1·00	362	22·8	·10	64	40·4	...	...	...	24·4
B. 60	·12	66	34·7	·09	66	46·3	...	...	...	39·7
B. H. 10 (12)	1·19	760	40·3	1·08	936	54·7	...	...	...	47·2
Ba. 8846	·23	174	47·7	·10	79	49·9	...	...	...	48·4
B. 67	·12	80	42·1	·09	128	89·8	...	...	...	62·5
H.?	·21	9	2·7	...	...	...	·25	0	0	1·2
D. 504	1·82	53	1·8	...	...	...	·95	12	·8	1·5
H. 227	...	...	...	·53	51	6·1	·25	15	3·8	5·3
T. 202	...	...	...	·86	334	24·5	·34	73	13·5	21·4
B. 3922	...	...	...	·91	963	66·8	·60	391	41·1	56·6
B. 347	·21	50	15·0	...	...	...	...	...	...	15·0
B. S. F. 12 (34)	·08	39	30·8	...	...	...	...	...	...	30·8

It will be seen that B. 4934 has been the least susceptible and that the Badila, L. 511, H. ?, B. 6308 and D. 504 have been only slightly attacked by the mosaic disease. It is also gratifying to note that the two varieties most grown in the island viz.:—B. 156 and D. 109 show only a slight susceptibility to the disease. Two small plots of the Uba have shown no signs of the disease. On the other hand some of the more recently introduced varieties, which have been gaining favour with planters, such as Ba. 6032, B. S. F. 12 (27) and B. H. 10 (12) have been very susceptible to the mosaic disease.

An attempt was also made during the crop season of 1920, to estimate the loss sustained on canes attacked with mosaic disease; this may be twofold: (1) loss of weight on the crop and (2) inferior quality of juice from diseased canes.

For carrying out these investigations, blocks of twenty stools each of plant canes and first ratoons were marked off. Generally, the varieties selected were those which appeared to be the most seriously affected with a view of obtaining sufficient material to ensure accurate results.

After marking out the plots all the canes were cut and removed to a convenient spot where they were sorted into healthy and diseased canes and classified according to their approximate degree of ripeness. The canes from each section were then counted and weighed separately. A proportionate number of canes from each classification from the healthy and diseased canes respectively was then sampled for analysis. The lengths of ten healthy and diseased canes respectively were measured and the canes weighed.

The field results are given in Tables XVII to XIX and the analytical results in Tables XX to XXII.

The figures under the column loss per cent. indicate the loss that would have occurred if all the canes had been diseased whereas those under the column *true loss* show the actual loss sustained based on the percentage of diseased and healthy stools found for each variety.

TABLE XVII.—LOSS DUE TO MOSAIC DISEASE.—WEIGHT OF CANE.

Plant Canes, Field 9.—20 Stools.

CANE.	Condition of Cane.	Canes.						Average weight per foot of ripe canes.
		Total Number.	Total weight.	Per cent.	Average weight.	Loss per cent.	True loss per cent.	
			Lb.		Lb.			Lb.
B. 156	Healthy	283	982	96·6	3·47	...	...	0·602
B. 156	Diseased	10	33	3·4	3·30	4·9	·16	...
B. 10650	Healthy	93	373	58·9	4·01	...	...	0·889
B. 10650	Diseased	65	255	41·1	3·92	2·2	·90	0·788
B. 6388	Healthy	178	694	90·3	3·90	...	...	0·689
B. 6388	Diseased	19	60	9·7	3·16	19·0	1·84	...
B. H. 10 (12)	Healthy	180	963	74·1	5·35	...	...	0·672
B. H. 10 (12)	Diseased	63	301	25·9	4·79	10·6	2·74	0·631
Ba. 6032	Healthy	132	796	68·4	6·03	...	..	0·771
Ba. 6032	Diseased	61	333	31·6	5·46	9·4	2·97	0·688
B. 14761	Healthy	172	613	91·5	3·56	...	...	0·733
B. 14761	Diseased	16	37	8·5	2·31	35·1	2·98	...
B. 6450	Healthy	104	307	49·1	2·95	...	...	0·606
B. 6450	Diseased	108	251	50·9	2·32	21·4	10·89	0·540
B. 16536	Healthy	159	684	52·3	4·30	...	...	0·655
B. 16536	Diseased	145	426	47·7	2·94	31·6	15·07	0·564

TABLE XVIII.—LOSS DUE TO MOSAIC DISEASE.

First Ratoons, Field 11.—20 Stools.

CANE.	Condition of Cane.	Canes.						Average weight per foot of ripe canes.
		Total Number.	Total weight.	Per cent.	Average weight.	Loss per cent.	True loss per cent.	
					Lb.			Lb.
H. 146	Healthy	191	641	79·2	3·36	...	...	0·671
H. 146	Diseased	50	180	20·8	3·60	...	...	0·619
B. 10650	Healthy	108	453	48·4	4·19	..	....	0·763
B. 10650	Diseased	115	480	51·6	4·17	·48	·25	0·766
B. 156	Healthy	284	644	80·0	2·27	...	...	0·468
B. 156	Diseased	71	125	20·0	1·76	22·5	4·50	0·423
Bourbon	Healthy	98	341	61·2	3·48	...	...	0·643
Bourbon	Diseased	62	179	38·8	2·89	16·9	6·56	0·662
B. 16536	Healthy	73	189	27·9	2·59	...	...	0·566
B. 16536	Diseased	189	301	72·1	1·59	38·6	27·83	0·457

From the figures given in the preceding three tables it will be seen that:

(1) The percentage of diseased canes varied considerably showing that certain varieties are more susceptible to the disease than others. The range was from 3·4 to 50·9 per cent. for plant canes and 20·0 to 72·1 for first ratoons.

(2) The figures in Tables XVII and XVIII are not strictly comparable, the varieties not being the same throughout, nevertheless there is sufficient evidence to show that the disease gets worse from one year to the next, if left uncontrolled. *Vide* figures for B. 156, B. 10650 and B. 16536 in Tables XVII and XVIII.

(3) The average weight of diseased canes is less than that of healthy canes. The solitary exception being H. 146 (Table XVIII) for which no explanation can be offered, other than possibly a large number of the diseased canes were well grown canes which had only recently been attacked.

(4) With the exception of B. 10650 and the Bourbon *vide* Table XVIII, the weight per foot of healthy ripe canes is greater than that of diseased canes and

(5) The *true loss* in weight on the crop has varied from 0·16 to 15·07 per cent. for plant canes and 0·25 to 27·83 for first ratoons.

With regard to the analytical results it will be seen from the tables below that:

(1) There is not much difference in the quality of the juice of healthy and diseased canes.—Generally when the cane leaves alone are diseased and the stalks apparently healthy or slightly diseased, there is very little or practically no difference in the quality of the juice, *vide* B. 156, B. 14761 and B. H. 10 (12) in Table XIX. When, however the cane

stalks reach the cankered stage the juice is of inferior quality; compare the figures for B. 6450 and B. 16536 in Table XIX and B. 16536 in Table XX. A still greater difference in the quality of the juice is obtained when the canes are badly cankered and cracked, *vide* Table XXI, so that it appears that the quality of the juice varies with the degree of infestation. The figures in Table XXI were obtained from selected varieties of second ratoons badly cankered and cracked and from which no diseased canes have been previously dug out. On the whole they confirm those obtained by Dominguez, (1) who in addition has pointed that the acidity of the juice from badly cankered canes is appreciably higher than that from healthy canes or canes whose leaves only are diseased.

(2) Generally, the varieties showing the greatest loss in the field also show the greatest loss in quality of the juice.

(3) The percentage of loss on the quality of the juice has varied from 0·04 to 3·17, for plant canes and 0·73 to 8·28 for first ratoons.

(4) The loss in weight of cane is likely to be much greater than that from deterioration in the quality of the juice, *vide* Table XXII.

TABLE XIX.—LOSS DUE TO MOSAIC DISEASE.

Analytical Results.

Plant Canes, Field 9.

CANE.	Condition of Cane.	JUICE.								Loss per cent. on indicated Sucrose per gallon.	True loss per cent. on indicated Sucrose per gal'n.
		Per cent. extracted.	Specific gravity.	Brix.	Percentage of			Quotient of purity.	Sucrose per gallon.		
					Sucrose.	Glucose.	Non-sugar.				
									Lb.		
B. 156 ...	Healthy ...	65·3	1·0877	21·0	19·06	1·29	0·65	90·8	2·073	...	...
B. 156 ...	Diseased...	63·1	1·0864	20·7	18·84	1·48	0 38	91·0	2·047	1·25	0·04
B. 14761 ...	Healthy ...	64·3	1·0828	19·9	17·85	1·04	1·01	89·7	1·933	...	...
B. 14761 ...	Diseased...	64·4	1·0828	19·9	17·56	1·09	1·25	88·2	1·901	1·65	0·14
B. H. 10 (12)	Healthy ..	65·5	1·0855	20·5	18·71	1·19	0·60	91·3	2·031	...	...
B. H. 10 (12)	Diseased...	66·9	1·0832	20·0	18·27	1·14	0·59	91·3	1·979	2·56	0·66
Ba. 6032 ...	Healthy ...	63·8	1·0766	18·5	16·55	1·04	0·91	89·4	1·782	...	...
Ba. 6032 ...	Diseased...	65·0	1·0744	18·0	16·05	1·14	0·81	89·2	1·724	3·25	1·03
B. 6388 ...	Healthy ...	68·2	1·0815	19·6	17·53	1·44	0·63	89·4	1·896	...	...
B. 6388 ..	Diseased...	67·5	1·0757	18·3	15·69	1·63	0·98	85·7	1·688	10·92	1·06
B. 10650 ...	Healthy ...	68·0	1·0824	19·8	18·00	1·02	0·78	90·0	1·948	...	...
B. 10650 ...	Diseased...	68·1	1·0788	19·0	16·80	1·32	0·88	88·4	1·812	6·98	2·87
B. 6450 ...	Healthy ...	67·0	1·0797	19·2	17·03	1·26	0·91	88·7	1·839	...	...
B. 6450 ...	Diseased...	65·4	1·0766	18·5	16·06	1·48	1·06	86·8	1·729	5·98	3·04
B. 16536 ...	Healthy ...	66·4	1·0779	18·8	16·04	1·69	1·07	85·3	1·729	...	...
B. 16536 ...	Diseased...	68·1	1·0748	18·1	15·02	1·96	1·12	83·0	1·614	6·65	3·17

(1) *Journ. Dept. Agr. Porto Rico*, III No. 4, 1919.

TABLE XX.—LOSS DUE TO MOSAIC DISEASE.

Analytical Results.

First Ratoons, Field 11.

CANE.	Condition of Cane.	JUICE.								Loss per cent. on indicated Sucrose per gallon.	True loss per cent. on indicated Sucrose per gal'n.
		Per cent. extracted.	Specific gravity.	Brix.	Percentage of			Quotient of purity.	Sucrose per gallon.		
					Sucrose.	Glucose.	Non-sugar.				
									Lb.		
Bourbon ...	Healthy ...	67·6	1·0766	18·5	15·53	1·53	1·44	83·9	1·672	...	...
Bourbon ...	Diseased ..	67·7	1·0757	18·3	15·21	1·58	1·51	83·1	1·636	2·15	0·73
B. 156 ...	Healthy ...	63·7	1·0895	21·4	19·37	1·19	0·84	90·5	2·110	...	...
B. 156 ...	Diseased...	62·9	1·0868	20·8	18·46	1·32	1·02	88·7	2·006	4·93	0·99
B. 146 ...	Healthy ...	63·2	1·0873	20·9	18·59	1·40	0·91	88·9	2·021	...	...
B. 146 ...	Diseased...	64·2	1·0837	20·1	17·59	1·58	0·93	87·5	1·906	5·69	1·18
B. 10650 ...	Healthy ...	69·2	1·0819	19·7	16·95	1·14	1·61	86·0	1·834	...	...
B. 10650 ...	Diseased...	67·8	1·0775	18·7	16·10	0·98	1·62	86·1	1·735	5·40	2·79
B. 16536 ...	Healthy ...	64·7	1·0850	20·4	18·39	1·06	0·95	90·1	1·995	...	...
B. 16536 ...	Diseased...	61·5	1·0788	19·0	16·37	1·09	1·54	86·1	1·766	11·48	8·28

TABLE XXI.—LOSS DUE TO MOSAIC DISEASE.

Comparison between the juice of healthy and badly cankered canes.

Second Ratoons.

CANE.	Condition of Cane.	JUICE.								Loss per cent. on indicated Sucrose per gallon.
		Per cent. extracted.	Specific gravity.	Brix.	Percentage of			Quotient of purity.	Sucrose per gallon.	
					Sucrose.	Glucose.	Non-sugar.			
									Lb.	
T. 202 ...	Healthy ...	65·7	1·0932	22·2	21·16	0·61	0·43	95·3	2·313	...
T. 202 ...	Diseased...	59·8	1·0832	20·0	18·47	0·76	0·77	92·3	2·000	13·53
B. 1753 ...	Healthy ...	62·2	1·0788	19·0	16·03	1·88	1·09	84·4	1·729	...
B. 1753 ...	Diseased...	61·4	1·0704	17·1	13·77	2·24	1·09	80·5	1·474	14·74
B. 6450 ...	Healthy ...	65·2	1·0864	20·7	19·32	0·91	0·47	93·3	2·099	...
B. 6450 ...	Diseased...	60·8	1·0797	19·2	16·26	1·35	1·59	84·7	1·755	16·39
B. 3956 ...	Healthy ...	62·9	1·0873	20·9	18·49	1·44	0·97	88·5	2·010	...
B. 3956 ...	Diseased...	62·6	1·0726	17·6	14·33	1·81	1·46	81·4	1·537	23·53

TABLE XXII.—LOSS DUE TO MOSAIC DISEASE.

Estimated *True Loss* in the Field and on the Analytical results for PLANT CANES and FIRST RATOONS.

CANE.	*True loss* per cent. on weight of canes.	*True loss* per cent. on sucrose content of juice.	Total loss per cent.	Remarks.
B. 156	0·16	0·04	0·20	Plant Canes.
B. 10650	0·90	2·87	3·77	do.
B. 6388	1·84	1·06	2·90	do.
B 14761	2·98	0·14	3·12	do.
B. H. 10 (12)	2·74	0·66	3·40	do.
Ba. 6032	2·97	1·03	4·00	do.
B. 6450	10·89	3·04	13·93	do.
B. 16536	15·07	3·17	18·24	do.
H. 146	...	1·18	1·18	First Ratoons.
B. 10650	0·25	2·79	3·04	do.
B. 156	4·50	0·99	5·49	do.
Bourbon	6·56	0·73	7·29	do.
B. 16536	27·83	8·28	36·11	do.

CACAO.

CACAO CULTIVATION IN GRENADA.

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The following paper was read by Mr. R. O. Williams at a meeting of the Naparima (Trinidad) District Agricultural Society in November, 1921. It gives a useful comparison between Grenada conditions and methods of cultivation and those of Trinidad :—

During my two years as Superintendent of Agriculture in Grenada I was called upon in the course of my duties to visit estates in all parts of the island and thus had opportunities of studying various methods of work and I should here like to say that I was at all times treated with the greatest courtesy and kindness by the planters and others with whom I came in contact.

Although Trinidad and Grenada are so close together, only about ninety miles apart, and the climatic conditions are not very different, there are distinct differences in the methods employed in the cultivation of their staple crop.

Sugar was at one time the staple crop of Grenada but when prices fell it was more or less abandoned and cacao steadily planted, chiefly though by small proprietors. In the year 1855 the exports of cacao are stated to have been 5,069 bags which by 1880 had risen to 28,735 bags. The crop afterwards continued to increase till at the present time it ranges between 70,000 and 80,000 bags of 180 lb. net per annum. Little increase of exports is to be expected in the future as most of the cacao plantations have reached full bearing and but few new areas are being planted.

Agriculturally, Grenada is a much more fully developed colony than Trinidad, consequently there is less available land suitable for further cacao planting and under present conditions it would be a much better economic policy to concentrate any further agricultural efforts on the production of ground provisions and other local foodstuffs.

There is a large number of peasant proprietors in Grenada most of whom own small plots of cacao. Whilst some of these small proprietors take a keen interest in their cultivation, there is on the part of others a need for improvement in their methods and the curing of the crop for market.

In a country relying principally on one crop for its support small uncared or neglected patches of that particular crop may present a menace on account of the liability of their forming breeding grounds for pests and diseases. Improper methods of preparing the crop for market have also a detrimental effect on the reputation of that crop on the market.

I intend this afternoon to deal with my subject under two heads. (1) Methods of cultivation and (2) Treatment of Pests.

The latter subject comes in for as great a share of attention from the Grenada planter as the former and as I hope to explain later when dealing with the questions of no shade and partial shade it is of the greatest necessity that a rigorous control over pests and diseases be exercised.

PLANTING.

With very few exceptions, cacao in Grenada is much more closely planted than in Trinidad. The actual distance varies owing to the irregular manner in which planting operations were carried out, but an average distance could probably be estimated at nine or ten feet. The irregularity of planting is due to the fact that most of the estates were originally planted on the metayer system, under which system I believe the peasant was responsible for the planting as well as for the care of the trees, until they were taken over by the estate proprietor.

In Trinidad most of the cacao has been established under the contract system, by which the peasant makes himself responsible only for the care and not for the planting of the young trees.

The irregularity of planting so common in Grenada is not only detrimental to a proper well balanced development of the trees but is also troublesome when lining out drains.

TEMPORARY SHADE.

Although cacao in Grenada is largely grown without permanent shade, the young plots and bare patches in old plots are replanted in much the same manner as practised in Trinidad. Bananas, plantains, canes, tannias, etc., being used as temporary shade.

PERMANENT SHADE.

The question probably of most interest to the Trinidad planter is that of permanent shade and it is on this point principally where the Grenada methods of cultivation differ from those of Trinidad.

Many of the cacao fields in Grenada are entirely without shade, others have numbers of other trees, principally breadfruit and other fruit trees scattered amongst them and in a few cases a systematic planting of Immortelles has been practised.

Before we go farther with this question I should say that the Grenada planter fully recognises that when cacao is grown without shade it must either be naturally protected from wind or else be supplied with good wind breaks, that the soil must be frequently forked and manured and the land thoroughly drained. If he neglects these essential conditions in a no shade plot he is only courting failure.

In a plot shaded by large trees, such trees besides various other functions assist in carrying off the surplus water from the soil and thus serve as a form of natural drainage. In places where there are no, or few shade trees, a stricter attention has to be paid to drainage than in those carrying a large number.

Instances have occurred in Grenada where it has been thought advisable to cut out large trees protecting the cacao, with the result that the cacao suffered badly from exposure and the resultant maladies, and in some cases efforts were afterwards made to re-establish shade trees.

The question of shade for plants in general is largely a matter of what the plants have been accustomed to. Plants reared under shaded and protected conditions are much more delicate than those reared without and are bound to suffer if such shade or protection is suddenly removed. An example of this was provided at the no shade plot at River Estate, where, for a few years after the Immortelles had been removed the crop dropped below its average of former years, till eventually when the trees became accustomed to the new conditions the crops increased.

When cacao is grown without shade not only is it necessary to pay more attention to drainage but it is als essential to give better cultural conditions by forking and manuring and this the Grenada planter usually does in a very thorough manner. He endeavours as far as possible to keep a good tilth on his soil and it is doubtful if his efforts in these matters were relaxed whether it would be possible to make a paying concern of cacao growing without shade. The actual position in Grenada seems to be that the planter endeavours by forking and manuring to do what the Trinidad planter does largely with shade trees. The Trinidad planter protects his soil from loss of organic matter by the action of the sun and wind and the Grenada planter replaces his loss. The latter is no doubt preferable so long as it can be maintained economically, as in the no shade fields of Grenada little loss from pod rot is to be observed and this fact alone should more than compensate for extra expense and labour.

It is marvellous to see on certain of the exposed seaboards of Grenada in what good condition the trees are maintained by cultural measures although the tops of the trees present a close clipped appearance from their exposure to the wind.

The close planting already referred to, helps of course to a certain extent also to protect the soil from exposure to wind and sun. Whether this close planting will have an ultimate detrimental effect on the life of the tree remains to be seen, but it is very probable that it will.

MANURING.

As regards manuring, the Grenada planter has been in the habit of treating his plantation fairly generously. Besides chemical manures of which large amounts were till recently regularly supplied, large quantities of pen manure were also either bought from peasants or made on estates.

A system of making pen manure largely in practice on estates is to picket cattle in various parts of the field, where they are fed for a few months and then removed to another place, the heap meanwhile being allowed to rot down till it is in suitable condition for applying to the cacao. Whilst this system has its disadvantages in that all the valuable liquid portion of the manure is lost or only benefits the few trees in the immediate vicinity and the manure heap is unprotected from weather, it *has* certain advantages, the principal being from the planter's point of view, a saving of labour in carting feed for the stock and bringing the manure back to the cacao. This class of manure is bought from peasants at from one to two cents per cacao basket. A common practice is for the estate labourers to take over the feeding of an animal and be paid for the manure.

Horse beans (*Canavalia ensiformis*) are used to quite a large extent on the best estates, being sown under the cacao and turned in as green manure or cut and left to form a mulch. Several thousand pounds of seed are distributed annually by the local Agricultural Department.

On one of the best estates a proper rotation system of intensive cultivation is carried out, by which the fields are treated in one year with pen manure, in the second with leaves, brushings and prunings bedded in, in the third bedded again and mulched, if material is available, in the fourth artificial manures are applied and in the fifth the soil is limed to clear up the land for a repetition of the rotation. Under this system it was arranged that one-fifth of the estate would receive one or the other of the above-mentioned treatments each year.

PARTIAL SHADE.

So far I have dealt almost entirely with complete no shade conditions but in many of the fields there are a large number of what are known in Grenada as "foreign trees" such as mango, breadfruit, etc., and whilst from an agricultural point of view these are not such good shade for cacao as the Immortelles, it must be remembered that they play an important part in the economic life of the island. At certain times of the year the breadfruit is the staple food of the peasantry, fruiting as it does when other local provisions are scarce. The breadfruit crop is gathered almost entirely from amongst the cacao plantations.

These so-called "foreign" trees do give a certain amount of shade and protection to many of the fields which are sometimes described as having no shade and this should be borne in mind when considering the subject.

WINDBREAKS AND HEDGES.

A good deal of attention is given to the establishment and care of windbreaks and their value is very great, galba (*Calophyllum Calaba*) is one of the principal trees used for the purpose, whilst almond (*Terminalia Catappa*), cashew (*Anacardium occidentale*), Mango (*Mangifera indica*) and other trees are used to a lesser extent. Protection to most cacao fields is also afforded by hedges, the principal plants used for the purpose being galba, which is planted thickly and trimmed periodically and the wild coffee (*Aralia Guilfoylei*). A very fine example of the latter can be seen along the eastern main road where there is a long, thick stretch of this plant growing to a height of about fifteen or twenty feet.

PRUNING.

With regard to the pruning of cacao in Grenada opinions amongst planters differ, as they do in Trinidad. The planter's chief care however is to see that his pruning is not so severe to expose the soil to sun and wind, as he has no other protection he can rely upon, as has the planter who cultivates his cacao on the shade principle, but, owing to the close distances at which the trees are planted, fairly heavy prunings are necessary.

Owing to the close planting it is difficult to prune in such a manner as to prevent interlacing of the branches and such a condition consequently usually exists. Chupons, or suckers as they are called in Grenada, are only allowed to grow when a renew to the tree is required.

BEDDING.

This term is applied in Grenada to the method used for disposal of the surplus leaves. When the soil becomes thickly strewn with leaves the practice is to rake them together into heaps and dig holes a few feet square into which they are put and the soil thrown back upon them. This has the advantage of returning all leaves, etc., to the soil and thus increasing the stock of humus. This system is generally recognised amongst planters as being one of the cheapest and best ways of cleaning up the plantation. On heavy soils, under which head the majority of those in Grenada may be classed, holes of this kind unless supplied with an outlet into a drain are apt to form water pockets which on flat lands may prove troublesome. The broken pods are also often buried in the same way.

A few persons adopt a system of raking the leaves away from the trunks of the trees and burning them under careful supervision. This is not a system to be recommended as by its practice much vegetable matter is destroyed which if retained in the soil would form valuable humus. When practised on the same fields for successive years it must have an ultimate detrimental effect on the cultivation. Another point is that unless done under very careful supervision, the result may be a scorching of the trees. On the other hand this method has an advantage in fields infested with mealy bug, in that the leaves falling to the ground are often thickly covered with the pest which can, as I have observed, migrate back to the plant. It is very doubtful however whether the good done in this way can in any way counter-balance the harm caused by the loss of vegetable matter to the soil.

METHODS OF SMALL PROPRIETORS.

In my remarks on cultivation I have confined myself chiefly to methods adopted by the large estate proprietor in Grenada, but it must be remembered that there is also a very large peasant proprietary whose numbers run into thousands and in the majority of cases it cannot be said that the peasant pays the same attention to his cultivation as the larger planter.

The peasants' product as prepared for market is also not generally of as high a standard as that prepared by the estates, principally for the reason that he is anxious to realise ready money and will not wait to allow the beans the necessary period of fermentation.

Another reason is that the quantity of wet cacao that he gathers at one particular time is so small that unless dealt with very carefully only imperfect fermentation takes place. Some of the smaller proprietors are now making efforts to prepare their crop for market in a better manner and the low prices paid for cacao this year have shown them how really necessary this is as at certain times during the last few months unfermented cacao was practically unsaleable.

It has been suggested by the Mycologist of the Imperial Department of Agriculture that a two-walled box stuffed with dry grass or some such material would be a useful article to experiment with in which to ferment small quantities of cacao.

In fermenting small lots of say thirty to forty pounds of cacao it will be found that the maximum temperature is usually reached at about the third or fourth day and begins to drop fairly rapidly after. With large lots of cacao such as are handled by estates the maximum temperature is I believe not reached till the fifth or sixth day and the beans have therefore a longer period of fermentation.

There is room for much useful work in assisting and instructing the peasant regarding the fermentation of his crop and its preparation for market.

Preparation of the estate product is done on much the same lines as in Trinidad with the exception that no clay is used.

The drying trays are usually in the form of sliding drawers under the Boucans or sometimes a combination of sliding drawers and roofs. There are also installed on a number of the larger estates artificial Gordon rotary driers, made by John Gordon and Company, Broad Street, London.

PESTS.

I will now pass on to discuss a few of the commoner pests of cacao in Grenada and the methods adopted for keeping them under control.

Thrips

is the most widely distributed and most virulent pest of cacao in Grenada and has at times caused great anxiety to the planter. Expert advice has been sought on many occasions and the pest has been so thoroughly investigated that the planter is now quite conversant with the mode of tackling it and usually puts such knowledge into practice at the first signs of an outbreak.

Thrips are probably always present in cacao fields and when suitable conditions for their propagation prevail (usually those unsuitable for the growth of the cacao tree) they assume epidemic form. They are minute insects which cause damage to the tree by sucking the leaves and thus bringing about defoliation. A badly infected plot will be rendered practically leafless. If no control measures be exercised and successive attacks be made on new flushes of leaves the trees may be killed outright. The pods are also usually infested, especially in the dry season. The infection on these can easily be distinguished by the brownish markings which in bad cases may completely alter the appearance of the pods. This causes much loss of time in picking and some loss or detriment to the cured product may result from the inability to distinguish when such pods are ripe, and unripe pods may thus be gathered together with the ripe and thus lower the grade of the cured beans.

Thrips attacks are usually worse after the heaviest rains although minor attacks are reported throughout the year. All such attacks are usually found in conjunction with some bad condition of the soil, viz., lack of drainage or manure or a poor condition of the cultivation. The

remedy is therefore to put the soil in proper condition but as this cannot be done quickly it is necessary to spray in the case of a severe attack in which immediate relief is required.

The best spray for the purpose and the one most generally employed is Nicotine sulphate (Black Leaf 40), used (on the recommendation of Mr. Urich, Entomologist of the Trinidad Department of Agriculture, who visited Grenada a few years ago to advise on Thrips) at the rate of six ounces to fifty gallons. It is usually applied in combination with Bordeaux mixture made on the 5.5.50 formula.

When the trees are in a healthy condition it is doubtful whether ever thrips assume epidemic form, in fact it was once stated by Mr. Ballou, Entomologist of the Imperial Department of Agriculture that thrips might be regarded as a friend of the planter in that it showed him that something was wrong with his cultivation.

In short then the advice for treatment of an epidemic of thrips is to improve the cultivation and spray with a mixture of nicotine sulphate. As a preventative measure the advice is to keep the cultivation to a high standard. Unless a high standard of cultivation is maintained under the no-shade conditions, the trees are more susceptible to attacks of thrips for the reasons stated when dealing with permanent shade.

Mealy Bug and Black Ants.

A pest which is causing considerable trouble in the cacao fields of Grenada at the present time is mealy bug, which, in combination with the black ant, is commonly found on estates and is no doubt the cause of considerable loss in crop.

In bad attacks the undersides of the leaves are thickly covered with the white mealy bugs as are also the flower cushions, flowers and pods. The mealy bugs form an attraction for the black ants which feed on their excretions. Large colonies of both pests are found clustering among the cushions of infested trees. They make their way into holes and crevices caused by pruning and the gathering of pods and almost certainly aggravate such injuries.

A short time ago a visit was paid by the Entomologist of the Imperial Department of Agriculture to specially investigate this pest, and we visited together plantations in all parts of the island. After his visit a set of experiments were commenced by his suggestion in three different parts of the island to test the value of various mixtures for spraying purposes. As a preliminary measure to spraying he recommended the thorough cleaning up of the trees by close pruning of all old stumps of branches and dead material and the painting with crude oil of the cut surfaces.

The spraying materials recommended for trial were:—

Bordeaux Nicotine 5.5.50.6.

Bordeaux and arsenate of lead 5.5.50.2.

Lime sulphur: Stock solution 4 lb. lime, 8 lb. sulphur, 9 gallons water, boiled together for 45 minutes and diluted 1 to 14.

Crude oil emulsion: 1 lb. soap, 1 gallon crude oil to 10 gallons of water.

The preliminary observations showed very little beneficial results from the spraying with the two former mixtures. Lime sulphur was effective where actual contact with the insects was obtained, but crude oil emulsion appeared to be the most effective from all points of view. The oil laid somewhat thickly on the trunk and leaves but no injury was noticed either to the leaves or bark.

The flowers with which the emulsion came in contact were however injured, and it would be necessary to spray with such an emulsion when the trees were not in flower. An emulsion made in more dilute proportions might also be tried.

Besides being the most effective spray of the four experimented with crude oil emulsion was also found to be much the cheapest. Lime sulphur is worthy of further trials provided sulphur can be obtained at a cheaper rate than it was possible to purchase it at in Grenada.

Whilst, as Mr. Ballou points out, neither of the sprays has the power of penetration, it seems to me that the crude oil emulsion may also act as a preventative as well as a cure by making the surface of the trees distasteful to the insects. This work, however, is still in such an early experimental stage that it would be presumption on my part to offer any definite opinion. In Trinidad mealy bugs, from their scarcity, may be presumed to be kept in check by fungus parasites by virtue of our more humid conditions.

Termites.

Another pest not as serious as the former but all the same one which accounts for the loss of a fair number of trees annually in certain parts of the island, is the large termite (*Kalotermes Ballouii*). This large termite or wood ant enters old wounds and tunnels through the wood of the tree sometimes for a distance of four or five feet. The occurrence of this pest in a tree is usually not observed till the whole tree or branch is broken down. It can however be discovered earlier if an examination of old decayed wounds be made. The point of a knife dug into the rotten wood will as a rule expose a few of the insects if they are present.

The old adage, prevention is better than cure, is the best to apply to this pest, and if all wounds caused by pruning be treated with an antiseptic and even all old treated wounds inspected and re-treated occasionally if necessary, little trouble from the pest should be experienced. Whilst speaking of antiseptics I may say that paint and tar have been and are still largely used in Grenada for the treatment of wounds, but crude oil is now becoming the most popular remedy and I must say that from personal observations it is apparently most efficacious.

Other Pests.

There are a number of other pests of more or less minor importance and with which you are familiar, so I will not treat them in detail.

Bird vine is fairly troublesome, but it does not appear to be such a strong or rapidly-growing species as the one with which you are so familiar in Trinidad and Tobago.

YIELD.

As to the comparison in crop between the two islands I have no very definite information, but should say that as a rough average we might assume Trinidad to be 3 to 4 bags per acre and Grenada 4 to 5 the Trinidad bags being 165 lb. net and the Grenada 180 lb.

Van Hall says in his book on cacao that on a well-managed plantation in Grenada 350 kilogrammes (approximately 4 bags) per acre were obtained, whilst he gives three instances of Trinidad in which 230 kilos (about 3 bags), 135 kilos, (1¾ bags) and 112 kilos, (about 1½ bags) were obtained.

I should not leave this subject without reference to the somewhat famous estate of Good Hope, where it is on record that the late Rev. G. W. Branch by intensive cultivation reaped as many as 87 bags per annum from 12 acres, or over 7 bags per acre. His methods of cultivation by which he achieved such results can be judged from his reply to a question once asked him by Mr. G. Whitfield Smith as to whether he intended extending his cultivation. It is published in Vol. 1 of the *West Indian Bulletin.* He said, "No.; the remaining portion of my land is too much swept by prevailing winds to be of any value for cacao; besides I find that it pays me better to keep a portion in cane cultivation or some other fodder, not from the profit to be derived from sugar, but because it enables me to feed my stock; without this I could get no manure, and without manure I could get no cacao. I look upon my stock, therefore, as part of my working capital. People here seem entirely to forget this. I very often hear them speaking of the hard work they are having to get their plantation 'covered in' as they call it, but if they knew what I know, they would find it more to their interest to keep one-fifth of their plantation in pasture lands and fields of fodder plants, and to keep several head of stock to fertilise the other four-fifths."

GENERAL.

One word in conclusion as to the official agricultural activities in the island. The agricultural officers resident in the island are always at the service of planters and peasants for advice and demonstration in all matters connected with agriculture. A stock of spraying materials and apparatus is kept at the Botanic Gardens for sale and hire to planters or for loan and gift to needy peasants and this stock is fully made use of by both classes of the community.

There are also the officers of the Imperial Department of Agriculture who pay occasional visits to the island and have by demonstration and valuable reports done much to assist the agriculturist.

BOTANICAL.

THE INTRODUCTION OF THE BREAD-FRUIT INTO THE WEST INDIES.

Under the title the "West Indies Revisited" Mr. Algernon E. Aspinal, C.M.G., B.A., Secretary of the West India Committee, is publishing in the *West India Committee Circular* an account of his recent official tour of these Colonies. In dealing with St. Vincent he has included (*W.I.C.C.* XXXVI, 1921 197–9) a very full account of the introduction of the bread-fruit (*Artocarpus incisa*) under the appropriate heading "The Romance of the Bread-Fruit." The original plants were brought to the St. Vincent Garden, and after the abandonment of that Garden many of the plants it contained were transferred to Trinidad and formed the beginning of the collections of our Royal Botanic Gardens. The West India Committee played an important rôle in the introduction of the bread-fruit which has proved of very great value to the peasantry of all the West Indian Colonies. The account now given is also of great interest as recording very completely an early chapter in the history of the St. Vincent and Trinidad Gardens. The thanks of the Department are gratefully accorded to the West India Committee and to Mr. Aspinall personally for permission to reproduce the article, and for the loan of the blocks of the illustrations.

W.G.F.

THE ROMANCE OF THE BREAD-FRUIT.

"St. Vincent has an historic Botanic Garden. This garden, which is situated at the back of the town, about one mile from the landing-stage, was first established as far back as 1765, and though it cannot claim to have had a continuous existence, it is still in a very flourishing condition.

"Probably few of those who now visit it are aware that it is closely associated with the mutiny of the *Bounty* and the establishment of the British settlement on Pitcairn Island in the far distant South Seas. Let me, therefore, make a slight digression to show how this connection arose.

"It was to supply the St. Vincent Garden with specimens of the Bread-fruit tree that the memorable voyage of the *Bounty* was undertaken. Anson, Dampier, and other travellers mention this tree in the narratives of their voyages, but Captain Cook, who came across it at Tahiti, is credited with having been the first to recommend its introduction into the West Indies. His suggestion appears to have impressed John Ellis, the Agent for Dominica, who devoted a treatise to the subject in 1775. (1) In that work Ellis expressed the belief, based on 'the favourable sentiments of the Society of West India Merchants, and of the Agents of the West India Colonies' that very handsome premiums would be offered to such persons as should 'bring over in a healthy growing state plants of the Mangostan, Bread-fruit, or any other valuable trees that may be of real use to these Colonies.'

A reference to the old minute books of the West India Committee shows that at a Meeting of that ancient body held on February 7, 1775, Mr. Beeston Long presiding, a letter was read 'from George Walker, Esq., to the Chairman, relative to the introduction into England of the Bread-fruit tree and Mangostan from the East Indies, in order for their being sent over and propagated in the West Indies.' Whereupon it was agreed 'that the West India Merchants are willing to be at any reasonable expense in endeavouring to introduce the above trees into the West India Colonies.' It was, no doubt, this resolution that Ellis had in mind.

"The minute was not confirmed, a more definite resolution being passed at the next meeting, held on March 7, stating 'that if the captain of an East India ship, or other person, shall bring to England from any part of the world, a plant of the true Bread-fruit tree in a thriving vegetation, properly certified to be of the best sort of that fruit, such person shall be entitled to receive the sum of one hundred pounds out of the General fund of this Society.'

"In the following year the Royal Society of Arts offered a prize to whoever should succeed in transplanting the Bread-fruit from the East to the West Indies. This, however, was evidently regarded as inadequate, for at a meeting of West India planters and merchants held at the London Tavern on February 18, 1777, at which Mr. Ellis himself

THE BREAD-FRUIT.

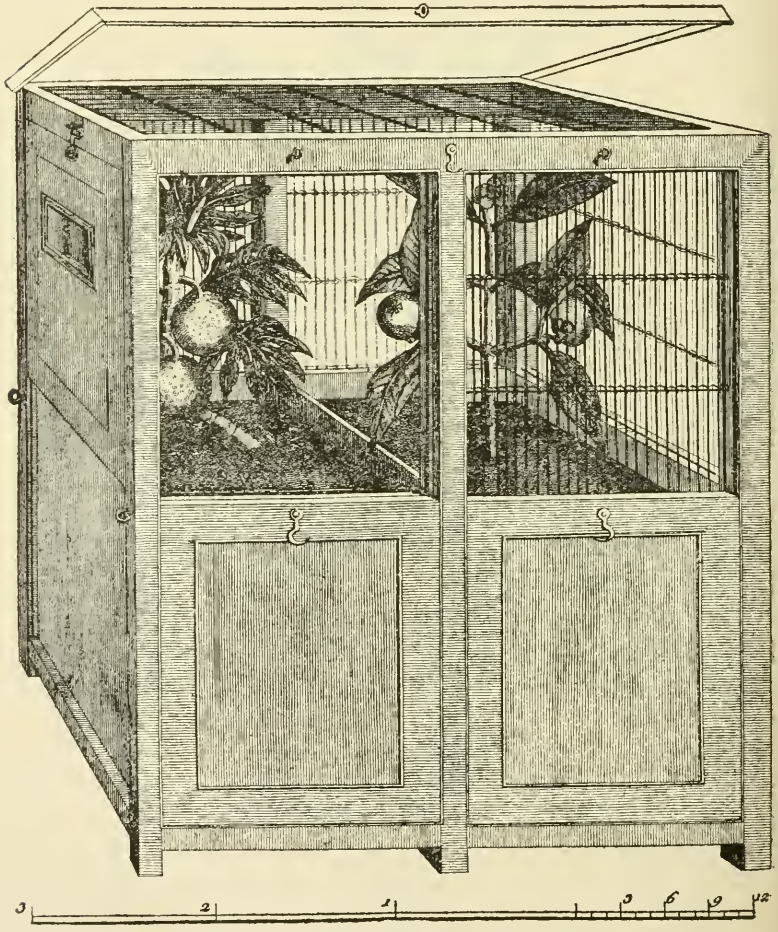
This characteristic picture of the Bread-fruit is reproduced from the work of John Ellis, Agent for Dominica, which was published in London in 1775.

was present, it was resolved 'to enter into subscription and to recommend it to all the gentlemen interested in the Sugar Colonies, for obtaining the different species of the Bread-fruit tree in a more ample

manner than is provided for by a certain advertisement published by the Society of Arts and Manufacturers and Commerce, offering Premiums for that purpose, intended as a Fund towards rewarding such claimants (if more than one shall apply) as may be worthy of the Premiums offered by the said Society.'

"The question was again considered on June 4, 1776, when 'several papers' from Mr. Ellis were laid before the meeting, and on July 2 a special committee, comprising Mr. Long, Mr. Stephen Fuller, Mr. Bond, Mr. Neave, Mr. Atkinson, Mr. Hankey, Mr. Menisie, Mr. Pearce, Mr. Gowland. Mr. Lovell, Mr. Smith and Mr. Purrier was appointed to deal with them.

"Probably the 'papers' consisted of the treatise already referred to. Ellis was emphatic as to the merits of the Bread-fruit, which 'afforded a most necessary and pleasant article of subsistence to many.' He believed that it might be easily cultivated in the West Indies, where it



A Travelling Case for Bread-fruit Plants.

This case was designed for bringing over Bread-fruit plants from the South Sea Islands to the West Indies. It had wire sides and shutters which could be slid up or down as required. The maker was "John Sevans, Carpenter, opposite Bull and Gate, High Holborn."

could be 'made to supply an important article of food towards all ranks to their inhabitants, especially the negroes.'

"After touching on early references made to the fruit by travellers, and to its botanical characteristics, he proceeded to give a detailed description of a box 'found by experience capable of preserving very tender plants in great health and vigour during a very long and tedious voyage.' This and two other boxes, which he also described, bear a very close resemblance to the Wardian cases used at the present day for transplanting rare and valuable plants from one part of the world to another.

"The matter was at last warmly taken up by Sir Joseph Banks, the President of the Royal Society, who had accompanied Cook to Tahiti in 1769, and it was largely due to his exertions that in 1787 the *Bounty* was commissioned and despatched to the South Sea Islands in quest of specimens of the Bread-fruit tree. Captain William Bligh, who had been with Captain Cook as sailing-master in the *Resolution* during his second voyage round the world, was given command of the expedition, and all went well until the *Bounty* had started on her homeward voyage to England with a large cargo of Bread-fruit trees. The story of how the crew, under Fletcher Christian, then mutinied; and how, after setting Bligh adrift in an open boat with eighteen officers and men, they eventually sailed for Pitcairn Island, where their descendants remain to this day, has often been told. In his frail craft Bligh and his comrades after a tempestuous voyage lasting forty-one days, during which they traversed 3,618 miles of sea, eventually reached Timor, and thence England.

"BREAD-FRUIT BLIGH."

"For days the little party subsisted on the meagre daily ration of 1 oz. of bread, ¼ pint of water, an occasional teaspoonful of rum, and 1 oz. of pork per head. Undismayed, however, by his terrible experience, Bligh, who was known thereafter in the Royal Navy as 'Bread-fruit Bligh,' assumed the command of a second expedition, and in January, 1793, he successfully landed from his ship, the *Providence*, and her tender, the *Assistant*, plants of the Bread-fruit, Mangostan, and other exotics which he had obtained at Tahiti.

"This valuable collection was planted out in the St. Vincent Botanic Garden, and it was soon proved that the soils of the West Indies were admirably suited to the Bread-fruit tree, which now grows prolifically throughout the islands. The tree yields an abundant supply of fruit, which you see the people cooking over charcoal fires outside their huts, much after the manner described by Captain Cook.

"'The fruit' he wrote, 'is gathered just before it is perfectly ripe, and, being laid in heaps, is closely covered with leaves: in this state it undergoes fermentation, and becomes disagreeably sweet; the core is then taken out entire, which is done by gently pulling the stalk, and the rest of the fruit is thrown into a hole which is dug for the purpose,

generally in the houses, and neatly lined in the bottom and sides with grass: the hole is then covered with leaves, and heavy stones laid upon them. In this state it undergoes a second fermentation and becomes sour; after which it will suffer no change for many months. It is taken out of the hole as it is wanted for use, and being made into balls, it is wrapped up in leaves and baked: after it is dressed, it will keep five or six weeks.'

"The gratitude of the West India Committee to those who had been instrumental in providing such an important addition to the food supply of the West Indies was expressed in the following resolutions which were adopted at a meeting over which Lord Penrhyn presided at the London Tavern on March 18, 1794.

"Resolved Unanimously:

"That the thanks of this Meeting be given to Sir Joseph Banks for his care and judicious regulations to which we are indebted for the introduction of the Bread-fruit tree and many other valuable plants into the West India Islands.

"That the thanks of this Meeting be given to Captain Bligh for his care and attention to the great object of bringing the Bread-fruit tree and many other useful plants to the West India Islands.

"Resolved:

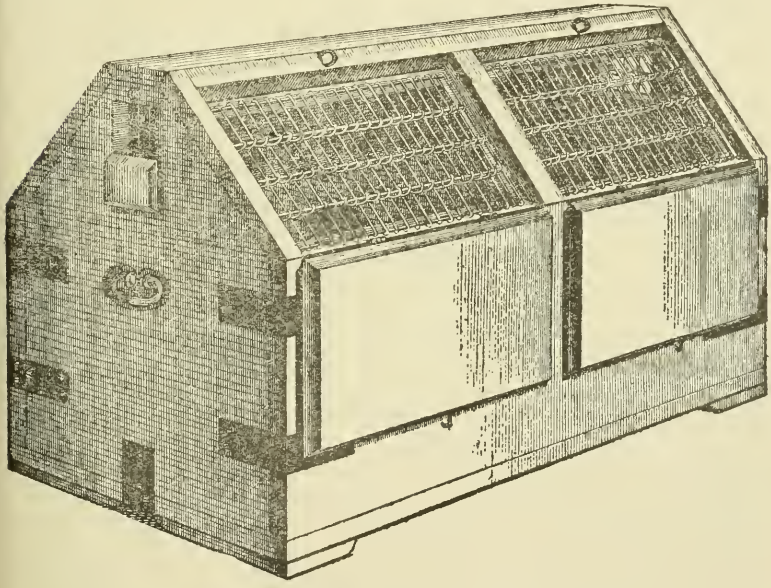
"That Stephen Fuller, Esq., be requested to transmit the above resolutions respectively to Sir Joseph Banks and Captain Bligh.

"Meanwhile the Garden had been enriched by plants of the mango and cinnamon from Jamaica, where they had been introduced in 1782 by Sir George Rodney, who found specimens of them in a French ship which he captured on her way from Mauritius to the West Indies; by the clove from Martinique four years later, and by nutmeg trees from Cayenne in 1809.

"At first the garden belonged to the Secretary for War, who at that time controlled the destinies of the Colonies, and it was blessed with a succession of most capable curators until at last one arose who found not favour in the eyes of the Government of the day. A disagreement arose, and it was decided to close the Garden and to hand over the grounds to the local Government. This was done. Many of the more valuable plants were transferred to Trinidad, where they formed the nucleus of the collection at St. Ann's which evoked the admiration of Charles Kingsley when he stayed at what he described as the 'Cottage Ornée' as the guest of Sir Arthur Gordon (afterwards Lord Stanmore) in 1869. The St. Vincent Government endeavoured to maintain the Garden at Kingstown, and for some years a sum of money was voted annually by the Legislature for its upkeep; but this grant was suspended in 1828, and cultivation was abandoned in 1849. All that was done after that year was to collect the fruit and spices from the trees, most of which were, however, destroyed by a hurricane in 1886. The Garden

then practically ceased to exist until 1890, when, at the instance of Sir Daniel Morris, it was re-established on an entirely new footing, its main object now being to propagate and distribute economic plants for cultivation by planter and peasant.

"This it has done, and is doing, most effectively, and it is not too much to say that the success which has attended the development of the system of peasant proprietorship in St. Vincent has been due to the care and devotion shown by successive Curators of the Botanic Station to the requirements of the people. The establishment of the system dates from 1897, and one remembers the howl of indignation with which its inception was received by the larger estates' proprietors; but none would, one ventures to assert, now deny that it has proved a conspicuous success."



A Case for Young Plants.

Seeds of the Bread-fruit and Mangostan were to be sown in soil in a case like this. As soon as the plants growing from it were six inches in height they were to be shipped in the case overseas. Note the movable shutters which could be lowered when desired to enable the plants to get the benefit of rain or dew.

A TRINIDAD TREE-GENTIAN.

By Dr. N. L. Britton,
Director-in-Chief, New York Botanical Garden.

One of the most interesting wild plants observed by us in Trinidad during April, 1920 was a small tree of the Gentian family, growing at the top of the precipitous northern slope of Mount Tucuche a short distance from the summit; we had gone a few feet off the excellent path up this mountain and plunging through dense undergrowth came out at the top of the slope and face to face with this curious plant, which is probably rare, for none of the several botanists who have previously explored the mountain appear to have found it; at all events it has never been described and is thus new to Science.

Other shrubs and small trees of this family are known in several genera inhabiting South America, and I had read descriptions of them and studied dried specimens of some, but had never before had the good fortune of seeing one living. At first glance this Trinidad species in no manner suggested any gentian of any member of the family known to me and it was only after I had broken off a flowering branch and got a good look at the blossoms that its relationship became apparent. The tree is two or three times the height of a person, with a few nearly upright branches and a smooth trunk three or four inches in diameter near the ground; it has broad dark green leathery, stalked leaves and terminal clusters of greenish-yellow bell-shaped flowers about an inch long. I append a technical description:

Chelonanthus Arboreus spec. nov.

A tree up to 5m. high, with few virgate branches, glabrous throughout.

Leaves elliptic, coriaceous, 5-8cm. long, 2·5—4·5cm. wide, the midvein prominent beneath, the lateral venation wholly obscure, the apex acute or short-acuminate, the base narrowed or subcuneate, the rather stout petioles 1-2cm. long; panicles stalked, binate, several flowered; bractlets lance-subulate, 3-5mm. long; pedicels stout, 6-12 mm. long, decurved in fruit; calyx campanulate, 8-10 mm. long, rounded at the base, its short lobes rounded; corolla tubular-campanulate, greenish-yellow, 2–2·5 cm. long, its short lobes rounded; stamens about as long as the corolla-tube; stigmas flat, oblong.

Type specimen from forested bank near summit of Mount Tucuche. Trinidad (*Britton, Hazen and Mendelson 1295*). Good specimens, collected by Mr. W. G. Freeman at the same place are preserved in the herbarium of the Trinidad Department of Agriculture.

I include this species in the genus *Chelonanthus* with some hesitation, inasmuch as the type species is herbaceous, as also several of the others, but a species much resembling the Trinidad plant, inhabiting St. Vincent and Guadeloupe, first described by Swartz as *Lisianthus frigidus*, has been referred by recent authors to *Chelonanthus* and I am quite confident that the two are congeneric. *C. frigidus* (Sw.) Urban, is much less woody than the Trinidad species, with relatively thin leaves and solitary or few, much larger flowers. *C. frigidus* has also been referred to another genius, *Calolisianthus*, by Gilg., but it is not much like its typical species. The tetrad pollen of all these plants is very interesting under high magnification.

LIVE STOCK.

THE IMPORTANCE OF THE TUBERCULIN TEST.

By Captain H. V. M. Metivier, o.b.e, b.sc., m.r.c.v.s.,
Government Veterinary Surgeon.

Bovine Tuberculosis is up to the present an incurable disease and no means is known of giving protection to cattle by vaccination or otherwise. At one time it was advocated that protection could be afforded cattle by inoculating tubercle bacilli of the human type into calves, and thus producing immunity against the bovine type, but it was subsequently discovered that animals thus treated, although immune to the bovine disease continued to give milk (in the case of cows) rich in human tubercle bacilli and consequently such a method of vaccination was abandoned.

Although the progress of the disease is as a rule slow, nevertheless an infected animal may, after the lapse of a few years, cause the infection ef an entire herd and it is to the advantage of every owner to test his animals periodically to make sure that his cattle are free from tuberculosis.

Tuberculosis is no doubt a disease of domestication. Animals that are confined in pens suffer much more from the disease than those that lead an open air existence: for instance tuberculosis is to all intents and purposes unknown in sheep in the United Kingdom. In the same way the disease in the United Kingdom is more frequently found in milch cows which are confined to shippons and byres than in beef cattle which, before they are eventually slaughtered, spend most of their life in the open air. For these reasons it is pointed out that tuberculosis is less common in cattle in the tropics than in a temperate climate, because our are less confined to sheds, byres and shippons than in colder regions.

In spite of this however it would be to the advantage of both owners of cattle and the consumers of milk in the Colony that animals should be tested from time to time so as to detect at once any animal infected with the disease. The best method of testing cattle is by the Tuberculin Test, the hypodermic test being the one usually employed.

Tuberculin is an extract of dead tubercle bacilli in broth, to which a very small quantity of Carbolic acid is added to ensure its keeping It is made by growing at body temperature tubercle bacilli in flasks containing broth and after an abundant growth is obtained the flasks are subjected to a great heat which destroys all the organisms. The contents of the flasks are then filtered and the clear filtrate is tuberculin, As already pointed out a small quantity of Carbolic acid is added to this clear liquid.

Summary of the Subcutaneous Test.

(1) Dose 3c.c. for a cow, 4c.c. for a bull.

(2) The animals temperature must be taken at least once the day before testing and also at the time of testing. The test is only reliable in those whose temperature is not above 103° F. at the time of injection.

(3) The tuberculin must be injected with a clean, sterile hypodermic syringe into the subcutaneous tissue.

(4) The temperature must be taken at the 9th, 12th, 15th and 18th hour after injection.

(5) Animals in which the temperature during the eighteen hours following the injection rises gradually from the normal (between 101° and 102°) to 104° or more, may be classed as tuberculous, and those in which it remains under 103° as non-tuberculous. When the maximum temperature attained is under 104° but over 103° the case must be considered doubtful, and the animal re-tested after a month.

The result of a test carried out at the Government Farm in May last on sixteen cows and three oxen is given below. One animal "Rhoda" gave a doubtful reaction but on re-testing proved negative.

It is the intention of the Department to test all the Dairy herd at the Farm in 1922 and the result will be published as soon as possible after the test has been made.

RESULTS OF TUBERCULOSIS TEST—GOVERNMENT FARM.

Name of Cow.	Breed.	Temperatures of Cattle.				
		11. 5. 21.		12. 5. 21.		
		9.30 p.m.	6.30 a.m.	9.30 a.m.	12.30 p.m.	3.30 p.m.
Rebecca ..	Pure bred Holstein	103	103·4	103·6	103	102·2
Rhoda ...	do. .	102	101·4	103·4	103·2	103·4
Theresa ...	do. ...	102·4	100·7	103	101·6	102·6
Prude ...	½ bred Holstein ...	100	100·6	102·5	102·1	101
Panty ...	do. ...	102·8	102·8	101·6	102·4	102
Nurse ...	do. ...	101·6	101·8	103	103	103·2
Princess ...	½ bred Shorthorn..	102·6	101·4	103·3	102	102·6
Prime ...	do. ...	101·8	103·2	102·7	103·8	102·8
Nanie ...	do. ...	103·2	101·2	100·6	102·4	101·6
Honsonie ...	½ bred Red Poll ...	101·4	100·6	103·4	103	102
Carlo ...	do. ...	101	101·2	102·8	102	101·8
Latchie ...	do. ...	102	101·4	101·2	102	101·8
Tarau ...	do. ...	101·4	99	102·8	102·2	101·4
Charlotte ...	do. ...	101	100·4	103·6	101·8	101·4
Jessamine ...	½ bred Zebu ...	100·6	98·2	101·3	101·4	101
Olga ...	½ bred Guernsey ...	101·4	101·4	102·5	102·2	102·4
Sookhram ...	½ bred Zebu ...	102·2	101·4	101·2	102	102
Marcas ...	do. ...	101·6	100·6	102	102·2	102·8
Riley ...	do. ...	101	100	102·2	101·6	101·8

ULCERATIVE LYMPHANGITIS.

By Captain H. V. M. Metivier, o.b.e., b.sc., m.r.c.v.s.,
Government Veterinary Surgeon.

This disease is one of the forms of Contagious Lymphangitis in *Equidae*, *i.e.* horses, donkeys and mules. The other forms are (1) Farcy—Cutaneous Glanders—(2) Epizootic Lymphangitis or South African Farcy and (3) Sporothricosis.

On August 23, 1921, I visited a Trinidad estate accompanied by the Veterinary Surgeon of the Company to examine four cases of Lymphangitis in mules which were suspected to be either cases of (1) Farcy—Cutaneous Glanders—or (2) Epizootic Lymphangitis. These animals had been tested with Mallein previously to my inspection together with twenty-six other mules, but the results were all negative. The test was again repeated on September 5 and the result was again negative. These results proved definitely that the condition was not Farcy.

A bacteriological examination of the pus obtained from nodes and abscesses on these four animals' legs was made and it was impossible to detect any Cryptococci in the contents of these lesions; this eliminated Epizootic Lymphangitis as the cause of the trouble. It should also be mentioned that the thick creamy pus present in the lesion of Epizootic Lymphangitis could not be obtained from any of the lesions on these four animals.

The presence of a small Gram positive bacillus was discovered in two smears from two different animals, and in one of these cases I obtained the same organism in pure culture. This organism is the cause of Ulcerative Lymphangitis in *Equidae*.

The following is a summary of this disease from most recent literature on the disease.

CAUSE.

The causal organism is the Preisz Nocard bacillus, which presents many points of analogy with the diphtheria bacillus; like the latter it forms a very acute toxin. The disease was very common in horses and mules during the late European War.

SYMPTOMS.

The disease is characterised by the successive development in the subcutanous cellular tissue, most frequently of the limbs, of a series of abscesses and nodes due to the action of the bacillus. Under the influence of the diffused toxic product of the organism the subcutaneous connective tissue undergoes a fibrous change resulting in Elephantiasis of the affected limb. The disease is essentially local and chronic. Experiments have proved that the organisms causing the disease penetrate through or into the skin subsequent to the formation of erosions caused in particular by the irritant effect of mud contaminated with excreta—it was understood that this state of affairs existed in the

pen where the mules were kept. Animals as a rule feed well and their condition is satisfactory. The temperature of affected animals is normal. At times however, the toxic product of the bacteria becomes absorbed into the blood stream in which case Suppurative Nephritis is set up, the animals become fevered, lose flesh considerably and eventually die.

TREATMENT.

A.—Preventative: There is fortunately, not much risk of the disease being propagated under conditions of peace as it was with serious consequences, among army horses and mules in the war. The disease is only very slightly contagious in well kept stables. When isolated cases of the disease occur the patients should be separated from other animals and the stables, harness and instruments used for dressing them should be disinfected. Animals with wounds about limbs, especially around the heel or fetlock, should not be worked in muddy fields or grazed on swampy pastures.

B.—Curative: Absolute rest constitutes the best form of treatment of Ulcerative Lymphangitis—rest should be as complete as possible. The ulcers should be treated by douching with weak antiseptic (2½ per cent. carbolic acid) every three days and then applying a slightly irritant or caustic agent such as tincture of iodine or the following preparation:—rape oil 75 parts, ether 25 parts, creosote 5 parts, iodoform 10 parts. The patients should be suitably fed and maintained under perfect hygienic conditions, in disinfected, commodious and well ventilated stables. This treatment is the one recommended by the Alfort Veterinary School. In certain cases however, the most heroic treatment fails.

The disease is only very slightly contagious under ordinary conditions, because it has been proved that healthy animals when kept in stables previously occupied by animals suffering from Ulcerative Lymphangitis and with the same litter could not become affected. It therefore follows that there is little danger of direct contagion. For these reasons there is no necessity for the disease to be included in Ordinance No. 21 of 1918 (Contagious Disease of Animals).

Maceration of the legs in mud doubtless plays a pre-disposing rôle by favouring the penetration of the bacilli as already pointed out.

METEOROLOGY.

RAINFALL RETURN—JULY TO DECEMBER, 1921.

STATIONS.	July.	August.	September.	October.	November.	December.	Total for 1921.	Total for Corresponding period 1920.
North West District.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.
St. Clair—Royal Botanic Gardens	10·06	10·30	10·17	6·53	7·71	6·25	75·51	44·94
Port-of-Spain—Colonial Hospital	9·40	9·15	8·95	5·76	5·98	5·69	63·54	33·01
do. Constabulary Headquarters	5·59	9·13	10·46	7·35	6·64	4·65	64·92	32·26
St. Ann's—Reservoir	8·67	10·30	8·00	6·48	5·63	5·32	68·80	58·09
Maraval—Reservoir	10·44	9·69	14·11	7·23	5·40	6·80	77·64	53·42
do. Constabulary Station	10·36	10·21	14·10	7·77	7·19	6·04	77·68	56·42
Diego Martin do, do.	14·28	10·65	16·03	9·62	7·72	8·58	94·38	58·65
do. Waterworks	13·33	10·76	13·13	7·27	6·94	7·45	81·82	55·29
do. River Estate	13·38	10·94	14·06	8·52	7·22	8·24	84·37	53·15
Fort George Signal Station	7·65	9·78	9·34	7·87	6·49	5·05	73·13	52·17
North Post do.	8·60	6·16	6·92	5·38	3·90	4·15	48·04	34·30
Carenage Constabulary Station	10·01	11·18	13·09	7·97	9·25	9·55	94·22	68·57
Carrera Island Convict Depôt	2·45	2·60	3·96	2·90	2·91	2·54	25·74	19·11
Chacachacare Light House	5·93	7·99	6·24	6·07	6·04	5·34	55·73	41·68
Santa Cruz—Maracas District.								
Santa Cruz Constabulary Station	11·27	10·70	14·56	7·65	7·10	9·01	88·31	64·29
St. Joseph, Government Farm	12·05	11·68	9·82	7·09	4·90	7·65	81·24	43·81
St. Joseph Constabulary Station	8·24	8·26	6·64	3·96	3·04	3·13	51·36	40·52
Tunapuna, St. Augustine Estate	10·89	9·12	7·77	7·15	2·83	6·74	71·02	42·47
do. Whinfield, St. John	11·39	10·85	9·18	6·80	4·80	8·69	...	...
Maracas—Government School	7·39	11·11	10·77	5·91	5·28	8·78	77·98	63·71
do, Ortinola Estate	7·21	9·05	12·53	6·24	5·05	7·66	73·68	62·11
Caura, Wardour Estate	7·15	7·60	11·20	6·82	5·87	8·38	73·91	55·51
do. El Manacal do.	7·99	11·47	16·24	9·59	9·91	7·93	108·78	...
do. La Florida do.	7·97	9·68	11·26	7·71	6·75	7·30	84·10	...
do. La Concordia Estate	7·68	9·14	9·58	6·56	5·94	7·63	76·28	...
West Central District.								
Caroni, Frederick Estate	9·75	9·47	7·54	7·83	4·72	3·01	66·31	53·67
Chaguanas. Constabulary Station	12·43	6·64	5·66	5·38	6·91	6·30	71·17	58·80
do. Woodford Lodge Estate	12·03	6·88	5·93	7·25	6·69	6·60	71·32	54·99

RAINFALL RETURN—JULY TO DECEMBER 1921.—CONTINUED.

STATIONS.	July.	August.	September.	October.	November.	December.	Total for 1921.	Total for Corresponding period 1920.
West Central District.—Contd.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.
Carapichaima, Waterloo Estate	13·07	7·91	10·33	8·63	10·29	5·76	79·83	58·30
do. McBean Cacao Estate	11·30	8·55	5·08	6·49	8·78	5·61	68·23	54·12
do. Friendship Hall Estate...	14·99	8·62	6·78	8·50	8·61	6·40	76·67	56·86
Couva, Exchange Estate	11·05	7·04	9·03	8·27	7·64	...	...	38·46
do. Brechin Castle do.	11·56	8·07	10·80	8·72	8·72	8·39	79·35	51·33
do. Perseverance do.	10·05	...	...	...	...	...	...	43·26
do. Camden do.	11·41	6·88	6·49	8·15	7·78	6·57	...	36·47
do. Milton do.	11·08	9·52	9·42	9·10	8·05	8·18	79·50	53·00
do. Spring do.	11·82	7·83	9·33	7·79	7·84	10·38	79·66	44·94
do. Constabulary Station	10·18	6·18	6·92	7·84	5·83	8·13	65·76	46·87
do. Esperanza Estate	8·54	6·39	8·46	6·68	6·61	7·07	60·38	44·73
Montserrat District.								
Brasso Piedra, Mamoral Estate	14·59	10·71	8·52	11·83	10·56	10·85	106·51	77·98
do. La Mariana Estate...	13·13	9·52	9·92	8·17	8·45	7·48	93·97	74·80
Montserrat Constabulary Station	12·84	9·04	9·83	8·54	7·60	6·95	76·92	51·33
Brasso, La Vega Estate	16·38	10·66	10·82	12·60	13·39	8·87	111·33	75·03
Tabaquite, Trelawne Estate	14·58	11·24	11·46	11·61	14·38	10·82	108·56	67·86
Arima District.								
Arima, Warden's Office	7·93	10·80	9·39	13·30	7·10	10·02	87·15	76·96
do. Torrecilla Estate	10·40	13·29	10·67	12·44	6·94	12·01	108·40	83·93
do. Verdant Vale Estate	10·58	12·35	11·36	11·86	6·76	11·07	106·38	75·78
San Rafael Constabulary Station	13·91	17·20	9·84	12·82	9·20	10·43	116·69	94·35
Guanapo, Talparo Estate	12·34	12·50	8·51	12·77	10·33	11·58	106·79	79·00
do. El Quemado Estate	11·87	12·09	8·20	12·63	13·11	11·86	118·61	91·53
Tamana, Santa Marta Estate	12·16	16·26	11·36	18·32	15·16	17·42	155·92	104·34
do. La Corona Estate	11·32	11·40	9·13	20·22	12·08	13·47	132·56	116·96

RAINFALL RETURN—JULY TO DECEMBER, 1921.—Continued.

Stations.	July.	August.	September.	October.	November.	December.	Total for 1921.	Total for corresponding period 1920.
	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.
San Fernando & Princes Town District.								
Claxton's Bay, Forres Park Estate	8·44	6·54	7·61	7·01	5·39	6·78	60·50	37·69
Pointe-à-Pierre, Plein Palais Estate	9·59	5·58	8·62	7·10	8·18	9·20	64·44	51·11
Naparima, Picton Estate	8·79	7·13	8·44	9·00	8·82	8·72	71·69	58·49
do. Usine Ste. Madeleine Estate	7·28	6·38	9·14	11·10	13·26	10·07	80·19	55·53
do. La Fortunée Estate	9·02	8·03	9·18	8·91	8·48	...	...	...
do. Tarcuba Estate	7·50	3·71	8·37	8·02	8·08	7·84	61·66	45·62
do. Union Hall Estate	6·73	...	...	...	...	...	...	57·43
do. Palmiste do.	8·57	8·49	11·29	12·09	12·75	10·63	86·43	58·88
do. Lewisville House	11·03	6·21	8·54	10·74	10·70	8·58	78·76	59·27
do. Hermitage Estate	9·45	...	...	9·73	...	...	...	...
do. Petit Morne Estate	8·11	7·24	7·78	10·30	12·12	9·21	70·82	...
do. Bien Venue	8·79	5·89	8·11	8·82	8·97	...	...	...
Princes Town Craignish Estate	7·35	7·33	9·65	11·89	10·12	9·71	79·67	61·46
do. Cedar Hill Estate	8·10	9·30	9·50	10·37	10·75	6·83	74·49	54·69
do. Williamsville Estate	9·39	8·95	10·58	10·45	9·54	12·06	81·66	59·27
do. Esmeralda Estate	12·71	9·14	11·08	8·33	10·62	9·70	88·16	64·00
do. New Grant Estate	12·23	8·08	11·37	12·32	12·61	9·79	94·64	59·27
do. Constabulary Station	8·12	5·71	6·13	11·25	8·96	8·95	67·08	42·44
do. La Retraite Estate	16·77	9·76	14·19	12·01	17·38	12·95	121·28	80·90
do. Malgretoute do.	8·41	7·31	10·59	12·02	10·81	9·82	83·14	65·05
South-West District.								
Oropuche, Constabulary Station	5·28	4·31	4·05	3·97	3·64	2·67	31·70	21·58
Siparia, Constabulary Station	10·71	9.82	7·59	8·48	6·26	6·74	70·85	52·31
do. Alta Gracia Estate	10·20	10·86	8·66	10·08	9·07	6·13	78·63	61·42
Guapo, Adventure Estate	10·40	8·87	7·20	4·88	9·49	5·66	65·50	54·40
do. Perseverance Estate	12·71	6·30	8·84	8·81	12·74	7·77	...	...
Point Fortin—Constabulary Station	13·34	12·74	9·51	8·88	13·42	11·17	98·06	67·92
Erin, La Ressource Estate	4·19	4·64	7·53	8·92	11·41	10·31	60·67	38·34
do. La Union Estate	8·08	7·67	7·89	7·37	9·09	...	...	50·12
do. Industry Estate	6·75	7·35	7·84	5·75	10·02	5·61	66·20	50·64
Cedros, La Retraite Estate	8·74	11·35	8·70	9·73	15·12	6·07	97·98	70·56

RAINFALL RETURN—JULY TO DECEMBER, 1921.—Continued.

Stations.	July.	August.	September.	October.	November.	December.	Total for 1921.	Total for Corresponding period 1920.
South-West District.—(Contd.)	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.
Cedros, Perseverance Estate	4·20	7·48	5·11	5·03	14·71	5·18	65·94	56·21
do. Ste. Marie Estate	4·51	7·05	5·10	5·73	15·68	5·61	67·24	55·90
do. Constabulary Station	4·23	6·80	5·20	5·91	16·76	6·11	75·64	60·01
do. Ste. Quintin Estate	3·75	8·39	5·06	7·32	12·81	6·20	70·52	48·31
Icacos, Constance Estate	2·39	7·04	3·98	5·52	6·86	12·61	58·70	37·33
Irois, Government School...	5·13	9·43	6·58	6·59	10·20	5·92	68·34	62·56
South Coast.								
Moruga, Constabulary Station	8·72	6·30	7·79	15·77	12·77	9·03	90·24	57·39
East Coast.								
Matura, La Juanita Estate	12·74	12·30	13·00	27·29	17·31	15·21	150·58	100·79
Manzanilla, Constabulary Station	6·37	6·21	8·19	22·65	6·91	15·75	112·89	79·97
Sangre Grande, Evasdale Estate	12·72	10·09	9·10	20·21	12·84	15·02	131·63	94·55
do. Grosvenor Estate	11·34	9·85	10·39	22·86	13·10	20·16	136·74	97·51
do. El Recundo Estate	11·05	10·17	9·55	22·52	10·15	17·53	122·27	92·83
do. San Francisco Estate	11·80	8·56	11·61	27·85	13·97	18·14	142·52	102·72
Mayaro, Constabulary Station	4·97	6·53	6·47	16·86	11·87	14·32	93·33	61·76
North Coast.								
Blanchisseuse, Constabulary Station	8·00	7·78	6·39	5·46	10·53	14·45	94·25	76·24
do. Avondale Estate	6·47	13·15	8·29	11·71	11·06	10·56	105·48	...
Grande Rivière, Mon Plaisir Estate	8·91	12·61	10·74	31·14	11·02	15·65	141·81	104·76
Toco, Aragua House	7·39	8·64	8·66	25·98	7·81	12·99	107·14	72·84
do. Constabulary Station	6·76	7·88	5·79	25·24	7·39	13·50	95·18	53·67
Tobago.								
Tobago, Hermitage Estate	11·91	7·75	20·40	15·51	6·00	12·05	119·75	80·78
do. King's Bay Estate	7·44	7·33	11·71	12·76	5·24	12·38	92·67	57·91
do. Roxburgh do.	7·45	8·31	12·78	12·70	7·55	12·67	98·71	67·05
do. Botanic Station	6·82	7·53	7·08	13·79	3·63	10·69	68·66	55·70
do. Government Farm	5·05	5·09	4·46	12·12	2·86	8·64	52·08	43·76
do. Friendship Estate	4·11	4·99	8·40	11·07	5·04	8·54	61·00	44·39

(*Bulletin, Department Agriculture, Trinidad and Tobago*, pp. 169-238. Issued February 28, 1922).

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BULLETIN

OF THE

DEPARTMENT OF AGRICULTURE, TRINIDAD AND TOBAGO.

VOLUME XX, 1922-23.

Editor:
W. G. Freeman.

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J. de Verteuil, F.I.C., F.C.S., *Agricultural Chemist.*

TRINIDAD:
Printed by the Government Printer,
Government Printing Office.

1925.

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Assistant to Agricultural Chemist.....L. Daniel.

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under Ordinances No. 30, 1915 and No. 41 of 1921.

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Trinidad	*Date of Registration.*
Diego Martin	October 12, 1916.
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Lengua	November 9, 1919.
Penal	November 21. 1919.
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Moriah	December 16, 1918.
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Parlatuvier	July 10, 1920.
Roxborough	October 23, 1920.
Les Coteaux	December 20, 1920.
Montgomery	January 7, 1921.

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G. Hodge.

Pests Proclaimed under the Ordinance.

Proclamation No. 56 of 1921.

Bud-rot disease, Red-ring disease and Little-leaf disease of the Coconut; Mosaic disease of the Sugar-cane; Blossom-blight and Wither-tip of the Lime tree; Bird Vine; Love Vine; Coconut butterfly; Parasol ant; Cacao beetle; Locust; Gru-gru beetle; Rhinoceros beetle.

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LIST OF ILLUSTRATIONS.

Part 1.] [Vol. XX.

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W. G. Freeman.

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Department of Agriculture.

GOVERNMENT STUD ANIMALS.

THE following are the arrangements for July and August, with regard to Stud animals of the Government Farms in Trinidad and Tobago.

Stallions.

Name.	*Class.*	*Where standing for Service.*	*Fee.*	*Groom's Fee.*
QUICKMATCH	...Thorough-bred..	Govt. Farm, Trinidad ...	$10.00	60c.
NELSWEEP	...Thorough-bred	do. Tobago ...	5.00	60c.
MARAT	...Thorough-bred	do. do. ...	5.00	60c.

Jack Donkeys.

Monarch	...American Donkey	...Govt. Farm, Trinidad...	$ 5.00	60c.
Emperor ...	do.	... do. do. ...	1.20	60c.
Barbados Joe	...	... do. do. ...	1.20	60c.
President	...American Donkey	... do. Tobago ...	5.00	60c.

Bulls.

A.—AT GOVERNMENT FARMS.

TRINIDAD.		TOBAGO.	
Class.	*Fee.*	*Class.*	*Fee.*
2 Pure-bred Zebu ...	$ 1.20c.	1 Pure-bred Zebu	...$1.00
1 Half-bred Red Poll ...	1.20c.	1 Half-bred Shorthorn	... 1.00
1 Cross-bred Holstein-Zebu	1.20c.	1 do. Guernsey	... 1.00
1 Pure-bred Red Poll ...	2.40c.	1 do. Red Poll	... 1.00

B.—AT PUBLIC PASTURES OR ESTATES.

Place.	*Class.*
Queen's Park Savannah	1 Half-bred Shorthorn ; 2 Half-bred Holsteins
Mucurapo Pasture	
St. Clair Expt. Station	1 Guernsey-Zebu Shorthorn ; 1 Three-Qtr. bred Zebu
St. Augustine Estate	1 Half-bred Zebu ; 1 Half-bred Guernsey 1 Cross-bred Zebu-Guernsey.
River Estate	1 Half-bred Zebu.
San Fernando	1 Half-bred Jersey ; Three-Qtr. bred Zebu.
Arima	1 Half-bred Zebu.

Pigs.

AT GOVERNMENT FARM, TRINIDAD.

Poland China, Berkshire, $1.00, and Attendant's Fee 25c.

AT GOVERNMENT FARM, TOBAGO.

Berkshire ...	...	...	...	...Fee 50c.
Large Black ...	...	...	...	... 50c.

POULTRY.

GOVERNMENT FARM, TRINIDAD.

Eggs of Barred Plymouth Rocks, Rhode Island Reds, White Leghorns, and Rouen Ducks ... ...$1.00 per doz.
Great Kind Pigeons ... ... 60c. per pair.

GOVERNMENT FARM, TOBAGO.

Eggs of Plymouth Rocks, Black Minorcas, Rhode Island Reds 48c. per doz.
Also Cocks and Pullets of Plymouth Rocks and Rhode Island Reds.

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under Ordinances No. 30 of 1915 and No. 41 of 1921.

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Inspector.....Jos. E. Seheult.
Clerk.....Ashraff Hosein.

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Assistant Inspectors.....J. A. Pinder. J. Blackman. A. T. Warner. Alfred H. Pena. G. Hodge.

Diseases and Pests Proclaimed under the Ordinance

Proclamation No. 56 of 1921.

Bud-rot disease, Red-ring disease and Little-leaf disease of the Coconut palm; Mosaic disease of the Sugar-cane; Blossom-blight and Wither-tip of the Lime tree; Bird Vine; Love Vine; Coconut butterfly; Parasol ant; Cacao beetle; Locust; Gru-gru beetle; Rhinoceros beetle.

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The Froghopper Egg Parasite and its Colonization in Cane Fields, by F. W. Urich.—Price 1d.

The Mongoose in Trinidad and methods of destroying it, 2 plates, by F. W. Urich.—Price 3d.

Control of Cacao Thrips. (Illustrated) by F. W. Urich.—Price 3d.

Annual Reports, Department of Agriculture, 1916, 1917 & 1918.—Price 1s. 9d. each, 1919–1920, price 2/3.

Memoir No. 1.—Froghopper-Blight of Sugar-Cane in Trinidad by C. B. Williams, M.A., F.E.S.—Price 2/6. 9 plates (2 coloured) and 32 other illustrations.

Memoir No. 2.—The Butterflies of Trinidad by W. J. Kaye, F.E.S. Price 5s. one coloured plate.

All publications can be obtained from the Head Office of the Department, St. Clair Experiment Station, post free within the Colony. The Bulletin is also on sale at Messrs. Muir, Marshall, and Davidson & Todd, Port-of-Spain.

BULLETIN

OF THE

DEPARTMENT OF AGRICULTURE,
Trinidad and Tobago.

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DESCRIPTIVE NURSERY STOCK LIST.

By R. O. WILLIAMS,
Superintendent and Curator.

CONTENTS.

Regulations for the Sale of Plants.

TRINIDAD.

Orders should be addressed to "The Curator, Experiment Station, St. Clair."

All charges for plants, packages, delivery, &c., must be paid in advance.

Postal Orders, Cheques, &c., should be made payable to the Director of Agriculture and crossed Receiver-General.

It is to be understood that the Department does not undertake the delivery of plants, and will not be responsible for them after they leave the Station. When practicable, to meet the convenience of purchasers plants can be delivered in Port-of-Spain, including the Railway Station, at the following charges :—

Plants delivered by messenger in Port-of-Spain ...12c.
Do. cart ... ...50c. per load.

Plants sent by rail are despatched "carriage forward" at the purchaser's risk.

Special quotations for Cacao, Coffee and Limes grown from selected seeds are as follows:—

Delivered at Nursery unerated:

Plants in lots of 1 to 1,000 plants, 3c. per plant.
Plants in lots of several thousands, $25 per thousand.
Budded Cacao, in lots over 100 at $8.00 per 100.
Limes from beds, in lots over 100 $1.50 per 100.

Delivered at Railway Station, Port-of-Spain or Queen's Wharf, securely packed in open crates:

Plants purchased in lots up to 100 at 4c. per plant.
Plants purchased in lots up to 1,000 at $3.50 per 100.
Plants purchased in lots of several thousands at $33 per 1,000.

Plants can be obtained on week-days during the following hours:—

7 a.m. to 11 a.m.; 12 noon to 4 p.m.; Saturdays 7 a.m. to noon.

No plants supplied on Sundays or Public Holidays.

To prevent disappointment large orders should be booked at least six months previous to the date when the plants are required, as it is found too expensive to keep large supplies on hand for casual demands.

Any complaints as to the quantity or the quality of plants, &c., supplied should be made in writing and addressed to the Director.

Persons desirous of obtaining plants on loan for decorative purposes should apply in writing at least three clear days beforehand; they must provide their own transport and deposit a sum sufficient to cover damage to pots and plants. Forms of application can be had at the office.

TOBAGO.

Orders should be addressed to the Curator, Botanic Station, Scarborough, who will give information as to price for plants delivered at the Botanic Station. All charges must be paid in advance.

Office hours, responsibility of the Department, and previous booking of large orders are the same as in Trinidad.

W. G. FREEMAN,
Director of Agriculture.

The following plants are usually available from the nursery at the St. Clair Experiment Station. Orders for budded and grafted plants or for large quantities of any particular kind of plant should be booked at least six months in advance of requirements. All plants in bamboo pots, unless otherwise stated.

Fruits.

Achras Sapota. Sapodilla. Seedlings 5 cents.

A common, medium sized tree. Fruits russet brown containing sweet, succulent pulp. Useful as a dessert fruit.

Propagated chiefly from choice Tobago varieties. The tree is the source of chicle gum exported largely from British Honduras for manufacturing "chewing gum."

Anacardium occidentale. Cashew Nut. Seedlings 5 cents.

A medium sized tree, valued principally for its seeds which have a pleasant, nutty flavour when roasted. The edible fruit stalk or so-called "fruit" is somewhat astringent, but may be eaten either raw or cooked.

Anona muricata. Soursop. Seedlings 5 cents.

A small tree. Fruits large, green, their pulp used for cooling drinks, ices, &c. The flavour is somewhat peculiar, being both sweet and acid.

Anona reticulata. Custard Apple. Seedlings 5 cents.

A small tree with brownish-red, rounded fruits with sweet, custard-like pulp; not very popular.

Anona squamosa. Sugar apple. Seedlings 5 cents.

A small tree thriving best near the sea. The fruits, useful for dessert, contain white sugary pulp.

Artocarpus incisa. Breadfruit. Rooted suckers 25 cents.

A medium sized tree bearing the common breadfruit, a staple article of diet in many of the West Indian Islands. It may be used in a variety of ways but is usually either boiled or roasted.

Artocarpus incisa var. Breadnut. Seedlings 5 cents.

A tree very similar in appearance to the above but the fruits, unlike those of the Breadfruit, are full of edible seeds, which require boiling before being eaten.

Artocarpus integrifolia. Jackfruit. Seedings 5 cents.

A medium sized tree producing huge fruits of irregular shape, containing numerous seeds embedded in coarse fibrous pulp. The seeds and pulp are edible.

Artocarpus Lakoocha. Lacoocha. Seedlings 5 cents.

A large tree, somewhat similar in appearance to the Jackfruit. It bears large quantities of small, soft, yellow fruits of sharply acid flavour. It is appreciated by some people as an edible fruit.

Averrhoa Bilimbi. Cucumber tree. Seedlings 5 cents.

A small tree, with cucumber shaped fruits, of the same consistency as the Carambola, but of more delicate flavour when made into preserves, &c. The fruits are also useful for pickles, curries, &c.

Averrhoa Carambola. Carambola. Coolie Tamarind. Seedlings 5 cents.

A small ornamental tree, bearing in great profusion, translucent, yellow, five-winged fruits. These are acid, but of good flavour and are very useful for stewing, and for making jams and jellies.

Bertholletia excelsa. Brazil Nut. Seedlings 25 cents.

A tall tree, bearing large, round, woody fruits containing edible seeds, the Brazil nuts of commerce. Seedlings are difficult to raise, and plants are thus only occasionally available.

Blighia sapida. Akee. Seedlings 5 cents.

A medium sized tree bearing reddish fruits, which split open when ripe, disclosing black seeds attached to a cream coloured aril (the edible portion of the fruit). Certain pink tissue in the fruit is poisonous and

those unfamiliar with the mode of preparation for table should not use it till they have been instructed by someone able to advise. Damaged or fallen fruit should not be used. When properly cooked the cream coloured aril is most delicious.

Carica Papaya. Papaw. Seedlings 5 cents.

A small, fast growing, single stemmed plant, often unisexual. There are a number of varieties, the fruits of which vary both in size, shape and flavour. They are used largely as dessert fruits but may also be cooked in tarts or when green boiled as a vegetable.

Caryocar nuciferum. Souari Nut. Butter Nut. Seedlings 25 cents.

A tall tree, bearing large, globular fruits, containing one to four kidney-shaped seeds, the kernels of which are of excellent flavour. It fruits sparingly in the gardens and plants are thus only occasionally available.

Chrysobalanus Icaco. Coco Plum. Fat Pork. Seedlings 5 cents.

A native shrub with small brownish red, astringent fruits, edible when stewed with sugar.

Chrysophyllum Cainito. Caimite. Star Apple. Seedlings 5 cents.

A large ornamental tree, with round, sweet, succulent fruits. There are several varieties, some bearing green and others purple fruits.

Citrus Aurantium vars. Orange. Budded plants on sour orange stock 24 cents.

The following varieties are raised to order:—

Homosassa. Fruits medium sized, thin skinned, very seedy, sub-acid flavour.

Jaffa. Fruits large and of good flavour, few seeds, sub-acid flavour.

Lamb's Summer. Small fruits, thin skinned, numerous seeds, acid, fine flavour.

Majorca. Medium sized fruits, few seeds, sweet, less insipid than Washington Navel.

Parson Brown. Medium sized fruits, very juicy, considerable rag and seeds, sweet, somewhat lacking in flavour.

Pineapple. Medium sized fruits, very juicy and sweet, little flavour.

Ruby. Medium sized, dark fleshed fruits, sweet, very mild flavour, skin rough.

Sandford's Mediterranean. Large fruits, thick rough skin, dark fleshed, very mild flavour.

St. Michael's. A Mediterranean variety of medium flavour, dark fleshed, numerous seeds.

St. Michael's Blood. Dark fleshed but not a typical blood orange, seedy and of mild flavour.

Tardiff or Hart's Late. A Florida seedling. Juicy fruits, sub-acid, excellent flavour, few seeds.

Washington Navel. Fruits large with characteristic navel markings seedless or nearly so, sweet, without acid flavour.

Citrus decumana var. Grape Fruit. Budded plants on sour orange stock 24 cents.

Grape Fruits resemble large oranges with comparatively thin, pale yellow, smooth skin and usually very pale yellow flesh. They are slightly bitter in flavour but greatly esteemed as a first course in the morning meal. The following varieties are raised to order :—

Bowen's Late.

Conner's Prolific. Large fruit somewhat coarse fleshed, good flavour.

Duncan. A fruit of excellent quality and flavour, originating in Florida, flesh pale yellow, fairly bitter.

Foster. The flesh of this fruit is separated by pinkish membranes giving the whole a pink appearance: somewhat coarse and bitter, with thickish rind and a fair number of seeds.

Marsh Seedless. Large fruit with whitish juicy flesh of a slightly bitter flavour ; almost or quite seedless.

Pernambuco. A variety from Brazil. Fruits of fine quality, pale yellow flesh, bitterness well marked.

Tobago Select. Medium sized fruits. thin skinned, juicy, yellowish flesh of good flavour.

Walters. A variety originating in Florida and described as a heavy bearer with the true grape fruit bitterness and flavour in perfection. Flesh pale yellow, bitterness strongly marked.

Citrus decumana var. Shaddock. Pomelo. Budded plants on sour orange stock, 24 cents.

Large, round or sometimes pear-shaped fruits with thick rind and yellow or pink flesh. The juicy varieties are delicious for dessert and the rind of all, candied in boiling syrup, is a favourite preserve. The variety Labuan has pink flesh and thick rind. Plants raised to order.

Citrus medica. Citron. Seedlings 5 cents. Budded plants 24 cents.

A small tree, with large pointed fruits, possessing a thick rind, which when preserved is known as " candied peel."

Citrus medica var. *Limonum.* Lemon. Seedlings 5 cents. Budded plants 24 cents.

The well known lemon of commerce.

Citrus medica var. *acida.* Lime. Seedlings in pots 5 cents, or direct from beds 2 cents. Special quotations on page 2 for large quantities.

The well known tree from which concentrated Lime Juice, Citrate of Lime, Otto of Limes, Distilled Oil of Limes, &c., are manufactured; also largely used for making refreshing drinks.

Seedless and spineless Limes. Budded plants 24 cents.

Citrus nobilis. Mandarine and Tangerine.

Easily recognizable from the orange by the loose skin and easily separated fruit segments. The following varieties are raised to order :—

Cleopatra. Highly coloured ornamental fruits. Very small. Seedlings 5 cents.

Grenadine Orange. Large fruits with thick rough rind. Very juicy and of a slightly bitter flavour. Budded plants 24 cents.

King Orange. Large fruits with deep, orange coloured pulp, very juicy and sweet. Budded plants 24 cents.

Satsuma. A Japanese variety of excellent quality, nearly seedless. Budded plants 24 cents.

Diospyros mabola. Seedlings 5 cents.

A handsome evergreen tree with spherical fruits, velvety orange brown in colour, containing a few large seeds embedded in soft, unpleasant smelling, edible pulp.

Eugenia Jambos. Rose Apple. Seedlings 5 cents.

A medium sized tree. Fruits edible, small, sweetly scented, pale yellow, containing one seed.

Eugenia malaccensis. Pomerack (Pomme Malac). Malacca Apple. Seedlings 5 cents.

A medium sized tree. Fruits pear shaped, usually eaten stewed with sugar and cloves or cinnamon.

Eugenia uniflora. Surinam Cherry. Seedlings 5 cents.

A large shrub. Fruits ribbed, cherry like, somewhat insipid, eaten raw or used for jellies, &c.

Flacourtia Ramontchi. Governor Plum. Seedlings 5 cents.

A medium sized tree with small round purple fruits containing numerous seeds. They make excellent jelly. A good hedge plant.

Garcinia Mangostana. Mangosteen. Seedlings 24 cents.

A small, evergreen tree with round, reddish brown fruits containing a few seeds embedded in white gelatinous pulp, of very delicate flavour. Usually esteemed one of the best of tropical fruits. It is a somewhat difficult plant to rear and plants are thus only occasionally available.

Malpighia glabra. Barbados Cherry. Seedlings 5 cents.

A bush or small tree suitable for hedges. Fruits small, cherry like, very useful for jams and jellies.

Mammea americana. Mammy Apple. Seedlings 5 cents.

A medium sized tree with large, brown, almost spherical fruits containing several large seeds. The flesh is eaten stewed or made into preserves.

Mangifera indica. Mango. Selected varities grafted on common mango stocks 24 cents.

Evergreen trees valued for their edible fruits. Seedling varieties are common in the Colony but are often stringy and possessed of a turpentine flavour. The three best grafted varieties, respectively sweet, sub-acid and acid in flavour are Julie, Peters and Gordon (Totofari). These

will meet most tastes and are recommended for extensive planting. The following varieties are raised to order but owing to the large demand orders must be booked at least six months in advance:—

Ceylon No. 1. Fruits large, of good flavour, bright yellow, stringless.

Divine. Good flavoured, rather small fruits somewhat subject to anthracnose.

Gordon (Totofari). Supposed to have been named after Sir Arthur Gordon a former Governor of Trinidad. Fine, large yellow fruits with soft flesh of a delightful acid flavour uncommon in mangos.

Julie. Usually regarded locally as the best flavoured mango. Fruits green, flat sided, sweet, dark yellow flesh and small thin stones.

Peters. One of the best mangos, of delightful flavour, slightly acid near the stone. Fruits large, either green or rosy according to situation where grown.

Sandersha. The largest mango in the collection, flavour insipid, but useful for chutney and jam making. Pale yellow flesh not stringy.

Minnie. A seedling raised by Mr. J. H. Hart. Fruits small not stringy and of good flavour.

Other mangoes in the collection from which grafted plants may be supplied to order are:

Alphonse. Apricot (Zabricot). Blackman. Cadez Special. Chinois Martinique. De Boissière. Dora Barbadensis. Elliot. Fielden. Kathleen. Martin. Millen. Number Eleven. Père Louis. Roseau.

Melicocca bijuga. Genip. Seedlings 5 cents.

A tall tree with small, greenish-yellow fruits containing one large seed surrounded by soft, pleasantly flavoured pulp. The roasted seeds are also edible.

Nephelium Litchi. Litchi. Seedlings 10 cents.

A tall tree with nearly spherical fruits. Seeds covered with clean, white, jelly-like pulp, delicious either fresh or dried and preserved. Plants are only occasionly available as the tree rarely fruits in the Botanic Gardens.

Passiflora laurifolia. Belle Apple. Seedlings 5 cents.

A climbing plant. Fruits round, orange coloured, containing numerous small seeds embedded in sweet edible pulp of pleasant flavour.

Passiflora macrocarpa. Granadilla. Seedlings 5 cents.

A vigorous climber. Fruits large, yellowish green with slightly acid, pleasant flavoured pulp, used for making sweet drinks and ices; boiled green as a vegetable.

Pereskia aculeata. Barbados Gooseberry. Seedlings and rooted cuttings 5 cents.

A climbing plant bearing an abundance of small, round, orange coloured fruits of acid flavour; good when stewed.

Persea gratissima. Avocado. Budded plants 24 cents. Seedlings 5 cents.

The following varieties are raised to order, but owing to the large demand orders must be booked at least six months in advance. Budded plants only are recommended for planting.

St. Clair.
River.
St. Ann's. } Large fruits with thick flesh and small seeds.

Phyllanthus distichus. Otaheite Gooseberry. Seedlings 5 cents.

A medium sized tree with abundant yellowish ribbed fruit of acid flavour, useful for making preserves, pickies, &c.

Psidium Guajava. Guava. Seedlings 5 cents.

Small to medium sized bushes or trees. Fruits largely used for stewing and jelly. The following varieties are stocked :—

Large White or Cayenne. Large greenish yellow fruits with whitish interior.

Large Red or Spice. Large fruit, greenish yellow exterior, reddish interior.

Psidium sp.

Strawberry Guava. Thick shiny leaves and small reddish fruit, useful for dessert.

Psidium sp.

Currant Guava. Small thin leaves and tiny currant-like fruits.

Punica Granatum. Pomegranate. Seedlings 5 cents.

A small tree with bright scarlet flowers and large fruits. The acid pulp surrounding the seeds is edible.

Rheedia macrophylla. Seedlings 5 cents.

An evergreen tree with yellowish fruits which may be used in the making of tarts, &c.

Spondias dulcis. Pomme Cythere. Golden Apple. Seedlings 5 cents.

A medium size tree bearing rounded fruits about the size of duck's eggs or larger in good varieties, pulp sweet but stringy. Useful for dessert or for making into preserves.

Spondias lutea. Hog Plum. Seedlings 5 cents.

A large tree with small yellow fruit, acid, and of an unpleasant odour. They are greedily eaten by cattle and sometimes used for making jelly.

Tamarindus indicus. Tamarind. Seedlings 5 cents.

A large spreading tree, pods brown containing several seeds embedded in acid pulp, very useful for making drinks and preserves.

Terminalia Catappa. Almond. Seedlings 5 cents.

A spreading tree with hard fruit, each containing one seed somewhat resembling the sweet almond in flavour.

Vangueria edulis. Tamarinde des Indes. Seedlings 5 cents.

A large spreading shrub with green spherical fruits, containing pleasant, slightly acid pulp.

Beverage Plants.

Coffea arabica. Creole Coffee. Arabian Coffee. Seedlings 3 cents.

A small shrub. Fruits borne in small clusters along the side branches, falling when ripe; of good flavour.

C. excelsa. Congo Coffee. Seedlings 3 cents.

A coffee somewhat resembling the Liberian in foliage. Small fruits, borne in dense clusters at intervals along the branches. They ripen more or less together and do not fall so readily as the Arabian. This coffee will thrive under drier and more exposed conditions than *C. robusta.*

C. Liberica. Liberian Coffee. Seedlings 3 cents.

A strong growing and hardy species with large fruits, producing coffee of inferior flavour to the Arabian, being more bitter.

C. robusta. Robusta Coffee. Congo Coffee. Seedlings 3 cents.

Similar in general characteristics to *C. excelsa* but with smaller leaves, less hardy and consequently requires more protection from sun and wind. In flavour it is almost equal to the Arabian.

C. stenophylla. Narrow Leaf Coffee. Sierra Leone Coffee. Seedlings 3 cents.

Characterized by narrow leaves and small, dark purple cherries borne usually in pairs. The latter character makes picking somewhat expensive. Of good flavour but is not a favourite for cultivation locally.

Cola acuminata. Kola nut. Seedlings 3 cents.

A small tree bearing pods containing several large seeds which when dry are of a reddish brown colour. These are exported for medicinal use and for the making of beverages.

Theobroma Cacao. Cacao.

Seedlings from selected, good type, heavy bearing trees at River Estate.

Budded—Budded from the best varieties, the budwood taken from trees giving an average of over 80 pods a year: 12 cents each.

Special quotations for large quantities. See page 2.

Spices and Perfumes.

Cinnamomum Camphora. Camphor. Seedlings 5 cents. Layered Plants 24 cents.

A small tree, which yields the camphor of commerce by distillation of the young leaves and twigs.

Cinnamomum zeylanicum. Cinnamon. Seedlings 10 cents.

A small tree valued for its aromatic bark, which when dried is used largely for flavouring purposes.

Dipteryx odorata. Tonka Bean. Seedlings 10 cents.

A large tree with fragrant seeds, which after curing are exported for use in the perfumery and tobacco trades.

Eugenia caryophyllata. Clove. Seedlings 10 cents.

A small tree. The dried flower buds are the commercial cloves, largely used for flavouring.

Myristica fragrans. Nutmeg. Seedlings 5 cents.

A handsome medium sized tree, bearing yellow fruits which burst open when ripe, showing the scarlet mace, covering the brown shell of the well known nutmeg. The fleshy portion of the fruit makes a good jelly.

Pimenta acris. Bay Berry. Seedlings 5 cents.

A medium sized tree yielding the bay oil of commerce by distillation of the leaves and young shoots.

Piper nigrum. Black Pepper. Seedlings 5 cents.

A creeping vine with small red berries, black when dry. These are ground into black pepper; white pepper is obtained after removal of the dry outer covering.

Vanilla planifolia. Vanilla. Cuttings 3 cents.

A climbing orchid producing clusters of long pods, which when cured are the vanilla beans of commerce, largely used for flavouring. The flowers have to be pollinated by hand.

Zingiber officinalis. Ginger. 'Roots' 5 cents. Obtained to order.

A small herbaceous plant with fleshy underground stems from which ginger is prepared by peeling, slicing and drying.

Rubbers.

Castilloa elastica. Central American Rubber. Seedlings 3 cents.

A large tree with heavy foliage. Cuts in the trunk yield a milky latex, which coagulates on the bark and is collected as scrap. It is inferior to Para Rubber and has been given up as a cultivated rubber plant.

Cryptostegia grandiflora. Rubber Vine. 'Purple Allamanda.'

A scandent shrub. The stems contain a milky latex which yields rubber. It is a handsome decorative plant bearing terminal cymes of purple, tubular flowers, which change with age to a lighter colour.

Funtumia elastica. West African or Lagos Silk Rubber. Seedlings 3 cents.

A tall tree of slender growth, very liable to fall in high winds. It yields a good rubber, difficult to prepare.

Hevea brasiliensis. Para Rubber. Seedlings 5 cents.

A tall tree which yields from incisions made in the lower portion of the trunk a white latex, which collected, coagulated and cured, is known as Para Rubber, the best and most widely grown rubber.

Landolphia spp. African Rubber Vine. Seedlings 12 cents.

Large woody climbers, yielding rubber.

Mimusops globosa. Balata. Bullet Tree. Seedlings 5 cents.

A large tree; its latex yields balata, somewhat resembling gutta percha.

Drugs.

Aegle Marmelos. Bael Fruit. Seedlings 12 cents.

A small tree, with large, gourd-like fruits the pulp of which is an aperient and valuable remedy in dysentery.

Areca Catechu. (See also under Palms p. 28.) Betel Nut Palm. Seedlings 12 cents.

A small palm with yellow, egg-shaped fruits. The seeds are astringent, useful in dysentery and for expelling worms in dogs. In the East thin slices are chewed, together with a little lime and a piece of betel (pepper) leaf, and other materials according to taste. Betel chewing is regarded as a preventative of dysentery.

Carica Papaya. (See also under Fruits p 4.) Papaw. Seedlings 5 cents.

A small tree the green fruits of which yield a milky juice, from which papain largely used in preparations for the treatment of dyspepsia is prepared.

Erythroxylon Coca. Cocaine. Seedlings 5 cents.

A small ornamental shrub the leaves of which yield the drug cocaine. Useful as a hedge plant.

Quassia amara. Bitter Wood. Seedlings 5 cents.

A small ornamental tree with bitter wood possessing medicinal properties.

Sarcocephalus esculentus. Sierra Leone Peach. Seedlings 5 cents.

A small tree; its roots yield a yellow dye. Also stated to be of medicinal value.

Fibre Plants.

Agave Sisalana. Sisal Hemp. Seedlings 5 cents.

A succulent plant the leaves of which yield a strong fibre used largely for rope making.

Boehmeria nivea. Ramie Fibre. China Grass. 5 cents.

A small perennial plant; the stems yield a good fibre.

Caryota urens. Kittool Palm. Seedlings 5 cents.

A tall palm with bipinnate leaves from the bases of which a strong fibre may be obtained. Used for making ropes, brushes, &c.

Hibiscus elatus. Cobbast. Seedlings 5 cents.

A small native tree; its stems yield a strong fibre.

Sansevicria sp. Bowstring Hemp. 5 cents.

A perennial plant with fleshy, sword-shaped leaves yielding a tough, elastic fibre, formerly used for bowstrings.

Timber and Decorative Trees.

Acacia Farnesiana. Fragrant Acacia. Seedlings 5 cents.

A small tree with mimosa-like leaves and small round heads of fragrant yellow flowers.

Adenanthera pavonina. Circassian Bean. Seedlings 5 cents.

A medium sized tree with hard reddish heartwood. The scarlet seeds are used for making necklaces and ornaments.

Albizzia Lebbek. Yoke wood. Woman's Tongue. Seedlings 5 cents.

A medium sized tree producing hard and heavy timber which takes a good finish. The pods when ripe rattle incessantly in the wind.

Amherstia nobilis. Seedlings $1.00.

One of the most beautiful flowering trees in the world, it produces pendulous racemes of large vermilion blossoms, marked with yellow. The tree requires protection from wind especially in its young stages.

Barringtonia speciosa. Seedlings 5 cents.

A medium sized. spreading tree with large leathery leaves and white myrtle-like flowers. The fruits are large, four angled, tapering to a point; each contains one seed surrounded by fibrous tissue; one of the characteristic drift fruits of the eastern tropics.

Bauhinia Galpini. Layered plants 24 cents.

A half climbing shrub with small, bi-lobed leaves and pretty scarlet flowers, not unlike Nasturtiums in general appearance.

Bauhinia megalandra. Seedlings 5 cents.

A small, native tree with bi-lobed leaves and white flowers.

Bauhinia Paulctia. Railway Fence. Seedlings 5 cents.

A spiny shrub with bright green bi-lobed leaves, very suitable for hedges. The flowers are not ornamental as the white petals are mere threads.

Bauhinia purpurea. Seedlings 5 cents.

A small, quick-growing tree with fragrant flowers, reddish purple in colour, one petal bearing white markings.

Bauhinia tomentosa. Seedlings 5 cents.

A shrub or small tree with pretty bell-shaped flowers, pale yellow with a dark purple blotch at the base of one petal.

Bauhinia variegata. Napoleon's Hat. Seedlings 5 cents.

A small tree producing an abundance of flowers varying in colour from white variegated with yellowish green, to rose variegated with crimson, cream and purple.

Bauhinia variegata var. *candida.* Seedlings 5 cents.

A small tree with bi-lobed leaves and pure white, scented flowers.

Bixa Orellana. Anatto. Roucou. Seedlings 5 cents.

A small native tree with pale pink flowers. Pods heart-shaped, scarlet, containing a large number of seeds surrounded by red pulp from which a preparation is made and used for colouring butter, &c.

Brownea capitella. Seedlings 5 cents.

A medium sized tree bearing large semi-globular heads of orange-scarlet flowers with stamens protruding about 2–3 inches.

Brownea coccinea. Mountain Rose. Seedlings 5 cents.

A medium sized tree bearing small heads of scarlet flowers. The young pendant shoots in all the Browneas are ornamental.

Brownea grandiceps. Seedlings 5 cents.

A medium sized tree producing pink flowers in magnificent rounded heads 6 to 8 inches in diameter; stamens not protruding. It is one of the most beautiful flowering trees of the gardens.

Brownea grandiflora. Seedlings 5 cents.

A medium sized tree with rose coloured flowers in compact heads, 4 to 5 inches in diameter, with stamens protruding ½ to ¾ inch.

Caesalpinia coriaria. Divi-Divi. Seedlings 5 cents.

A small tree with feathery foliage and small, sweetly scented flowers. The small brown pods are used in tanning.

Carapa guianensis. Carapa. Seedlings 5 cents.

A tall native tree, wood reddish in colour, durable and easily worked, suitable for furniture-making, house building, &c. The seeds yield crab oil.

Cassia fistula. Cass. Indian Laburnum. Seedlings 5 cents.

A medium sized tree with bright yellow flowers borne in hanging sprays during May and June. Very subject to a leaf disease in Trinidad. The long cylindrical pods contain numerous seeds embedded in brown sticky pulp, valued medicinally on account of its laxative properties.

Cassia grandis. Horse Cassia. Seedlings 5 cents.

A medium sized tree bearing small rosy pink flowers and large coarse pods, containing a large number of small seeds and offensive smelling pulp.

Cassia javanica. Apple Blossom Cassia. Seedlings 5 cents.

A small tree usually bare of leaves during the dry season; during May and June it produces masses of beautiful, rosy pink flowers closely resembling large apple blossoms. Very subject to a root disease in Trinidad.

Cassia moschata. Seedlings 5 cents.

A medium sized tree, bearing pendulous racemes of beautiful flowers; colour a combination of reddish brown, yellow, orange and red. It flowers in March.

Cassia multijuga. Yellow Cassia. Seedlings 5 cents.

A small native tree bearing pendulous masses of yellow flowers during the months of September and October.

Cassia nodosa. Seedlings 5 cents.

A small tree with flowers somewhat similar to *Cassia javanica* but smaller, of deeper colour and sweetly scented.

Cassia spectabilis. Calceolaria Cassia. Seedlings 5 cents.

A quick growing tree producing during November and December large, erect spikes of yellow flowers; bare of leaves part of the year.

Casuarina equisetifolia. Whistling Pine. Seedlings 5 cents.

A slender upright tree with leafless branches, somewhat like a conifer in general appearance.

Cedrela mexicana. West Indian Cedar. Seedlings 5 cents.

A tall, native tree yielding a reddish, fragrant timber, largely used locally for house building and exported for making cigar boxes.

Centrolobium paraense. Porcupine Tree. Seedlings 5 cents.

A medium sized tree with handsome grey green foliage and large winged fruits, spiny at the base.

Colvillea racemosa. Seedlings 10 cents.

A medium sized tree with mimosa-like foliage, very handsome when producing, about October, its large erect trusses of orange-scarlet flowers.

Copaifera officinale. Balsam of Copaiba. Seedlings 5 cents.

A medium sized tree with somewhat handsome foliage, of value on account of an oleo resin obtained by making incisions in the trunk and also for the finely marked, dark reddish brown wood; used for railway carriages, furniture and cabinet work.

Cordia gerascanthus. Cypre or Cyp. Seedlings 5 cents.

A tall, native tree producing a valuable timber, light brown in colour, of medium hardness, tough but easily worked, and used for joinery, furniture, cabinet work, carriage building and house construction.

Couroupita guianensis. Cannon Ball Tree. Seedlings 5 cents.

A tall, native tree with large, fragrant flowers borne on long, pendant, woody branches, produced thickly around the trunk in an untidy manner. The fruits are similar in size and shape to cannon balls.

Crescentia cujete. Calabash. Seedlings 5 cents.

A small spreading tree with greenish-white, bell-shaped flowers borne on the woody branches. The large globular, or oval fruits, known as calabashes, are used when ripe for domestic utensils, ornaments, &c. The wood is made use of locally to grow orchids upon.

Cynometra trinitensis. Seedlings 5 cents.

A large evergreen, native tree with reddish coloured hard timber; young foliage and white flowers ornamental.

Detarium senegalense. Dattock. Seedlings 5 cents.

A large spreading tree producing about April a profusion of small white flowers; very attractive to bees. A useful shade tree.

Dimorphandra Mora. Mora. Seedlings 5 cents.

A very large, native, forest tree yielding a strong and tough, close grained timber, very durable in water, and suitable for building and construction work.

Diospyros embryopteris. Seedlings 5 cents.

An evergreen tree remarkable for its particularly dense growth. The young foliage is blood-red, flowers cream coloured.

Enterolobium cyclocarpum. Devil's Ear. Seedlings 5 cents.

A large spreading tree with feathery foliage and large curiously twisted pods.

Eperua falcata. Wallaba. Bootlace Tree. Seedlings 10 cents.

A medium sized tree valued for its hard durable wood used largely for shingles. The dull red flowers and the scimitar shaped pods are borne on long slender, pendant stalks.

Eriodendron anfractuosum. Silk Cotton. Ceiba. Seedlings 5 cents.

A huge, soft-wooded tree, valued for the silky fibre surrounding the seeds; used for stuffing cushions, life belts, &c. The pods are produced in great abundance and ripen about April and May.

Erythrina pallida. Coral Bean. Jumbie Bead. Seedlings 5 cents.

A medium sized, thorny tree with scarlet and black seeds.

Erythrina micropteryx. Bois Immortel. Anauco. Seedlings 5 cents.

A tall tree with scarlet flowers, used largely as a shade for cacao, especially in the higher lands.

Erythrina glauca. Bois Immortel. Bocare. Seedlings 5 cents.

A medium-sized, somewhat spreading, tree with salmon coloured flowers, used largely as shade for cacao especially in low-lying and wet lands.

Eucalyptus tereticornis. Eucalyptus. Seedlings 5 cents.

A medium sized, ornamental tree with somewhat naked branches and trunk. An infusion of the leaves is used locally for cases of fever.

Eugenia sinemariensis. Seedlings 5 cents.

A medium-sized tree bearing curious, spherical fruits, brownish yellow when ripe, resembling rough, crinkled oranges but with numerous ridges; each contains one large seed and the outer portion is aromatic.

Ficus Benjamina. Ceylon Willow. Layered plants 25 cents.

A spreading evergreen tree, of graceful drooping habit. Slender aerial roots produced from the main branches grow downwards and finally root in the soil. The fruits are very small reddish with whitish dots. A very useful shade tree.

Ficus Benjamina var. *comosa.* Ceylon Willow. Layered plants 25 cents.

An evergreen "fig" very similar to the above but with larger leaves and fruits, the latter are orange yellow when ripe.

Gliricidia maculata. Nicaraguan cacao shade. Seedlings 5 cents, cuttings 1 cent.

A small tree bare of leaves in the dry season. It produces an abundance of lilac coloured, pea-like flowers in February and March. Sometimes used as a shade tree for cacao and coffee. Can be used as a fence and remains in leaf if cut back at the right time.

Guaiacum officinale. Lignum vitæ. Seedlings 5 cents.

A small, slow growing, evergreen tree, always ornamental, particularly when flowering during March and April. The flowers are deep blue when freshly open but rapidly fade to almost white. The brownish-green heart wood is extremely hard and tough and is used for mortars, pestles bowls, pulleys, &c

Haematoxylon campeachianum. Log-wood. Seedlings 5 cents.

A small, slow growing tree with yellow flowers, chiefly valued on account of the reddish dye which is extracted from the heart wood. It thrives in dry situations.

Hura crepitans. Sandbox. Seedlings 5 cents.

A large tree with a prickly trunk and containing a poisonous, milky sap. Pods dark brown, circular, fluted and divided into a dozen or more sections, separating when mature and dry with much violence and a loud noise ; filled with lead they are used as paper weights.

Hymenaea Courbaril. Locust. Seedlings 5 cents.

A tall native tree with tough, hard and close-grained wood, highly valued for cabinet making.

Jacaranda coerulea. Fern tree. Seedlings 5 cents.

A small tree with fern-like foliage and tubular, blue, lilac coloured or nearly white flowers, borne in many flowered trusses. The buds are deep violet.

Lagerstroemia Flos-reginæ. Queen Flower. Pride of India. Seedlings 5 cents.

A large tree bearing large erect panicles of usually mauve-coloured flowers. Considered one of the prettiest of tropical flowering trees. It is bare of leaves during the dry season.

Melia sempervirens. Wild Lilac. Seedlings 5 cents.

A small tree with feathery leaves and small lilac coloured trusses of flowers.

Mimusops Elengi. Ghee Tree. Seedlings 5 cents.

An evergreen, shade tree of symmetrical shape. The seeds yield an abundance of oil, used in India for making ghee or "butter." The highly fragant, somewhat inconspicuous flowers yield their perfume to water by distillation.

Monodora tenuifolia. Seedlings 10 cents.

A small tree bearing handsome pendant flowers, white at the base shading to yellow, with crimson markings. The pods are round, a little larger than a golf ball.

Murraya exotica. China Box. Citronella. Limonia. Seedlings 5 cents.

A shrub or small tree with dark green, pinnate leaves, and flowers resembling miniature orange blossoms. Fruits small red. The plant can be clipped to any desired shape and is excellent for hedges. Some orchids, *e.g.*, *Vanda teres*, Oncidiums, etc., grow well upon it.

Ochna mossambicensis. Seedlings 10 cents.

A pretty shrub or small tree bearing brilliant yellow flowers followed by black fruits embedded in a scarlet calyx.

Pachira aquatica. Wild Chestnut. Chataigne marron. Seedlings 5 cents.

A medium-sized spreading tree with palmate leaves and large flowers which open in the evening or early morning and wither by mid-day. The conspicuous part of the flower is the numerous shiny stamens, white for more than half their length, crimson at the top. The pods are somewhat similar to those of cacao.

Parmentiera cerifera. Candle tree. Seedlings 5 cents.

A small, much branched tree with trifoliate leaves and greenish white flowers borne on the trunk and branches. The long, cylindrical, pendulous yellow fruits, one foot or more in length, resemble candles in appearance.

Peltogyne porphyrocardia. Purple Heart. Seedlings 5 cents.

A large timber tree, highly valued for its beautiful, purple heart wood, in great demand for structural purposes on account of its rich colouring, durability and strength. The colour darkens considerably with age.

Peltophorum ferrugineum. Seedlings 5 cents.

A medium sized, handsome, quick-growing, spreading tree with graceful, evergreen feathery foliage. The flowers are borne in large, erect panicles, yellow on opening, with brown markings at the back of the petals. The seed pods are reddish-brown when young, changing to darker brown as they ripen. It is one of the best trees for shade and ornamental purposes.

Peltophorum Linnaei. Braziletto. Seedlings 5 cents.

A much branched, medium sized tree with feathery foliage. The trunk and branches are smooth, blotched grey, green, and brown. The flowers are small, reddish brown in the bud, deep yellow on opening, sweetly scented. Evergreen and ornamental.

Pithecolobium fragrans. Naked Indian. Seedlings 5 cents

A tall tree with smooth trunk and branches and mimosa-like foliage.

Pithecolobium Saman. Saman. Seedlings 5 cents.

One of the best shade trees for general purposes. The trunk is short and produces very long horizontal branches. It is bare of leaves for only a short time during the year and this is fully compensated by the flush of bright green foliage which follows. At night the leaflets close together. The fruits ripen in the early months of the year and are much liked by cattle. Hence it is a valuable shade tree for pastures. It seeds much more freely in the Northern West Indian Islands than in Trinidad. The wood is durable, of a rich dark colour when polished, has a good grain and makes handsome furniture.

Platymiscium polystachyum. Roble. Seedlings 5 cents.

A tall tree with orange coloured flowers exuding a violet like fragrance. The wood is reddish brown, hard and durable useful for out-door work, cabinet work, furniture etc.

Poinciana regia. Flamboyante. Seedlings 5 cents.

A medium sized, spreading tree, quite bare of leaves during the dry season when its large flat pods are very conspicuous. Before the rainy season it burst into masses of brilliant red flowers quickly followed by the feathery leaves. Whilst in flower (about two months) it is one of the most gorgeous trees of the tropics. There is a moderate range in colour of flower, from brilliant scarlet to almost orange.

Posoqueria latifolia. Seedlings 10 cents.

A small native evergreen tree with dark green, glossy leaves and large trusses of pure white, fragrant flowers. The individual flowers are narrow tubes, 5 inches or so in length with five spreading petals.

Sapindus Saponaria. Soap Berry. Seedlings 5 cents.

A medium sized native tree chiefly of interest for the gelatinous looking fruits sometimes made use of for washing purposes. The black seeds about the size of marbles, are made into necklaces, rosaries, etc.

Saraca indica. Seedlings 5 cents.

A small evergreen tree, native of South India and Ceylon. It flowers chiefly during the dry season, producing showy masses of yellowish red, Ixora-like flowers.

Spathelia simplex. Jamaica Mountain Pride. Seedlings 5 cents.

A slender stemmed tree with the habit of a Palm *i.e.* a single slender stem surmounted by a crown of leaves. It takes some 8 or 10 years from the seed to the flowering stage when it bears large, handsome, terminal panicles of lilac coloured flowers. Each plant usually only flowers once and dies after ripening its seeds.

Swartzia grandiflora. Seedlings 5 cents.

A native shrub or small tree with beautiful yellow flowers and scarlet pods, the latter ending suddenly with a sharp point about half an inch in length.

Swietenia macrophylla. British Honduras Mahogany. Seedlings 5 cents.

A tall upright tree valued for its timber and also utilised to some extent in the Colony as a windbreak for cacao, etc.

Swietenia Mahogani. West Indian Mahogany. Seedlings 5 cents.

Somewhat similar to the preceding species, but with smaller leaves and of slower growth.

Tecoma pentaphylla. Pink Poui.

A medium sized tree closely related to the Poui. The flowers borne in loose clusters are of a pale rose colour ; when the whole tree becomes a mass of blossoms it is very ornamental.

Tecoma serratifolia. Poui. Seedlings 5 cents.

A small, native forest tree which makes a brilliant show on the hillsides for a short time during the dry season when the whole tree, leafless, is a mass of golden flowers. The wood is very heavy, hard and durable.

Terminalia arjuna. Raw Beef Tree. Seedlings 5 cents.

A large tree native to the East Indies—chiefly noteworthy for its bark, which, while smooth and grey on the outside, is red and juicy in appearance when cut.

Terminalia Catappa. Almond. Seedlings 5 cents.

A medium sized tree with branches spreading horizontally. The large leathery leaves take on "autumn tints" before they fall during the dry season. The hard fruit contains one seed somewhat resembling the sweet almond in flavour.

Decorative Foliage Plants.

Acalypha macrostachys. Acalypha Copper Leaf. Rooted cuttings 5 cents.
A quick growing, ornamental leaved shrub with inconspicuous flowers. The leaves are irregularly blotched with red and dark brown.

Acalypha marginata. Acalypha. Rooted cuttings 5 cents.
A quick growing, ornamental leaved shrub with inconspicuous flowers. Leaves green with red veins, the margin white, flushed with red, deepest on the teeth.

Acalypha Balfourii. A small dark crinkled leaved variety. Rooted cuttings 5 cents.

Acalypha obovata. Rooted cuttings 5 cents.
Very similar to the former but with obovate leaves.

Aralia filicifolia. Rooted cuttings 5 cents.
An ornamental leaved shrub with much divided, fern-like leaves, bright green with a dark coloured mid-rib. The stem and leaves are also dark coloured and marked with white spots.

Aralia Guilfoylei. Wild Coffee. Rooted cuttings 5 cents.
An ornamental shrub with handsome variegated leaves having pale yellow margins. Used as a hedge for cacao fields.

Asparagus Sprengeri. Seedlings 10 cents.
An ornamental foliaged asparagus very suitable for growing in hanging baskets. It has small white flowers and round, red fruits.

Aspidistra lurida. Aspidistra. Plants 10 cents.
A small plant with dark green leaves, very useful as a pot plant; readily propagated by division. *Aspidistra lurida variegata*, is a variety with yellow and green variegated leaves.

Calathea spp. Plants 10 cents.
Small, stemless, ornamental leaved plants of which several kinds are in stock.

Carludovica palmata. Panama Hat Plant. Plants 25 cents.
A stemless plant with palmate leaves borne on stalks 6–8 feet in length. Besides being an ornamental plant the unexpanded leaves can be prepared into straw for the manufacture of Panama Hats.

Codiaeum variegatum vars. Crotons assorted. From 5 to 24 cents according to size and variety.
Medium sized shrubs with beautiful foliage. Leaves in the different varieties are very variable both in shape and colour. They make excellent pot plants, are suitable for an ornamental hedge, and for growing as large specimen plants.

Cordyline terminalis. Garden vars. Rayo. Dracaena. Rooted cuttings 5 cents.

Slender stemmed plants of which there are numerous garden varieties differing in height, size, colour, etc. They are grown for their ornamental leaves which may be bright or dark red, green, white, etc. A bright red variety locally called Rayo has long been used in Trinidad as a boundary mark.

Cycas circinalis. False Sago Palm. Plants 25 cents to $1.00.

A single stemmed plant bearing a dense crown of dark, evergreen, pinnate leaves at the summit. They make ornamental pot plants and are of slow growth, but finally reach 15 to 20 feet in height.

Cycas revoluta. False Sago Palm. Plants 25 cents to $1.00.

A plant of similar habit to the former but much smaller in growth. The leaves are used for wreath making.

Dieffenbachia picta. Rooted cuttings 10 cents.

A low perennial plant with variegated green and white leaves.

Dracaena fragrans. Rooted cuttings 5 cents.

A tall plant 20–30 feet high, densely clothed with lanceolate leaves which encircle the stem in a symmetrical manner. It is largely used in the Colony for windbreaks and hedges to cacao plantations.

Dracaena Godseffiana. Rooted cuttings 5 cents.

A small shrub branching at the base to form a thick bush 2–3 feet in height. The stems are slender and the leaves borne in scattered whorls. The latter are green, spotted with white.

Dracaena Sanderiana. Rooted cuttings 5 cents.

A small slender stemmed species with short lanceolate leaves prettily striped longitudinally with white.

Eranthemum eldorado. Rooted cuttings 5 cents.

A small shrub with yellow foliage mottled and veined with green. Very suitable for an ornamental hedge.

Eranthemum tricolor. Rooted cuttings 5 cents.

A small shrub with leaves variegated green and purple shades.

Eranthemum variegatum. Rooted cuttings 5 cents.

A small shrub with variegated leaves, greyish-green and white.

Euphorbia cotinifolia. Rooted cuttings 5 cents.

A shrub with erect branches and small purplish leaves. Very ornamental, bare in the dry season.

Ferns: Assorted varieties, Small plants 12–24 cents.

Graptophyllum hortense. Caricature plant. Rooted cuttings 5 cents.

A small shrub with crimson flowers and green and pale yellow variegated leaves. The name "caricature plant" arose from the curious variegation of the foliage

Graptophyllum hortense var. *Nortoni.* Rooted cuttings 5 cents.

Similar in habit to the former but varying in colour of the variegated leaves, which have a reddish hue.

Pandanus gracilis. Screw pine. Rooted cuttings 10 cents.

A dwarf screw pine 3–4 feet high with green leaves very prickly on the margins.

Pandanus pacificus. Screw pine. Rooted cuttings 10 cents.

A strong growing screw pine with large leaves and spiny margins.

Pandanus utilus. Screw pine. Seedlings 10 cents.

A distinct screw pine with bare branches and large globose heads of many fruits.

Pandanus Veitchii. Screw pine. Rooted cuttings 5 cents.

One of the best screw pines for pot cultivation, the leaves being variegated green and white when young. When planted out it grows to a large size and develops characteristic aerial roots.

Pedilanthus sp. Rooted cuttings 5 cents.

A small shrub with handsome green and white variegated leaves.

Ravenala madagascariensis. Travellers' Tree. Plants 50 cents.

A handsome single-stemmed tree sometimes suckering from the base. The very large leaves somewhat, like those of a banana, are all borne in one plane and the plant resembles a huge fan in appearance.

Sanchezia nobilis. Seedlings 5 cents.

A spreading, soft-wooded shrub grown for its ornamental leaves which are green with yellowish veins.

Decorative Flowering Plants.

Acalypha hispida. Rooted cuttings 5 cents.

A quick growing shrub with large green leaves and catkins of red flowers, reaching with good cultivation 2–3 feet in length.

? *Adhatoda sp.* Rooted cuttings 5 cents.

A quick-growing soft wooded shrub, producing large, erect, pyramidal spikes of pale coloured flowers and crimson bracts. It is a very handsome plant.

Barleria cristata. Rooted cuttings 5 cents.

A small, quick-growing shrub with mauve coloured flowers, very suitable for a small ornamental hedge.

Begonia spp. Rooted cuttings 10 cents.

Several species are in stock including the following.

B. coccinea var. Rooted cuttings 10 cents.

A variety with erect stems about 5 feet high and large trusses of pink flowers. It thrives well without shade and is therefore very useful for the flower garden.

Begonia "President Carnot" is another very fine variety of stronger growth than the former but standing less exposure. It bears large trusses of reddish flowers.

Caesalpinia pulcherrima. Barbados Pride. Seedlings 5 cents.

A common, prickly shrub attaining a height of twelve feet, commencing to flower when a few feet high and can be kept pruned to that height if desired. The inflorescence is terminal, composed of brilliant coloured flowers. There are two varieties yellow and orange red.

Clerodendron fallax. Seedlings 5 cents.

A spreading shrub 5–6 feet high. The flowers bright scarlet on reddish stalks are borne in large terminal panicles. It flowers continuously for a long period—a year or more—and is very suitable for large beds or borders.

Cochlospermum gossypium. Seedlings 5 cents.

A small native tree bare of leaves during the dry season when it produces large, brilliant yellow flowers.

Crossandra undulaefolia. Seedlings 5 cents.

A small shrub from 1–3 feet in height with handsome shiny foliage and spikes of reddish orange flowers. The plant is well suited for making neat compact beds of flowers.

Duranta Plumieri. Seedlings 5 cents.

A shrub or small tree with blue or white flowers and clusters of yellow berries which are borne practically throughout the year in great profusion.

Euphorbia pulcherrima. Poinsettia (Red.) Seedlings 10 cents.

A shrub from 8–10 feet high cultivated for its brilliant coloured bracts which are borne in terminal clusters surrounding the small inconspicuous flowers.

Euphorbia pulcherrima var. Poinsettia (White.) Rooted cuttings 10 cents.

A variety of the former with cream coloured bracts. It is not as strong growing as the red, nor does it come true from seed.

E. pulcherrima plenissima. Poinsettia double red. Rooted cuttings 20 cents.

The bracts of this plant are almost similar in colour to the red poinsettia but form a double series, making a dense head about 15 inches across. It remains in perfection for a much longer time than does the "single" red. All poinsettias should be cut hard back after flowering.

Galphimia glauca. Shower of Gold. Seedlings 5 cents.

A pretty shrub of a few feet in height, with yellow flowers borne on racemes 3–4 inches in length. It flowers throughout the year and is at its best when from 1½ to 2 feet high when it is usually covered with flowers. Quite effective and useful for a flower bed.

Gardenia jasminoides var. Cape Jasmine. Rooted cuttings 12 cents.

A small shrub with dark green shiny leaves and solitary double white flowers, 4 inches or so in diameter, very highly fragrant.

Hibiscus mutabilis. Changeable Rose. Seedlings or cuttings 5 cents.

A quick-growing shrub with large, showy flowers about 5 inches in diameter. These open in the early morning, pure white, change to a delicate rose pink by mid-day and to dull red in the evening, when they finally close. There are single and double varieties. There is also a variety which opens pale pink in the morning.

Hibiscus rosa-sinensis vars. Rooted cuttings 5 cents.

A shrubby plant the common varieties of which are largely used for hedges to cacao plantations. Various forms of the species have been utilised by hybridists in Trinidad and other parts of the world, and there are now about 120 varieties in the Botanic Gardens collection, the majority of which have been raised in the Colony, largely by the Venerable Archdeacon Hombersley. The double red and pink varieties look very pretty grown as standards, *i.e.*, with one straight stem several feet high, and a head of foliage and flowers on the top.

Homskioldia sanguinea. Chinese Hat. Rooted cuttings 10 cents.

A medium sized shrub with scarlet flowers and a shallow, cup-like, orange coloured, persistent calyx from which it takes its common name.

Ixora coccinea. Flame Flower. Red Ixora. Plants 10 cents.

A medium sized shrub with alternating pairs of dark green, somewhat leathery leaves and trusses of deep, coral red flowers borne abundantly throughout the year.

Ixora lutea. Yellow Ixora. Plants 10 cents.

Very similar in habit to the preceding, but usually rather smaller and with flowers a deep canary yellow. It is a difficult plant to propagate as it does not come true from seed, and layers with difficulty. The most practicable way is by suckers.

Jasminum grandiflorum. Jasmine. Rooted cuttings 20 cents.

A woody climber with drooping branches and white, star-shaped, very fragrant flowers.

Jatropha multifida. Seedlings 5 cents.

A medium sized shrub with succulent stems, much divided handsome leaves, and brilliant scarlet heads of flowers.

Lagerstroemia indica. Queen of flowers. Crepe Flower. Rooted cuttings 5 cents.

A shrub with slender, erect branches bearing very beautiful, terminal, many flowered inflorescences, the petals of the flowers being beautifully fringed and curved. There are several varieties pink, white, red, etc. The plants should be pruned after flowering. In wet localities they make a good ornamental hedge.

Lawsonia alba. West Indian Mignonette. Seedlings 5 cents.

A shrubby plant with small leaves and long terminal racemes of very fragrant, small creamy white flowers. The henna of the Egyptians.

Myosotis palustris. Forget-me-not. Plants 5 cents.

A well known, blue flowered, perennial plant of low growth. It is best during the wet season and is useful for small beds or as edgings to larger ones. In the dry season plants should be transferred to a shady spot and kept well watered.

Petrea arborea. Blue Tree Petrea. Seedlings 5 cents.

A small native tree bearing profuse sprays of violet flowers about three times during the year. The calyx is of a lighter shade than the corolla, the latter soon falls but the calyx persists, changing to a dull ashen-grey colour with age.

Petrea volubilis. Blue Climbing Petrea. Seedlings 5 cents.

A woody climber, differing from the former, not only in habit, but in the shape of the leaves which are narrower and more sharply pointed and in the larger and more pendulous sprays of flowers.

Petrea volubilis alba. White climbing Petrea. Bridal wreath. Seedlings 12 cents.

A white variety of semi-climbing habit.

Plumeria spp. Frangipani. Rooted cuttings 5 cents.

A small spreading tree with thick cylindrical stems and branches containing an abundance of latex. Most shed their leaves early in the dry season and then before the rains come produce masses of flowers and later young leaves at the ends of the branches. There are various colours, pure white, white and yellow, yellow, red, red and yellow etc.; all are fragrant in the evening. They thrive best in dry situations.

Rondeletia odorata. Rondeletia. Rooted cuttings 24 cents.

A medium sized shrub of dense growth, bearing small rough leaves, and terminal trusses of pretty flowers, deep orange and red with orange yellow centres. The flowers have but little scent.

Russelia juncea. Antigua Heath. Rooted cuttings 5 cents.

A slender semi-scandent shrub with long drooping stems. The side shoots spring in whorls of about 5 to 7 from the main stems and like these bear only small leaves. The small, scarlet tubular flowers are borne singly, or in pairs on the side shoots. They have a great attraction for humming birds.

Salvia splendens. Scarlet Sage. Rooted cuttings 5 cents.

A small shrub of about 3 feet, bearing erect spikes of brilliant scarlet flowers; very showy in beds or borders but thrives best in semi-shade.

Solanum macranthum. Potato Flower. Seedlings 5 cents.

A small, soft-wooded tree of very rapid growth with large, spiny, deeply cut leaves. The flowers are about 3 in. in diameter and on first opening are of a rich, bluish violet colour, changing when a day old to a pale blue and later fading to almost white. The one-day-old flowers are much smaller than those of two or three days.

Tabernaemontana capensis. Rooted cuttings 12 cents.

A shrubby plant with dark green, shiny leaves and small white single flowers.

Tecoma stans. Seedlings 5 cents.

A native shrub producing soft shoots which bear terminal heads of beautiful yellow, funnel-shaped flowers.

Thevetia nereifolia. Lucky Bean. Seedlings 5 cents.

A small native tree with narrow, shiny green leaves, and tubular brilliant yellow flowers. The fruits yellow when ripe, contain a single, triangular shaped seed lined around the margin and down the centre. The latter, known as "lucky beans," are carried by some people in their purses, worn as watch charms, or given to represent good luck. They are also put into the hands of babies at birth for the same purpose. In India they are known as a cattle poison.

Thunbergia erecta. Seedlings 5 cents.

A small shrub, with stiff, erect branches a few feet high and tubular flowers, purple, with an orange-coloured throat.

Thunbergia erecta alba. Seedlings 5 cents.

This plant is similar to the above but has white flowers with a yellow tube.

Turnera ulmifolia var. *elegans.* Rooted cuttings 5 cents.

A beautiful flowering shrub of low growth with pale yellow or sulphur-coloured flowers, purplish brown at the base. They open in the morning and close about mid-day.

Decorative Climbers.

Allamanda cathartica. Rooted cuttings 5 cents.

A scandent shrub with handsome yellow flowers, tubular below, expanding above to a diameter of about 3 inches. Very attractive over arches, pergolas, etc.

Antigonon Leptopus. Corallita (single pink). Seedlings 5 cents.

A beautiful climber commonly grown in Trinidad for covering arbours, etc. There is also a white variety.

Argyreia speciosa. Elephant Climber. Seedlings 5 cents.

A strong handsome climber with large heart-shaped leaves of a silvery colour beneath. The corolla is funnel-shaped, purple at first and deepening with age.

Aristolochia elegans. Swan Flower. Seedlings 5 cents.

A slender stemmed, pretty climbing plant with heart-shaped leaves and solitary flowers, heart-shaped in outline. In colour they are heavily marked reddish purple on a white ground; velvety in appearance at the base of the greenish yellow tube.

Asparagus plumosus. Asparagus. Seedlings 10 cents.

A graceful evergreen climber with dense fern-like foliage. It is useful for training over arbours or for house decoration.

Beaumontia grandiflora. Plants 25 cents.

A strong woody climber the young branches and leaves of which have a rusty appearance. The flowers are pure white, very large, and tubular in shape, and are in much demand for wreath making and church decorations.

Bougainvillea glabra. Purple Bougainvillea. Rooted cuttings 5 cents.

A woody semi-climber bearing abundant masses of handsome showy purple bracts. Easily propagated by cuttings.

Bougainvillea spectabilis var. *lateritia* Brick-red or Salmon Bougainvillea. Plants $1.00.

A strong climber growing to the tops of the tallest trees. It has yellowish green, velvety leaves and beautiful sprays of brick-red bracts, varying slightly in colour with age. It a most difficult plant to propagate and plants are only rarely available.

Bougainvillea spectabilis var. Crimson Bougainvillea. Rooted cuttings 5 cents.

This plant throws strong upright branches and bears beautiful trusses of crimson bracts. Very easily propagated.

Calichlamys riparia. Layered plants 25 cents.

An ornamental woody climber with beautiful yellow, tubular flowers somewhat resembling those of the Allamanda. They are borne in profusion several times during the year, lasting only a few days at each time of flowering.

Camoensia maxima. Seedlings 12 cents.

A beautiful climber with deep green, glossy, trifoliate leaves. Three or four times during the year it produces trusses of very large flowers about 9 inches in diameter, pure white, with a narrow gold edge on opening. The flowers open in the afternoons and are very sweetly scented during the evening; the next day they rapidly fade and turn brown.

Clitoria ternatea. Blue and White Pea. Seedlings 5 cents.

A small climbing leguminous plant with deep blue, white and pea like, flowers. There are also white and blue varieties also double forms of each.

Cryptostegia grandiflora. Seedlings 10 cents.

A scandent shrub, bearing terminal cymes of purple, tubular flowers, which change with age to a lighter colour. *See* also page 10.

Lonicera japonica. Honeysuckle. Rooted cuttings 10 cents.

A climbing plant with very fragrant cream coloured flowers borne along the extremities of slender branches.

Porana paniculata. Corallila, Coronilla. Christmas Wreath. Rooted cuttings 5cts.

A very strong climber bearing large, spreading panicles of small white flowers. It will cover the tops of large trees and is a magnificent sight when in full bloom at the end of the year.

Quisqualis indica. Rooted cuttings 10 cents.

A large climber with rich green foliage and star shaped flowers with long weak tubes borne in axillary and terminal clusters. They open in the evening white, change next day to a beautiful rose pink, and later to a dark crimson. The several colours borne on the plant at the same time are very effective. The plant throws up numerous suckers often at a considerable distance from the parent, and is difficult to eradicate once it has become established.

Stephanotis floribunda. Stephanotis. Seedlings 10 cents.

A slender stemmed vine bearing in the axils of the leaves trusses of pure white, very fragrant flowers of a waxy consistency. Very valuable for wreath making.

Solanum Seaforthianum. Rooted cuttings 5 cents.

A somewhat slender growing vine with much divided leaves and drooping panicles of small star shaped light blue or purple flowers.

Solanum Wendlandii. Potato Vine. Rooted cuttings 5 cents.

An attractive climber with spiny stems and large, deeply cut, prickly leaves suitable for growing on large arbours. The lilac blue flowers are borne in large trusses. The plant can be grown in a pot where it produces a long stem with a terminal truss of bloom. As however they bend readily, circular loops or knots can be made in the stems, to obtain short plants.

Thunbergia grandiflora.

A strong, quick growing climber with large, bright blue flowers borne in the leaf axils. There is also a white flowered variety. Very useful for pergolas or anywhere a screen is wanted, the branches hanging vertically and flowering freely.

Palms.

PRICE 12 CENTS PER PLANT AND UPWARDS ACCORDING TO SIZE.

Acanthorhiza aculeata. Mexico

A characteristic feature of this palm are the aerial roots borne on the stem in great abundance. Those at the base of the trunk penetrate into the soil but those higher up develop into strong, sharply pointed spines about three to four inches in length. When full grown the stem is from 30 to 40 feet high, bearing palmate leaves, silver coloured on the under surface. The flowers are borne in great abundance as also are the white fruits, many of which contain no seeds. The fertile fruits are about the size of marbles.

Acrocomia sclerocarpa. The Gru-Gru. Native.

Abundant on dry hills in both Trinidad and Tobago. Height 20 to 30 feet trunk erect about one foot in diameter, often swollen near the summit and armed with black spines. Leaves pinnate, the main ribs covered with strong black spines. Flowers yellow and fragrant; the yellowish-brown, round fruits, about the size of a billiard ball, are borne in great abundance.

Archontophoenix Alexandrae. Eastern Australia.

A lofty palm, 70 to 80 feet high, with a trunk 6 to 8 inches in diameter, larger at the base. Leaves pinnate, leaflets green above and ashy green beneath. Fruit small roundish, about the size of peas, with a somewhat fibrous outer covering slightly resembling mace.

Archontophoenix Cunninghamii. Tropical Australia.

Of variable height very similar to *Archontophoenix Alexandrae* but recognizable from that species by the under sides of the leaves being green whilst in *A. Alexandrae* they are glaucous. The pinnæ are also paler green and more thickly dispersed and the leaf stalks are much flatter.

Areca Catechu. Betel Nut Palm. Malaya.

A graceful slender stemmed palm, reaching to a height of 50 feet or more with a small crown of pinnate leaves. The yellow egg-shaped fruits each contain one seed about the size of a nutmeg and with similar internal markings. *See* also p. 11.

Areca madagascariensis. Bamboo Palm. Madagascar.

A lofty palm with numerous bamboo-like stems, showing distinct circular markings 4 to 6 inches apart. Leaves pinnate, dark green.

Arenga saccharifera. Gomutti or Sugar Palm. Malay.

A large palm 30 to 40 feet high, with very large pinnate leaves. It is extensively cultivated in the East for sugar; the tree is said to reach its flowering stage about its twelfth year, and to continue to bear for four or five years before it dies.

Sago is manufactured from the large quantities of starchy matter contained in the heart of the stem. By tapping the male inflorescences and afterwards evaporating the sap jaggery or palm sugar is obtained.

Astrocaryum aureum. Native.

Height sixty feet; exceedingly spiny; long sharp black spines being developed on stem, leaves, peduncle and spathe. Old and young plants are alike strongly armed. Leaves pinnate, with shiny segments.

Attalea Cohune. Cohune Palm. Honduras and Guiana.

A spineless palm, height 50 to 60 feet with large, erect, ultimately spreading pinnate leaves. Fruits large brown about the size of hen's eggs and borne in large pendant clusters.

Cohune nut-oil used for illuminating purposes is obtained from the kernels. This is considered superior to coconut oil but it is costly to prepare, owing to the thickness of the walls of the fruit and the comparative small size of the kernels.

Bactris major. Native.

A slender, many stemmed palm growing to a height of 20 to 30 feet, freely armed with black spines several inches in length. The leaves pinnate. Flowers yellow, fruit about the size of pigeons' eggs, said to be edible. It occurs chiefly in damp lands in both Trinidad and Tobago.

? *Bentinckia nicobarica.* Nicobar.

In great demand in the colony as a decorative pot plant, being exceptionally graceful in the young stage. Leaves pinnate with drooping segments, the plant in general appearance somewhat resembling *Euterpe edulis.*

Caryota mitis. Fish Tail Palm. Burma to Malaya.

A spineless palm with numerous stems, 25 to 30 feet high, leaves bipinnate. Leaflets wedge shaped, broad and jagged, like a fish's tail, the outer angles usually being prolonged. Fruits purple borne in long pendant bunches. The individual fruit is about the size of a marble.

Caryota urens. Wine Palm. Toddy Palm. Fish Tail Palm. India and Ceylon.

Height 50 to 60 feet, leaves bipinnate, inflorescences pendulous, produced in descending order when the tree is fully grown, the oldest at the top and the younger successively lower down in the axils of the old leaves till the tree finally becomes exhausted and dies.

Chrysalidocarpus lutescens. Madagascar.

One of the most popular and ornamental palms, branching at the roots to form numerous stems which grow to a height of 10 to 20 feet. Leaves bipinnate, bright green with yellow petioles. This plant is largely grown in pots, etc., in many countries for decorative purposes, and is very common in Trinidad.

Cocos amara. West Indies.

A lofty palm. Stem erect about 10 inches in diameter bearing a crown of drooping, pinnate leaves. The fruit is about the size of a hen's egg, of a bright yellow colour turning to brown when dry.

Cocos plumosa. Brazil.

A most attractive palm 30 to 40 feet high. Leaves plume-like, dark green from 12 to 15 feet in length. Fruits orange coloured, very sweet and sticky, much liked by the local children.

Desmoncus major. Lattan (Tobago). Native.

A strongly armed climbing palm with a slender flexible stem, and pinnate leaves. The upper pairs of leaflets on the older leaves develop into hooks to assist the plant in attaching itself to trees. The fruit is small, round and red when ripe.

The mature stems are used for basket making, etc.

Dictyosperma rubrum. Palmiste Rouge. Hab ?

Height about 30 feet. Trunk 8 to 9 inches in diameter, having corky spiral ridges where the old leaves were attached. Leaves pinnate with bases encircling the stem for 3 or 4 feet. Leaflets usually adhering at the tips. In young plants the leaves are darker green with the primary veins and margins dark red, the redness however disappears very much in adult plants. As a pot plant in its young state it is very attractive.

Didymosperma nanum. Assam and Khasi mountains.

A dwarf palm about four feet in height. Leaves pinnate, segments alternate, thinly dispersed, broad and jagged somewhat resembling Caryota. Fruit purple, oval, about ½ an inch in length, containing two hard brown seeds.

Diplothemium caudescens. Wax Palm. Brazil.

An erect palm, stem 12 to 20 feet high and about 10 inches in diameter. Leaves pinnate. Segments numerously arranged opposite each other, the middle ones about 2 feet in length with the upper and lower ones shorter, under surface densely glaucous, and the apex obtuse.

Elaeis guineensis. Oil Palm. Tropical Africa.

A most important economic palm with a stout, erect stem 40 to 50 feet in height crowned with a dense head of leaves. Leaves shiny, pinnate with more or less drooping leaflets, and petioles armed with stout spines. Male and female flowers are usually borne on distinct spikes and generally on different trees, the latter bearing dense heads of orange yellow fruits.

From the fleshy fibrous outer layer of the fruit, the well known palm oil is obtained which is chiefly used in soap and candle making. "Nut oil" is a white oil expressed from the kernels and used for making margarine etc. The cake after the oil has been extracted is a good cattle food.

Guilielma speciosa. Peachnut. Pewa. Pupunha. Venezuela and Guiana.

An erect palm with a slender trunk covered with bands of spines of varying length alternating with the leaf scars. Height 20 to 30 feet, leaves pinnate. Leaflets and petioles spiny. Fruit borne in dense clusters and about the size of apricots, reddish yellow in colour. Suckers are produced freely from the base of the plant.

The fruits are eaten boiled with salt or roasted, and the kernel has a sweet nutty flavour.

Hydriastele Wendlandiana. Tropical Australia.

In general appearance not unlike *Areca Catechu*, but can be readily recognized from that plant by its much smaller, round, scarlet fruit, which are a little larger than peas. The seed is ribbed longitudinally.

Hyophorbe Verschaffeltii. Mauritius.

Stem smooth 20 to 30 feet high and 8 to 12 inches in diameter. Leaves pinnate and arching 4 to 6 feet in length with petioles only a few inches long. The top of the trunk is encircled for a distance of several feet with the green leaf sheaths. Fruit oval, about half an inch in length, purple when ripe.

Latania Loddigesii. Mauritius.

A handsome palm with an irregular stem 10 to 12 inches in diameter usually swollen at the base. Leaves palmate glaucous, giving the whole plant a greyish appearance. Petioles covered with a brownish scurfy substance and divided at the base. Staminate and pistillate flowers borne on different plants, the former being long and pendant, the latter denser and more erect, producing pear-shaped fruit.

Licuala grandis. Round-leaved Palm. New Britain.

A handsome, shade loving palm of low growth, with bright green fan-shaped leaves. Petioles armed with short stout spines. The seeds are about the size of peas.

Licuala spinosa. Java, Moluccas.

A slender many-stemmed palm 10 to 15 feet in height with orbicular leaves composed of many widely separated lobes from 15 to 18 inches in length with obtuse many-toothed apices. Petioles bear brown hooked spines and fibrous basal sheaths. The flowers and fruit are borne on long erect spikes, the latter being about the size of currants, orange-coloured when ripe.

Livistona altissima. Java.

A very tall, erect, slender stemmed palm, exceedingly handsome when carrying a good crop of scarlet berries. Leaves palmate, strongly armed.

Livistona chinensis. China and Japan.

Height 50 to 60 feet with a grey trunk about 1 foot in diameter surmounted by a crown of palmate leaves. The narrow pendant leaflets are quite a characteristic feature of the plant and make it recognizable for a long distance. The petioles are armed with retrorse spines which are more strongly developed on young plants. The fruits about the size of marbles are borne on arching branches.

This palm is largely grown for decorative purposes. Fans are made from the leaves.

Livistona Jenkinsiana. Toko Pat. Assam.

An erect palm 30 to 50 feet high, with a trunk 8 to 12 inches in diameter. Leaves palmate. Petiole armed with short hooked spines for about half its length. The fruits of a deep blue colour contain seeds about the size of marbles.

In Assam the natives use the leaves for thatching and for making the peculiar umbrella hats worn in that country.

Martinezia caryotæfolia. New Granada.

A slender stemmed palm 20 to 30 feet high armed with rings of dark coloured spines, and bearing a few leaves on the summit. As it ages it is of little decorative value. Leaves pinnate about 5 feet long, the pinnæ not so long as those of *M. corallina*, and with a broader lobed, truncate apex.

Martinezia corallina. Martinique.

A slender palm about 20 feet high, with stems thickly armed with long, black, needle-like spines. Leaves pinnate from 5 to 6 feet in length, with wedge-shaped leaflets 16 to 18 inches long, broadest at the apex and bearing a few spines. Fruits globose, brilliant scarlet, about the size of peas.

Oreodoxa oleracea. Palmiste. Cabbage Palm. Native.

A lofty palm with a perfectly straight, unarmed trunk, sometimes reaching as much as 180 to 200 feet high. Very handsome, much used for avenue planting, the straight, grey tranks surmounted by the large crowns of pinnate leaves give a noble effect. It is fairly common throughout Trinidad and Tobago. The leaf bud or "cabbage" may be eaten.

Oreodoxa regia. Royal Palm. Cuba and Panama.

Very similar to the palmiste (*O. oleracea*), the most noticeable differences being the thinner leaflets and the more plume-like appearance of the leaves, the lower of which droop instead of standing out horizontally as is usual with the palmiste.

Phœnix acaulis. Burma.

A dwarf thick stemmed palm, 10 to 12 feet high, with long spreading pinnate leaves. Leaflets dark green, very rigid, and with a spine-like apex, those near the bases being developed into strong spines several inches in length. Grown as a pot plant it is very ornamental.

Phœnix canariensis, Hort. Canary Islands.

Somewhat resembling the Date palm (*Phœnix dactylifera*), but with a much larger and more graceful head of leaves and a more naked stem. It is a very pretty sight when carrying a full crop of orange yellow fruits the outer portions of which are edible.

Phœnix rupicola. India.

Height 15 to 20 feet, producing one or more slender stems and long, pinnate, arching leaves. Leaflets drooping, long and narrow, the lower ones reduced to spines. A handsome palm when young.

Phytelephas macrocarpa, Vegetable Ivory. Ivory Nut Palm or Corozo Nut. Colombia.

This palm thrives best in moist situations. Stem short, prostrate bearing handsome, erect, pinnate leaves often measuring as much as 20 feet in length. Male and female flowers are borne on different plants. The spiky fruits form an aggregration of drupes borne in globular clusters about the size of a man's head. The hard seed known as Vegetable Ivory, is chiefly used as a substitute for elephant Ivory, and manufactured into billiard balls, spindles, toys, buttons, chess men, etc. The shavings are used for snow flakes in theatres.

Pritchardia pacifica. Pacific Islands.

Readily recognized by its large, plaited, palmate leaves which when young are covered with a white downy substance as are also the petioles. When full grown the trunk is about 30 feet high, straight and smooth. The fruit are round and black borne in dense heads.

Prichardia pacifica var *longi pedunculata.* On this plant the fruit are borne on long peduncles which hang down below the level of the leaves.

Ptychosperma Macarthurii. Australia.

A palm of medium height, producing many slender, spineless stems one to three inches in diameter, showing circular markings. Leaves pinnate. The small, pale yellow, slightly scented flowers are borne on many branched spikes, followed by an abundance of small brilliant scarlet fruits.

Rhapis flabelliformis. Partridge Cane Palm. Ground Rattan Palm. China and Japan.

Height 6 to 8 feet with slender flexible stems produced in great abundance and clothed with fibrous sheaths, which, on falling away, expose a green stem with distinct circular markings about $\frac{1}{2}$ to $\frac{3}{4}$ an inch apart. Leaves palmate. The plant is very useful for hedges, fine examples of which can be seen in the Gardens. Partridge cane walking sticks are made from the stems.

Sabal glaucescens. Native.

Tall growing palms with deeply cut, fan-shaped leaves, glaucous beneath.

Sabal sp. (? Sabal acaulis, Hort..) Stemless Palm.

Leaves palmate glabrous. Leaflets are closely plaited and united for about half their length with very stiff ridges.

Sabal umbraculifera. Palmetto Royal. Native.

An erect palm with a stout columnar trunk 1 foot or more in diameter, and 60 to 80 feet in height. The large orbicular leaves form a dense head at the summit of the trunk, the lower ones usually lying flat against it. Leaflets long and narrowed to a very fine point. Fruits small, black, borne in great abundance on long arching spikes which often develop some distance above the crown of leaves.

Stevensonia grandifolia. Seychelles.

A handsome palm, reaching to a height of 50 feet. Leaves entire (or divided in older specimens) mottled with reddish brown, and with a bifid apex. Strong spines thickly clothe the leaf-stalks. The fruit are about half an inch in length, scarlet when ripe.

Thrinax argentea. Thatch Palm. Broom Palm. Native.

A slender stemmed, erect, unarmed palm of medium height. Leaves palmate, glaucous beneath, the segments uniting at the base where an orange coloured papilla is formed on the upper surface. Petioles enveloped at the base by a brown netted fibre. Flower spikes arching 2 to 3 feet in length, bearing small white fruit. In Panama brooms are made from the leaves, hence the name of Broom Palm. Young specimens of this palm are good pot plants.

Thrinax floridana. Florida.

An elegant slender palm, 12 to 15 feet high, with stiff, light green, palmate leaves. Segments broader than those of *T. argentea*, bifid at the apex and united at the base, where a pale green papilla is formed. Petioles surrounded at the base by fibrous sheaths. The fruits which are about the size of peas, are borne on pendant branches. As a pot plant it is not so graceful as *T. argentea* the leaflets being more rigid.

Thrinax Morrisii. Anguilla. West Indies.

A dwarf palm. Height 3 to 4 feet. Leaves palmate, slightly glaucous beneath; segments divided to about half their length when they gradually taper off to a sharp bifid apex. Fruits white, scarcely ¼ of an inch in diameter, borne on erect spikes which often grow out beyond the leaves.

Verschaffeltia splendida. Seychelles.

A slender stemmed Palm. Height 60 to to 80 feet, trunk raised on stilt roots, spiny towards the summit. Leaves broad and entire with reddish stalks, serrated edges and bifid apex, the sheath being thickly armed with slender spines. In old specimens the red colour of the stalk is less evident, the plant is less spiny and the leaves are more divided. When young they make handsome decorative plants.

Index of Common Names.

Index of Botanical Names.

NOTES ON 23 TRINIDAD AND TOBAGO TIMBERS.

By C. S. Rogers,
Conservator of Forests.

The following table sets forth the information at present available concerning several native timbers which it is thought may be of interest to consumers both within and outside the Colony.

2. The information contained in the table has been compiled both from local information and from the undermentioned publications :—

Timbers of Commerce by Stone.

Timbers of British Guiana by Stone and Freeman.

Indian Timbers by Gamble.

Timbers of the World by A. L. Howard.

The Catalogue of the British Empire Timber Exhibiton of 1920.

3. The weights of the timbers have all been determined locally from air-dried specimens in the Forest Office and have, as far as possible, been checked by Prestoe's list of 1876. These weights have been given in preference to those recorded in the authorities quoted which principally refer to timbers of the same species from countries other than Trinidad

4. The figures denoting resistance to different stresses that are variously expressed in the publications referred to have for the sake of uniformity been re-calculated to conform to one standard.

5. The grades of hardness given are those used by Messrs. Stone and Freeman in "Timbers of British Guiana."

6. The statements of quantities available are intended to refer only to undertakings on a large scale. Small quantities of all the timbers are always obtainable with more or less facility according to locality.

Local Name.	Botanical Name.	Weight, Lbs. per cubic ft.	Co-efficient of transverse strength. Tons per sq. inch.	Crushing strength. Tons per sq. inch.	Shearing strength. Tons per sq. inch.	Breaking weight. Cwts.	Modulus of Rupture. Lbs.
			CLASS I.				
Acoma ...	*Sideroxylon foetidissimum* Jacq. (mastichodendron Jacq.)		...	...	...	...	...
Balata ...	*Mimusops globosa* Gaertn. ...	70	8*	...	...	...	...
Balsam ...	*Copaifera officinalis* Jacq. ...	50	...	...	...	...	...
Cedar ...	*Cedrela mexicana* Roem. ...	30	3·39	1·89	·362	2·83	5·724
Cypre or Cyp ...	*Cordia alliodora* (R. et P.) Cham. (gerascanthus Jacq.)	36	...	...	...	...	...
Locust ...	*Hymenaea Courbaril* L. ...	60	4·54	2·23	·559	...	...
Poui	*Tecoma serratifolia* Don ...	75	...	...	...	...	...
Roble ...	*Platymiscium platystachyum* Benth.	55	...	...	...	...	...
			CLASS II.				
Angelin ...	*Andira jamaicensis* (W. Wr.) Urb. (inermis Kth.)	50	2·01	1·98	·320	...	...
Bois lezard ...	*Vitex capitata* Vhal. ...	30	...	...	...	...	...
Crappo ...	*Carapa guianensis* Aubl. ...	40-45	4·50	...	...	...	...
Fiddlewood ...	*Citharexylum spinosum* L. (quadrangulare Griseb.)	46	...	...	...	...	...
Fustic ...	*Chlorophora tinctoria* Gaud. ...	56	...	...	...	...	...
Galba ...	*Calophyllum calaba* Jacq. ...	45	5·15	2·61	·220	...	...
Guatacre ...	*Lecythis idatimon* Aubl. (? laevifolium Miers)	50-70	...	...	...	6·7*	...
Laurier ..	Lauraceae	30	...	...	...	...	...
Mattack ...	*Aniba megacarpa* Hemal. ...	35-40	...	...	...	...	...
Olivier ...	*Chunoa obovata* Poir ...	50	...	...	...	...	...
Purple Heart ...	*Peltogyne porphyrocardia* Gr.	60-70	...	...	...	...	...
Tapana ...	*Hieronyma caribaea* Urb. ...	50	...	...	...	...	...
Yoke	*Piptadenia peregrina* Benth....	60-70	...	..	...	...	...
L'Epinet ...	*Zanthoxylum micro-arpum* Griseb.	60	...	...	...	...	...
Mora	*Dimorphandra Mora* Benth & Hook.	65-70	9·327	...	...	7·26	14,644

* Estimated from tests made with nearly allied species

Modulus of Elasticity. Lbs.	Hardness.	Other properties.	Uses.	Quantity available for local use.
			CLASS I.	
...	Rather hard ...	Strong and durable	Constructional work...	Limited.
...	Extremely hard.	Very strong & durable, suffers from teredo and worms. Splits easily.	Heavy constructional work, shaft bearings, windmill arms, posts, railway sleepers, wheel spokes, fence posts, shingles and other work in exposed situations. As piles in fresh water, said to outlast Greenheart.	Limited.
...	Rather hard ...	Durable. Polishes well.	Constructional work, railway trucks, furniture, and cabinet making.	Limited.
987,424	Soft ...	Very durable, not attacked by white ants.	Building work, furniture, cabinet making, boat building, cigar boxes, linings for clothes presses, shingles, &c. Of general utility.	Very limited.
...	Firm ...	Durable in water ...	Building construction, furniture and cabinet making, boat timbers and oars.	Limited.
...	Very hard ...	Durable, not attacked by worms or dry rot, splits easily.	Heavy constructional and building work, mill beds, furniture and cabinet making, felloes, naves for cart wheels.	Limited.
...	Extremely hard.	Very durable. Not readily attacked by insects.	Heavy constructional work, shaft bearings, boat rubber keels, railway sleepers, &c.	Fairly plentiful.
...	Hard ...	Durable, subject to transverse fracture	Constructional work	Limited.
			CLASS II.	
...	Hard ...	Durable	Ship and house building, naves of cart wheels, and knees of boats.	Plentiful.
...	Firm ...	Durable underground.	Building work and fence posts ...	Limited.
...	Firm ...	Subject to warping and splitting.	Indoor building work, furniture and cabinet making. A substitute for mahogany.	Plentiful.
...	Soft ...	Not durable ...	House building	Plentiful.
...	Hard ...	Durable	House building, mill rollers, furniture & mosiac work, felloes and naves of cart wheels. A valuable dye-wood.	Limited.
...	Rather hard ...	Durable in exposed situations, warps.	Ship and house building, carpentry and shingles.	Limited.
...	Extremely hard.	Very durable in all situations, said to resist teredo, and last longer than Greenheart. Contains silica crystals and blunts tools.	Wharves, sluices, piles, house building and cart shafts.	Plentiful
...	Soft ...	Not durable ...	Building construction	Plentiful.
...	Soft ...	Not durable ...	Building construction	Plentiful.
...	Firm ...	Subject to dry rot ...	Building construction and furniture ...	Plentiful.
...	Extremely hard.	Strong and durable	House framing, mill and mortar beds, furniture, inlaying and buhl-work, ramrods, turnery and panelling. Colour not permanent.	Plentiful.
...	Hard ...	Durable	Heavy constructional work, shaft bearings, felloes and naves of cart wheels.	Fairly plentiful.
...	Extremely Hard.	Strong	House building	Limited.
...	Rather hard ...	... ...	Building construction	Fairly plentiful.
2,297	Extremely hard.	Very durable, tough, strong, polishes well, resists dry rot but not teredo.	Ship and house building, shaft bearings railway sleepers, paving blocks, railway waggons and piles.	Plentiful.

Extremely hard compare Boxwood. Very hard compare Blackthorn. Hard compare Hornbeam.
Rather hard do. Ash. Firm do. Oak. Soft do. Pine.

AGRICULTURAL LEGISLATION.

AGRICULTURAL CREDIT SOCIETIES ORDINANCE.

TRINIDAD AND TOBAGO.

No. 41—1921.

I ASSENT,

[L.S.]

T. A. V. BEST,
Acting Governor.

September 17, 1921.

AN ORDINANCE to amend the Agricultural Credit Societies Ordinance, 1915. (1)

[*September 17, 1921.*]

BE it enacted by the Governor of Trinidad and Tobago with the advice and consent of the Legislative Council thereof as follows:—

Short title and construction. Ord. 30—1915.

1. This Ordinance may be cited as the Agricultural Credit Societies (Amendment) Ordinance, 1921, and shall be read as one with the Agricultural Credit Societies Ordinance, 1915, hereinafter called the Principal Ordinance.

Amendment of s. 6 of Principal Ord.

2. In section 6 of the Principal Ordinance, in lieu of the words "Ward Union" shall be read the word "County."

Advances by Receiver-General.

3. Section 12 of the Principal Ordinance is hereby repealed, and in lieu thereof shall be read the following:—

12. It shall be lawful for the Receiver-General on the order of the Governor, from time to time to make advances by way of loan to any registered Credit Society applying for the same.

Loans to Societies from general revenue.

4. Section 13 of the Principal Ordinance is hereby repealed, and in lieu thereof shall be read the following:—

Provisions as to loans.

13. The following provisions shall apply to loans granted in the manner set forth in the last preceding section:—

(*a*) The amonnt of the loan or loans to any one Credit Society shall be in the discretion of the Governor;

(*b*) All loans shall be for not loss than twelve months and subject to any renewal which may be permitted by the Governor;

(*c*) The Governor shall have power, on being satisfied that there is good and sufficient reason therefor, to call in a loan at any time, and in the event of non-payment the Attorney-General may take proceedings in accordance with the Crown Suits Ordinance, 1913; Ord. 9—1913

(1) See *Bull. Dept. Agr. T. & T.* XV 1916, 35-55.

(*d*) All loans shall bear interest at such rate, payable half-yearly, as the Governor may from time to time decide;

(*e*) All loans shall be made on the joint and several liability of the Trustees and every member of the Credit Society;

(*f*) The Trustees on behalf of all the members of the Credit Society shall enter into an agreement for the repayment of the loan and the payment of the interest thereon in the form set out in Schedule IV to this Ordinance.

Loans from private sources.

5. Section 14 of the Principal Ordinance is hereby repealed, and in lieu thereof shall be read the following:—

14.—(1) It shall be unlawful for any registered Credit Society which has contracted a loan under section 12 of this Ordinance to borrow from private sources without the consent of the Governor.

Any member of the Committee of any Credit Society knowingly contravening this section shall be liable to a fine not exceeding £20.

(2) The provisions of clauses (*e*) and (*f*) of section 13 of this Ordinance shall apply to all loans from private sources.

Loans to be applied to agricultural purposes only.

6. Section 15 of the Principal Ordinance is hereby repealed, and in lieu thereof shall be read the following:—

15. It shall be unlawful for the Committee of any registered Credit Society which has contracted a loan under section 12 of this Ordinance to allow any part of such loan to be applied to any purposes but those incidental to agriculture. Likewise it shall be unlawful for any member of any registered Credit Society who has obtained a loan from such Society to apply any part of such loan to any purposes other than those incidental to agriculture and the providing of a residence for the applicant for such loan. Any member of the Committee of any Credit Society and any member of any Credit Society knowingly contravening this section shall be liable to a fine not exceeding £20.

Charge on buildings and crops as security for loan to member.

7. The following section shall be inserted as section 16a of the Principal Ordinance:

16a. A charge in the form in Schedule VI hereto and executed as hereinafter provided shall when filed with the Registrar-General constitute a good and effectual charge and security in favour of a Credit Society making a loan, on all canes, rice, cocoa and other crops which shall be grown and become ready to be reaped on the land described in such charge, and also upon all movable buildings occupied by a member as a residence or for agricultural purposes and which are described in such charge, whether erected or to be erected and wherever situate, and upon all live and dead stock of such member used for agricultural purposes, but subject to any rent which may then

be due or which during the continuance of such security may become due, and subject also to the rights of any prior mortgagee or incumbrancer under the Bills of Sale Ordinance (No. 63) or the Farmers' Advances Ordinance, 1913, or the Agricultural Produce (Advances) Ordinance, 1917.

Ord. 28—1913.
Ord. 14—1917

A charge under this Ordinance shall not be deemed to be a bill of sale within the meaning of the Bills of Sale Ordinance, No. 63, or a contract within the meaning of the Agricultural Contracts Ordinance, No. 67, or a contract or metairie contract within the meaning of the Tobago Metairie Ordinance, No. 310, or a mortgage under the Agricultural Produce (Advances) Ordinance, 1917.

A charge shall not be deemed to affect the title to land, but every purchaser of land the canes, rice, cocoa, crops or buildings upon which is or are affected by a charge duly filed under the provisions hereof shall be deemed to have notice of any such charge.

Execution and registration of charge.

8. The following section shall be inserted as section 16b of the Principal Ordinance :—

16b. A charge under this Ordinance shall be deemed to be duly executed if signed in duplicate by the member executing the same in the presence of the Chairman and Secretary of the Society making the loan.

It shall be the duty of such Secretary forthwith to file one copy of the charge in the office of the Society and transmit the other copy to the Registrar-General, who shall file the same and shall keep a book to be called the Register Book of Agricultural Credit Societies' Charges, in which particulars of all such charges received by him shall be entered.

Any person shall be entitled to inspect the file of charges in the office of a society and the file and register kept by the Registrar-General and take extracts therefrom on payment of a fee of sixpence.

Penalty for dealing with property charged.

9. The following section shall be inserted as section 16c of the Principal Ordinance :—

16c. Any member who disposes of or deals with or attempts to dispose of or deal with any property comprised in any charge in fraud of the Society shall be liable to a penalty not exceeding £50.

Endorsation of repayment of loan on charge.

10. The following section shall be inserted as section 16d of the Principal Ordinance :—

16d. As soon as the loan in respect of which a charge under this Ordinance has been given has been repaid, the Secretary of the Society shall forthwith record the same in the copy filed in the office of the Society and shall notify the Registrar-General, who shall endorse the copy of the charge filed in his office accordingly.

Report by Warden.

11. Section 17 of the Principal Ordinance is hereby repealed, and in lieu thereof shall be read the following:—

17. The Governor may require any Warden to enquire into and report on any application under section 4 hereof, and on the working of any registered Credit Society operating within his county, and it shall be the duty of the Warden and of his officers to take all steps necessary to enable such report to be made.

Powers of Audit.

12. Section 18 of the Principal Ordinance is hereby repealed, and in lieu thereof shall be read the following:—

18. The accounts, vouchers, documents and funds of any registered Credit Society shall be at all times liable to inspection by the Auditor-General or any person authorized by him either at the Audit Office or at the office of the Society.

Expulsion of member from Society.

13.—(1) The Committee of any registered Credit Society may make an order (herein referred to as an Order of Expulsion) excluding from the Society any member who may become insolvent, or be in arrears of payments due by him to the Society or whose conduct or reputation threatens to impair seriously the welfare of the Society: provided always that such order of expulsion shall not relieve a member from any indebtedness to the Society at the time of his expulsion, or deprive him of a right to any sums then due to him by the Society.

(2) Any member so excluded may appeal against such order of expulsion to the next general meeting of the Society, whose decision shall be final.

Amendment of Schedule II.

14. Schedule II to the Principal Ordinance is hereby amended as follows:—

(i) After the word "Secretary" in sub-section (2) of Rule II shall be inserted the following:—

All applications for membership shall be submitted by the Secretary to the Committee of Management before being brought up at a general meeting.

(ii) Paragraph (4) of Rule II is hereby repealed.

(iii) In lieu of the words "An annual general meeting of the members of the Credit Society shall be held in the month of August each year" in Rule V (*b*) shall be read the words:—

An annual general meeting of the members of the Society shall be held in July or August each year.

(iv) The following shall be inserted at the end of paragraph (*b*) of Rule V:—

Provided that a special general meeting may by a majority of two-thirds of the members present increase the total amount of loans that may be contracted.

(v) Rule No. IX is hereby amended by inserting the following at the end of the first paragraph:—

(*j*) To file and transmit copies and record and notify payments of charges.

(vi) In Rule XI, in lieu of the words "Board of Management" and "Board" shall be read the words "the Governor."

Amendment of Form I of Schedule III.

15. In lieu of Form I in Schedule III to the Principal Ordinance shall be read the following:—

Form I.

FORM OF APPLICATION FOR MEMBERSHIP.

To the AGRICULTURAL CREDIT SOCIETY,

19

I, the undersigned, hereby apply to be admitted a member of the above-named Credit Society, and if accepted, agree to be bound by and observe all the Rules and Regulations of the Credit Society.

Signature of Applicant
(in full)
Occupation
Address
Whether owner or renter of land
Amount of land owned or rented

Admitted a member of the above-named Credit Society this day of 192

Chairman.

Secretary.

Amendment of Form IV of Schedule III.

16. In lieu of Form IV in Schedule III of the Principal Ordinance shall be substituted the following:—

Form IV.

LOAN REPAYMENT CARD.

AGRICULTURAL CREDIT SOCIETY.

Loan Repayment Card.

Registered Office :

Hours :

OFFICERS :

Name of Borrower :

Address :

LOANS.	REPAYMENTS. Date.	Amount. $	Amount. c.	Secretary's Initials.
1. Amount Date granted Term of Loan How to be repaid Date when to be completed 192				
2. Amount Date granted Term of Loan How to be repaid Date when to be completed 192				
3. Amount Date granted Term of Loan How to be repaid Date when to be completed 192				

OBJECTS OF THE CREDIT SOCIETY.

To assist members by Loans of money at a moderate rate of interest and to raise money for this purpose on the combined security of all the members of the Credit Society.

CONDITIONS OF BORROWING.

That the borrowers shall be persons of good character.

That they shall be owners or occupiers of land and shall live in the district in which the Credit Society operates.

That they shall apply the money borrowed for a specific purpose sanctioned by the Committee.

That they shall give such security as the Committee may consider necessary.

That they shall be bound by the Rules and Regulations of the Credit Society.

17. The following shall be inserted as Schedule VI to the Principal Ordinance :— Form of charge.

SCHEDULE VI.

I (or we) hereby charge all (state nature of crop) which shall be grown and become ready to be reaped prior to the day of 19 , upon (describe the land) and also all live and dead stock thereon (describe stock) and all movable buildings thereon (describe buildings and location) with the payment to the Credit Society on the day of of the amount of $ lent to me (or in the case of a charge by a surety to A.B.) by the said Society with interest thereon at the rate of per cent. per annum.

Passed in Council this second day of September, in the year of Our Lord one thousand nine hundred and twenty-one.

G. D. OWEN,
Clerk of the Council.

DOGS ORDINANCE.

TRINIDAD AND TOBAGO.

No. 14—1918.

I ASSENT.

[L.S.]

S. W. KNAGGS,
Governor's Deputy.

13th June, 1918.

AN ORDINANCE relating to Dogs.

[*13th June, 1918.*]

BE it enacted by the Governor of Trinidad and Tobago with the advice and consent of the Legislative Council thereof as follows:—

Short title.

1. This Ordinance may be cited as the Dogs Ordinance, 1918.

Interpretation.

2. In this Ordinance the term:—

"City of Port-of-Spain" means the City of Port-of-Spain as defined by the Port-of-Spain Corporation Ordinance, 1914, together with any extension thereof under the power conferred by section 7 of that Ordinance;

"Inspector" includes the Inspector-General of Constabulary, any Inspector or Sub-Inspector of Constabulary, and all Sergeants of Constabulary in charge of towns or districts outside the City of Port-of-Spain and the Boroughs of San Fernando and Arima;

"Constable" includes any member of the Constabulary Force;

"Owner" includes the head of a family occupying any house or premises in which a dog is kept or permitted to live or remain; and in case there are more occupiers than one in any house or premises let in separate apartments or lodgings or otherwise, the occupier of that particular part of the premises in which such dog shall have been kept or permitted to live or remain shall be deemed to be the owner of such dog.

"Prescribed" means prescribed by regulations made under this Ordinance.

Licensing of Dogs.

License.

3.—(1) No person shall keep a dog above the age of three months unless such person shall for each dog which he may have or keep obtain a yearly license—

(*a*) In the City of Port-of-Spain, from the Inspector-General of Constabulary;

(*b*) In the Borough of San Fernando, from the Warden of Naparima;

(*c*) In the Borough of Arima, from the Warden of Arima;

(*d*) In the several Wards, from the Wardens of such Wards respectively;

for which license shall be paid the sum of Eight shillings and fourpence in the City of Port-of-Spain and the Boroughs of San Fernando and Arima, and Four shillings and two pence elsewhere.

(2) Every such license shall expire on the succeeding thirty-first day of December.

(3) All moneys received in respect of licenses granted under this Ordinance shall be paid into the Colonial Treasury.

Keeping unlicensed dog.

4. Any person who keeps any dog without having a license in force, is liable to a fine of not less than Five shillings and not more than Twenty shillings, and in default of payment may be imprisoned either with or without hard labour for any term not exceeding fourteen days, and the amount of any fine recovered under this section shall be paid as to one moiety thereof to the informer and as to the other moiety into the Colonial Treasury.

Labels or badges.

5.—(1) With every license granted under this Ordinance there shall be issued free of charge and delivered to the licensee or his agent a metal label or other badge in such form as may from time to time be ordered by the Inspector-General of Constabulary.

(2) The Inspector-General of Constabulary, may, on its being made to appear to his satisfaction that the metal label or badge delivered to a licensee under sub-section (1) of this section, has been lost or destroyed, issue a duplicate label or badge to such licensee.

Power to destroy.

6.—(1) Every dog found in or upon any place, other than private premises, without having the proper label or badge secured to a collar or otherwise round his neck, may be destroyed by any Constable or person authorized in writing by any Inspector, in such manner and by such means as may from time to time be ordered by the Inspector-General of Constabulary.

(2) The owner of any such dog is guilty of an offence and is liable on conviction for a first offence to a penalty not exceeding ten shillings, and for a second and every subsequent offence to a penalty not exceeding twenty shillings, and in default of payment of any such penalty to imprisonment with or without hard labour for any term not exceeding fourteen days.

Counterfeiting label or badge.

7. If any person counterfeits any prescribed label or badge or if upon any dog there shall be found any false or counterfeit label or badge, such person or the owner of such dog, as the case may be, is liable to imprisonment, with or without hard labour for any term not exceeding three months.

Suspension of clauses relating to badges.

8. Sections 5, 6 and 7 of this Ordinance shall not be in force except during such time as the Governor in Executive Council may from time to time by proclamation direct.

Muzzling of Dogs.

Muzzling proclamation.

9.—(1) It shall be lawful for the Governor in Executive Council from time to time by proclamation to direct that all dogs being in or upon any place, other than private premises, shall be muzzled.

(2) Such proclamation may relate either to the whole Colony or to any part or parts thereof therein named.

(3) Any such proclamation may be from time to time varied, amended or revoked by the Governor in Executive Council.

Penalty for permitting unmuzzled dog to be at large.

10. Any person who, in a district in which a proclamation under section 9 of this Ordinance is in operation, permits any dog to go at large without being muzzled in the prescribed manner, is liable to a penalty not exceeding £2, or to imprisonment, with or without hard labour, for any term not exceeding one month.

Unmuzzled dogs may be destroyed.

11. Any dog found in or upon any place, other than private premises, without being muzzled in the prescribed manner, may be destroyed by any Constable or person authorized in writing by any Inspector, in such manner and by such means as may from time to time be prescribed, after being kept for not less than three days in a prescribed place of detention, unless the opinion of a Veterinary Surgeon or an Inspector it be in such condition that it ought to be destroyed forthwith.

Where owner claims unmuzzled dog.

12.—(1) Where the owner of any dog found at large without being muzzled as aforesaid claims such dog, such dog shall unless it has been destroyed as hereinbefore provided, be restored to the owner upon payment by him of the costs and expenses attendant on the detention and delivery of such dog to its owner, together with the further sum of ten shillings by way of penalty.

(2) If the owner shall refuse or neglect to pay such costs expenses and penalty, such dog may be destroyed forthwith.

Importation of Dogs.

Prohibition of importation.

13.—(1) It shall be lawful for the Governor in Executive Council from time to time by proclamation to prohibit the importation of dogs into this Colony during the continuance of such proclamation from any specified country or part of such country either altogether or subject to regulations made under this Ordinance.

(2) Any such proclamation may from time to time be varied, amended or revoked by the Governor in Executive Council.

(3) Nothing in this section contained shall affect the provisions of section 14 of the Customs Ordinance (No. 178).

Penalty.

14. The master of any vessel from which any dog is landed in contravention of any proclamation under the last preceding section of this Ordinance, and any person landing or assisting or allowing any such dog to be so landed, is liable to a penalty not exceeding £20, or to imprisonment with or without hard labour for any term not exceeding six months.

General.

Dangerous dogs.

15.—(1) Any Magistrate may take cognizance of a complaint that any dog in respect of which a license is granted is dangerous to person or property and not kept under proper control, and if it appears to such Magistrate that such dog is dangerous, such Magistrate may make order in a summary way directing the dog to be kept by the owner under proper control, or he may order it to be destroyed.

(2) Any person failing to comply with such order is liable to a penalty not exceeding £1 for every day during which he fails to comply therewith.

Permitting dangerous or rabid dogs to go at large.

16. Any person who being the owner thereof suffers or permits :—

(1) Any dangerous or ferocious dog to go at large without being properly muzzled; or

(2) Any dog which is in a rabid state to go at large;

is liable to a penalty not exceeding £5, or to imprisonment with or without hard labour, for any term not exceeding one month.

Assault or obstruction.

17. Any person who assaults or obstructs or aids or abets any other person in assaulting or obstructing any Constable or other person authorized as aforesaid in the execution of his duty, is liable to a penalty not exceeding £20, and in default of payment to imprisonment, with or without hard labour, for any term not exceeding six months.

Power to regulations

18.—(1) The Governor in Executive Council may make regulations providing for :—

(*a*) The placing restrictions on dogs during such periods as he may think expedient;

(*b*) The muzzling of dogs;

(*c*) The conditions under which dogs may be landed in this Colony;

(*d*) The detention of dogs in prescribed places, and the length of the period of such detention;

(*e*) The manner of conveying dogs to such places, and the charges to be made for such conveyance;

(*f*) The amount to be paid for the keep of dogs and for any medicines supplied for their use during detention;

(*g*) The manner and conditions of removing dogs from places of detention;

(*h*) The proper supervision of places of detention and the appointment of persons to see that the provisions of this Ordinance are carried into effect therein;

(*i*) The manner in which dogs are to be kept in places of detention; and

(*j*) The conditions under which dogs confined in places of detention may be killed;

(*k*) As to all other matters and things whatsoever, including the payment of the expenses which may be deemed necessary for the better carrying into effect of the provisions of this Ordinance;

And may attach to the breach of any such regulation a penalty not exceeding £10 or imprisonment with or without hard labour for any term not exceeding one month.

(2) All regulations made under this Ordinance shall be published in the *Royal Gazette*.

Publication of proclamations.

19. Every proclamation made under the provisions of this Ordinance shall be published in the *Royal Gazette*, and production of a copy of such *Gazette* purporting to contain a copy of any such proclamation shall be sufficient evidence in all Courts and for all purposes whatsoever of the due making and tenor of such proclamation.

Procedure.

20. Any offence under this Ordinance may be prosecuted, and all penalties, costs and expenses imposed or directed to be paid thereby may be recovered before a Magistrate according to the procedure prescribed by the Summary Conviction Offences (Procedure) Ordinance 1918.

Repeal.

21. The enactments specified in the first column of the Schedule hereto are hereby repealed to the extent indicated in the third column thereof.

Passed in Council this Twenty-third day of May, in the year of Our Lord one thousand nine hundred and eighteen.

HARRY L. KNAGGS,
Clerk of the Council.

SCHEDULE.

Enactments Repealed.

No. of Ordinance.	Short Title.	Extent of Repeal.
No. 5... ...	The Summary Conviction (Offences) Ordinance	Clauses 20 and 21 of section 85.
No. 143 ...	The Dog License Ordinance... ...	The whole.
No. 237 ...	The Dog License (Amendment) Ordinance	The whole.
No. 21 of 1907 ...	The Dog License Ordinance, 1907 ...	The whole.
No. 26 of 1911 ...	The Dogs (Muzzling) Ordinance, 1911...	The whole.
No. 37 of 1912 ...	The Importation of Dogs Ordinance, 1912	The whole.
No. 38 of 1912 ...	The Dogs (Muzzling) Amendment Ordinance, 1912	The whole.

DOGS.

Regulations made by the Governor in Executive Council under section 18 of the Dogs Ordinance, 1918.

RABIES.

1. Every person having in his possession or under his charge any dog affected with or suspected of being infected with Rabies shall forthwith give notice of the fact to the member of the Constabulary Force in charge of the nearest Constabulary Station.

Such member of the Force shall immediately transmit the information to the Government Veterinary Surgeon or to such other person as the Governor may appoint as an Inspector of Dogs for the purposes of these regulations.

Every person failing to give such notice and every Officer failing to transmit information in manner prescribed, shall be guilty of an offence against these regulations and shall be liable on conviction to a penalty not exceeding twenty shillings and in default of payment to imprisonment with or without hard labour for any term not exceeding fourteen days.

2. The Government Veterinary Surgeon or any Inspector of Dogs appointed as aforesaid on receiving any information of the supposed existence of Rabies shall proceed with all practicable speed to the place where such disease exists or is supposed to exist and may there order any dog in his opinion affected with Rabies to be destroyed or to be dealt with as he may direct. Such Government Veterinary Surgeon or any Inspector of Dogs appointed as aforesaid may also direct to be isolated any dogs which in his opinion may have been exposed to infection.

IMPORTATION.

3. No dog shall be landed in the Colony from a country specified in any Proclamation issued under section 13 of the said Ordinance except on a permit signed by the Government Veterinary Surgeon.

4.—(*a*) All dogs landed as provided in Regulation 3 shall be forthwith taken to the Pound Detention Station for Animals, St. Joseph Road, Port-of-Spain, (hereafter in these Regulations called the Dog Detention Station, and shall be detained there for a period of six months.

If at the end of that period, or of such further period as is in his opinion necessary to allow him to form an opinion, the Government Veterinary Surgeon certifies that a dog is free from contagious disease, it may be removed from the station by the owner or his agent. But if the owner of a dog wishes to convey it away from the Colony before the period of detention has expired, he may apply to the Government Veterinary Surgeon for permission to do so, and the Government Veterinary Surgeon shall grant such permission, and the detention officers or attendants shall thereupon convey the dog and hand it over to the person authorized by the Government Veterinary Surgeon to receive it on board such vessel to be conveyed away from the Colony.

(*b*) Provided that in the case of performing dogs it shall be lawful for the Government Veterinary Surgeon to grant a permit to the owner of such dogs relieving him from the obligations as to detention imposed by this regulation, but subject to such conditions as to segregation and otherwise as may be attached by the Government Veterinary Surgeon in his discretion to the grant of any such permit.

5. Subject to the provisions of regulation 4 (*b*) the owner of a dog or his agent shall, on obtaining a permit under regulation 3, convey the dog ashore and hand it over to the detention officer at the Detention Station.

6. Any person acting in contravention of the provisions of any of the three preceding regulations or of any condition imposed by a permit under regulation 4 (*b*) is liable to a penalty not exceeding £10 or to imprisonment with or without hard labour for any term not exceeding three months.

7. A dog landed under the preceding regulations shall only be released from the Detention Station on the written permit of the Government Veterinary Surgeon.

8. At the time the dog is landed the owner of the dog shall pay to the Collector of Customs the sum of $25, being the detention charges for six months at such detention station: provided that if before one month of the period of detention has expired an owner conveys a dog out of the Colony as provided in regulation 4 (*a*) the sum of $16 shall be returned to the person who made the deposit.

9. All expenses incurred for removal, feeding, and keeping of dogs in the detention station, shall be paid by the Receiver-General on the certificate of the Inspector-General of Constabulary.

10. If a dog is kept at a Dogs Detention Station for more than six months, the owner of such dog shall be liable to pay at the rate of Sixpence per diem for every day during which the dog remains at the detention station after the expiry of such period of six months. The owner of the dog shall also be liable to pay for all medicines supplied by the Government Veterinary Surgeon for the use of such dog at the Government contract rates for that year.

11. Before a dog is removed as provided for in regulation 4 (*a*) the owner or his agent shall pay all amounts due for medicines, or other charges incidental to its treatment.

12. Any person liable to pay any amount under the provisions of the three preceding regulations and refusing or neglecting to pay the same is liable to a penalty not exceeding £5.

13. The detention station and all Detention Officers and attendants appointed for the purposes of these regulations shall be under the control of the Inspector-General of Constabulary; and all such officers and attendants shall obey the directions of such Inspector-General or of the Government Veterinary Surgeon as to the admission, keeping, release and treatment or destruction of all dogs in the detention station.

14. The Inspector-General of Constabulary shall appoint fit and proper persons to be Detention Officers and attendants for the purposes of this Ordinance, who shall be paid at such rates as the Inspector-General may decide.

15. Each dog shall be kept in a separate kennel and securely fastened by a chain and collar except when under exercise, when it will be on a leash. A slate shall also be kept in each kennel with the particulars of each dog and directions concerning such dogs.

16. If a dog is suffering from any disease from which, in the opinion of the Government Veterinary Surgeon it cannot recover, the Government Veterinary Surgeon may order such dog to be destroyed.

17. The Rules and Regulations made in Executive Council on 12th January, 1904, 1st of February, 1905, 16th September, 1911, 16th November, 1911 and 26th September, 1912 are hereby revoked.

Made by the Governor in Executive Council, this 21st day of November, 1918.

HARRY L. KNAGGS,
Acting Clerk of the Council.

METEOROLOGY.

RAINFALL—RETURN FOR 6 MONTHS—JANUARY TO JUNE, 1922.

STATIONS.	Jany.	Feby.	March.	April.	May.	June.	January to June, 1922.	January to June, 1921.
North West District.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.
St. Clair—Royal Botanic Gardens	4·01	1·11	1·41	2·39	2·18	6·10	17·20	24·08
Port-of-Spain—Colonial Hospital	3·48	1·02	1·29	1·96	1·36	5·51	14·62	18·61
do. Constabulary Headquarters	2·53	1·27	1·30	·32	1·17	6·37	12·96	...
St. Ann's—Reservoir	1·72	1·86	2·27	1·61	2·89	6·19	16·54	24·40
Maraval—Reservoir	2·59	2·95	2·50	·73	4·05	3·62	16·73	23·97
do. Constabulary Station	2·83	3·42	3·37	1·02	4·68	4·50	19·82	22·01
Diego Martin do. do.	4·25	3·31	3·92	·85	5·14	6·00	23·47	27·50
do. Waterworks	3·96	2·58	2·97	1·46	3·18	4·55	18·70	22·94
do. River Estate	4·25	2·43	3·77	1·72	2·96	4·66	19·79	22·01
Fort George Signal Station	3·33	2·82	3·07	2·68	2·50	4·58	18·98	26·95
North Post do.	1·48	1·06	1·50	·47	1·23	2·80	8·54	12·93
Carenage Constabulary Station	5·00	6·15	5·39	3·29	4·33	9·70	33·86	33·17
Carrera Island Convict Depôt	1·41	·48	1·87	·68	·73	2·82	7·99	8·38
Chacachacare Light House	3·42	·96	2·33	1·61	3·63	3·87	15·82	18·12
Santa Cruz—Maracas District.								
Santa Cruz Constabulary Station	4·03	2·67	5·02	·88	3·79	5·35	21·74	28·02
St. Joseph, Government Farm	1·96	·53	1·14	·51	3·24	7·51	14·88	28·05
St. Joseph Constabulary Station	·87	·16	·71	·22	1·96	3·73	7·65	18·09
Tunapuna, St. Augustine Estate	1·59	·51	·68	·31	3·02	6·12	12·53	26·52
do. Whinfield, St. John	1·54	·94	1·10	·65	3·52	8·11	15·86	...
Maracas—Government School	4·34	1·60	1·30	·61	3·15	6·46	17·46	28·74
do. Ortinola Estate	4·56	1·59	1·38	·98	2·97	5·55	16·03	25·94
Caura, Wardour Estate	2·32	·47	1·60	·84	3·24	5·76	14·23	26·89
do. El Manacal do.	6·82	2·48	2·50	2·16	5·15	7·83	26·84	...
do. La Florida do.	2·69	·66	1·85	·78	3·94	7·04	16·96	...
do. La Concordia Estate	1·77	·47	1·97	·45	3·65	6·25	14·56	...
West Central District.								
Caroni, Frederick Estate	2·01	1·03	1·29	1·12	5·67	12·53	24·15	23·99
Chaguanas, Constabulary Station	3·17	·20	1·46	·83	1·46	4·08	11·20	27·85
do. Woodford Lodge Estate	...	...	...	...	...	...	...	25·95

RAINFALL—RETURN FOR 6 MONTHS—JANUARY TO JUNE, 1922.—Continued.

Stations.	Jany.	Feby.	March.	April.	May.	June.	January to June, 1922.	January to June, 1921.
West Central District.—Contd.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.
Carapichaima, Waterloo Estate	4·23	1·38	2·19	·18	4·38	11·50	23·86	23·84
do. McBean Cacao Estate	2·92	1·62	1·71	·69	4·11	8·25	19·30	22·42
do. Friendship Hall Estate...	3·12	1·99	2·45	·85	3·68	8·96	20·05	22·77
Couva, Exchange Estate	1·95	1·04	·79	·06	2·22	5·45	11·51	19·62
do. Brechin Castle do.	3·95	·80	2·77	·59	2·47	8·83	19·41	23·09
do. Perseverance do.	2·73	·93	·92	·26	2·94	7·20	14·98	18·54
do. Camden do.	2·40	·97	1·09	·31	2·84	6·09	13·70	...
do. Milton do.	3·19	·85	2·35	·73	2·99	10·40	20·51	24·15
do. Spring do.	4·58	1·46	3·40	·56	4·97	10·28	23·25	24·67
do. Constabulary Station	3·49	·90	1·10	nil.	3·26	8·30	17·05	20·68
do. Esperanza Estate...	...	...	...	...	...	...	...	16·63
Montserrat District.								
Brasso Piedra, Mamoral Estate	4·51	2·57	4·09	1·44	...	14·15	...	39·45
do. La Mariana Estate...	4·27	2·87	4·61	·92	5·30	11·84	29·81	37·30
Montserrat Constabulary Station	3·68	1·63	2·00	·68	2·78	7·83	18·60	22·12
Brasso, La Vega Estate	4·90	2·41	4·47	1·10	5·45	12·29	30·65	38·61
Tabaquite, Trelawne Estate	5·98	2·82	4·34	1·65	3·95	9·78	28·12	...
do. T. C. Oilfields	5·12	3·11	5·07	1·59	4·01	10·46	29·36	...
Arima District.								
Arima, Warden's Office	1·52	1·12	2·59	·54	3·01	12·87	21·85	28·61
do. Torrecilla Estate	3·51	2·30	2·78	1·98	8·48	17·10	36·15	42·65
do. Verdant Vale Estate	4·29	2·12	2·86	1·61	6·34	11·56	28·71	42·40
San Rafael Constabulary Station	8·25	3·48	4·61	2·24	9·06	17·03	45·67	43·29
Guanapo, Talparo Estate	7·08	2·46	4·37	1·97	5·71	13·16	34·75	38·76
do. El Quemado Estate	5·04	3·06	5·68	2·04	7·02	14·00	36·84	...
Tamana, Santa Marta Estate	6·74	4·46	7·21	2·12	7·81	14·65	41·65	65·24
do. La Corona Estate	5·93	3·41	6·87	2·44	7·41	12·02	38·08	54·94

RAINFALL—RETURN FOR 6 MONTHS—JANUARY TO JUNE, 1922.—Continued.

Stations.	Jany.	Feby.	March.	April.	May.	June.	January to June, 1922.	January to June, 1921.
San Fernando & Princes Town District.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.
Claxton's Bay, Forres Park Estate	1·57	·96	1·58	·18	2·47	5·18	11·94	18·73
Pointe-à-Pierre, Plein Palais Estate	2·21	1·33	1·15	...	3·15	7·67	15·51	16·26
Naparima, Picton Estate	2·49	2·49	1·46	1·15	3·69	7·99	19·18	20·79
do. Usine Ste. Madeleine Estate	5·27	4·96	4·33	1·87	6·28	9·16	31·87	22·96
do. La Fortunée Estate	...	...	...	...	...	...	...	17·89
do. Tarouba Estate...	2·64	1·59	1·31	·33	1·85	6·07	13·69	18·14
do. Union Hall Estate	...	...	...	...	...	...	...	18·64
do. Palmiste do.	2·36	2·27	1·22	1·33	3·25	7·08	17·51	22·96
do. Lewisville House	2·97	2·16	1·99	·48	3·04	8·30	19·84	22·16
do. Hermitage Estate	...	...	...	...	...	...	...	17·66
do. Petit Morne Estate	2·45	4·90	2·14	·20	2·43	7·19	19·31	17·19
Princes Town Craignish Estate	3·32	2·34	1·96	1·38	3·78	9·24	22·02	23·62
do. Cedar Hill Estate	3·00	2·63	1·95	·55	2·60	7·86	18·59	19·64
do. Williamsville Estate	2·71	1·77	2·56	·62	2·98	11·07	21·71	20·69
do. Esmeralda Estate	4·89	2·07	3·08	1·48	...	8·70	...	26·58
do. New Grant Estate	3·11	2·95	1·71	1·13	4·19	10·79	23·88	28·14
do. Constabulary Station	3·38	2·35	1·78	1·13	2·82	8·67	20·13	17·96
do. La Retraite Estate	5·64	3·95	3·68	1·95	5·60	13·90	34·72	38·22
do. Malgretoute do.	3·51	3·21	2·05	1·60	4·09	9·77	24·23	24·18
South-West District.								
Oropuche, Constabulary Station	·95	·87	·54	·53	1·99	2·75	7·63	21·42
do. Patna Estate	2·03	3·46	2·52	2·05	5·56	6·91	22·53	...
Siparia, Constabulary Station	2·23	1.87	1·97	2·02	5·24	7·25	20·58	21·25
do. Alta Gracia Estate	2·57	1·99	2·21	1·87	5·80	6·98	21·32	23·63
Guapo, Adventure Estate	1·89	3·18	3·31	3·18	4·20	5·67	21·43	19·00
Point Fortin—Constabulary Station	3·00	4·41	5·87	4·57	4·49	4·61	27·95	29·00
Erin, La Ressource Estate	1·97	·73	1·42	2·91	6·26	6·39	19·68	13·67
do. La Reunion Estate	...	...	...	...	...	...	...	21·03
do. Industry Estate	3·56	1·69	2·76	2·23	6·41	8·41	25·06	22·88
Cedros, La Retraite Estate	3·88	5·00	5·83	5·22	7·70	8·15	35·78	38·27

RAINFALL—RETURN FOR 6 MONTHS—JANUARY TO JUNE, 1922.—Continued.

Stations.	Jany.	Feby.	March.	April.	May.	June.	January to June, 1922.	January to June, 1921.
South-West District.—(Contd.)	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.
Cedros, Perseverance Estate	5·39	2·96	3·51	2·83	5·77	7·53	26·99	24·23
do. Ste. Marie Estate	5·33	2·78	3·93	3·66	4·98	7·64	28·32	23·56
do. Constabulary Station	5·69	2·78	4·24	3·53	5·75	8·44	30·38	30·63
do. Ste. Quintin Estate	5·23	2·77	4·34	2·32	4·74	7·02	24·42	26·99
Icacos, Constance Estate	5·80	2·25	2·37	2·15	4·16	9·33	26·06	20·30
Irois, Government School	1·82	3·50	6·21	6·92	6·30	8·58	33·33	24·49
South Coast.								
Moruga, Constabulary Station	4·31	2·93	2·38	1·57	5·53	9·60	26·32	29·86
East Coast.								
Matura, La Juanita Estate	5·82	5·62	5·73	2·17	4·51	12·01	35·76	52·73
Manzanilla, Constabulary Station	2·39	3·15	1·50	1·42	5·65	8·35	22·46	46·81
Sangre Grande, Evasdale Estate	6·20	4·64	4·84	2·56	6·60	12·07	36·91	51·65
do. Grosvenor Estate	6·57	4·49	5·72	2·26	8·74	12·50	40·28	49·04
do. El Recundo Estate	8·14	4·07	4·39	2·78	6·01	12·03	37·42	...
do. San Francisco Estate	6·01	3·88	5·82	1·58	6·14	14·83	39·26	...
Mayaro, Constabulary Station	3·67	3·00	3·60	1·52	2·09	11·84	25·72	32·31
North Coast.								
Blanchisseuse, Constabulary Station	4·75	3·24	4·27	3·68	4·56	11·52	32·02	41·64
do. Avondale Estate	4·42	2·40	2·38	1·59	5·45	8·59	24·73	...
Grande Rivière, Mon Plaisir Estate	5·39	5·01	4·24	3·49	6·52	13·26	39·01	51·74
Toco, Aragua House	4·04	1·93	2·88	1·35	3·50	10·17	23·77	35·67
do. Constabulary Station	4·55	1·17	2·61	·99	2·89	9·90	22·11	...
Tobago.								
Tobago, Hermitage Estate	5·36	3·37	2·85	3·48	5·28	9·26	29·60	46·13
do. King's Bay Estate	5·36	2·29	2·52	2·08	4·02	6·32	26·59	35·81
do. Roxburgh do.	6·79	2·79	3·41	2·91	3·83	8·53	28·16	37·25
do. Botanic Station	3·33	1·73	1·33	1·65	3·27	8·06	18·37	19·12
do. Government Farm	·37	1·08	·73	1·41	3·89	4·65	12·13	13·86
do. Friendship Estate	2·82	1·63	·58	1·69	3·98	6·51	17·21	18·85

(*Bulletin, Department Agriculture, Trinidad and Tobago*, pp. 1–63. Issued August 1, 1922).

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BULLETIN

OF THE

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Department of Agriculture.

GOVERNMENT STUD ANIMALS.

The following are the arrangements for February, March and April with regard to Stud animals of the Government Farms in Trinidad and Tobago.

Stallions.

Name.	*Class.*	*Where standing for Service.*		*Fee.*	*Groom's Fee.*
Quickmatch	...Thorough-bred..	Govt. Farm,	Trinidad ...	$15.00	60c.
Nelsweep	...Thorough-bred	do.	Tobago ...	7.50	60c.
Marat	...Thorough-bred	do.	Trinidad ...	10.00	60c.

Jack Donkeys.

Monarch	...American Donkey	...Govt. Farm,	Trinidad...	$ 7.50	60c.
Emperor ...	do.	... do.	do. ...	7.50	60c.
Barbados Joe	...	... do.	do. ...	1.80	60c.
President	...American Donkey	... do.	Tobago ...	7.50	60c.
Small Donkey (from Barbados)		...		1.80	

Bulls.

A.—At Government Farms.

TRINIDAD.		TOBAGO.	
Class.	*Fee.*	*Class.*	*Fee.*
2 Pure-bred Zebu ...	$ 1.80c.	1 Pure-bred Zebu	...$1.50
1 Cross-bred Holstein-Zebu	1.80c.	1 Half-bred Shorthorn	... 1.50
2 Pure-bred Red Poll ...	3.60c.	1 do. Guernsey	... 1.50
		1 do. Red Poll	... 1.50

B.—At Public Pastures or Estates.

Place.	*Class.*
Queen's Park Savannah	1 Half-bred Shorthorn; 2 Half-bred Holsteins
Mucurapo Pasture	
St. Clair Expt. Station	1 Guernsey-Zebu Shorthorn; 1 Half-bred Holstein.
St. Augustine Estate	1 Half-bred Zebu; 1 Half-bred Guernsey 1 Cross-bred Zebu-Guernsey.
River Estate	1 Half-bred Zebu.
San Fernando	1 Half-bred Jersey; Three-Qtr. bred Zebu.
Arima	1 Half-bred Zebu.

Pigs.

At Government Farm, Trinidad.

Large Black, Poland China, Berkshire, $1.50, and Attendant's Fee 25c.

At Government Farm, Tobago.

Berkshire ...	...	...	...	...Fee 75c.
Large Black ...	...	...	...	... 75c.

POULTRY.

Government Farm, Trinidad.

Eggs of Barred Plymouth Rocks, Rhode Island Reds, White Leghorns, and Rouen Ducks ... ...$1.20 per doz.

Government Farm, Tobago.

Eggs of Plymouth Rocks, Black Minorcas, Rhode Island Reds 60c. per doz. Also Cocks and Pullets of Plymouth Rocks and Rhode Island Reds.

DEPARTMENT OF AGRICULTURE.

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under Ordinances No. 30 of 1915 and No. 41 of 1921.

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Registered Societies.

	Date of Registration.
Trinidad	
Diego Martin	October 12, 1916.
Lothians	April 4, 1919.
Malgretout	April 30, 1919.
Petit Morne	April 30, 1919.
Union Hall	April 30, 1919.
Malgretout East Indian	May 26, 1919.
Picton	May 30, 1919.
Petit Morne (Palmyra)	June 13, 1919.
Tarouba (Ne Plus Ultra)	June 13, 1919.
Union-Marabella	July 10, 1919.
Harmony Hall	July 10, 1919.
Williamsville East Indian	July 10, 1919.
Indian Walk	August 19, 1919.
Williamsville, West Indian	September 11, 1919.
Plein Palais	November 9, 1919.
Lengua	November 9, 1919.
Peñal	November 21, 1919.
Broomage	August 11, 1920.
Cedar Hill	August 11, 1920.
Trois Amis	August 11, 1920.
Monkey Town	August 16, 1920.
Tobago.	
Pembroke	June 18, 1917.
Scarborough	April 11, 1918.
Delaford	August 26, 1918.
Mason Hall	December 16, 1918.
Moriah	December 16, 1918.
Charlotteville	February 4, 1919.
Parlatuvier	July 10, 1920.
Roxborough	October 23, 1920.
Les Coteaux	December 20, 1920.
Montgomery	January 7, 1921.

Plant Protection Ordinance.

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Diseases and Pests Proclaimed under the Ordinance.

Proclamation No. 56 of 1921.

Bud-rot disease, Red-ring disease and Little-leaf disease of the Coconut palm Mosaic disease of the Sugar-cane; Blossom-blight and Wither-tip of the Lime tree; Bird Vine; Love Vine; Coconut butterfly; Parasol ant; Cacao beetle; Locust; Gru-gru beetle; Rhinoceros beetle.

PUBLICATIONS FOR SALE.

Vol. XIX. Pt. 1.—The Trinidad Cane Farming Industry; Sugar Cane Blight in Trinidad; Froghopper Blight in Trinidad; Implemental Tillage; Mosaic Disease of Sugar Cane in Trinidad, &c.

Vol. XIX. Pt. 2.—Report on the Froghopper Blight of Sugar Cane in Trinidad; Trinidad Seedlings and Tests of Varieties; Cacti of Trinidad; Storing Sweet Potatoes; Seasoning Standing Timber, &c.

Vol. XIX. Pt. 3.—Sugar Cane Pests and Diseases 1920; Diseases of Animals Ordinance; Rotation Scheme for a Small Holding; Cacao Prize Competition 1920–21, &c.

Vol. XIX. Pt. 4.—Plant Protection Legislation in Trinidad; Sugar Cane Experiments 1919–21; Cacao Cultivation in Grenada; Importance of the Tuberculin Test; Introduction of the Bread-fruit into the West Indies, &c.

Vol. XX. Pt. 1.—Descriptive Nursery Stock List; Notes on Trinidad and Tobago Timbers; Agricultural Credit Societies (Amending) Ordinance Dogs Ordinance.

Our Local Foods: Their Production and Use, by W. G. Freeman and R. O. Williams.—Price 3d.

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The Avocado in Trinidad and Tobago.—Illustrated.—Price 3d.

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Annual Reports, Department of Agriculture, 1916, 1917 & 1918.—Price 1s. 9d. each, 1919–1920, price 2/3.

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All publications can be obtained from the Head Office of the Department, St. Clair Experiment Station, post free within the Colony. The Bulletin is also on sale at Messrs. Muir, Marshall, and Davidson & Todd, Port-of-Spain.

BULLETIN
OF THE
DEPARTMENT OF AGRICULTURE
Trinidad and Tobago.

PARTS 2, 3 & 4.] 1922. [VOL. XX.

SUGAR.

SUGAR CANE EXPERIMENTS, 1920-22.

TESTS OF TRINIDAD SEEDLINGS AND OF NEWLY INTRODUCED AND OTHER VARIETIES.

By JOSEPH DE VERTEUIL, F.I.C., F.C.S., Agricultural Chemist, and L. A. BRUNTON, Assistant Superintendent, St. Augustine Experiment Station.

This report is divided into two parts :—
(1) Raising and testing of new Trinidad seedlings.
(2) Testing of varieties grown in plots.

Raising and Testing of New Trinidad Seedlings.

The work started in 1917 of raising new sugar-cane seedlings has been continued on the lines indicated in the report for 1917-19 (1)

TRINIDAD SEEDLINGS RAISED IN 1921.

During the flowering season of 1921, the canes arrowed late and very irregularly. Of the known good parents, only seed from H.? germinated freely and half of the seedlings planted out were raised from this variety. Other good parents from which a few seedlings were raised, are B. 6835, M.P. 55 and Bourbon. Fertile seed of the following varieties was obtained from Union Hall Estate :—D. 625, B. 6308, B. 6450, Ba. 6032, B.H. 10 (12) and "Mc. Culloch" seedling.

Altogether over 15,000 seedlings were raised during 1921 ; of these 4,565 were potted and 3,626 of the most vigorous planted out in the field between March 1 and April 12, 1922. A very good start was made by the seedlings planted out early in March as the weather was very favourable, but from March 15 to May 17 a very dry spell was experienced at the Experiment Station, only 0·64 inches of rain having been registered during that period, and a large proportion of the smaller plants dried up.

(1) *Bull. Dept. Agr.*, Trinidad and Tobago. *XVIII*, 136 1919.

TRINIDAD SEEDLINGS RAISED IN 1920.

Out of the seedlings raised and potted in 1920, 4,016 were planted out in the field during March and April, 1921. The weather was favourable and a very large number grew into fair stools. Of the seedlings originally planted out, 685 or 17·0 per cent. were selected from their field characters for analytical test and 220 or practically 5·5 per cent. have been selected for further trial.

Good and Bad Parent Plants.

As in previous years, it has been found that certain varieties are useless for raising new seedlings, and the detection of good parents seems to be of great importance as will be seen below.

Table. 1.—Trinidad Seedlings Raised in 1920.

Comparative results from various parent canes.

Parent.	Number of seedlings planted out in field.	Selected for testing from field characters.	Selected for further trial from field characters and analytical results.
H. 146 ..	4	0	0
D. 625 ..	552	35= 6·3 per cent.	1= 0·2 per cent.
D. 109 ..	227	54=23·8 do.	1= 0·4 do.
T. 75 ..	80	9=11·2 do.	1= 1·2 do.
H. 27 ..	1,180	77= 6·5 do.	23= 1·9 do.
B. 156 ..	24	1= 4·1 do.	1= 4·1 do
AR 55——B. ..	16	4=25·0 do.	1= 6·2 do.
N H. 227 ..	28	10=35·7 do.	2= 7·1 do.
H.? (1) ..	493	157=31·8 do.	44= 8·9 do.
M.P. 55 ..	1,008	230=22·8 do.	93= 9·2 do.
Bourbon ..	248	77=31·0 do.	30=12·1 do.
B. 7482 ..	124	19=15·3 do.	15=12·1 do.
Ba 7924 ..	32	12=37·5 do.	8=25·0 do.

(1) A Hawaiian cane of which the number was lost on the journey when first introduced.

From the above it will be seen that, out of the thirteen varieties from which seedlings were raised, the six first were practically useless. The juice from the D. 625 and D. 109 seedlings was of very poor quality. H. 146 has on a previous occasion given quite good results. This year the best parents have been the Bourbon, H.? and M.P. 55. The latter is a seedling cane introduced from Mauritius about eight years ago. Some promising seedlings have also been obtained from B. 7482 and Ba. 7924.

First Selection of 1920 Seedlings.

The following are the results of the seedlings raised in 1920, which have been selected for their combined field characters and analytical results, and are being kept for a further trial. They were planted out in the field from bamboo pots during March and April, 1921, and were consequently about 14 months old when tested between May 4 and June 23, 1922. The rainfall from March 1, 1921 to April 30, 1922, was 81·72 inches. Very little rain, viz :—0·34 inches fell during April and up to May 17, 1922 and most of the seedlings tested up to June 8, were giving juice of good quality. Between May 18 and June 8, 1922, 5·56 inches of rain were registered and from June 9 an appreciable change in the quality of the juice was noticeable. The seedlings raised from H.? were tested after June 9 and most of the seedlings which gave less than 1·75 lb. sucrose per gallon were retained for further trial, as there can be no doubt that had it not been for the large amount of rain which fell during the three weeks preceding the test, these seedlings would have shown a much higher sucrose content.

TABLE II.—TRINIDAD SEEDLINGS RAISED IN 1920.—FIRST YEAR'S SELECTION.

CANE.	PARENT.	WEIGHT OF STOOL.	AVERAGE WEIGHT OF CANES.	JUICE.							
				PER CENT. EXTRACTED.	SPECIFIC GRAVITY.	BRIX.	PERCENTAGE OF			QUOTIENT OF PURITY.	SUCROSE PER GALLON.
							SUCROSE.	GLUCOSE.	NON-SUGAR.		
		lb.	lb.								lb.
T. 1712	D. 109	72·5	3·6	65·9	1·0739	17·9	16·15	0·75	1·00	90·2	1·734
T. 1329	B. 156	117·4	6·9	66·3	1·0761	18·4	16·12	1·78	0·60	87·6	1·735
T. 1485	T. 75	57·3	3·8	64·9	1·0806	19·4	17·55	0·69	1·16	90·5	1·896
T. 1511	D. 625	57·2	3·8	65·2	1·0815	19·6	17·77	1·38	0·45	90·7	1·922
T. 1323	55—AR—B.N	91·1	6·1	66·8	1·0873	20·9	19·50	0·84	0·56	93·3	2·120
T. 1287	H. 227	113·5	4·5	66·6	1·0761	18·4	15·97	0·92	1·51	86·8	1·718
T. 1286	do.	64·5	5·0	65·1	1·0819	19·7	17·86	0·80	1·04	90·6	1·932
T. 1310	Ba. 7924	114·0	8·1	66·9	1·0739	17·9	15·76	1·20	0·94	88·0	1·692
T. 1320	do.	139·5	7·0	65·8	1·0761	18·4	16·22	0·87	1·31	88·1	1·745
T. 1311	do.	145·0	5·0	66·2	1·0761	18·4	16·60	0·98	0·82	90·2	1·786
T. 1321	do.	73·5	5·2	70·4	1·0766	18·5	16·74	0·68	1·08	90·4	1·802
T. 1313	do.	73·5	7·3	65·6	1·0815	19·6	17·10	0·81	1·69	87·2	1·849
T. 1315	do.	114·0	5·7	66·4	1·0810	19·5	17·83	0·68	0·99	91·4	1·927
T. 1319	do.	71·4	7·9	65·7	1·0828	19·9	18·43	0·76	0·71	92·6	1·996
T. 1318	do.	97·0	5·4	68·3	1·0859	20·6	18·95	0·70	0·95	92·0	2·058
T. 1297	B. 7482	226·5	8·7	67·9	1·0757	18·3	15·98	1·29	1·03	87·4	1·719
T. 1291	do.	115·0	5·2	67·2	1·0766	18·5	16·11	0·96	1·43	87·1	1·734
T. 1306	do.	133·5	4·8	62·3	1·0753	18·2	16·33	0·60	1·27	89·7	1·756
T. 1293	do.	135·0	5·6	68·3	1·0788	19·0	16·66	1·23	1·11	87·7	1·797
T. 1292	do.	97·9	8·9	63·2	1·0801	19·3	16·73	1·45	1·12	86·7	1·807
T. 1294	do.	88·0	8·0	62·2	1·0801	19·3	16·88	1·37	1·05	87·5	1·823
T. 1303	do.	99·7	4·7	64·3	1·0846	20·3	17·63	0·94	1·73	86·8	1·912
T. 1307	do.	115·8	4·6	63·4	1·0806	19·4	17·74	0·74	0·92	91·4	1·917
T. 1296	do.	102·0	3·9	64·0	1·0824	19·8	17·86	0·44	1·50	90·2	1·933

TABLE II.—TRINIDAD SEEDLINGS RAISED IN 1920.—FIRST YEAR'S SELECTION.—*Continued.*

CANE.	PARENT.	Weight of Stool.	Average weight of Canes.	JUICE.							
				Per cent. extracted.	Specific gravity.	Brix.	Percentage of			Quotient of Purity.	Sucrose per gallon.
							Sucrose.	Glucose.	Non-Sugar.		
		lb.	lb.								lb.
T. 1305 ..	B. 7482 ..	72·0	5·5	62·2	1·0832	20·0	18·08	0·84	1·08	90·4	1·958
T. 1302 ..	do. ..	82·0	5·1	69·2	1·0850	20·4	18·53	0·80	1·07	90·8	2·010
T. 1308 ..	do. ..	72·8	3·8	63·4	1·0873	20·9	19·02	0·68	1·20	91·0	2·068
T. 1327 ..	do. ..	99·5	4·5	63·1	1·0859	20·6	19·09	0·73	0·78	92·7	2·073
T. 1295 ..	do. ..	156·9	6·2	67·3	1·0873	20·9	19·16	0·76	0·98	91·7	2·083
T. 1298 ..	do. ..	136·0	5·7	60·1	1·0895	21·4	19·61	0·46	1·33	91·6	2·136
T. 1410 ..	H. 27 ..	121·0	6·7	63·0	1·0757	18·3	16·17	0·94	1·19	88·4	1·739
T. 1412 ..	do. ..	120·9	7·1	65·8	1·0770	18·6	16·15	1·09	1·36	86·8	1·739
T. 1440 ..	do. ..	74·0	6·2	67·9	1·0744	18·0	16·19	1·02	0·79	89·9	1·739
T. 1434 ..	do. ..	89·5	6·0	66·2	1·0735	17·8	16·26	0·98	0·56	91·3	1·745
T. 1460 ..	do. ..	91·6	5·4	67·3	1·0757	18·3	16·27	1·15	0·88	88·9	1·750
T. 1473 ..	do. ..	140·0	4·4	65·4	1·0748	18·1	16·28	1·15	0·67	89·9	1·750
T. 1417 ..	do. ..	107·2	8·2	66·4	1·0783	18·9	16·28	1·57	1·05	86·1	1·755
T. 1452 ..	do. ..	121·3	5·8	66·0	1·0766	18·5	16·31	1·30	0·89	88·2	1·756
T. 1450 ..	do. ..	222·3	7·7	63·6	1·0797	19·2	16·79	1·20	1·11	87·4	1·813
T. 1433 ..	do. ..	108·0	6·7	66·0	1·0783	18·9	16·91	1·07	0·92	89·5	1·823
T. 1435 ..	do. ..	74·0	5·3	63·2	1·0775	18·7	16·92	0·78	1·00	90·5	1·823
T. 1477 ..	do. ..	77·5	3·9	64·8	1·0766	18·5	16·98	0·76	0·76	91·8	1·828
T. 1425 ..	do. ..	47·8	3·7	61·6	1·0828	19·9	17·70	1·09	1·11	88·9	1·916
T. 1445 ..	do. ..	80·0	4·4	67·8	1·0815	19·6	17·73	1·07	0·80	90·4	1·917
T. 1429 ..	do. ..	116·5	5·3	66·3	1·0815	19·6	17·82	0·85	0·93	90·9	1·927
T. 1469 ..	do. ..	71·5	4·0	63·3	1·0810	19·5	17·83	0·59	1·08	91·4	1·927
T. 1470 ..	do. ..	47·5	4·3	60·4	1·0824	19·8	17·81	0·94	1·05	89·9	1·928
T. 1441 ..	do. ..	102·0	5·1	59·1	1·0837	20·1	18·03	0·98	1·09	89·7	1·954
T. 1430 ..	do. ..	57·2	3·8	63·5	1·0815	19·6	18·21	0·76	0·63	92·9	1·969
T. 1482 ..	do. ..	85·5	4·5	66·9	1·0837	20·1	18·27	1·02	0·81	90·9	1·980

TABLE II.—TRINIDAD SEEDLINGS RAISED IN 1920.—FIRST YEAR'S SELECTION.—*Continued.*

CANE.	PARENT.	Weight of Stool.	Average weight of Canes.	JUICE.							
				Per cent. extracted.	Specific gravity.	Brix.	Percentage of			Quotient of Purity.	Sucrose per gallon.
							Sucrose.	Glucose.	Non-Sugar.		
		lb.	lb.								lb.
T. 1464 ..	H. 27 ..	58·5	4·2	60·5	1·0819	19·7	18·30	0·76	0·64	92·9	1·980
T. 1478 ..	do. ..	64·7	4·3	61·2	1·0859	20·6	19·19	0·54	0·87	93·1	2·084
T. 1449 ..	do. ..	90·0	6·4	65·3	1·0891	21·3	19·37	0·57	1·36	90·9	2·109
T. 1371 ..	Bourbon ..	110·5	9·2	63·6	1·0753	18·2	15·94	1·29	0·97	87·6	1·714
T. 1374 ..	do. ..	103·6	9·2	63·0	1·0779	18·8	16·00	1·65	1·15	85·1	1·724
T. 1340 ..	do. ..	84·0	8·4	65·2	1·0761	18·4	16·22	1·45	0·73	88·1	1·745
T. 1346 ..	do. ..	105·5	8·1	68·4	1·0783	18·9	16·67	1·55	0·68	88·2	1·797
T. 1360 ..	do. ..	93·5	4·7	67·6	1·0770	18·6	16·83	0·85	0·92	90·5	1·812
T. 1351 ..	do. ..	111·6	8·6	66·3	1·0837	20·1	16·78	2·18	1·14	83·5	1·818
T. 1357 ..	do. ..	90·5	5·6	61·0	1·0792	19·1	17·13	1·09	0·88	89·7	1·849
T. 1335 ..	do. ..	126·1	6·6	64·6	1·0806	19·4	17·16	0·80	1·44	88·4	1·854
T. 1376 ..	do. ..	71·5	7·1	64·7	1·0797	19·2	17·22	1·15	0·83	89·7	1·859
T. 1342 ..	do. ..	89·9	6·9	63·5	1·0797	19·2	17·22	1·23	0·75	89·7	1·859
T. 1359 ..	do. ..	66·5	3·7	63·5	1·0810	19·5	17·35	1·33	0·82	89·0	1·875
T. 1361 ..	do. ..	104·7	6·1	63·2	1·0815	19·6	17·34	0·98	1·28	88·5	1·875
T. 1385 ..	do. ..	106·3	8·2	62·2	1·0819	19·7	17·38	1·27	1·05	88·2	1·880
T. 1362 ..	do. ..	106·4	7·1	64·5	1·0806	19·4	17·74	0·89	0·77	91·4	1·917
T. 1394 ..	do. ..	89·5	5·6	64·0	1·0828	19·9	17·85	1·23	0·82	89·7	1·933
T. 1365 ..	do. ..	86·5	10·8	60·4	1·0819	19·7	18·06	1·20	0·44	91·7	1·954
T. 1393 ..	do. ..	184·0	8·4	66·0	1·0828	19·9	18·18	0·80	0·92	91·3	1·968
T. 1352 ..	do. ..	76·0	3·8	62·2	1·0824	19·8	18·29	0·87	0·64	92·4	1·980
T. 1379 ..	do. ..	92·0	5·7	64·9	1·0828	19·9	18·38	0·62	0·90	92·4	1·990
T. 1381 ..	do. ..	98·5	6·1	65·7	1·0841	20·2	18·50	0·70	1·00	91·5	2·005
T. 1390 ..	do. ..	79·4	6·1	63·6	1·0841	20·2	18·59	0·75	0·86	92·0	2·015
T. 1396 ..	do. ..	110·5	8·5	67·9	1·0850	20·4	18·67	0·56	1·17	91·5	2·026
T. 1372 ..	do. ..	89·5	6·4	64·0	1·0837	20·1	18·79	0·68	0·63	93·5	2·036

TABLE II.—TRINIDAD SEEDLINGS RAISED IN 1920.—FIRST YEAR'S SELECTION.—*Continued.*

CANE.	Parent.	Weight of Stool.	Average weight of canes.	JUICE.							
				Per cent. extracted.	Specific gravity.	Brix.	Percentage of			Quotient of Purity.	Sucrose per gallon.
							Sucrose.	Glucose.	Non-Sugar.		
		lb.	lb.								lb.
T. 1336 ..	Bourbon ..	97·1	4·6	66·7	1·0846	20·3	18·83	0·68	0·79	92·7	2·042
T. 1356 ..	do. ..	100·5	4·2	63·2	1·0868	20·8	19·22	0·92	0·66	92·4	2·089
T. 1355 ..	do. ..	61·5	5·1	63·8	1·0886	21·2	19·38	0·83	0·99	91·4	2·110
T. 1391 ..	do. ..	50·7	7·2	62·3	1·0873	20·9	19·55	0·70	0·65	93·5	2·126
T. 1344 ..	do. ..	97·5	6·5	64·0	1·0900	21·5	20·02	0·68	0·80	93·0	2·182
T. 1353 ..	do. ..	107·5	4·3	64·9	1·0909	21·7	20·01	0·85	0·84	92·2	2·183
T. 1363 ..	do. ..	70·6	5·4	62·8	1·0904	21·6	20·07	0·74	0·79	92·9	2·188
T. 1578 ..	H.? ..	174·4	6·6	65·6	1·0726	17·6	14·96	1·24	1·40	85·0	1·605
T. 1593 ..	do. ..	112·6	5·4	69·7	1.0704	17·1	15·33	0·71	1·06	89·7	1·641
T. 1589 ..	do ..	102·8	6·8	66·9	1·0717	17·4	15·36	0·84	1·20	88·3	1·646
T. 1605 ..	do. ..	113·3	6·7	66·4	1·0717	17·4	15·60	0·76	1·04	89·1	1·672
T. 1645 ..	do. ..	135·4	7·1	62·3	1·0713	17·3	15·61	0·77	0·92	90·2	1·672
T. 1610 ..	do. ..	61·5	8·8	70·1	1·0722	17·5	15·60	0·76	1·14	89·1	1·673
T. 1630 ..	do. ..	80·8	6·2	62·9	1·0717	17·4	15·65	1·00	0·75	89·9	1·677
T. 1629 ..	do. ..	108·6	6·4	61·9	1·0744	18·0	15·86	0·92	1·22	87·8	1·704
T. 1654 ..	do. ..	80·5	6·7	65·5	1·0735	17·8	15·92	0·96	0·92	89·5	1·709
T. 1649 ..	do. ..	86·0	7·2	67·7	1·0757	18·3	15·93	1·25	1·12	87·0	1·713
T. 1564 ..	do. ..	151·0	7·5	66·5	1·0761	18·4	15·97	1·24	1·19	86·8	1·718
T. 1653 ..	do. ..	65·5	5·9	68·2	1·0722	17·5	16·03	0·91	0·56	91·6	1·719
T. 1537 ..	do. ..	91·5	3·8	65·3	1·0748	18·1	15·99	0·67	1·44	88·3	1·719
T. 1619 ..	do. ..	78·0	6·0	66·4	1·0748	18·1	16·09	1·14	0·87	88·9	1·729
T. 1637 ..	do. ..	92·6	7·1	64·6	1·0744	18·0	16·10	1·04	0·86	89·4	1·730
T. 1609 ..	do. ..	85·0	7·1	63·8	1·0730	17·7	16·17	0·77	0·76	91·3	1·735
T. 1691 ..	do. ..	119·7	4·3	65·8	1·0744	18·0	16·15	0·73	1·12	89·7	1·735
T. 1551 ..	do. ..	108·3	4·3	72·3	1·0748	18·1	16·24	0·84	1·02	89·7	1·745
T. 1642 ..	do. ..	105·4	5·5	70·5	1·0735	17·8	16·31	0·55	0·94	91·6	1·751

TABLE II.—TRINIDAD SEEDLINGS RAISED IN 1920.—FIRST YEAR'S SELECTION.—*Continued.*

CANE.	Parent.	Weight of Stool.	Average weight of Canes.	JUICE.							
				Per cent. extracted.	Specific gravity.	Brix.	Percentage of			Quotient of Purity.	Sucrose per gallon.
							Sucrose.	Glucose.	Non-Sugar.		
		lb.	lb.								lb.
T. 1584	H.?	80·3	4·7	69·7	1·0748	18·1	16·33	0·76	1·01	90·7	1·755
T. 1621	do.	72·5	4·5	63·8	1·0748	18·1	16·38	0·71	1·01	90·5	1·760
T. 1635	do.	127·6	6·1	65·6	1·0766	18·5	16·45	1·35	0·70	88·9	1·771
T. 1540	do.	110·5	5·0	69·4	1·0757	18·3	16·51	0·68	1·11	90·2	1·776
T. 1658	do.	74·9	4·4	69·9	1·0753	18·2	16·62	0·70	0·88	91·3	1·787
T. 1616	do.	97·5	7·0	69·0	1·0757	18·3	16·66	0·70	0·94	91·0	1·792
T. 1648	do.	82·0	6·8	65·5	1·0761	18·4	16·70	1·06	0·64	90·8	1·797
T. 1569	do.	106·0	5·9	63·4	1·0770	18·6	16·74	0·81	1·05	90·0	1·803
T. 1553	do.	81·7	6·3	67·8	1·0775	18·7	16·92	0·78	1·00	90·5	1·823
T. 1556	do.	97·5	4·4	65·9	1·0788	19·0	16·90	0·98	1·12	88·9	1·823
T. 1576	do.	76.5	4·8	65·0	1·0783	18·9	17·39	0·73	0·78	92·0	1·875
T. 1549	do.	95·0	3·6	69·7	1·0806	19·4	17·35	1·07	0·98	89·4	1·875
T. 1546	do.	94·0	5·5	69·6	1·0783	18·9	17·53	0·76	0·61	92·7	1·890
T. 1567	do.	118·0	3·9	62·1	1·0810	19·5	17·78	0·94	0·78	91·2	1·922
T. 1554	do.	75·0	4·2	67·0	1·0815	19·6	17·92	0·84	0·84	91·4	1·938
T. 1585	do.	53·0	5·5	57·2	1·0819	19·7	18·06	0·47	1·17	91·7	1·954
T. 1570	do.	105·0	5·8	69·3	1·0815	19·6	18·30	0·61	0·69	93·4	1·979
T. 1559	do.	69·3	5·3	60·5	1·0828	19·9	18·38	0·65	0·87	92·4	1·990
T. 1538	do.	66·0	5·5	67·8	1·0819	19·7	18·54	0·40	0·76	94·1	2·006
T. 1624	do.	119·8	4·8	65·4	1·0837	20·1	18·51	0·78	0·81	92·1	2·006
T. 1574	do.	72·0	4.5	57·3	1·0832	20·0	18·56	0·51	0·93	92·8	2·010
T. 1528	do.	62·5	3·9	63·6	1·0837	20·1	18·75	0·43	0·92	93·3	2·032
T. 1529	do.	50·0	5·0	60·5	1·0850	20·4	18·91	0·55	0·94	92·7	2·052
T. 1561	do.	57·9	4·5	64·0	1·0859	20·6	19·23	0·41	0·96	93·3	2·088
T. 1572	do.	71·0	7·9	64·9	1·0859	20·6	19·62	0·47	0·51	95·2	2·130
T. 1108	M.P. 55	125·0	8·9	63·4	1·0713	17·3	15·32	1·39	0·59	88·5	1·641

TABLE II.—TRINIDAD SEEDLINGS RAISED IN 1920.—FIRST YEAR'S SELECTION.—*Continued.*

CANE.	PARENT.	Weight of Stool.	Average weight of Canes.	JUICE.							
				Per cent. extracted.	Specific gravity.	Brix.	Percentage of			Quotient of Purity.	Sucrose per gallon.
							Sucrose.	Glucose.	Non-Sugar.		
		lb.	lb.								lb.
T. 1270 ..	M.P. 55 ..	96·0	**6·5**	70·4	1·0748	18·1	16·04	1·12	0·94	88·6	1·724
T. 1232 ..	do. ..	98·0	**7·5**	68·0	1·0775	18·7	16·10	1·56	1·04	86·1	1·735
T. 1250 ..	do. ..	124·8	7·3	65·3	1·0757	18·3	16·17	1·67	0·46	88·4	1·739
T. 1234 ..	do. ..	82·5	8·2	64·5	1·0783	18·9	16·23	1·67	1·00	86·0	1·750
T. 1281 ..	do. ..	86·4	6·7	61·4	1·0775	18·7	16·24	1·33	1·13	86·8	1·750
T. 1264 ..	do. ..	92·5	5·8	68·9	1·0788	19·0	16·22	1·60	1·18	85·4	1·750
T. 1179 ..	do. ..	54·4	6·0	67·3	1·0770	18·6	16·35	1·39	0·86	87·9	1·761
T. 1230 ..	do. ..	153·5	5·7	67·8	1·0783	18·9	16·42	1·51	0·97	86·9	1·770
T. 1061 ..	do. ..	94·0	4·3	63·0	1·0797	19·2	16·40	2·08	0·72	85·4	1·771
T. 1124 ..	do. ..	75·1	8·3	66·2	1·0801	19·3	16·40	1·67	1·23	85·0	1·771
T. 1212 ..	do. ..	77·6	7·0	67·7	1·0779	18·8	16·48	1·04	1·28	87·6	1·776
T. 1206 ..	do. ..	91·5	4·0	66·0	1·0788	19·0	16·61	1·56	0·83	87·4	1·792
T. 1204 ..	do. ..	76·0	3·8	69·4	1·0792	19·1	16·70	1·47	0·93	87·4	1·802
T. 1210 ..	do. ..	102·6	4·9	65·3	1·0819	19·7	16·80	1·61	1·29	85·3	1·817
T. 1090 ..	do. ..	75·0	7·5	66·3	1·0788	19·0	16·90	1·43	0·67	88·9	1·823
T. 1203 ..	do. ..	64·4	4·9	67·4	1·0797	19·2	17·18	1·47	0·55	89·5	1·855
T. 1280 ..	do. ..	68·5	4·9	63·9	1·0824	19·8	17·18	1·26	1·36	86·8	1·859
T. 1265 ..	do. ..	79·5	5·0	67·0	1·0810	19·5	17·35	0·94	1·21	89·0	1·875
T. 1231 ..	do. ..	62·1	4·3	64·2	1·0828	19·9	17·37	1·47	1·06	87·3	1·881
T. 1194 ..	do. ..	62·7	4·8	68·5	1·0806	19·4	17·45	1·25	0·70	89·9	1·886
T. 1180 ..	do. ..	41·7	4·2	65·0	1·0810	19·5	17·49	0·91	1·10	89·7	1·891
T. 1112 ..	do. ..	52·5	4·4	60·5	1·0810	19·5	17·49	1·31	0·70	89·7	1·891
T. 1185 ..	do. ..	62·5	4·2	64·3	1·0824	19·8	17·47	1·56	0·77	88·2	1·891
T. 1055 ..	do. ..	65·5	6·5	63·7	1·0806	19·4	17·50	1·14	0·76	90·2	1·891
T. 1177 ..	do. ..	69·6	5·5	70·3	1·0806	19·4	17·50	1·25	0·65	90·2	1·891
T. 1245 ..	do. ..	87·3	6·7	68·3	1·0806	19·4	17·55	1·06	0·79	90·5	1·896

TABLE II.—TRINIDAD SEEDLINGS RAISED IN 1920.—FIRST YEAR'S SELECTION.—*Continued.*

CANE.	PARENT.	Weight of Stool.	Average weight of Canes.	JUICE.							
				Per cent. extracted.	Specific gravity.	Brix.	Percentage of			Quotient of Purity.	Sucrose per gallon.
							Sucrose.	Glucose.	Non-Sugar.		
		lb.	lb.								lb.
T. 1223	M.P. 55	103·5	5·7	66·9	1·0819	19·7	17·53	1·78	0·39	89·0	1·896
T. 1127	do.	72·5	4·5	67·9	1·0810	19·5	17·59	0·92	0·99	90·2	1·901
T. 1240	do.	80·5	8·0	66·1	1·0832	20·0	17·55	1·31	1·14	87·7	1·901
T. 1257	do.	97·5	6·5	67·3	1·0819	19·7	17·57	1·25	0·88	89·2	1·901
T. 1070	do.	60·9	4·1	65·0	1·0832	20·0	17·60	1·72	0·68	88·0	1·905
T. 1176	do.	47·0	5·2	67·3	1·0806	19·4	17·64	1·11	0·65	90·9	1·906
T. 1159	do.	50·2	6·3	60·4	1·0824	19·8	16·61	1·28	0·91	88·9	1·906
T. 1208	do.	87·7	6·7	65·1	1·0806	19·4	17·64	1·09	0·67	90·9	1·906
T. 1233	do.	89·0	6·3	62·1	1·0815	19·6	17·68	1·00	0·92	90·2	1·912
T. 1115	do.	51·5	3·2	65.5	1·0824	19·8	17·71	1·47	0·62	89·4	1·917
T. 1215	do.	78·8	7·2	67·1	1·0824	19·8	17·76	0·94	1·10	89·7	1·922
T. 1060	do.	60·1	3·2	64·8	1·0837	20·1	17·78	1·43	0·89	88·4	1·927
T. 1132	do.	54·8	4·2	65·7	1·0824	19·8	17·81	1·09	0·90	89·9	1·928
T. 1143	do.	51·0	5·7	64·9	1·0815	19·6	17·97	0·71	0·92	91·7	1·943
T. 1237	do.	71·0	11.8	65·8	1·0859	20·6	17·89	1·11	1·60	86·5	1·943
T. 1085	do.	92·5	5·8	64·6	1·0841	20·2	17·92	1·39	0·89	88·7	1·943
T. 1182	do.	60·8	4·9	63·7	1·0837	20·1	17·98	1·11	1·01	89·4	1·948
T. 1073	do.	66·9	5·1	64·2	1·0837	20·1	17·98	1·19	0·93	89·4	1·948
T. 1105	do.	79·0	5·6	62·3	1·0819	19·7	18·06	1·11	0·53	91·7	1·954
T. 1058	do.	49·2	4·9	65·2	1·0855	20·5	18·04	1·47	0·99	88·0	1·958
T. 1140	do.	68·0	5·7	66·5	1·0841	20·2	18·11	1·19	0·90	89·6	1·963
T. 1066	do.	65·6	3·8	63·7	1·0868	20·8	18·79	1·19	0·82	90·3	1·965
T. 1091	do.	58·0	3·9	64·0	1·0846	20·3	18·15	1·31	0·84	89·4	1·968
T. 1168	do.	55·7	6·2	67·0	1·0837	20·1	18·17	0·86	1·07	90·4	1·969
T. 1228	do.	119·5	8·5	65·9	1·0846	20·3	18·20	1·22	0·88	89·6	1·974
T. 1152	do.	52·7	5·3	66·6	1·0855	20·5	18·23	1·19	1·08	88·9	1·979

TABLE II.—TRINIDAD SEEDLINGS RAISED IN 1920.—FIRST YEAR'S SELECTION.—*Continued.*

CANE.	PARENT.	Weight of Stool.	Average weight of Canes.	JUICE.							
				Per cent. extracted.	Specific gravity.	Brix.	Percentage of			Quotient of Purity.	Sucrose per gallon.
							Sucrose.	Glucose.	Non-Sugar.		
		lb.	lb.								lb.
T. 1195	M.P. 55	62·7	4·2	62·9	1·0828	19·9	18·28	0·92	0·70	91·8	1·979
T. 1165	do.	76·6	6·9	64·1	1·0855	20·5	18·28	1·47	0·75	89·2	1·984
T. 1123	do.	33·5	4·8	57·1	1·0841	20·2	18·31	0·91	0·98	90·6	1·985
T. 1145	do.	90·7	8·2	66·4	1·0846	20·3	18·30	1·25	0·75	90·1	1·985
T. 1190	do.	92·4	4·4	61·6	1·0850	20·4	18·34	1·19	0·87	89·9	1·990
T. 1068	do.	49·2	5·5	63·7	1·0850	20·4	18·34	1·02	1·04	89·9	1·990
T. 1138	do.	41·0	3·7	68·0	1·0859	20·6	18·37	1·43	0·80	89·2	1·995
T. 1156	do.	37·7	4·2	64·6	1·0886	21·2	18·38	1·85	0·97	86·7	2·001
T. 1174	do.	43·0	6·1	61·3	1·0828	19·9	18·52	0·59	0·79	93·1	2·005
T. 1126	do.	58·9	3·8	65·0	1·0846	20·3	18·49	0·98	0·83	91·1	2·005
T. 1075	do.	68·7	5·3	63·2	1·0846	20·3	18·49	0·71	1·10	91·1	2·005
T. 1239	do.	139·0	6·9	64·8	1·0850	20·4	18·48	1·22	0·70	90·6	2·005
T. 1150	do.	58·0	5·3	61·4	1·0850	20·4	18·58	0·91	0·91	91·1	2·016
T. 1086	do.	71·5	4·5	67·5	1·0860	20·8	18·60	1·22	0·98	89·4	2·021
T. 1200	do.	73·8	5·9	67·0	1·0841	20·2	18·64	0·94	0·62	92·3	2·021
T. 1172	do.	47·5	5·3	64·5	1·0864	20·7	18·70	0·73	1·27	90·3	2·031
T. 1133	do.	44·0	4·0	66·2	1·0855	20·5	18·76	1·09	0·65	91·5	2·036
T. 1130	do.	37·2	3·7	67·4	1·0855	20·5	18·81	0·82	0·87	91·7	2·042
T. 1113	do.	58·5	2·9	64·5	1·0855	20·5	18·81	1·19	0·50	91·7	2·042
T. 1224	do.	101·0	5·6	65·6	1·0850	20·4	18·87	0·78	0·75	92·5	2·047
T. 1099	do.	72·6	3·5	64·6	1·0828	19·9	18·91	0·71	0·28	95·0	2·047
T. 1188	do.	50·0	4·2	68·5	1·0859	20·6	18·90	0·86	0·84	91·7	2·052
T. 1110	do.	58·5	6·5	64·7	1·0868	20·8	18·94	1·14	0·72	91·0	2·058
T. 1076	do.	42·0	2·8	64·0	1·0864	20·7	19·08	0·53	1·09	92·2	2·073
T. 1251	do.	77·1	5·1	64·2	1·0886	21·2	19·19	1·00	1·01	90·5	2·089
T. 1158	do.	52·0	4·0	62·9	1·0886	21·2	19·21	1·43	0·56	90·6	2·091

TABLE II.—TRINIDAD SEEDLINGS RAISED IN 1920.—FIRST YEAR'S SELECTION.—*Continued.*

CANE.	PARENT.	Weight of Stool.	Average weight of Canes.	JUICE.							
				Per cent. extracted.	Specific gravity.	Brix.	Percentage of			Quotient of Purity.	Sucrose per gallon.
							Sucrose.	Glucose.	Non-Sugar.		
		lb.	lb.								lb.
T. 1220 ..	M.P. 55 ..	58·5	4·5	63·9	1·0877	21·0	19·25	0·71	1·04	91·7	2·094
T. 1218 ..	do. ..	59·2	5·9	60·5	1·0895	21·4	19·27	1·25	0·88	90·0	2·099
T. 1065 ..	do. ..	95·5	6·8	65·7	1·0877	21·0	19·44	0·92	0·65	92·5	2·114
T. 1189 ..	do. ..	37·7	4·2	65·2	1·0873	20·9	19·45	0·77	0·68	93·1	2·115
T. 1178 ..	do. ..	42·7	3·3	66·8	1·0877	21·0	19·49	0·94	0·57	92·6	2·120
T. 1109 ..	do. ..	83·9	4·9	63·0	1·0895	21·4	19·46	0·88	1·06	90·9	2·120
T. 1154 ..	do. ..	63·2	5·7	66·3	1·0891	21·3	19·51	0·91	0·88	91·6	2·125
T. 1217 ..	do. ..	77·0	7·0	65·8	1·0904	21·6	19·54	0·98	1·08	90·5	2·131
T. 1283 ..	do. ..	107·0	8·9	66·1	1·0909	21·7	19·58	1·07	1·05	90·2	2·136
T. 1221 ..	do. ..	62·0	4·4	64·1	1·0900	21·5	19·64	1·00	0·86	91·3	2·141
T. 1198 ..	do. ..	60·4	5·4	66·0	1·0895	21·4	19·75	0·96	0·69	92·3	2·152
T. 1222 ..	do. ..	89·0	4·9	62·6	1·0891	21·3	19·85	0·82	0·63	93·2	2·162
T. 1260 ..	do. ..	131·2	6·2	67·4	1·0914	21·8	19·95	0·92	0·93	91·5	2·177
T. 1236 ..	do. ..	65·0	5·0	66·1	1·0895	21·4	20·18	0·48	0·74	94·3	2·199

Owing to the large number of promising seedlings obtained from the 1920 lot it has been found necessary to adopt a much higher standard than that of previous years. No seedlings, whose juice contained less than 1·700 lb. sucrose per gallon, have been retained for further trial unless the stools were exceptionally large or the canes very fine specimens. It will be seen from the above that the bulk of the good seedlings were raised from the Bourbon, H.P. and M.P. 55.

When the stools of these selected varieties have grown up, cuttings will be planted in plots about October-November and grown in competition with standard varieties, such as B. 156, Badilla, Ba. 6032 and B.H. 10 (12). From the results obtained a further selection will be made, only those varieties which give very good results will be kept and planted in larger plots.

TRINIDAD SEEDLINGS RAISED IN 1919.

Ou of the seedlings raised in 1919, fifty-eight were selected from their combined field characters and analytical results for further trial in plots. Fifty-one of these were planted out, in Field 15, on November 3, 1921, the other seven were discarded as the stools showed signs of disease or had died out.

Re-selection of seedlings raised in 1919.

As stated in a previous report (1) seedlings which do not grow into sufficiently large stools, during their first year's growth, to warrant their being tested, are allowed to grow into ratoons after the canes have been cut out. Fifty of the 1919 seedlings grew into fair stools as ratoons. The canes were accordingly sampled and the juice analysed on May 2 and 3, 1922, when they were approximately twelve months old.

1.) *Bull. Dept. Agr.*, Trinidad and Tobago, XIX, 191, 1922.

The results of the ten most promising seedlings from this selection are given in the following table :—

TABLE III.—TRINIDAD SEEDLINGS RAISED IN 1919.—SELECTED FROM THE RATOON STOOL.

CANE.	Parent.	Weight of Stool.	Average weight of Canes.	JUICE.							
				Per cent. extracted.	Specific gravity.	Brix.	Percentage of			Quotient of Purity.	Sucrose per gallon.
							Sucrose.	Glucose.	Non-Sugar.		
		lb.	lb.								lb.
T. 1032 ..	Ba. 7924 ..	75·3	2·3	65·4	1·0850	20·4	18·72	1·14	0·54	91·7	2·031
T. 1030 ..	D. 109 x H.? ..	93·0	2·0	63·2	1·0891	21·3	19·18	1·16	0·96	90·0	2·089
T. 1044 ..	L. 511 ..	49·8	2·2	68·7	1·0850	20·4	18·91	0·81	0·68	92·7	2·052
T. 1046 ..	do. ..	61·4	2·4	69·9	1·0954	22·7	21·40	0·43	0·87	94·3	2·344
T. 1041 ..	do. ..	38·2	2·2	66·0	1·0959	22·8	21·68	0·71	0·41	95·1	2·376
T. 1007 ..	H.? ..	55·5	5·0	60·6	1·0832	20·0	18·03	0·85	1·12	90·1	1·953
T. 1022 ..	do. ..	65·4	3·1	66·7	1·0824	19·8	18·10	0·91	0·79	91·4	1·959
T. 1027 ..	do. ..	59·9	2·4	65·6	1·0837	20·1	18·60	0·96	0·54	92·5	2·016
T. 1025 ..	do. ..	55·5	3·9	60·8	1·0859	20·6	19·04	0·96	0·60	92·5	2·067
T. 1009 ..	do. ..	131·0	4·5	60·3	1·0923	22·0	20·36	0·62	1·02	92·5	2·224

From this table it will be seen that, in making this selection, a much higher standard as regards the quality of the juice has been adopted than that for the first year's selection of seedlings. Although the stools and the canes of most of these seedlings are rather small, it is considered advisable to give them a further trial owing to the high quality of the juice. T. 1046 and T. 1041 have given juice of exceptionally good quality.

Cuttings from these ten varieties will be planted out in plots about October-November, 1922 and grown in competition with the standard varieties.

Results of Tests of Varieties.

The results of the tests of varieties grown in plots which form the second part of this report may be sub-divided into two parts :—

(*a*) New Trinidad varieties obtained from seedlings raised from 1917.

(*b*) Newly introduced and other varieties.

The canes under report were grown at the Experiment Station, St. Augustine, as plant canes, first and second ratoons. Plant canes receive an application of pen manure at the rate of 15 tons per acre ; no manures were applied to ratoons. The canes received ordinary estate cultivation. Mechanical tillage, *i.e.* passing the small plough and cultivator between the cane stools, is performed in the early stages of growth. After the canes have grown too tall to be worked by implements manual labour is substituted.

During the period under review great care has been taken to eradicate the Mosaic disease. Each field was systematically examined at least once a month, all cane stools which shewed signs of the disease were dug out and removed from the field. The number of diseased cane stools which had to be dug out was much less than in the previous year. Froghoppers were practically nil and the cultivation suffered very little from root disease. The crop of canes reaped was the highest on record, viz :—1765.7 tons ; an average yield of 26.75 tons per acre.

The results obtained for plant canes are recorded in Tables IV, V and VII to IX, those from the first ratoons in Tables VI and X

to XII ; Tables XIII to XVI give the results for the seond ratoons and Tables XVII and XVIII the average results for plant canes and ratoons.

Information with regard to the date of planting and testing of the juice is given at the head of the Tables.

TRINIDAD VARIETIES.

New Trinidad varieties from Seedlings raised in 1918.— First results from Plots.

The first plot results of the Trinidad seedlings raised in 1918 are given in Table IV. Cuttings from the original stool of the seedlings which were selected for a further trial were planted in Field 12 between October 23 and November 1, 1920, and grown in competition with B. 156, B.H. 10 (12), Ba. 6032 and Badilla. The canes were sampled and the juice tested between April 18 and May 2 and the reaping was completed on May 9, 1922, when the canes were approximately 18 months old.

TABLE IV.—NEW TRINIDAD VARIETIES FROM SEEDLINGS RAISED IN 1918: PLOTS OF PLANT CANES.

Date planted .. .. October 23 to November 1, 1920 .. .. .. Field 12.
Plants reaped and tested .. .. .. April 19 to May 9, 1922 .. .. 18 months old.
Rainfall .. .. October 23, 1920 to April 30, 1922 .. .. .. 94.79 inches.

CANE.	Area under cultivation.	JUICE.								PER ACRE.		
		Per cent. extracted.	Specific gravity.	Brix.	Percentage of			Quotient of purity.	Sucrose per gallon.	Canes.	Juice.	Sucrose in juice.
					Sucrose.	Glucose.	Non-Sugar.					
	Sq. ft.								lb.	Tons.	Gals.	Tons.
T. 718 ..	990	64.0	1.0891	21.3	19.51	1.00	0.79	91.6	2.125	47.85	6,298	5.97
T. 594 ..	990	69.2	1.0868	20.8	18.94	0.76	1.10	91.0	2.058	37.95	5,413	4.97
T. 617 ..	330	65.0	1.0832	20.0	18.37	0.78	0.85	91.8	1.990	41.25	5,545	4.93
T. 519 ..	880	65.5	1.0801	19.3	17.27	0.69	1.34	89.5	1.865	43.31	5,883	4.90
T. 547 ..	440	63.1	1.0850	20.4	18.39	1.12	0.89	90.1	1.995	42.07	5,480	4.88
T. 650 ..	440	67.3	1.0792	19.1	17.52	1.00	0.58	92.1	1.891	40.84	5,705	4.82
T. 595 ..	990	68.4	1.0832	20.0	18.03	1.14	0.83	90.1	1.953	38.50	5,446	4.75
T. 619 ..	440	67.0	1.0779	18.8	16.33	1.56	0.91	86.9	1.760	43.31	6,030	4.74
T. 720 ..	990	66.2	1.0797	19.2	16.26	1.92	1.02	84.7	1.755	43.45	5,967	4.67
T. 667 ..	880	66.7	1.0855	20.5	18.76	1.22	0.52	91.5	2.036	37.12	5,109	4.64
T. 552 ..	340	65.8	1.0841	20.2	18.07	1.51	0.62	89.4	1.959	38.43	5,225	4.57
T. 715 ..	990	69.1	1.0792	19.1	17.18	1.39	0.53	89.9	1.854	37.95	5,443	4.50
P. 156 ..	**1,100**	**66.0**	**1.0792**	**19.1**	**16.31**	**1.92**	**0.87**	**85.4**	**1.760**	**41.58**	**5,696**	**4.47**
T. 596 ..	880	69.8	1.0864	20.7	18.94	0.92	0.84	91.5	2.058	33.41	4,808	4.42
T. 708 ..	990	67.4	1.0797	19.2	17.42	1.04	0.74	90.7	1.881	37.40	5,230	4.39
T. 734 ..	990	65.9	1.0766	18.5	16.50	0.98	1.02	89.2	1.776	40.15	5,505	4.36
T. 737 ..	990	70.1	1.0775	18.7	16.53	1.61	0.56	88.4	1.781	37.40	5,450	4.33
T. 735 ..	990	70.9	1.0828	19.9	17.80	1.22	0.88	89.4	1.927	34.10	5,001	4.30
T. 578 ..	440	68.8	1.0757	18.3	15.74	1.26	1.30	86.0	1.693	39.60	5,673	4.29
T. 658 ..	990	64·7	1.0744	18.0	15.18	1.67	1.15	84.3	1.631	42.90	5,787	4.21

TABLE IV.—NEW TRINIDAD VARIETIES, FROM SEEDLINGS RAISED IN 1918: PLOTS OF PLANT CANES.—*Continued.*

CANE.	Area under cultivation.	JUICE.								PER ACRE.		
		Per cent. extracted.	Specific gravity.	Brix.	Percentage of			Quotient of purity.	Sucrose per gallon.	Canes.	Juice.	Sucrose in juice.
					Sucrose.	Glucose.	Non-Sugar.					
	Sq. ft.								lb.	Tons.	Gals.	Tons.
T. 512 ..	330	67.4	1.0841	20.2	18.02	1.12	1.06	89.2	1.953	34.65	4,825	4.21
T. 741 ..	990	66.7	1.0739	17.9	13.39	2.00	2.51	74.8	1.438	46.20	6,428	4.13
T. 585 ..	440	65.1	1.0864	20.7	18.27	1.20	1.23	88.3	1.985	34.65	4,651	4.12
T. 608 ..	440	68.0	1.0886	21.2	18.76	1.39	1.05	88.5	2.042	32.17	4,501	4.10
B.H. 10 (12) ..	**1,100**	**64.0**	**1.0337**	**20.1**	**17.59**	**1.12**	**1.59**	**87.5**	**1.906**	**36.13**	**4,779**	**4.07**
T. 600 ..	990	69.3	1.0819	19.7	17.04	1.12	1.54	86.5	1.843	34.10	4,893	4.02
T. 725 ..	990	66.6	1.0864	20.7	18.22	1.35	1.13	88.0	1.979	33.00	4,531	4.00
T. 637 ..	990	66.0	1.0855	20.5	18.62	1.11	0.77	90.8	2.021	32.45	4,419	3.99
T. 622 ..	880	66.8	1.0824	19.8	17.86	1.25	0.69	90.2	1.933	33.41	4,619	3.98
T. 591 ..	880	67.7	1.0846	20.3	18.25	0.61	1.44	89.9	1.979	32.17	4,498	3.97
Ba. 6032 ..	**1,100**	**65.4**	**1.0757**	**18.3**	**16.37**	**1.22**	**0.71**	**89.4**	**1.761**	**40.09**	**5,054**	**3.97**
T. 588 ..	770	66.7	1.0783	18.9	16.42	1.33	1.15	86.9	1.770	36.06	4,996	3.95
T. 607 ..	880	64.9	1.0792	19.1	17.38	0.83	0.89	91.0	1.876	34.65	4,668	3.91
T. 738 ..	990	68.0	1.0819	19.7	17.33	1.56	0.81	88.0	1.875	33.00	4,646	3.89
T. 590 ..	990	69.2	1.0819	19.7	18.01	0.53	1.16	91.4	1.948	30.80	4,413	3.84
T. 520 ..	440	69.6	1.0757	18.3	15.40	1.55	1.35	84.1	1.656	35.89	5,202	3.84
T. 673 ..	440	65.8	1.0775	18.7	16.73	1.02	0.95	89.5	1.803	34.65	4,740	3.81
T. 657 ..	990	61.7	1.0841	20.2	17.69	1.67	0.85	87.5	1.917	34.65	4,417	3.78
T. 573 ..	440	64.6	1.0797	19.2	16.79	1.37	1.04	87.4	1.813	34.65	4,644	3.76
T. 604 ..	1,100	70.8	1.0859	20.6	18.71	0.96	0.93	90.8	2.032	28.21	4,120	3.74
T. 621 ..	990	66.4	1.0776	18.5	16.02	1.72	0.76	86.6	1.725	35.20	4,863	3.74
T. 711 ..	990	60.3	1.0859	20.6	18.85	0.88	0.85	91.5	2.047	32.45	4,025	3.68
T. 509 ..	200	67.3	1.0841	20.2	18.26	0.88	1.06	90.4	1.979	29.95	4,165	3.68
T. 561 ..	770	61.2	1.0788	19.0	16.90	1.23	0.87	88.9	1.823	35.36	4,493	3.66

TABLE IV.—NEW TRINIDAD VARIETIES, FROM SEEDLINGS RAISED IN 1918: PLOTS OF PLANT CANES.—*Continued*.

CANE.	Area under cultivation.	JUICE.								PER ACRE.		
		Per cent. extracted.	Specific gravity.	Brix.	Percentage of			Quotient of purity.	Sucrose per gallon.	Canes.	Juice.	Sucrose in juice.
					Sucrose.	Glucose.	Non-Sugar.					
	Sq. ft.								lb.	Tons.	Gals.	Tons.
T. 542 ..	990	67.6	1.0730	17.7	14.71	1.50	1.49	83.1	1.578	36.30	5,123	3.61
T. 634 ..	990	66.6	1.0722	17.5	14.92	1.92	0.66	85.2	1.600	35.75	4,974	3.55
T. 638 ..	990	58.0	1.0828	19.9	17.68	2.00	0.82	85.8	1.849	35.75	4,289	3.54
T. 627 ..	880	65.9	1.0882	21.1	19.67	0.67	0.76	93.2	2.140	27.22	3,692	3.53
T. 577 ..	990	67.3	1.0744	18.0	15.13	1.65	1.22	84.0	1.625	34.65	4,862	3.53
T. 554 ..	990	67.1	1.0709	17.2	14.06	1.71	1.43	81.7	1.506	37.40	5,249	3.53
T. 661 ..	440	64.4	1.0779	18.8	16.33	1.67	0.80	86.8	1.760	33.41	4,471	3.51
T. 574 ..	990	64.1	1.0761	18.4	15.44	1.55	1.41	83.9	1.661	34.65	4,623	3.43
T. 599 ..	990	67.5	1.0753	18.2	14.39	1.92	1.89	79.1	1.547	35.20	4,949	3.42
T. 651 ..	880	65.5	1.0914	21.8	20.05	0.94	0.81	92.0	2.188	25.99	3,494	3.41
T. 714 ..	990	66.0	1.0810	19.5	16.67	1.78	1.05	85.5	1.802	30.80	4,212	3.39
T. 513 ..	440	66.4	1.0761	18.4	15.83	1.37	1.20	86.0	1.703	32.17	4,446	3.38
Badilla ..	**1,100**	**58.7**	**1.0945**	**22.5**	**20.71**	**0.80**	**0.99**	**92.0**	**2.267**	**27.72**	**3,330**	**3.37**
T. 668 ..	880	64.4	1.0859	20.6	18.61	1.16	0.83	90.3	2.021	27.84	3,698	3.34
T. 532 ..	440	62.9	1.0792	19.1	16.51	1.45	1.14	86.4	1.782	32.17	4,200	3.34
T. 631 ..	990	66.8	1.0770	18.6	16.93	0.78	0.89	91.0	1.823	28.60	3,973	3.23
T. 630 ..	990	63.4	1.0722	17.5	14.92	1.78	0.80	85.2	1.600	34.10	4,517	3.23
T. 582 ..	770	67.2	1.0859	20.6	18.80	0.60	1.20	91.3	2.041	25.46	3,529	3.21
T. 593 ..	880	62.4	1.0801	19.3	16.88	1.14	1.28	87.5	1.825	30.32	3,924	3.19
T. 727 ..	880	68.5	1.0846	20.3	18.54	0.92	0.84	91.3	2.011	24.75	3,501	3.14
T. 566 ..	880	68.5	1.0730	17.7	15.10	1.41	1.19	85.3	1.620	30.32	4,336	3.13
T. 556 ..	330	60.7	1.0779	18.8	15.32	1.92	1.56	81.5	1.651	33.00	4,163	3.07
T. 569 ..	990	67.6	1.0783	18.9	17.15	1.00	0.75	90.8	1.849	26.40	3,707	3.06
T. 693 ..	440	63.6	1.0730	17.7	14.32	1.85	1.53	80.9	1.536	33.41	4,436	3.04
T. 571 ..	440	64.2	1.0717	17.4	14.48	1.45	1.47	83.2	1.552	32.17	4,317	2.99

TABLE IV.—NEW TRINIDAD VARIETIES, FROM SEEDLINGS RAISED IN 1918: PLOTS OF PLANT CANES.—*Continued.*

CANE.	Area under cultivation.	JUICE.								PER ACRE.		
		Per cent. extracted.	Specific gravity.	Brix.	Percentage of			Quotient of purity.	Sucrose per gallon.	Canes.	Juice.	Sucrose in juice.
					Sucrose.	Glucose.	Non-Sugar.					
	Sq. ft.								lb.	Tons.	Gals.	Tons.
T. 687 ..	440	64.6	1.0704	17.1	13.82	2.38	0.90	80.8	1.479	33.41	4,516	2.98
T. 584 ..	880	67.6	1.0815	19.6	16.18	1.41	2.01	82.5	1.750	27.22	3,811	2.97
T. 625 ..	280	64.7	1.0792	19.1	16.80	0.81	1.49	87.9	1.813	27.22	3,655	2.96
T. 614 ..	440	67.0	1.0815	19.6	16.86	1.67	1.07	86.0	1.825	25.99	3,607	2.93
T. 548 ..	440	67.0	1.0770	18.6	16.01	1.26	1.33	86.1	1.724	27.22	3,793	2.92
T. 549 ..	440	66.4	1.0748	18.1	15.46	1.50	1.14	85.4	1.662	28.46	3,929	2.91
T. 581 ..	990	67.5	1.0792	19.1	16.89	0.96	1.25	88.4	1.823	25.30	3,545	2.88
T. 550 ..	360	64.1	1.0779	18.8	16.53	1.35	0.92	87.9	1.782	27.22	3,636	2.88
T. 675 ..	440	68.1	1.0788	19.0	16.22	2.08	0.70	85.4	1.750	25.99	3,675	2.87
T. 646 ..	330	67.5	1.0682	16.6	14.14	1.72	0.74	85.2	1.510	29.70	4,204	2.83
T. 676 ..	990	62.7	1.0753	18.2	14.73	2.00	1.47	80.9	1.584	30.25	3,951	2.79
T. 526 ..	110	65.0	1.0713	17.3	14.44	1.41	1.45	83.5	1.547	29.70	4,036	2.79
T. 745 ..	440	66.6	1.0837	20.1	17.59	1.43	1.08	87.5	1.906	23.51	3,236	2.75
T. 531 ..	880	67.4	1.0717	17.4	14.24	1.65	1.51	81.8	1.526	28.46	4,009	2.73
T. 632 ..	990	64.5	1.0700	17.0	12.90	2.00	1.60	75.9	1.380	32.45	4,382	2.70
T. 603 ..	770	68.9	1.0932	22.2	20.39	0.62	1.19	91.8	2.229	19.09	2,695	2.68
T. 572 ..	220	66.4	1.0687	16.7	13.60	1.85	1.25	81.4	1.453	29.70	4,133	2.68
T. 739 ..	440	68.2	1.0859	20.6	18.61	1.35	0.64	90.3	2.021	21.04	2,960	2.67
T. 722 ..	440	69.0	1.0783	18.9	16.33	1.47	1.10	86.4	1.761	23.51	3,370	2.65
T. 592 ..	880	61.7	1.0900	21.5	19.74	0.70	1.06	91.8	2.152	21.66	2,746	2.64
T. 663 ..	990	65.8	1.0730	17.7	13.79	1.85	2.06	77.9	1.480	29.15	4,004	2.64
T. 748 ..	440	59.8	1.0882	21.1	18.62	1.39	1.09	88.2	2.026	23.51	2,894	2.62
T. 533 ..	440	59.6	1.0824	19.8	18.34	0.52	0.94	92.6	1.985	23.51	2,900	2.57
T. 515 ..	285	60.1	1.0788	19.0	16.95	1.25	0.80	89.2	1.828	24.84	3,100	2.53
T. 589 ..	440	62.6	1.0882	21.1	19.48	0.50	1.12	92.3	2.121	19.80	2,551	2.41

TABLE IV.—NEW TRINIDAD VARIETIES, FROM SEEDLINGS RAISED IN 1918: PLOTS OF PLANT CANES.—*Continued.*

CANE.	Area under cultivation.	JUICE.								PER ACRE.		
		Per cent. extracted.	Specific gravity.	Brix.	Percentage of			Quotient of purity.	Sucrose per gallon.	Canes.	Juice.	Sucrose in juice.
					Sucrose.	Glucose.	Non-Sugar.					
	Sq. ft.								lb.	Tons.	Gals.	Tons.
T. 517 ..	440	64.1	1.0792	19.1	16.80	1.02	1.28	87.9	1.813	22.27	2,963	2.40
T. 636 ..	440	64.9	1.0757	18.3	16.56	1.00	0.74	90.5	1.781	22.27	3,010	2.39
T. 527 ..	660	66.0	1.0700	17.0	13.73	1.78	1.49	80.8	1.469	26.40	3,648	2.39
T. 597 ..	990	59.5	1.0841	20.2	17.01	1.67	1.52	84.2	1.844	22.55	2,772	2.28
T. 612 ..	440	64.9	1.0923	22.0	20.12	0.87	1.01	91.4	2.197	17.32	2,305	2.26
T. 601 ..	990	63.6	1.0828	19.9	17.80	1.11	0.99	89.4	1.927	19.80	2,605	2.24
T. 665 ..	990	58.7	1.0757	18.3	14.87	2.00	1.43	81.2	1.599	25.30	3,092	2.21
T. 605 ..	400	63.9	1.0868	20.8	19.22	0.83	0.75	92.4	2.090	17.69	2,330	2.17
T. 696 ..	440	65.5	1.0722	17.5	14.77	1.61	1.12	84.4	1.584	22.27	3,047	2.15
T. 514 ..	880	67.7	1.0523	12.9	8.56	2.28	2.06	66.3	0.901	35.89	5,172	2.08
T. 655 ..	325	63.1	1.0828	19.9	17.61	1.56	0.73	88.5	1.907	18.43	2,406	2.05
T. 666 ..	440	69.5	1.0730	17.7	13.45	2.08	2.17	76.0	1.443	21.04	3,053	1.97
T. 618 ..	330	60.9	1.0832	20.0	17.70	1.72	0.58	88.5	1.917	18.15	2,286	1.96
T. 643 ..	330	63.6	1.0775	18.7	16.73	0.82	1.15	89.5	1.803	18.15	2,400	1.93
T. 598 ..	550	61.1	1.0855	20.5	18.28	1.02	1.20	89.2	1.984	16.83	2,122	1.88
T. 640 ..	550	69.5	1.0819	19.7	17.81	0.96	0.93	90.4	1.927	14.85	2,137	1.84
T. 683 ..	440	59.4	1.0722	17.5	14.58	1.78	1.14	83.3	1.563	21.04	2,611	1.82
T. 697 ..	440	61.0	1.0700	17.0	14.17	1.51	1.32	83.3	1.516	21.04	2,687	1.82
T. 587 ..	440	67.3	1.0674	16.4	13.52	1.45	1.43	82.4	1.442	19.80	2,796	1.80
T. 613 ..	550	65.3	1.0882	21.1	19.58	0.53	0.99	92.7	2.131	13.86	1,863	1.77
T. 606 ..	,100	62.7	1.0846	20.3	18.44	1.00	0.93	90.8	2.000	15.34	1,986	1.77
T. 654 ..	990	58.1	1.0806	19.4	15.76	2.17	1.47	81.2	1.703	19.25	2,318	1.76
T. 523 ..	550	62.4	1.0770	18.6	15.48	1.71	1.41	83.2	1.667	17.82	2,313	1.72
T. 645 ..	550	64.8	1.0783	18.9	16.67	1.43	0.80	88.2	1.797	15.84	2,132	1.71
T. 719 ..	990	64.1	1.0722	17.5	14.96	1.47	1.07	85.5	1.604	17.60	2,357	1.69

TABLE IV.—NEW TRINIDAD VARIETIES, FROM SEEDLINGS RAISED IN 1918: PLOTS OF PLANT CANES.—*Continued.*

CANE.	Area under cultivation.	JUICE.								PER ACRE.		
		Per cent. extracted.	Specific gravity.	Brix.	Percentage of			Quotient of purity.	Sucrose per gallon.	Canes.	Juice.	Sucrose in juice.
					Sucrose.	Glucose.	Non-Sugar.					
	Sq. ft.								lb.	Tons.	Gals.	Tons.
T. 609 ..	440	66.6	1.0855	20.5	18.42	1.11	0.97	89.8	1.999	13.61	1,870	1.67
T. 510 ..	550	60.5	1.0770	18.6	16.40	0.73	1.47	88.2	1.766	16.83	2,118	1.67
T. 610 ..	990	64.4	1.0770	18.6	16.15	0.74	1.71	86.8	1.739	15.95	2,136	1.66
T. 678 ..	550	62.4	1.0726	17.6	15.20	1.67	0.73	86.4	1.630	16.83	2,193	1.59
T. 564 ..	990	64.3	1.0766	18.5	16.26	1.26	0.98	87.9	1.750	14.30	1,913	1.49
T. 677 ..	440	63.4	1.0819	19.7	17.19	2.00	0.51	87.2	1.860	13.61	1,786	1.48
T. 611 ..	440	65.3	1.0775	18.7	16.63	0.75	1.32	88.9	1.792	13.61	1,847	1.48
T. 716 ..	550	58.6	1.0739	17.9	16.15	0.98	1.77	90.2	1.734	14.85	1,815	1.40
T. 750 ..	330	66.4	1.0918	21.9	19.90	0.91	1.09	90.9	2.173	9.90	1,349	1.31
T. 626 ..	550	64.1	1.0695	16.9	14.08	1.67	1.15	83.3	1.506	12.87	1,728	1.16
T. 730 ..	770	64.7	1.0665	16.2	11.92	2.08	2.20	73.6	1.271	12.73	1,730	0.98
T. 583 ..	660	57.7	1.0779	18.8	16.91	0.76	1.13	89.9	1.823	5.77	692	0.56
T. 713 ..	440	48.4	1.0753	18.2	15.50	1.67	1.03	85.2	1.667	7.42	748	0.56

From the above Table it will be seen that fifty-three varieties have given better results than the Badilla, twenty-eight have done better than Ba. 6032, twenty-three have given better results than B.H. 10 (12) and twelve than B. 156. T. 718 which comes first on the list is a seedling raised from H. 146. It gave 5·97 tons of indicated sucrose in the juice per acre, *i.e.* 1·50 tons more than B. 156 which comes first among the standard varieties. T.594, T. 617, T. 519, T. 547, T. 650, T. 595, T. 619, T. 720, T. 667, T. 552 and T. 715 have also done better than B. 156 and have given from 4·50 to 4·97 tons of indicated sucrose in the juice per acre. The next eleven varieties viz :—T. 596, T. 708, T. 734, T. 737, T. 735, T. 578, T. 658, T. 512, T. 741, T. 585 and T. 608 show an indicated sucrose in the juice of from 4·10 to 4·42 tons per acre which is better than that obtained for B.H. 10 (12), the second best of the standard varieties. T. 600, T. 725, T. 637, T. 622, T. 591 and T. 588 come next. They have given practically the same results as that obtained from Ba. 6032, viz :—3·97 tons of indicated sucrose in the juice per acre. Twenty-four other varieties have also given better results than the Badilla which shows an indicated sucrose in the juice of 3·37 tons per acre. All of these varieties as also a few others which have not come up to the standard varieties in their first test, but which nevertheless possess very good qualities will be replanted in plots about October and submitted to a second trial.

Trinidad varieties from seedlings raised in 1917.
Results of Plant Canes.

Cuttings from thirteen of the most promising of the new Trinidad seedlings raised in 1917 were planted in plots on October 21, 1920 and grown in competition with the standard varieties—Badilla, B. 156, B.H 10 (12) and Ba. 6032. The canes were reaped and tested between April 10 and 18, 1922, at approximately 18 months of age. The results are given in Table V.

Table V.—Trinidad Varieties, from Seedlings Raised in 1917: Plots of Plant Canes.

Date planted .. .. October 21, 1920 .. .. Field 12.
Plants reaped and tested .. .. April 10 to 18, 1922 .. .. 18 months old.
Rainfall .. .. October 22, 1920 to April 10, 1922 .. .. 94.65 inches.

Cane.	Area under cultivation.	Juice.								Per Acre.		
		Per cent. extracted.	Specific gravity.	Brix.	Percentage of			Quotient of purity.	Sucrose per gallon.	Canes.	Juice.	Sucrose in juice.
					Sucrose.	Glucose.	Non-Sugar.					
	Sq. ft.								lb.	Tons.	Gals.	Tons.
T. 487 ..	990	67.1	1.0859	20.6	18.80	0.89	0.91	91.3	2.041	37.40	5,177	4.72
T. 496 ..	2,200	67.4	1.0832	20.0	18.51	0.83	0.66	92.5	2.005	34.15	4,760	4.26
T. 301 ..	1,760	68.0	1.0704	17.1	14.26	1.92	0.92	83.4	1.526	40.53	5,767	3.93
T. 399 ..	440	67.9	1.0810	19.5	17.35	0.98	1.17	89.0	1.875	30.94	4,353	3.64
Badilla ..	**2,200**	**61.2**	**1.0909**	**21.7**	**20.39**	**0.83**	**0.48**	**94.0**	**2.224**	**28.21**	**3,545**	**3.52**
B. 156 ..	**2,200**	**67.6**	**1.0753**	**18.2**	**15.89**	**1.50**	**0.81**	**87.3**	**1.709**	**32.67**	**4,600**	**3.51**
T. 491 ..	880	66.7	1.0797	19.2	16.16	1.55	1.49	84.2	1.745	28.46	3,938	3.07
T. 499 ..	550	69.4	1.0770	18.6	15.67	2.09	0.84	84.2	1.688	26.74	3,860	2.91
T. 407 ..	440	59.8	1.0770	18.6	16.40	1.09	1.11	88.2	1.766	29.70	3,694	2.91
T. 303 ..	1,980	67.5	1.0801	19.3	17.31	1.12	0.87	89.7	1.870	24.20	3,387	2.83
B.H. 10 (12) ..	**2.200**	**65.7**	**1.0779**	**18.8**	**16.24**	**1.78**	**0.78**	**86.4**	**1.750**	**26.48**	**3,615**	**2.82**
Ba. 6032 ..	**2,200**	**65.7**	**1.0695**	**16.9**	**14.32**	**1.29**	**1.29**	**84.7**	**1.531**	**28.21**	**3,882**	**2.65**
T. 422 ..	440	68.7	1.0713	17.3	14.54	1.60	1.16	84.0	1.560	23.51	3,377	2.35
T. 320 ..	1,320	59.8	1.0713	17.3	14.30	2.09	0.91	82.6	1.532	27.22	3,403	2.33
T. 406 ..	1,100	55.0	1.0748	18.1	15.65	1.45	1.00	86.6	1.682	24.75	2,837	2.13
T. 413 ..	440	60.2	1.0695	16.9	14.51	1.55	0.84	85.8	1.551	18.56	2,340	1.62
T. 395 ..	1,100	58.3	1.0717	17.4	14.68	1.41	1.31	84.4	1.573	15.34	1,869	1.31

From the above it will be seen that four varieties—T. 487 T. 496, T. 301 and T. 399 have given better results than the Badilla and B. 156; four others, T. 491, T. 499, T. 407 and T. 303 have done better than B.H. 10 (12) and Ba. 6032. The best of these varieties viz:—T. 487 has given 1·2 tons of indicated sucrose in the juice per acre more than either the Badilla or B. 156 and approximately 2·0 tons more than B.H. 10 (12) and Ba. 6032. T. 496 which comes next has given half a ton and 1·44 tons of sucrose per acre more than the yield obtained for B. 156 and B.H. 10 (12) respectively.

NEWLY INTRODUCED AND OTHER VARIETIES.

Comparison of the Badilla and B. 156 as Plant Canes.

On July 3, 1920, approximately two acres each of the Badilla and B. 156 were planted in Field 20 to test the relative value of these two varieties. The canes were reaped and tested between February 23 and March 1, 1922 at 19½ to 20 months of age. It will be seen (Table VI) that B. 156 has given a much better yield of canes per acre than the Badilla but that the latter has given juice of superior quality to that of B. 156. When these two factors and the extraction of the juice are taken into consideration, the Badilla shows slightly better results viz:—4·10 tons of indicated sucrose per acre as against 3·96 tons for B. 156.

Table VI.—Badilla and B. 156 as Plant Canes.

Date planted .. .. July 3, 1920 .. .. Field 20.
Plants reaped and tested .. .. .. February 23 to March 1, 1922 .. .. 19¾ months old.
Rainfall .. .. July 1, 1920 to February 28, 1922 .. .. 117.94 inches.

Cane.	Area under cultivation.	Juice.								Per Acre.		
		Per cent. extracted.	Specific gravity.	Brix.	Percentage of			Quotient of purity.	Sucrose per gallon.	Canes.	Juice.	Sucrose in juice.
					Sucrose.	Glucose.	Non-Sugar.					
	Sq. ft.								lb.	Tons.	Gals.	Tons.
Badilla ..	96,722	63.8	1.0886	21.2	19.57	0.81	0.82	92.3	2.130	32.89	4,318	4.10
B. 156 ..	83,050	67.1	1.0665	16.2	12.50	2.38	1.32	77.1	1.333	47.19	6,650	3.96

Comparison of the Badilla and B. 4934 as Plant Canes.

Plots of approximately three-quarter and half of an acre of Badilla and B. 4934 respectively were planted on July 20, 1920, in Field 16 to test the relative value of these two varieties. The canes were reaped and tested on March 4, 1922, when they were 19½ months old. From the figures recorded in Table VII, it will be seen that B. 4934 has given eleven tons more of canes per acre than the Badilla but that the juice from the latter is of much better quality. Taking into consideration the percentage of the juice extracted, the quality of the juice and the yield of canes per acre, the Badilla shows better results viz :—4·07 tons of indicated sucrose per acre as against 3·82 tons for B. 4934.

Table VII.—Badilla and B. 4934 as Plant Canes.

Date planted .. .. July 20, 1920 .. .. Field 16
Plants reaped and tested .. .. .. March 4, 1922 .. .. 19½ months old.
Rainfall .. .. July 16, 1920 to February 23, 1922 .. .. 113.88 inches.

Cane.	Area under cultivation.	Juice.								Per Acre.		
		Per cent. extracted.	Specific gravity.	Brix.	Percentage of			Quotient of purity.	Sucrose per gallon.	Canes.	Juice.	Sucrose in juice.
					Sucrose.	Glucose.	Non-Sugar.					
	Sq. ft.								lb.	Tons.	Gals.	Tons.
Badilla ..	32,568	64.3	1.0801	19.3	17.36	1.09	0.85	89.9	1.875	36.46	4,862	4.07
B. 4934 ..	21,731	66.6	1.0591	14.5	12.05	1.43	1.02	83.1	1.276	47.66	6,713	3.82

VARIETIES FROM VARIOUS SOURCES.—PLOTS OF PLANT CANES.

Twenty-five varieties were planted in Field 12 between October 12 and 20, 1920, including seven of the Ste. Madeleine seedlings and one from the Brechin Castle Estate, in plots of approximately one-fifth of an acre. The plots of B.H. 10 (12), H.P and B.S.F. 12 (27) were slightly more than one-third of an acre each. The canes were reaped and tested between March 30 and April 12, 1922, at approximately 17½ months of age. Owing to the poor quality of the juice from the first samples tested, all of these varieties were re-sampled and the juice tested a second time. The analytical results given, under Table VIII, are the averages of the two tests made. Generally the field returns were good but on the whole the quality of the juice was very poor.

The best results were obtained from B. 6388, followed by Q. Badilla U, B 156, 55 $\frac{AR}{N}$ B., B.H. 10 (12), B. 6308 Badilla, Q. Badilla A. and T. 202 all of which show an indicated sucrose in the juice of from 4.08 to 4.92 tons per acre. Twelve other varieties show over 3 tons per acre of indicated sucrose in the juice, viz :—H.P, Uba, B.S.F. 12 (24) 26 $\frac{AR}{N}$ B. B.C. seedling, D. 504, B.S.F. 12 (27), Ba. 7924, L. 511, Q. Badilla D., B. 4934 and D. 109.

Table VIII.—Introduced and other Varieties.—Plant Canes.

Date planted .. .. October 12 to 20, 1920 .. .. .. Field 12.
Plants reaped and tested .. .. .. March 30 to April 12, 1922 .. .. .. 17½ months old.
Rainfall .. .. October 12, 1920 to March 31, 1922 .. .. 96.24 inches.

Cane.	Area under cultivation.	Juice.								Per Acre.		
		Per cent. extracted.	Specific gravity.	Brix.	Percentage of			Quotient of purity.	Sucrose per gallon.	Canes.	Juice	Sucrose in juice.
					Sucrose.	Glucose.	Non-Sugar.					
	Sq. ft.								lb.	Tons.	Gals.	Tons.
B. 6388 ..	8,932	67.5	1.0797	19.2	16.38	2.00	0.82	85.3	1.768	44.56	6,240	4.92
Q. Badilla U. ..	8,910	68.9	1.0700	17.0	13.80	2.35	0.85	81.2	1.477	50.72	7,316	4.82
B. 156 ..	8,932	68.9	1.0691	16.8	12.43	2.28	2.09	74.0	1.329	53.83	7,771	4.61
AR 55—B. N ..	8,888	66.7	1.0717	17.4	14.23	1.96	1.21	81.8	1.525	48.39	6,746	4.59
B.H. 10 (12) ..	17,820	67.0	1.0783	18.9	15.12	1.55	2.23	80.0	1.630	44.92	6,252	4.55
B. 6308 ..	8,932	67.6	1.0748	18.1	15.24	1.74	1.12	84.2	1.638	44.14	6,219	4.55
Badilla ..	8,910	63.9	1.0797	19.2	16.93	1.45	0.82	88.2	1.828	39.97	5,299	4.32
Q. Badilla A. ..	8,888	64.1	1.0687	16.7	12.11	2.40	2.19	72.5	1.294	54.09	7,267	4.20
T. 202 ..	8,866	66.9	1.0824	19.8	17.73	1.31	0.76	89.5	1.919	34.39	4,761	4.08
H.? ..	17,820	64.1	1.0761	18.4	15.78	1.52	1.10	85.8	1.698	39.17	5,226	3.96
Uba. ..	8,932	63.9	1.0691	16.8	11.79	2.40	2.61	70.2	1.260	51.27	6,864	3.86
B.S.F. 12 (24) ..	8,932	70.8	1.0713	17.3	13.59	2.18	1.53	78.5	1.456	39.93	5,911	3.84
AR 26—B. N ..	8,888	66.4	1.0617	15.1	10.94	2.53	1.63	72.4	1.162	52.31	7,328	3.80

TABLE VIII.—INTRODUCED AND OTHER VARIETIES.—PLANT CANES.—*Continued.*

CANE.	Area under cultivation.	JUICE.								PER ACRE.		
		Per cent. extracted	Specific gravity.	Brix.	Percentage of			Quotient of purity.	Sucrose per gallon.	Canes.	Juice.	Sucrose in juice.
					Sucrose.	Glucose.	Non-Sugar.					
	Sq. ft.								lb.	Tons.	Gals.	Tons.
B.C. Seedling ..	8,866	67.2	1.0801	19.3	16.49	1.65	1.16	85.4	1.781	33.65	4,690	3.73
D. 504 ..	8,910	63.5	1.0797	19.2	15.97	2.16	1.07	83.2	1.724	36.30	4,782	3.68
B.S.F. 12 (27) ..	17,864	67.4	1.0726	17.6	12.84	2.31	2.45	72.9	1.377	41.97	5,907	3.63
Ba. 7924 ..	8,932	66.2	1.0744	18.0	15.76	1.32	0.92	87.5	1.693	34.20	4,720	3.57
L. 511 ..	8,910	68.2	1.0832	20.0	18.04	1.06	0.90	90.2	1.954	28.84	4,067	3.55
Q. Badilla D. ..	8,910	64.1	1.0691	16.8	12.23	2.40	2.17	72.8	1.307	44.12	5,925	3.46
B. 4934 ..	8,932	64.7	1.0665	16.2	13.50	1.57	1.13	83.3	1.440	38.04	5,169	3.32
D. 109 ..	8,910	68.7	1.0613	15.0	10.95	2.18	1.87	73.0	1.162	41.62	6,035	3.13
Q. Badilla E. ..	8,910	67.4	1.0695	16.9	13.32	2.15	1.43	78.8	1.424	32.75	4,623	2.94
Ba. 6032 ..	8,932	67.0	1.0656	16.0	12.22	2.13	1.65	76.4	1.302	35.23	4,962	2.88
Q. Badilla C. ..	8,888	68.0	1.0583	14.3	9.75	2.53	2.02	68.2	1.032	38.04	5,475	2.52
Bourbon ..	8,932	70.9	1.0656	16.0	11.73	2.34	1.93	73.3	1.250	26.64	3,970	2.21

Trinidad varieties from Seedlings raised in 1917.
Results of Ratoon Canes

The first plot results, as ratoons, of the Trinidad Seedlings raised in 1917 are given in Table IX. The plant canes were reaped from May 11 to 16, 1921, at 18½ months of age and the first ratoons from May 11 to 17, 1922 when they were 12 months old. The best results were obtained from T. 493, T. 455 and T. 301, all of which have given a yield per acre of over 30 tons of canes containing more than 4 tons of sucrose. T. 491, T. 496 and T. 487 are also promising varieties which have given a yield of over 20 tons of canes containing more than 2·75 tons of sucrose in the juice per acre.

Table IX.—Trinidad Varieties, from Seedlings Raised in 1917: Plots of First Ratoons.

Date planted .. .. November 4, 1919 .. .. Field 13.
Plants reaped and tested .. .. .. May 11 to 16, 1921 .. .. .. • 18 months old.
Ratoons reaped and tested .. .. May 11 to 17, 1922 .. .. 12 months old.
Rainfall .. .. May 11, 1921 to May 16, 1922 .. .. .. 75.64 inches.

Cane.	Area under cultivation.	Juice.								Per Acre.		
		Per cent. extracted.	Specific gravity.	Brix.	Percentage of			Quotient of Purity.	Sucrose per gallon.	Canes.	Juice.	Sucrose in juice.
					Sucrose.	Glucose.	Non-Sugar.					
	Sq. ft.								lb.	Tons.	Gals.	Tons.
T. 499 ..	819	70.5	1.0828	19.9	16.74	2.17	0.99	84.1	1.813	41.88	6,108	4.94
T. 455 ..	220	62.1	1.0932	22.2	20.30	0.85	1.05	91.4	2.219	37.12	4,723	4.68
T. 301 ..	1,650	70.9	1.0783	18.9	17.25	1.43	0.22	91.3	1.860	33.99	5,006	4.16
T. 409 ..	55	55.8	1.0841	20.2	17.25	1.51	1.44	85.4	1.870	39.60	4,566	3.81
T. 412 ..	275	61.7	1.0868	20.5	18.12	2.17	0.51	87.1	1.969	33.66	4,280	3.76
T. 370 ..	220	69.1	1.0766	18.5	15.73	1.35	1.42	85.0	1.693	34.65	4,982	3.76
T. 402 ..	220	65.0	1.0832	20.0	17.50	1.31	1.19	87.5	1.896	29.70	3,992	3.38
T. 491 ..	330	66.8	1.0859	20.6	17.99	1.39	1.22	87.3	1.953	28.05	3,865	3.37
T. 368 ..	440	70.4	1.0766	18.5	15.19	2.08	1.23	82.1	1.635	30.94	4,532	3.31
T. 395 ..	385	60.3	1.0855	20.5	18.23	1.22	1.05	88.9	1.979	29.70	3,696	3.26
T. 488 ..	220	66.8	1.0877	21.0	18.63	1.51	0.86	88.7	2.026	24.75	3,405	3.08
T. 406 ..	440	62.6	1.0832	20.0	17.84	1.28	0.88	89.2	1.932	27.22	3,524	3.04
T. 422 ..	577	67.1	1.0753	18.2	15.50	1.61	1.09	85.2	1.667	29.25	4,088	3.04
T. 373 ..	275	68.5	1.0850	20.4	18.48	0.92	1.00	90.6	2.005	23.76	3,360	3.01
T. 496 ..	1,485	65.2	1.0841	20.2	18.11	1.11	0.98	89.6	1.963	25.30	3,408	2.99
T. 407 ..	550	61.2	1.0909	21.7	20.05	0.86	0.79	92.4	2.187	23.76	2,986	2.91
T. 487 ..	907	63.2	1.0941	22.4	20.95	0.73	0.72	93.5	2.293	21.01	2,718	2.78
T. 329 ..	220	68.9	1.0819	19.7	18.01	0.71	0.98	91.4	1.948	22.27	3,177	2.76
T. 452 ..	220	65.1	1.0859	20.6	18.23	1.78	0.59	88.5	1.979	22.27	2,991•	2.65
T. 502 ..	660	71.6	1.0682	16.6	11.41	2.50	2.69	68.7	1.219	19.80	2,973	2.63

TABLE IX.—TRINIDAD VARIETIES, FROM SEEDLINGS RAISED IN 1917: PLOTS OF FIRST RATOONS.—*Continued.*

[CANE.	Area under cultivation.	JUICE.								PER ACRE.		
		Per cent. extracted.	Specific gravity.	Brix.	Percentage of			Quotient of Purity.	Sucrose per gallon.	Canes.	Juice.	Sucrose in juice.
					Sucrose.	Glucose.	Non-Sugar.					
	Sq. ft.								lb.	Tons.	Gals.	Tons.
T. 372 ..	357	63.5	1.0824	19.8	16.84	1.78	1.18	85.0	1.823	24.40	3,206	2.60
T. 503 ..	247	68.3	1.0797	19.2	16.02	2.00	1.18	83.4	1.730	22.04	3,123	2.41
T. 413 ..	330	61.9	1.0832	20.0	17.84	1.35	0.81	89.2	1.932	21.45	2,746	2.37
T. 420 ..	275	59.1	1.0766	18.5	14.37	2.38	1.75	77.7	1.547	27.72	3,408	2.35
T. 424 ..	330	66.0	1.0739	17.9	15.37	1.51	1.02	85.8	1.650	23.10	3,180	2.34
T. 459 ..	440	62.3	1.0837	20.1	18.03	1.47	0.60	89.7	1.954	19.80	2,550	2.22
T. 350 ..	715	66.9	1.0753	18.2	15.36	1.92	0.92	84.4	1.652	21.32	2,971	2.19
T. 399 ..	1,017	62.9	1.0864	20.7	18.99	0.55	1.16	91.7	2.063	17.66	2,290	2.11
T. 381 ..	275	67.6	1.0730	17.7	15.34	1.72	0.64	86.7	1.646	17.82	2,515	1.85
T. 457 ..	165	62.7	1.0964	22.9	21.00	0.85	1.05	91.7	2.302	13.20	1,691	1.74
T. 303 ..	1,210	62.9	1.0748	18.1	15.75	1.43	0.92	87.0	1.693	14.58	1,911	1.44
T. 320 ..	687	69.1	1.0669	16.3	13.04	2.17	1.09	80.0	1.391	15.85	2,299	1.43
T. 489 ..	110	65.6	1.0895	21.4	19.70	1.19	0.51	92.0	2.146	9.90	1,335	1.28
T. 302 ..	137	68.3	1.0665	16.2	13.68	1.67	0.85	84.4	1.460	11.93	1,714	1.12
T. 403 ..	275	54.6	1.0806	19.4	17.45	0.76	1.19	89.9	1.886	9.90	1,120	0.94

RATOON CANES.

Eight varieties were grown in duplicate plots in Field 14. The canes were planted in September-October, 1919, and reaped in April, 1921, when they were 18 to 19 months old. They were reaped as first ratoons in March, 1922 at 11 months of age. In one plot the land was prepared and subsequently worked by hand labour alone, in the other the land was prepared and cultivated by animal drawn implements until the canes were too big. Unfortunately, owing to some misunderstanding, all of the plots were cultivated during the past year by animal drawn implements, so that a comparison of implemental versus hand tillage can no longer be obtained. As a varietal experiment (*see* Table X.), B. 4934 has given the best results followed by D. 504, B. 6308, Badilla and B. 156 with an indicated sucrose in the juice of over 3 tons per acre. D. 109 gave the lowest results.

TABLE X.—FIRST RATOONS.

Date planted .. .. September-October, 1919 .. .. .. Field 14.
Plants reaped and tested .. .. .. April, 1921 .. .. 18 to 19 months old.
First Ratoons reaped and tested .. .. March, 1922 .. .. 11 months old.
Rainfall .. .. April 16, 1921 to March 15, 1922 .. .. .. 75.54 inches.

CANE.	Area under cultivation.	JUICE.								PER ACRE.		
		Per cent. extracted.	Specific gravity.	Brix.	Percentage of			Quotient of Purity.	Sucrose per gallon.	Canes.	Juice.	Sucrose in juice.
					Sucrose.	Glucose.	Non-Sugar.					
	Sq. ft.								lb.	Tons.	Gals.	Tons.
B. 4934 ..	22,858	65.2	1.0691	16.8	14.90	1.20	0.70	88.7	1.593	37.78	5,161	3.67
D. 504 ..	22,836	65.0	1.0757	18.3	15.61	1.86	0.83	85.3	1.679	34.69	4,695	3.52
B. 6308 ..	68,178	69.4	1.0687	16.7	14.18	1.72	0.80	84.9	1.515	35.04	5,097	3.45
Badilla ..	22,616	65.1	1.0891	21.3	19.64	1.07	0.59	92.2	2.139	25.83	3,458	3.30
B. 156 ..	67,848	67.2	1.0704	17.1	14.13	1.96	1.01	82.6	1.512	32.39	4,555	3.07
T. 75 ..	21,320	68.5	1.0678	16.5	13.12	2.20	1.18	79.5	1.401	29.60	4,253	2.66
Ba. 6032 ..	45,298	68.3	1.0609	14.9	11.96	2.00	0.94	80.2	1.269	30.78	4,439	2.51
D. 109 ..	22,792	66.5	1.0656	16.0	12.00	2.78	1.22	75.0	1.279	29.57	4,133	2.36

EXPERIMENT WITH DRAINS AT VARIOUS DISTANCES.

It was also in Field 14 that the experiment with drains at various distances was tried last year. (1) Approximately two and a half acres were ploughed flat and marked off into three sections, having frontages of 110, 44 and 66 feet respectively. The land was ploughed-drilled and planted with cuttings of Badilla at distances of 5 feet by 5 feet, leaving the space necessary for putting in the usual drain every 22 feet in the first section and a dividing drain between the 44 and 66 feet plots. The plots were similarly treated and the canes reaped and weighed separately (1) on April 28, 1921, as plant canes at 19 months of age and (2) on March 28, 1922, as first ratoons at 11 months of age. The following results were obtained :—

Plot.	Distance of drains.	Yield of Canes per Acre.		
		Plant Canes, 19 months old.	First Ratoons, 11 months old.	Average for Plant Canes and First Ratoons.
1	22 feet apart	24.79 tons ..	30.15 tons ..	27.47 tons.
2	44 do. ..	27.18 do. ..	28.54 do. ..	27.86 do.
3	66 do. ..	27.83 do. ..	29.83 do. ..	28.83 do.

During the period of growth as plants *i.e.* the 19 months from October 1, 1919 to April 30, 1921, the rainfall was slightly below normal ; 72·10 inches of rain were registered. On the other hand the rainfall from May 1, 1921 to March 31, 1922 was unusually high. 75·06 inches of rain having been registered during this period, Notwithstanding the heavy rainfall obtained during the period of growth of the first ratoons, the plot with drains 22 feet apart has given only a very slightly better yield than the plots with drains 44 and 66 feet apart. If the yield for the two crops are taken together it will be seen that the plot with drains 66 feet apart has given the best results and that the plot with drains 22 feet apart the lowest return. The soil in this field and at the Experiment Station generally is a sandy loam and naturally porous. Under these conditions the results indicate that it is unnecessary to have drains every 22 feet or even every 44 feet as the best result was obtained from the plot with the drains 66 feet apart.

(1.) *Bull. Dept. Agr.*, Trinidad and Tobago XIX, 195, 1922.

NEWLY INTRODUCED AND OTHER VARIETIES.

The results of the first ratoons in Field 13, are given under Table XI. Twenty-one varieties were planted in October, 1919, and the plant canes reaped in May, 1921, at 19 months of age. The canes were reaped as first ratoons in April, 1922, when they were eleven months old. The two best varieties B. 6308 and H.? have given a very high yield of canes for ratoons viz : 37·04 and 36·37 tons per acre and they show an indicated sucrose in the juice of 4·04 and 4·01 tons per acre respectively.

The next best varieties are the Badilla and B.H. 10 (12), both of which have given an indicated sucrose in the juice of over 3 tons per acre. Good results have also been obtained for B. 4934, Ba. 6032, B. 347, B. 14761, B. 6388, Ba. 7924 and B.S.F. 12 (24).

Table XI.—Newly Introduced and other Varieties.—First Ratoons.

Date planted .. .. October-November, 1919 .. .. .. Field 13.
Plants reaped and tested .. .. .. May-June, 1921 .. .. 19 months old.
Ratoons reaped and tested .. .. April, 1922 .. .. 11 months old.
Rainfall .. .. June 1, 1921 to April 15, 1922 .. .. .. 72.34 inches.

Cane.	Area under cultivation.	Juice.								Per Acre.		
		Per cent. extracted.	Specific gravity.	Brix.	Percentage of			Quotient of Purity.	Sucrose per gallon.	Canes.	Juice.	Sucrose in juice.
					Sucrose.	Glucose.	Non-Sugar.					
	Sq ft.								lb.	Tons.	Gals.	Tons.
B. 6308 ..	18,392	67.9	1.0757	18.3	16.08	1.47	0.75	87.9	1.730	37.04	5,237	4.04
H. ? ..	9,042	62.1	1.0828	19.9	17.75	1.16	0.99	89.2	1.922	36.37	4,672	4.01
Badilla ..	17,952	64.2	1.0891	21.3	19.32	1.25	0.73	90.7	2.104	27.81	3,672	3.45
BH. 10 (12) ..	40,128	63.7	1.0824	19.8	17.42	1.47	0.91	88.0	1.885	28.79	3,795	3.19
B. 4934 ..	9,130	62.9	1.0788	19.0	17.29	0.96	0.75	91.0	1.865	30.24	3,568	2.97
Ba. 6032 ..	39,160	64.8	1.0770	18.6	16.30	1.39	0.91	87.6	1.755	28.16	3,795	2.97
B. 347 ..	9,086	67.1	1.0753	18.2	15.02	2.27	0.91	82.5	1.615	28.28	3,953	2.85
B. 14761 ..	9,636	65.3	1.0801	19.3	16.64	1.43	1.23	86.2	1.797	25.88	3,505	2.81
B. 6388 ..	9,438	66.7	1.0770	18.6	15.86	1.85	0.89	85.3	1.708	26.42	3,665	2.79
Ba. 7924 ..	9,680	67.5	1.0757	18.3	16.22	1.19	0.89	88.6	1.745	24.75	3,479	2.71
B.S.F. 12 (24) ..	10,736	69.2	1.0837	20.1	18.03	1.14	0.93	89.7	1.954	20.44	2,924	2.55
B.S.F. 12 (27) ..	37,312	65.5	1.0735	17.8	13.78	2.17	1.85	77.4	1.479	27.99	3,825	2.52
L. 511 ..	20,372	65.0	1.0927	22.1	20.74	0.48	0.88	93.8	2.266	16.73	2,229	2.25
B. 156 ..	10,142	66.1	1.0757	18.3	15.25	1.92	1.13	83.3	1.640	22.06	3,036	2.22
B. 6450 ..	9,482	64.6	1.0744	18.0	15.27	1.51	1.22	84.8	1.641	21.71	2,924	2.14
D. 109 ..	10,406	63.5	1.0797	19.2	16.65	1.72	0.83	86.7	1.798	19.73	2,599	2.09
B. 60 ..	5,170	65.6	1.0900	21.5	20.07	0.48	0.95	93.3	2.188	15.48	2,087	2.04
Ba. 8846 ..	9,900	66.8	1.0792	19.1	16.56	1.61	0.93	86.7	1.787	17.49	2,425	1.93
B.S.F. 12 (34) ..	3,509	64.1	1.0801	19.3	16.59	1.72	0.99	85.9	1.792	16.14	2,145	1.71
B. 67 ..	5,170	63.3	1.0815	19.6	17.10	1.43	1.07	87.2	1.849	15.38	2,016	1.67
Bourbon ..	9,592	68.1	1.0722	17.5	14.67	1.85	0.98	83.8	1.573	14.59	2,076	1.46

Comparison of B. 156 and Ba. 6032.—*Results of First Ratoons from "Spring" Plants.*

The result of the first ratoons of B. 156 and Ba. 6032 from "Spring" plants are given in Table XII. As plant canes B. 156 gave an indicated sucrose in the juice of 2.04 tons as against 1.29 tons per acre for Ba. 6032. The first ratoons were reaped on May 16, 1922 at ten and a half months of age. The yield of canes was practically the same for both varieties viz :—21.91 and 21.78 tons per acre, but B. 156 gave juice of better quality. When these two factors and the percentage of juice extracted are taken into consideration it will be seen that B. 156 shows an indicated sucrose in the juice of 2.82 tons as against 2.40 tons per acre for Ba. 6032.

Table XII.—B. 156 and Ba. 6032 as First Ratoons.

Date planted	June 26, 1920	Field 18.
Plants reaped and tested	July 1, 1921	12 months old.
Ratoons reaped and tested	May 16, 1922	10½ months old.
Rainfall	July 1, 1921 to May 15, 1922	57.45 inches.

Cane.	Area under cultivation.	Juice.								Per Acre.		
		Per cent. extracted.	Specific gravity.	Brix.	Percentage of			Quotient of purity.	Sucrose per gallon.	Canes.	Juice.	Sucrose in juice.
					Sucrose.	Glucose.	Non-Sugar.					
	Sq. ft.								lb.	Tons.	Gals.	Tons.
B. 156 ..	64,826	67.2	1.0886	21.2	19.14	1.16	0.90	90.3	2.083	21.91	3,030	2.82
Ba. 6032 ..	59,379	66.6	1.0779	18.8	16.58	1.16	1.06	88.2	1.787	21.78	3,014	2.40

SECOND RATOONS.

The second ratoons in Field 9 were reaped on March 6 and 7, 1922 at eleven and a half months of age. An average yield of 21·12 tons of canes was obtained per acre and the results are given in Table XIII. B.H. 10 (12) has given the best results viz :—31·25 tons of canes with an indicated sucrose in the juice of 3·10 tons per acre. Five other varieties : B. 6308, Badilla, B. 4934, B. 10650 and B. 13780 have also given better results than B. 156. Ba. 6032 comes 9th on the list with 20·53 tons of canes and 1·76 tons per acre o indicated sucrose in the juice. The quality of the juice from the Badilla was much superior to that of the other varieties grown in this field.

Table XIII.—Second Ratoons.

Date planted	October 10, 1918	Field 9.
Plants reaped and tested	April 1, 1920	17½ months old.
First Ratoons reaped and tested	March 24, 1921	11¾ months old.
Second Ratoons reaped and tested	March 6, 1922	11½ months old.
Rainfall	March 25, 1921 to March 5, 1922	77.08 inches.

Cane.	Area under cultivation.	Juice.								Per Acre.		
		Per cent. extracted.	Specific gravity.	Brix.	Percentage of			Quotient of purity.	Sucrose per gallon.	Canes.	Juice.	Sucrose in juice.
					Sucrose.	Glucose.	Non-Sugar.					
	Sq. ft.								lb.	Tons.	Gals.	Tons.
B.H. 10 (12) ..	7,040	68.7	1.0726	17.6	14.42	1.72	1.46	81.9	1.547	31.25	4,483	3.10
B. 6308 ..	7,062	65.9	1.0674	16.4	13.67	1.78	0.95	83.3	1.459	28.30	3,914	2.55
Badilla ..	6,996	63.0	1.0909	21.7	20.25	0.77	0.68	93.3	2.209	19.38	2,507	2.47
B. 4934 ..	7,062	62.8	1.0717	17.4	15.51	1.28	0.61	90.7	1.662	25.21	3,309	2.45
B. 10650 ..	7,062	71.8	1.0748	18.1	16.04	1.51	0.55	88.6	1.724	21.13	3,162	2.43
B. 17380 ..	7,040	69.1	1.0656	16.0	12.22	2.38	1.40	76.4	1.320	28.07	4,077	2.40
B. 156 ..	7,062	62.5	1.0779	18.8	16.00	1.78	1.02	85.1	1.725	19.81	2,573	1.98
B. 14761 ..	7,040	68.0	1.0779	18.8	16.81	1.39	0.58	89.4	1.812	15.62	2,207	1.78
Ba. 6032 ..	28,138	66.4	1.0643	15.7	12.92	1.92	0.86	82.3	1.375	20.53	2,869	1.76
B. 6388 ..	7,062	66.3	1.0761	18.4	15.83	1.72	0.85	86.0	1.703	16.04	2,214	1.68
Bourbon ..	6,996	62.7	1.0669	16.3	13.18	2.50	0.62	80.8	1.406	8.72	1,148	0.72

The results from the second ratoons in Field 19 are recorded in Table XIV. The canes from these plots were reaped in May, 1922, at fourteen months of age and they gave an average yield of 25.66 tons of canes per acre. The best results were obtained from B. 6308, followed by T. 202, B. 156, B. 6450, and Ba. 6032, all of which have given an indicated sucrose in the juice of over 3 tons per acre. The Badilla comes eighth on the list and it has again given juice of very good quality.

Table XIV.—Second Ratoons.

Date planted .. .. September, 1918 .. .. Field 19.
Plants reaped and tested .. .. .. April, 1920 .. .. 19 months old.
First Ratoons reaped and tested .. .. March, 1921 .. .. 11 months old.
Second Ratoons reaped and tested .. .. May, 1922 .. .. 14 months old.
Rainfall .. .. April 1, 1921 to May 15, 1922 .. .. .. 78.29 inches.

Cane.	Area under cultivation.	Juice.								Per Acre.		
		Per cent. extracted.	Specific gravity.	Brix.	Percentage of			Quotient of purity.	Sucrose per gallon.	Canes.	Juice.	Sucrose in juice.
					Sucrose.	Glucose.	Non-Sugar.					
	Sq. ft.								lb.	Tons.	Gals.	Tons.
B. 6308 ..	46,197	66.6	1.0810	19.5	17.97	1.11	0.42	92.1	1.942	31.14	4,297	3.72
T. 202 ..	37,591	65.3	1.0864	20.7	19.32	0.83	0·55	93.3	2.099	29.21	3,933	3.68
B. 156 ..	23,718	65.4	1.0824	19.8	18.05	1.25	0.50	91.2	1.954	28.58	3,868	3.37
B. 6450 ..	45,305	67.6	1.0824	19.8	18.05	0.91	0.84	91.2	1.954	27.47	3,843	3.35
Ba. 6032 ..	23,396	64.7	1.0744	18.0	15.76	1.28	0.96	87.5	1.693	31.44	3,241	3.20
D. 109 ..	34,255	63.9	1.0801	19.3	16.93	1.56	0.81	87.7	1.829	27.69	3,669	2.99
H. 227 ..	23,299	64.7	1.0837	20.1	17.93	1.09	1.08	89.2	1.943	24.02	3,212	2.79
Badilla ..	25,032	59.6	1.0932	22.2	20.77	0.71	0.72	93.5	2.270	21.99	2,685	2.72
B. 3922 ..	39,560	65.4	1.0792	19.1	17.76	1.00	0.34	93.0	1.917	22.76	3,089	2.64
H. 27 ..	11,649	65.4	1.0788	19.0	16.51	1.35	1.14	86.9	1.781	19.68	2,672	2.12
T. 75 ..	41,272	66.4	1.0739	17.9	15.67	1.47	0.76	87.5	1.683	15.30	2,119	1.60

When the first ratoons in Fields 2 and 5 were reaped on June 16, 1921, the rainy season had already been in progress since three weeks and the soil was well saturated with water. But, as the land on which these canes were grown, was not required for other purposes the canes were allowed to ratoon for a second time. The stools were weak and the canes did not sprout with vigour; very little cultural work was performed and the field returns have been poor in consequence.

The results for Field 2 are recorded in Table XV. The canes were reaped on May 29, 1922, at 11½ months of age and gave an average yield of 10·40 tons of canes per acre. B.H. 10 (12) gave the highest results followed by L. 511 and Ba. 7924. The juice from all of these varieties was of very good quality.

TABLE XV.—SECOND RATOONS.

Date planted	September 24, 1918	Field 2.
Plants reaped and tested	May 6, 1920	19½ months old.
First Ratoons reaped and tested	June 14, 1921	13 months old.
Second Ratoons reaped and tested	May 29, 1922	11½ months old.
Rainfall	June 15, 1921 to May 28, 1922	65.94 inches.

CANE.	Area under cultivation.	JUICE.								PER ACRE.		
		Per cent. extracted.	Specific gravity.	Brix.	Percentage of			Quotient of purity.	Sucrose per gallon.	Canes.	Juice.	Sucrose in juice.
					Sucrose.	Glucose.	Non-Sugar.					
	Sq. ft.								lb.	Tons.	Gals.	Tons.
B.H. 10 (12) ..	40,258	65.2	1.0868	20.8	19.46	0.60	0.74	93.5	2.115	13.55	1,821	1.72
L. 511 ..	12,698	63.1	1.0977	23.2	21.50	0.24	1.46	92.7	2.360	6.98	899	0.95
Ba. 7924 ..	14,894	64.3	1.0797	19.2	17.85	0.53	0.82	93.0	1.927	4.79	639	0.55

STE. MADELEINE SEEDLINGS.—SECOND RATOONS.

The varieties grown in Field 5 consisted of the seven seedlings raised by the Ste. Madeleine Sugar Co., Ltd., and the results are given under Table XVI. The canes were reaped on May 30, 1922, at eleven and a half months of age and gave an average yield of 11·05 tons of canes per acre.

The highest returns were obtained from 55 $\frac{AR}{N}$ B. Q. Badilla E. comes next, followed by Q. Badilla U. and Q. Badilla D. The other three varieties have given very poor results.

TABLE XVI.—STE. MADELEINE SEEDLINGS.—SECOND RATOONS.

Date planted	December 21, 1918	Field 5.
Plants reaped and tested	May 8, 1920	16½ months old.
First Ratoons reaped and tested	June 16, 1921	13 months old.
Second Ratoons reaped and tested	May 30, 1922	11½ months old.
Rainfall	June 17, 1921 to May 29, 1922	65.76 inches.

CANE.	Area under cultivation.	JUICE.								PER ACRE.		
		Per cent. extracted	Specific gravity.	Brix.	Percentage of			Quotient of purity.	Sucrose per gallon.	Canes.	Juice.	Sucrose in juice.
					Sucrose.	Glucose.	Non-Sugar.					
$\frac{AR}{N}$55——B.	3,168	65.3	1.0788	19.0	16.47	1.50	1.03	86.7	1.777	16.28	2,207	1.75
Q. Badilla E.	2,838	64.7	1.0717	17.4	14.29	2.09	1.02	82.1	1.531	16.61	2,246	1.53
Q. Badilla U.	2,530	67.4	1.0766	18.5	16.11	1.60	0.79	87.1	1.734	13.77	1,931	1.49
Q. Badilla D.	2,200	62.5	1.0761	18.4	16.26	1.41	0.73	88.4	1.750	11.63	1,513	1.18
Q. Badilla A.	2,124	54.5	1.0753	18.2	14.00	2.40	1.80	76.9	1.505	8.97	1,018	0.68
Q. Badilla C.	2,728	63.1	1.0722	17.5	14.38	2.00	1.12	82.2	1.542	6.79	895	0.62
$\frac{AR}{N}$26——B.	1,694	57.8	1.0766	18.5	16.74	1.20	0.56	90.5	1.802	4.22	507	0.41

AVERAGE RESULTS, PLANT CANES, FIRST AND SECOND RATOONS.

The average results of plant canes, first and second ratoons from Fields 2, 5, 9 and 19 are given in Table XVII. The best yields were obtained from T. 202 and B. 6308 with an average indicated sucrose in the juice of over 3 tons per acre per annum. The Badilla comes next, followed by B.H. 10 (12), D. 109, B. 156, H. 227 and B. 6450 with an average of over 2½ tons of indicated sucrose in the juice per acre. Nine other varieties viz :—B. 3922, Ba. 6032, L. 511, Ba. 7924, Q. Badilla U., H. 27, B. 4934, B. 10650 and $55\frac{AR}{N}$B. also show an indicated sucrose in the juice of over 2 tons per acre. The Bourbon and two of the Ste. Madeleine seedlings have given the lowest results.

Better results as second ratoons, than as first ratoons, have been obtained from eighteen out of the twenty-seven varieties recorded in this Table ; the most conspicuous being T. 202, B. 6308, B. 156, B. 6450, B. 3922, Ba. 6032, B. 4934, B. 10650 and B. 17380. The second ratoon returns from B. 6308, B. 6450 and B. 4934 are higher than those obtained as plant canes for each of these varieties respectively.

TABLE XVII.—AVERAGE RESULTS OF PLANT CANES, FIRST AND SECOND RATOONS.

Fields 2, 5, 9 and 19.

CANE.	SUCROSE IN JUICE—TONS PER ACRE.			
	Plant Canes, 1920.	First Ratoons, 1921.	Second Ratoons 1922.	Average for 3 years.
T. 202 ..	3.93	1.60	3.68	3.07
B. 6308 ..	3.23	2.27	3.53	3.01
Badilla ..	4.10	2.18	2.66	2.98
B.H. 10 (12) ..	5.04	1.69	1.93	2.89
D. 109 ..	3.72	1.95	2.99	2.89
B. 156 ..	3.74	1.74	3.05	2.84
H. 227 ..	3.61	2.06	2.79	2.82
B. 6450 ..	2.54	2.40	3.35	2.76
B. 3922 ..	2.97	1.71	2.64	2.44
Ba. 6032 ..	3.18	1.52	2.48	2.39
L. 511 ..	3.68	2.42	0.95	2.35
Ba. 7924 ..	4.42	1.92	0.55	2.30
Q. Badilla U. ..	2.37	2.86	1.49	2.24
H. 27 ..	3.10	1.40	2.12	2.21
B. 4934 ..	2.06	2.05	2.45	2.19
B. 10650 ..	2.67	1.16	2.43	2.09
AR 55——B. N ..	2.07	2.41	1.75	2.08
T. 75 ..	3.15	0.93	1.60	1.89
Q. Badilla E. ..	2.15	1.84	1.53	1.84
B. 6388 ..	2.81	0.94	1.68	1.81
B. 17380 ..	1.82	0.84	2.40	1.69
B. 14761 ..	1.55	1.06	1.78	1.46
AR 26——B. N ..	1.48	2.01	0.41	1.30
Q. Badilla C. ..	2.00	1.25	0.62	1.29
Bourbon ..	2.63	0.32	0.72	1.22
Q. Badilla D. ..	0.94	1.38	1.18	1.17
Q. Badilla A. ..	1.22	1.50	0.68	1.13

AVERAGE RESULTS, PLANT CANES AND FIRST RATOONS.

Table XVIII gives the average results of plant canes and first ratoons from Fields 13 and 14. Thirteen varieties have given better results as first ratoons than as plant canes and one variety Ba. 6032 has given the same return as plant canes and first ratoons. Six varieties have given higher results than B. 156 viz :—H.P., D. 504, B. 6308, Badilla, B. 4934 and B.H. 10 (12), all of which show an indicated yield of sucrose of over three tons per acre. Eight other varieties viz :—T. 75, Ba. 6032, D. 109, B.S.F. 12 (27), B. 347, B. 60, B.S.F. 12 (24) and B.S.F. 12 (34) have given an average of over two and a half tons of indicated sucrose in the juice per acre.

TABLE XVIII.—AVERAGE RESULTS OF PLANT CANES AND FIRST RATOONS.

Fields 13 *and* 14.

CANE.	SUCROSE IN JUICE—TONS PER ACRE.		
	Plant Canes 1921.	First Ratoons 1922.	Average for 2 years.
H.P. ..	4.13	4.01	4.07
D. 504 ..	3.63	3.52	3.57
B. 6308 ..	3.14	3.58	3.36
Badilla ..	3.03	3.37	3.20
B. 4934 ..	2.81	3.47	3.14
B.H. 10 (12) ..	3.03	3.19	3.11
B. 156 ..	3.05	2.96	3.00
T. 75 ..	3.32	2.66	2.99
Ba. 6032 ..	2.74	2.74	2.74
D. 109 ..	3.10	2.27	2.68
B.S.F. 12 (27) ..	2.74	2.52	2.63
B. 347 ..	2.37	2.85	2.61
B. 60 ..	3.14	2.04	2.59
B.S.F. 12 (24) ..	2.50	2.55	2.52
B.S.F. 12 (34) ..	3.32	1.71	2.51
B. 6388 ..	2.12	2.79	2.45
Ba. 7924 ..	2.09	2.71	2.40
B. 14761 ..	1.59	2.81	2.20
L. 511 ..	1.99	2.25	2.12
B. 6450 ..	1.49	2.14	1.81
B. 67 ..	1.92	1.67	1.79
Ba. 8846 ..	1.00	1.93	1.46
Bourbon ..	1.05	1.46	1.25

VEGETABLES.

CABBAGE CULTIVATION IN TRINIDAD.

By R. O. Williams,
Superintendent, Royal Botanic Gardens, etc.

The growing of cabbage if undertaken at the right season and under sufficiently intensive methods of cultivation is a paying proposition despite certain pests and diseases, as well as the adverse climatic conditions with which a grower in the tropics has to contend.

To demonstrate this a plot of cabbages one-ninth of an acre in extent was grown at the St. Clair Experiment Station.

An abstract of the expenditure for the working of the plot was as follows :

Forking	$5.75
Manuring	6.00
Seeds	.96
Sowing	.85
Pricking off	2.50
Transplanting and Supplying	1.85
Weeding	4.8
Reaping	1.20
Total	23.91

The most troublesome pests were mole crickets and a caterpillar which bored down the stem of the leaf into the heart of the cabbage. Hand picking of the worms is considered the most effective control.

Seven hundred and fifty-five cabbages gained maturity of which 114 or about 15 per cent., had the hearts destroyed by the caterpillar referred to above.

The varieties grown on the plot were Henderson's Early and Late Drumhead, and Ballhead raised from seeds purchased locally. Seed sowing was done on October 20, 1921 and pricking off on November 2. Reaping was commenced on January 18, and concluded on March 18.

Eight hundred and fifty-nine pounds of cabbage were sold, which realised $80.90, an average wholesale price of 9.4 cents per lb., the average weight of same being 1.36 lb., the range being from 4 lb., to a few ounces.

The profits thus obtained from one-ninth of an acre of land occupied for 4½ to 5 months was $56.99, or calculated per acre, a profit of $512. No allowance has been made for supervision.

Trials of English and American Varieties.

Acting upon instructions from the Director of Agriculture trials were then made in order to test the relative merits of various varieties of cabbage, under conditions pertaining at the St. Clair Experiment Station. Messrs. Henderson of the United States of America and Messrs. Sutton and Sons, Reading, England were asked to supply seed and both firms kindly did so free of charge.

The trials were conducted during the period January to June ; a little late in the season for obtaining the heaviest yields in Trinidad owing to the approach of the dry weather. Four distinct series were grown which embraced in several instances three trials of the same variety. Unfortunately only one trial with most of Messrs. Suttons seeds was possible owing to the seeds arriving too late in the planting season. The best period for planting is October to December, the crop maturing in the early months of the dry season.

Heavy losses were encountered both from mole crickets immediately after planting and from a caterpillar, the larva of a small moth (*Hellula* sp.) which bores into the stalks of the cabbage leaves and tunnels down to the heart which it destroys. As a consequence of this damage the number of supplies required was very great and in some cases amounted to restocking the whole of the plot. No variety appeared to be more resistant than others to caterpillar damage.

The tabulated results which are subjoined show particulars of the four distinct trials A. B. C. D. and these are again tabulated in in order of merit in tables E and F.

A brief summary of these statistics show that Sutton's " Tender and True," Henderson's " Flat Dutch," Sutton's " All Head," Sutton's " Eclipse Drumhead," Henderson's " Early Summer " and Henderson's " Selected Wakefield " are all suitable for cultivation locally, and that Sutton's " Summer Drumhead," Henderson's " Succession," Sutton's " Blood Red," " Dwarf Blood Red," "Maincrop" and " Plentiful " cannot be relied upon to produce a good crop.

Trial A.

Variety.	Sown.	Transplanted.	Supplies planted.	Total plants.	Range of Crop.	Plants matured.	Total Losses.	Range in weight.	Average weight.	Total Crop. lb.	oz.
Henderson's " Early Summer "	16.12.21.	9.1.22.	27	42	March 25-April 10	21	48	3 oz. to 1lb. 8 oz.	10.6 oz.	13	15
Henderson's " Flat Dutch "	16.12.21.	9.1.22.	27	44	March 29-April 10	13	58	3 oz.-2 lb.	12.7 oz.	10	6
Henderson's " Selected Wakefield "	16.12.21.	9.1.22	36	44	March 18-April 10	13	67	4 oz.-1 lb.	9.7 oz.	7	15
Henderson's " Succession "	16.12.21.	9.1.22.	50	44	March 31-April 10	7	85	2 oz.-15 oz.	7 oz.	3	1

Trial B.

Henderson's " Early Summer "	16.12.21	14.1.22	10	47	March 23-April 8	24	33	8 oz.-1 lb. 10 oz.	12 lb. 2 oz.	18	6
Henderson's " Flat Dutch "	16.12.21.	14.1.22.	19	43	1-13 April	20	42	2 oz. 1 lb. 10 oz.	11 lb. 3 oz.	14	3
Henderson's " Selected Wakefield "	16.12.21.	14.1.22.	13	43	March 29-April 13	19	56	5 oz.-1 lb.	10 lb. 1 oz.	12	
Henderson's " Succession "	16.12.21.	14.1.22	..	41	..	..	..	complete failure	complete failure		
Sutton's "Maincrop "	16.12.21.	14.1.22.	30	46	..	..	..	do.	do.		
Sutton's "Large Blood Red "	16.12.21	14.1.22	9	44	12-18 April.	24	29	2 oz.-12 oz.	4 lb. 2 oz.	6	6

Trial C.

Variety.	Sown.	Transplanted.	Supplies planted.	Total plants.	Range of Crop.	Plants matured.	Total Losses.	Range in weight.	Average weight.	Total Crop.
										lb. oz.
Henderson's " Early Summer "	16.12.21	14.1.22	21	63	March 15-April 24	26	58	3 oz.-1 lb. 4 oz.	9 lb. 9 oz.	16 2
Henderson's " Flat Dutch "	16.12.21	14.1.22.	20	62	March 25-April 24.	13	69	1 oz.-1 lb. 10 oz.	11 lb. 1 oz.	9 1
Henderson's " Selected Wakefield "	16.12.21	14.1.22.	24	62	March 25-April 21.	24	62	4 oz. -2lb.	12 oz.	18 1
Henderson's " Succession "	16.12.21	14.1.22.	48	62	complete failure.	—	—	..	..	..
Sutton's " Maincrop "	16.12.21.	14.1.22.	41	62	do.	—	—	..	..	..
Sutton's Large Blood Red "	16.12.21.	14.1.22.	29	60	April 12-May 4.	17	72	2 oz.-10 oz.	4 lb. 3 oz.	4 9
					Trial D.					
Sutton's " Summer Drumhead "	1.2.22.	10.3.22.	13	60	May 18-June 2.	14	59	3 oz.-1 lb.	8.5 oz.	7 7
Sutton's " All Head "	1.2.22.	10.3.22.	20	60	May 13-June 6.	14	66	3 oz.-1 lb. 8 oz.	11.3 oz.	9 15
Sutton's " Tender & True "	1.2.22.	10.3.22.	17	60	May 23-June 6	20	57	6 oz. 1 lb.	11.7 oz.	14 10
Sutton's " Maincrop "	12.22.	10.3.22.	18	30	complete failure.	..	..	..	..	..
Sutton's " Eclipse Drumhead "	1.2.22.	10.3.22.	49	68	May 18-June 16	16	101	8 oz.-1 lb. 2 oz.	11.3 oz.	11 6
Sutton's " Plentiful "	1.2.22.	10.3.22.	..	65	complete failure.	..	..	..	..	..
Sutton's " Dwarf Blood Red "	1.2.22.	10.3.22.	16	69	June 20	8	77	4-10 oz.	6.3 oz.	3 12

E.

AVERAGE INDIVIDUAL WEIGHTS (IN OUNCES) OF CABBAGES IN TRIALS A, B, C AND D.

	A.	B.	C.	D.	Average Oz.
Sutton's " Tender and True " ..	..	..	..	11.7	11.7
Henderson's " Flat Dutch " ..	12.7	11.3	11.1	..	11.7
Sutton's " All Head " ..	..	..	..	11.3	11.3
Sutton's " Eclipse Drumhead " ..	..	..	..	11.3	11.3
Henderson's " Early Summer " ..	10.6	12.2	9.9	..	10.9
Henderson's " Selected Wakefield " ..	9.7	10.1	12.	..	10.6
Sutton's " Summer Drumhead " ..	..	..	..	8.5	8.5
Henderson's " Succession " ..	7.	failed	failed	..	7.
Sutton's " Dwarf Blood Red " ..	..	..	..	6.3	6.3
Sutton's " Blood Red " ..	..	4.2	4.3	..	4.2
Sutton's " Plentiful " ..	..	..	..	failed	..
Sutton's " Maincrop " ..	..	failed	failed	failed	..

F.

TOTAL CROPS IN TRIALS A, B, C AND D.

VARIETY.	A. lb. oz.	B. lb. oz.	C. lb. oz.	D. lb. oz.	Average. lb. oz.	Average No. of plants to each trial.
Henderson's "Early Summer" ..	13.15	18.6	16.2	..	16.2	50
Sutton's "Tender and True" ..	..	..	..	14.10	14.10	60
Hendersons "Selected Wakefield"	7.5	12.0	18.1	..	12.10	50
Sutton's "Eclipse Drumhead" ..	..	..	..	11.6	11.6	68
Henderson's "Flat Dutch" ..	10.6	14.3	9.1	..	11.3	50
Sutton's "All Head"	..	..	..	9.15	9.15	60
Sutton's "Summer Drumhead" ..	..	..	..	7.7	7.7	60
Sutton's "Blood Red"	..	..	..	3.12	3.12	69
Sutton's "Large Blood Red" ..	..	6.6	4.9	..	3.10	52
Henderson's "Succession" ..	3.1	failed	failed	..	3.1	49
Sutton's "Maincrop"	..	failed	failed	failed	..	46
Sutton's "Plentiful"	..	..	..	failed	..	65

A FUNGUS DISEASE OF CABBAGES.

By F. Stell, Mycologist.

Reports and specimens recently received from growers of cabbages in the San Juan district show the presence of a highly important fungus disease. The affection is known as Cabbage Yellows and is caused by a soil fungus, a species of *Fusarium*. Evidence of the disease in the cabbage plot is often found on very young seedlings ; it is shown by the rapid wilting of the leaves and dying of the roots, while externally the stem appears to be sound. In more mature plants, the striking feature is the yellowing of the leaves hence the common name of the disease is " yellows." Sometimes the yellowing may affect the whole plant ; at other times only one side is diseased. In any case, once the plant is affected the effect is fatal.

The parasite, which lives in the soil, gains access through the young roots. Once established, the fungus invades the vessels of the stem and leaves. These become discoloured and gradual starvation results.

In the United States, where cabbages are grown on a large commercial scale, much investigation and experimental work has been carried out in connexion with this disease. As a result it has been found that the only satisfactory method of dealing with the affection is to grow resistant varieties.

Once the soil is infected, the parasites can live for years in the same soil so that it is practically useless to grow varieties of cabbages which are susceptible to the disease. Therefore local growers will do well to determine carefully the varieties they grow and their history.

Steps have since been taken by this Department to secure information from the United States as to the best varieties of cabbage which are immune to "yellows," and "Wisconsin" a variety reported o be immune is now under trial at St. Clair Experiment Station.

FORESTRY.

LOCAL WOODS FOR USE AS MARINE PILES.

By H. W. Moor,
Acting Conservator of Forests, Trinidad and Tobago.

As some interest has been taken lately in the kinds of local wood suitable for marine use, and as a certain amount of information has also recently become available regarding the suitability or otherwise of some of these woods as marine piles, an attempt is here made to collect and record what is known for the benefit of those interested, and to serve as a foundation to which further information can be added from time to time.

Piles particularly are very subject to the attacks of the teredo and limnoria, both allied to the mollusc family, and the chief desideratum is immunity, in the greatest degree possible, from the ravages of these destructive sea worms. Copper plating is not always possible, though where there is a depth of mud or soft sand overlying the bottom it may be tried with every hope of success. Creosoting the wood has been tried but is said to be a failure with wood used in tropical waters. Eliminating outside aids therefore immunity must be looked for in properties essential to certain woods themselves. The large degree of immunity enjoyed by the British Guiana Greenheart (*Nectandra Rodeii* Schomb) is said to be due to the presence in the wood of an alkaloid principle known as Bebeerine. Another wood has been found of a genus represented locally by our Guatacre (*Lecythis* spp.) containing silica crystals which are said to be present in sufficient quantities to interfere with the worms' boring apparatus, making this wood practically immune. Hardness of the wood is another factor in discouraging the attention of the teredo, though how much of such immunity as is enjoyed by certain very hard woods is due entirely to hardness, and how much to other properties (mostly chemical) peculiar to such woods is a matter on which little is known at present.

Other properties essential to woods used as piles are driving ability and resistance to crushing strains and vibration and some degree of freedom from warping, cracking and splitting, defects very common in all tropical woods ; the suitability of any wood for this purpose being as a general rule looked for in the length of the fibres, the longer fibred hard woods being usually the more suitable.

Taking all these factors into consideration, an attempt is made to supply a list of local woods in order of merit which have been or may be found suitable for piles, and (this with extreme diffidence) a column

has been added giving the number of years each wood may be expected to last when so used. It must be remembered that conditions under which these timbers are used are so variable, that it is impossible to do more than generalise, and in any case the list is only intended to serve as a rough guide to those who think of employing local woods for this purpose.

Kind of Wood.	Years.
1. Guatacre. *Lecythis idatimon Aubl.*	30
2. Poui. *Tecoma serratifolia Don*	10-15
3. Purpleheart. *Peltogyne porphyrocardia Gr.* ..	10
4. Balata. *Mimusops globosa Gaertn*	8
5. Red Mora. *Dimorphandra Mora Benth & Hook* ..	8
6. Locust. *Hymenaea Courbaril L.*	5?
7. Tapana. *Hieronyma caribæa Urb.*	5?
8. Yoke. *Piptadenia peregrina Benth*	5?
9. Angelin. *Andira inermis H.B.& K.*	5?
10. Monkeybone *Lucuma* sp.?	5

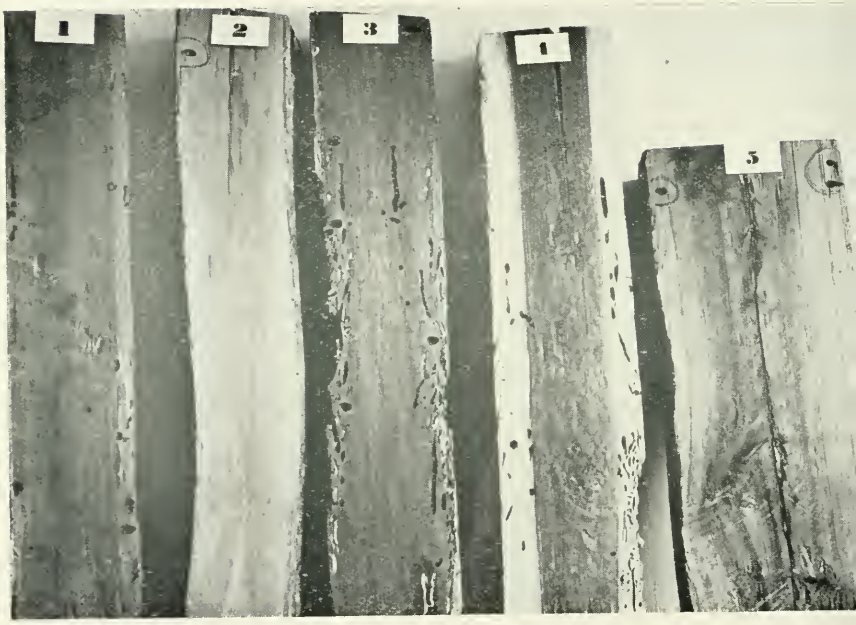
Nothing is known as to durability of Nos. 6 to 9 and these woods are merely suggested as being possibly suitable. In every case it is assumed that mature heartwood only will be used.

The accompanying photograph shows the longitudinal sections of five piles (four local woods and one imported) which were used in the Pointe-a-Pierre pipe line viaduct and drawn after three years and two months use, the results of the activities of the borers being plainly evident in all.

No. 1 is a centre section of a roundwood Monkeybone pile. The bore holes, though scattered and not very numerous, have penetrated right through both sap and heartwood.

No. 2 is a section of a roundwood Guatacre (*Lecythis idatimon Aubl.*) pile, the one hole shown is the deepest, being $1\frac{1}{2}$ inches in the sapwood. In no case was the heartwood reached. Reasons for the little damage done by borers in this wood have already been suggested. This is the best wood in the Colony for piles and has the additional advantage of being readily available in lengths up to forty, sometimes fifty and occasionally perhaps sixty feet. Although somewhat subject to end splits, it drives well and being long fibred is not so subject to transverse fracture. It can be confidently expected to last thirty years as a marine pile, and is claimed by some to outlast Greenheart.

No. 3 is a centre section of a squared heartwood pile of Crappo (*Carapa guianensis Aubl.*). This wood is too soft and is unsuitable in every way for marine use.



Longitudinal section of piles. Explanation in text.

No. 4 is a centre section through a roundwood Purpleheart (*Peltogyne porphyrocardia Grisb*) pile. As is shown, it was severely attacked at the water level, but though the sapwood was much damaged, the heartwood was not penetrated. This wood is hard, strong and durable, but unfortunately somewhat brittle and therefore more subject to transverse fracture, which defect may appear when driving, or from excessive vibration. It is readily obtainable in large sizes and if driven in the round log, *i.e.* with the sapwood not removed, the possibilities of fracture may be reduced.

No. 5 is a centre section of a waney Greenheart pile. This is not a local wood, and in any case is too well known to make it necessary to enlarge on its suitability for the purpose for which it was used. Its inclusion in the photograph is interesting for purposes of comparison and also as it provides definite evidence disproving the claim that this wood enjoys complete immunity from the attacks of borers. The three holes shown stopped at the heartwood however, and there is no evidence to show that any went further.

As has been already stated, this report is merely that of a preliminary investigation, based on such data as is at present available, as to the suitability of certain local woods for use under given conditions, it is not, nor should it be considered to be, final. All further information and legitimate criticism, when based on reliable data, will therefore be readily welcomed as being in the interest of the Colony in extending the at present restricted uses to which local woods may be put.

BOTANICAL.

BOUGAINVILLAEAS.

By R. O. Williams,
Superintendent, Royal Botanic Gardens, etc., Trinidad.

Bougainvillaeas rank amongst the most showy of tropical plants and are grown in most West Indian gardens.

The two kinds formerly most abundant in Trinidad were *B. glabra* and *B. Sanderiana* but of recent years a crimson variety which is thought to be a variety of *B. spectabilis* has become widely distributed and extremely popular. All three kinds are easily reproduced from cuttings. The brick-red variety (*B. spectabilis* var. *lateritia*) whilst in great demand has not become abundant, more perhaps on account of the difficulty of propagating it than from any other cause.

B. glabra the ordinary purple Bougainvillaea, is a rambling bush, which by continuous trimming can be made to form a thick, almost impenetrable hedge. There are several varieties of the species possessing purple or magenta coloured bracts of various shades.

B. Sanderiana is of somewhat similar habit but has larger and richer coloured bracts.

B. spectabilis, var. known locally as the "Butt" or crimson Bougainvillaea was introduced into Trinidad in 1910 by Mrs. R. V. Butt from Carthagena. From Trinidad it has been distributed to other West Indian Colonies and to Kew Gardens. It is a rampant grower, throwing strong, spiny shoots which are somewhat rebellious to training. The flowers are borne on long sprays or in tufts at the ends of the branches. These produce bracts of a beautiful, rich crimson. With careful and frequent pruning this Bougainvillaea may be trained down to wires and made to form masses of colour in beds in the flower garden, in much the same way that the stronger growing roses are treated in England, but to be a success when grown in this way the plants must receive unremitting care and attention.

B. spectabilis, var. *lateritia* is the most robust of the Bougainvillaeas and is never really at home unless provided with a large tree over which to climb. A specimen may be seen at the Botanic Gardens covering a tree over 80 feet in height; when in full bloom it is an attractive sight and is recognizable even from the opposite side of the Savannah a distance of half a mile or so. The bracts of the flowers are of a brick-red colour, bright when young, but fading with age. It is a most difficult plant to propagate. Occasionally success may be obtained from layers but the better method is to plant strong root cuttings.

To those who are not familiar with all the Bougainvillaeas referred to, it should be stated that it is not advisable to plant the different varieties in close proximity as the colours do not harmonize.

Mr. W. N. Sands, late Superintendent of Agriculture in St. Vincent, took a great interest in Bougainvillaeas and made several successful artificial crosses between the above-named species and varieties. Records of his work will be found in the *Annual Report* of the St. Vincent Agricultural Department for the years 1918 and 1919. So far two of his hybrids are recorded as having flowered, viz.: " Lady Watts " a plant described as having bracts between a dark terra-cotta and salmon-pink colour and " Master Norman " possessing flowers with small magenta bracts less than half the size of those of most Bougainvillaeas.

Plants of both are now in the plant collections of the Botanic Gardens. A Bougainvillaea new to Trinidad is now established over the front entrance to Government House. In habit it is very similar to the crimson Bougainvillaea but the bracts are smaller and of a delicate pink colour. It was introduced from Ecuador by Mrs. J. B. Rorer in January 1920. The late Mr. W. Buthn stated that it is a very common plant there and flowers very abundantly.

A very rare Bougainvillaea is one similar to *B. glabra* but with variegated leaves. It is a small anæmic looking plant with green and cream-coloured variegated leaves, or occasionally in some shoots the green colour is altogether absent.

This reminds one of the much talked of but elusive " white Bougainvillaea." So many inquiries have been made from time to time of the Department regarding this plant that inquiries were instituted to discover whether such a plant was actually in existence. A lady from Rangoon volunteered the information that a white Bougainvillaea was in cultivation in the province of Burma, but the Director of Agriculture of that province states that " none of the Botanists or Agriculturists in the province have heard of or seen the plant in Burma.

The Superintendent of the Agri-Horticultural Gardens of Rangoon does not know of the variety.

The help of the Chief Conservator of Forests of Burma was asked in the matter and he reports that his research staff does not know of the white variety.

I would therefore assume that the white Bougainvillaea does not exist in Burma.

In the course of the above inquiries it would appear that someone had seen the white variety in Mauritius and perhaps you would like to take up the hunt there."

A communication was then sent to the Director of Agriculture in Mauritius who replied " The white Bougainvillaea does not occur in Mauritius. I have made inquiries from a number of horticultural amateurs here, one of whom states that he recollects having seen mention of a white Bougainvillaea having been found in the forests of Trinidad ! ! ! "

Here the matter ended for some time until a visitor passing through Trinidad informed Mr. W. G. Freeman that he remembered seeing a white Bougainvillaea in Cuba.

On writing to Dr. R. M. Gray, Superintendent of the Botanical Gardens of Harvard University at Soledad Cienfuegos, Cuba, he stated, "we have no white Bougainvillaea, our small plant having died."

From this it would appear that there are grounds for supposing that a white Bougainvillaea exists.

When at Kew in 1919 I made a search in the library with the hope of finding some record of such a plant, but without success. In going through a monograph of the genus with Mr. Skan we did however find mention of species with unfamiliar coloured bracts. The following were amongst those noted :

B. Lindleyana, bracts cinnabar coloured.
B. stipitata, bracts first greenish, then brownish or pale yellowish to straw colour, from the Argentine.
B. infesta, bracts dirty brownish.
B. modesta, bracts yellowish green, from Bolivia.
B. Malmeana, bracts lively pale yellowish, from Brazil.
B. praecox, bracts brown, from the Argentine.
B. berberidiaefolia, bracts pale brownish, from Bolivia.

No plants of any of these species were under cultivation in Kew Gardens.

It still remains therefore, for someone to find and introduce a white bracted Bougainvillaea to Trinidad and to anyone attempting a continuation of the search care must be taken in instituting inquiries that confusion does not arise between the form with the whitish variegated leaves already mentioned and a species with white bracts—the desired plant.

Since the above was written a gentleman informed me that a friend had brought flowering sprays of a white Bougainvillaea from Dominica, but on writing to Mr. J. Jones, Curator of the Botanic Gardens, with long experience in Dominica he informed me that he had never seen the plant and was doubtful as to its existence there. These continued erroneous reports of the existence of this plant makes one wonder whether a plant of some other genus is not being confused with the white Bougainvillaea.

TRINIDAD BIRDS.

NOTES ON THE FOOD AND HABITS OF SOME TRINIDAD BIRDS.

By C. B. Williams, M.A., F.E.S.,
Formerly Sugar Cane Entomologist, Department of Agriculture, Trinidad and Tobago.

The notes on the various species of birds recorded below were made during my residence in the Island from March 1916 to January 1921, but in the first eighteen months of this period repeated absence resulted in very little progress being made.

The greater part of the observations are on the birds which occur in the sugar cane districts and were made in connection with my investigations on the sugar cane froghopper, but other species were added as opportunity occurred and a four months' residence in Maracas Valley enabled me to add notes on several of the birds of the forest and cacao districts. At the same time the list is not to be taken as indicating the relative abundance of the species, except under the conditions and in the districts in which observations were possible.

In view also of the fact that at certain periods of the year more time was available, or that it was more important to get information, the records are irregularly distributed, and on this account no attempt has been made to sum up breeding records to any period of months and in each case the individual records have been given.

It is only in this way and after the accumulation of many further records that accurate summaries can be made.

Most of the scientific names of the birds have been taken for convenience from Chapman's *List of the Birds of Trinidad* (see Bibliography at end) although it is recognised that this is by no means up to date.

The names used by Leotaud in his *Oiseaux de Trinidad* are also given with the numbers by which he distinguished them. The local names are those in most general use or most suited to be used.

There are altogether notes on one hundred and one species, of which thirty-nine have been found nesting and forty-nine dissected for stomach examination.

The notes on the stomach contents are admittedly very incomplete. They were undertaken almost entirely in the search for bird enemies of the sugar cane froghopper and in view of my lack of time and ability to prepare the skins of birds killed I was reluctant to shoot any further specimens after their relation to this insect had once been established.

The loss of the Leotaud collection of birds in the burning of the Victoria Institute in March 1920 will be a great blow to the study of the Island's birds, particularly to local naturalists who wish to identify birds seen in the field. It is to be hoped that steps will be taken soon to start a new collection. This could soon be done with most of the commoner species, but many of the species found by Leotaud may never again be seen in the island, and it will need someone with the enthusiasm and devotion of this naturalist to replace the rarer forms.

While some birds have doubtless gone never to return, other newcomers may be taking their places and two birds are recorded in this paper, the blue winged parakeet (*Psittacula passerina* Linn.) and Spix's Ground Dove (*Columbina griseola*) to which I can find no previous printed record. Both of them are now comparatively common and it is difficult to believe that Leotaud could have overlooked them unless they were much rarer in his time.

Many interesting problems of bird life are hinted at in the following pages and there is a fascinating field of study waiting for anyone who can carry on this investigation. The migration of the scissors-tail fly-catcher is remarkable in that it moves at the times of the changes of season in temperate climates, and more or less as birds which migrate from north to south and from heat to cold, in spite of the fact that its range is entirely within the tropics and its movement probably from east to west.

The roosting places at which these same birds congregate in thousands each night must be an interesting sight and I have only been able to indicate roughly the position of two of them. Where are the exact spots, and how many of them are there?

The question of the two different kinds of eggs in the nest of the Giouiti (*Synallaxis* sp.) is still unsolved and we do not know if the snake-skin so frequently found among the twigs forming the nest of this bird is carried there by the bird itself or left there by by the snake.

The food of the Waders, which come to the swamps each year and delight the sportsman's heart, was generally believed to be small crabs, snails and other water beasts. An examination of a number of stomachs in October 1920 showed that in some species, caterpillars composed over ninety per cent. of the food.

Lastly but by no means least, the search for and study of the nesting places of the Guacharo, some deep in the forest, some in the cliffs facing the open sea, will provide interest, excitement and even danger, which might attract those to whom lists of nesting places and tables of stomach contents have not the same appeal.

The account of the food and habits which it is yet possible to give is in many cases not enough to decide whether any one species is injurious or beneficial. However it is better to err on the side of over-protection than that of over-destruction, and the present law which protects all the general insect-eating birds is probably sound. From an administrative point of view, however, it would be better to list the species that are allowed to be shot rather than those forbidden, as this would protect the occasional rare visitor and also in any case of doubt, put the onus of proof on the man with the gun.

The humming-birds are described in more detail than the rest owing to the greater general interest that is taken in this group and also in the hope that someone may be encouraged to carry on observations on the nesting-habits, the few notes that I have been able to put together being but a small beginning which anyone with interest and leisure could rapidly increase.

Family TURDIDÆ. Thrushes.

1. *Merula fumigata* Licht. The Cacao Thrush.

Turdus cassius. Leotaud No. 107.

This bird is not uncommon in the cacao districts. A nest was found in Maracas Valley on January 1, 1921 on the upper surface of a broad leaf of a small ornamental palm, about five feet from the ground. It contained two young and one egg, which had not hatched. The nest was rather large and of the usual cup shape, made chiefly of twigs.

The egg is ovate, dull light blue, spotted and blotched light brown.

2. *Merula gymnophthalmus*. Cab. The Bare-Cheeked or Yellow-eyed Thrush.

Turdus nudigensis. Leotaud No. 106.

This is by far the commonest of the Trinidad Thrushes and is widely distributed, being often found in gardens in Port-of-Spain.

Nests have been found on the following occasions.

(1) On July 3, 1918, at Reform about 15 feet from ground on an overhanging branch of a large tree. It contained two eggs one of which was taken. On September 8 the parent bird was still sitting on the nest, but it is not known if there was a second brood in the same nest. The nest was made chiefly of roots.

(2) On July 7, 1918 at San Fernando, containing three eggs recently laid.

(3) On June 20, 1919 at Port-of-Spain, in a hedge about nine feet from the ground and containing three eggs nearly ready to hatch.

(4) On August 12, 1919 at the Usine Ste. Madeleine on the end of a branch of a large tree about twelve feet from the ground. There were no eggs.

(5) On August 26, 1919 a nest containing eggs was found near Port-of-Spain by O. Calvert.

The nest is deep cup shaped and made of various materials. I was informed by Mr. Shannon that the bird frequently places a large leaf of prickly Solanum in the middle of the nest, but have not been able to confirm this.

The egg is ovate or elongate ovate, pale blue or green, evenly speckled and spotted with sepia, some eggs are densely spotted at one of the ends.

Family TROGLODYTIDÆ. Wrens.

3. *Troglodytides rufulus*, Cab. The House Wren or God Bird.
Troglodytes tobagenis Leotaud No. 88.

This bird appears to be generally common and is far from shy It frequently nests inside houses. It is the species usually chosen by the parasitic " lazy bird " or " Oat Bird " (*Molothrus atronitens* q.v.) as a foster mother for its young.

Nests have been found on the following occasions.

(1) On November 23, 1918 on a ledge on the verandah of a house on Gasparee. It contained one young and one egg just ready to hatch. The nest was made of twigs and a few feathers, some of which were quite large. When examined on February 22, 1919 this nest was deserted.

(2) On August 12, 1919 at Usine Ste. Madeleine on the verandah of house, with two eggs.

(3) O. Calvert records a nest of this species in Tobago in August 1920 with 9 eggs. He saw a lazy bird enter this nest and later found an egg on the ground beneath which he believes was thrown out by the lazy bird. Five eggs were taken, two of which had a slightly more bluish ground than the others.

(4) On October 6, 1920 a nest on a ledge in a corner of room in a house in Maracas Valley. It contained two eggs, one of the house wren and one believed to be the lazy birds' (*Molothrus atronitens*).

(5) On November 14, 1920, nesting inside of verandah on house at Maracas with several eggs. This nest was raided by a half tame Trinidad squirrel (*Sciurus æstuans*) and the eggs sucked and the shells thrown on to the ground. The parent birds made a clucking sound when trying to frighten away the squirrel.

(6) On December 21, 1920 another nest in the same house was raided by the squirrel and three eggs destroyed.

The eggs vary considerably in shape, being sometimes normal egg shape and sometimes almost spherical. They are pale reddish brown finely mottled with darker red brown markings.

Family MNIOTILTIDÆ. Wood Warblers.

4. *Dendroeca aestiva*. Gmel. The Figuier or Trinidad Canary
Mniotilta petechia. Leotaud No. 91.

On October 27, 1917 one of this species was shot in a sugar cane field at Harmony Hall and the stomach was found to contain the remains of Chrysomelid beetles, flies and spiders.

5. *Geothlypis æquinoctialis*. Gmel. The Manicou Bird.
Leotaud No. 95.

A male of this species was shot at La Fortunee sugar estate on July 11, 1918 and a pair among tall grass in an abandoned cane field at Harmony Hall on October 10, 1919.

Food. The stomach of the first specimen contained several Cercopidæ (adults of *Tomaspis saccharina*, the sugar cane froghopper) small beetles and traces of some Hymenoptera.

The second (male) contained two or three adults and one nymph of *Tomaspis saccharina* and several caterpillars.

The third (female) contained three or four adults of *Tomaspis*, several small beetles and remains of a grasshopper.

The male shot at Harmony Hall was 140 mm. in total length, fold of wing 62 mm., tail 55mm. The breast of the female was yellow with a touch of cinnamon.

6. *Basileuterus vermivorus* Vieill. The Bush Warbler.
Trichus bivittatus. Leotaud No. 96.

A young of this species was shot in the forest at Palo Seco on August 29, 1920.

Family CŒRIBIDÆ. Honey Creepers.

7. *Cœreba luteola* Cab. The Sucrier or Sugar Bird.
Certhiola flaviola Leotaud No. 61.

This bird is generally common and conspicuous for its bravery in entering houses to eat sugar and other sweet things. It is particularly abundant on the Islands *e.g.* Gasparee.

It was found nesting on the following occasions.

(1) At Woodlands near Guaico on November 27, 1917 in a small bush about four feet from ground, and containing two eggs.

(2) At Maracas on August 22, 1920 a female flew out from a nest which contained neither eggs nor young.

(3) At Maracas on November 5, 1920 another nest was found being constructed.

(4) At Maracas on December 26, 1920 in an orange tree about seven feet from ground—No eggs.

(5) Another on the same day and place about six feet from ground in orange tree and containing one egg.

The nest is domed with a small round opening in one side.

The egg is of the normal egg shape, pale bluish, evenly spotted and speckled light sepia.

According to Mr. H. P. C. Strange this bird frequently builds nests without any idea of breeding and pulls them to pieces again. He also states that he has observed that the mother bird carries the droppings of the nestlings far from the nest, which he suggests makes the position of the nest less conspicuous.

8. *Arbelorhina cyanea* Linn. Red Legged Grampo.
Cœreba cyanea. Leotaud No. 57.

A female of this species was found dead in a house at San Fernando on September 13, 1919. Its legs were entangled with fluff, which was evidently the cause of its death.

The stomach contained the remains of some insects and about 40 Nematode worms which may have been parasitic.

Family VIREONIDÆ. Vireos.

9. *Vireo calidris* Linn. Grey Headed Vireo.
Vireo altiloquus. Leotaud No. 134.

One of these was shot on a tree at Brechin Castle Estate on July 14, 1919.

The stomach contained remains of a beetle and a grasshopper.

Family HIRUNDINIDÆ. Swallows.

10. *Atticora cyanoleuca* Viell. White-Bellied Swallow.
Hirundo cyanoleuca. Leotaud No. 43.

This swallow, though doubtless quite common, was only definitely recorded on three occasions when specimens were shot to determine their food.

(1) Shot at Caroni on September 28, 1917 flying over sugar cane contained one small fly (*Ortalidae*), one *Chalcid* fly, one head of bug (? *Reduviid*) and miscellaneous unidentifiable insect remains.

(2) Shot at Harmony Hall on July 1, 1919 among sugar cane infested with froghopper (*Tomaspis saccharina*) contained remains of several froghoppers, one winged ant, one small shot borer beetle, and one small phytophagous beetle.

(3) Shot at the same locality on July 29, 1920 contained 21 *Tomaspis saccharina*, one winged ant and two small beetles.

According to Leotaud this species is resident in Trinidad throughout the year.

11. *Chelidon erythrogaster.* Bodd. Red-Bellied Swallow.
Hirundo rufa. Leotaud No. 42.

Seen flying over infested sugar cane at Harmony Hall on July 1, 1919; probably generally common.

12. *Stelgidopteryx uropygialis.* Lawr. Yellow-Bellied Swallow.
Cotyle uropygialis. Leotaud No. 46.

Noted on two occasions.

(1) One shot at Williamsville on June 29, 1918 flying over a sugar cane field infested with froghoppers, contained in its stomach a number of winged ants, a *Muscid* fly, some small Hemiptera and beetles.

(2) One shot at Harmony Hall on August 28, 1919 on edge of a sugar cane field infested with froghoppers contained small beetles (*Phytophaga* and *Curculionidae*), various small flies and winged ants.

Neither of these contained froghoppers, but in all probability they would eat them if occasion arose.

Family TANAGREDÆ. Tanagers.

13. *Procnias viride.* Ill. The Blue Mantle.
Tersa ventralis. Leotaud No. 138.

Two seen in the Maracas Valley among cacao on March 28, 1920 and another specimen in the same district on November 27, 1920. Not seen in the open cane cultivation.

14. *Euphonia violacea.* Linn. Semp or Louis d'or Simple.
Leotaud No. 167.

This bird is not uncommon in the wooded districts but I have only two records. One was a nest stated to be of this species on a lime tree near Port-of-Spain on June 24, 1919; and on March 4, 1919 I saw a female carrying nesting material to a nest in a mahogany tree about twenty feet from ground in the Maracas Valley.

15. *Calliste desmaresti.* Grey. Worthless.
Leotaud No. 164.

This bird, which is greenish with a reddish brown head, is not uncommon in Maracas Valley among the cacao and the forest, where it feeds on seeds. I have only two records noted.

Two seen on March 28, 1920 and one on November 12, 1920.

The latter was eating the whitish berries of a species of *Urera* (*Urticaceae*).

16. *Tanagra cana.* The Blue Bird.
T. glauca. Leotaud No. 158.

This bird is the commonest Tanager in Trinidad and is found both in the sugar cane and cacao districts.

I have found nests on four occasions.

(1) In Maracas Valley on August 22, 1920 in a citrus tree about ten feet from ground and containing two young.

(2) In Maracas Valley in a calabash tree about eight feet from the ground on August 25, 1920.

(3) At Palo Seco on August 29, 1920 in a tree on the edge of the sea about fifteen feet from ground. The nest containing two young and both parent birds were bringing food.

(4) In Maracas Valley on December 16, 1920 in an orange tree about six feet from ground and containing two eggs.

The eggs are ovate, dull dirty white evenly spotted and blotched dark brown.

According to Guppy (*Bull. Dept. Agr.* 1914 p. 153) this bird is injurious to fruit.

The only food record that I have is that the stomach of one shot at Harmony Hall on October 10, 1919 contained small seeds and some fruit.

17. *Tanagra palmarum.* Ridgeway. Palmiste.
T. olivascens. Leotaud No. 159.

This bird is generally common and I have five records of its nest.

(1) Nest on verandah of house in Maracas Valley containing one egg.

(2) Nest under eave of verandah in a house in Maracas Valley on June 27, 1920 containing two eggs. The nest was cup shaped and lined with strips of dead banana leaves. One of the eggs was taken and on July 26, the nest contained one fully fledged young.

(3) On August 22, 1920 a nest was found under the eaves of the verandah of another house in Maracas Valley. It contained two large young.

(4) Another nest in the same verandah on the same date contained three smaller young.

(5) A nest in a croton bush about seven feet from ground in Maracas Valley contained on September 27, 1920 two eggs recently laid.

(6) Another nest in a croton bush on December 17, 1920 contained one egg, but this was later destroyed by a squirrel.

The egg is elongate ovate, light cream evenly spotted and speckled sepia.

According to Guppy (*Bull. Dept. Agr.* 1914 p. 153) this bird is sometimes injurious to fruit.

18. *Rhamphocelus jacapa* Lafr. The Silver Beak.
Leotaud No. 155.

This bird is not uncommon particularly in the less open districts. In the sugar cultivation I have only seen it when close to the edge of wooded land. I have noted its occurrence at Maracas, Harmony Hall and Palo Seco.

Two nests were found at the former locality.

(1) On August 4, 1920 in a croton bush, about four feet from the ground, containing two fully fledged young. The nest was cup-shaped and lined with strips of dead banana leaves.

(2) On August 22, 1920, in another croton bush about three feet from the ground and containing one egg.

The egg is elongate ovate, light blue, spotted and wreathed black atthe base.

Although known as the "silver beak" this bird gets its name from a white area at the base of the lower mandible; the beak proper is dark.

19. *Tachyphonus rufus* Bodd. The Parson.
T. beauperthuyi. Leotaud No. 162.

Generally common in the open districts. The black male and chestnut female make a conspicuous pair often thought to be different species. They are often very tame and on Gasparee and the other Islands frequently enter the houses in search of sugar and other tit-bits.

Nests have been found on three occasions.

(1) On June 26, 1919 in the angle at the base of a banana leaf at Tarouba. The nest was a mediumly deep cup made of strips of dead banana leaf with an inner lining of black fibres resembling horse hairs. It contained two eggs both on the verge of hatching.

(2) On July 9, 1919 near Princes Town in the fork of a branch of a mahogany tree about twelve feet from the ground. It was made as before of strips of banana leaves lined with wound black fibres, and contained two young well feathered.

(3) On August 11, 1919 at Tarouba in an angle of a banana leaf in every way similar to the first. The nest was of dried banana leaves lined with smaller leaves. It was empty but I was told that it had contained eggs about a month previously.

The eggs are pale reddish brown with irregular darker red brown markings.

The stomach of a male shot at La Fortunee on August 13, 1918, in an abandoned cane field contained two dozen small black seeds, some pulp and skin of a reddish-yellow fruit and legs of a beetle. According to Leotaud it eats berries, fruits and "eggs and nymphs of ants."

Family FRINGILLIDAE. Finches.

The Finches are locally known as "grass-birds" or, in patois "cici-zebe." Leotaud considers this latter word as a corruption of "cici-des-herbes." Some of them are apparently migrants and are much commoner at certain times of the year.

20. *Volatinia jacarini* Bon. The small Black Finch. Tiaris jacarini. Leotaud No. 170.

This active little blue-black bird is one of the commonest in the sugar cane fields. It is a ground feeder and a ground nester and its abundance, in spite of the presence of the mongoose, makes one doubt the effect that this animal is supposed to have had on the bird fauna.

The male has a remarkable and characteristic habit of perching on a small projecting stalk or twig and taking a sudden tumbling dancing flight upwards for a few feet only to return almost immediately to his perch.

The nest is a deep cup, neatly and openly made of grass woven circularly. They have been found on the following occasions.

(1) On November 28, 1918 at La Fortunee Sugar Estate, about one foot from the ground in a low plant growing among the canes. It contained two eggs.

(2) On August 12, 1919 at the Usine Ste. Madeleine, on the ground at the base of a small solanaceous bush in a pasture. It contained two eggs.

(3) On July 17, 1920 G. Thompson informed me that he saw one of this species carrying nesting material at Caroni.

(4) On August 12, 1920 in grass on the edge of a trace at Harmony Hall. The nest was new and contained no eggs. On August 16 there were two eggs in it.

The eggs are ovate, greenish white, spotted and blotched sepia there are more markings on the broad end.

The food consists of both seeds and insects as the following dissections will show.

(1) Shot among sugar cane at Caroni on September 28, 1917; many seeds and wings of a beetle.

(2) Shot among sugar cane at Harmony Hall on October 27, 1917 seeds and one froghopper (*Tomaspis saccharina*).

(3) Shot among sugar cane at Williamsville on June 11, 1918; seeds, remains of beetle and several froghoppers.

(4) Shot at same time as 3; seeds, remains of beetle and several froghoppers.

21. *Sporophila grisea.* Gmel. Picoplat or Grey Grass-Bird. Spermophila cinereola. Leotaud No. 172.

This bird is common during July, August and September when it is frequently trapped by native boys, as it makes a good cage bird and has a dainty song. Unlike the last species it nests in trees and hedges and not on the ground.

The nest is a deep cup, very openly and thinly woven so that it is possible to see into the nest through the walls. It is usually attached between a fork of a branch. They have been found on the following occasions.

(1) On September 15, 1919 at Tarouba about six feet from the ground in a Hibiscus hedge, containing two young.

(2) On August 31, 1920 near Princes Town, about eight feet from the ground in the fork of a twig of a plum tree, and containing two eggs. On September 2 these had hatched.

(3) On August 31, 1920 near Princes Town, about nine feet from the ground in a plum tree and containing two eggs. On September 2, these also had hatched.

(4) On September 5, 1920 near Princes Town in a Hibiscus hedge about nine feet from the ground and containing two young.

(5) On September 11, 1920 a bird was sitting on a nest about fifteen feet from the ground in a tree near Princes Town. The contents of the nest could not be seen.

The eggs are ovate, pale blue, evenly spotted and blotched dark and light brown.

The food cannot be stated beyond the fact that one bird shot at La Fortunée sugar estate on September 12, 1918 contained seeds only and no insect remains.

22. *Sporophila lineola* Sharpe. The Moustache Finch. Spermophila bouvronoides. Leotaud No. 173.

This black and white finch receives its popular name from the bunch of white moustache-like feathers on each side of the beak. It is not common and I have only seen it on two occasions and have no record of its nesting.

It was seen on July 5, 1919 at Palo Seco and on September 12 in the Maracas Valley.

The stomach of the one shot at Palo Seco contained seeds only.

23. *Sporophila gutturalis* Licht. The Yellow-Bellied Finch. Leotaud No. 175.

One of these was shot at La Fortunee sugar estate on September 12, 1918 and the stomach contained vegetable matter and a few small stones. I have no other record.

24. *Sporophila minuta* Linn. Small Red-Bellied Finch. Leotaud No. 176.

This is, after the small black finch, the commonest grass bird in the sugar cane districts of Trinidad, and it resembles this species in nesting on the ground.

Nests have been found on the following occasions.

(1) On July 15, 1919 in grass of a pasture at Harmony Hall and containing two eggs.

(2) On August 12, 1919 in grass of a pasture at the Usine Ste. Madeleine, containing one young.

The nest is of the usual finch type, deep cup shaped and neatly woven from grass.

The egg is ovate, pale blue, almost white, evenly spotted and speckled sepia.

The food is chiefly if not entirely vegetable as the following dissections show.

(1) Shot among sugar cane at Caroni on September 28, 1917 contained seeds only.

(2) Shot among sugar cane at Williamsville on July 17, 1918 contained seeds only.

25. *Oryzoborus torridus.* Scop. Large Red-Bellied Finch. Pitylus torridus. Leotaud No. 152.

This large finch is not common but has been seen in January, August and September.

One shot at Harmony Hall on August 13, 1919 differed from Leotaud's description in having the feet almost black, the belly feathers grey at the base, and the white at the base of the secondary wing feathers spread along the inner margin towards the apex.

The nest has been found on only one occasion in a Hibiscus hedge near Princes Town, on September 11, 1920 about six feet from ground and containing two eggs. The nest is larger and rougher than that of the Pico Plat.

The eggs are pale bluish white with many red brown markings, mor · or less irregular all over the egg.

26. *Oryzoborus crassirostris.* Gmel. Twa-Twa or Large Black Finch. Leotaud No. 172.

This is the largest Trinidad finch and I have only seen it on one occasion at Harmony Hall on August 25, 1919.

On September 30, 1918 an egg stated to be of this species was given to me taken from a nest in a Hibiscus hedge at the Usine Ste. Madeleine.

The egg is ovate, white, speckled and spotted light brown more so at base.

It is large and distinct from that of the last species, so that the identification is probably correct.

Family ICTERIDÆ. American Orioles.

27. *Ostinops decumanus.* Pall. The Yellow Tail. Casicus cristatus. Leotaud No. 146.

This bird is most remarkable for the long hanging nests which it builds in tall trees, usually a number of nests occupying the same tree. The whole nest may be three to five feet in length, but most of this is a stalk which supports the bulbous nest at the end. The opening of the nest is at one side of the bulb. The nest is made of woven grass and other fibres.

These birds are not uncommon in the wooded parts of the Island and may be frequently seen flying steadily in numbers between their nesting and feeding grounds, particularly in the evening.

Their flight is very noisy and they have a remarkable variety of cries including a sharp cry and a bubbling sound.

They are omnivorous, eating both fruit and insects and have been reported as doing damage when in numbers. The stomach of one shot in Maracas Valley on January 29, 1921 contained 12 red caterpillars, a few beetles and traces of vegetable matter.

The nests are visible all the year round, but I have no data of the actual breeding season.

28. *Casicus persicus.* Linn. Yellow-rumped Corn Bird. Leotaud No. 147.

This bird is intermediate in size between the yellow tail and the common corn bird. I have only seen it in the Southern portion of the Island at Palo Seco and Penal, in both of which localities there was a colony of the typical hang nests.

The nest is much shorter than that of the yellow tail, but like it has a solid stalk and the opening in the bulbous nest-proper at the end

I have no record of their food, but in the *Bull. Dept. Agr.* Trinidad. III p. 29 they are recorded as opening the pods of Lima beans (*Phaseolus*) just before sundown and extracting and eating the beans. The record says that the bird catches the pod in its feet and opens it and extracts the half ripe seeds.

29. *Icteris xanthornis*. Gmel. Common Corn Bird. Leotaud No. 148.

This brilliant golden-yellow and black bird is the commonest of the Trinidad *Icterids* and the nests are frequently met with. It is particularly noticeable in the more open sugar growing districts, where it nests in trees and bamboos in the small copses and on banks of streams.

The nest is like a stocking about one foot long and four inches across, made of finely woven grass and fibres. They are usually high above the ground, but on one occasion I found one only about six feet from the ground.

Nests have been found as follows:

(1) On June 18, 1918 at Craignish, a solitary nest at end of tall bamboo, containing two young and one egg.

(2) On June 22, 1918 on Patos Island attached to underside of midrib of coconut leaf near the end.

(3) On July 11, 1918 on the end of a branch of Hog plum at La Fortunee about ten feet from ground containing three eggs.

(4) On July 1, 1918 at Harmony Hall about seven feet from the ground in an isolated bush in the middle of a cane field. It contained three eggs one of which was taken and found to contain a small embryo. On July 6 both the remaining eggs had hatched. On July 23 the nest was empty and apparently abandoned.

(5) On August 13 another nest was just begun on the same tree within a few inches of the last and I believe by the same pair of birds. On August 18 about three inches of the neck was completed with longer hanging vertical grass stems in which to interlace the circular ones. On August 25 the nest was complete but empty. The old nest (4) was still intact alongside. On September 8 the new nest contained three eggs, but the old nest was almost destroyed. On October 7 the parent birds were still at the nest, but it was empty. On December 9 the birds were still at the nest.

(6) On July 8, 1920 a nest just finished in a bamboo clump only about seven feet from ground at Tarouba.

(7) At end of July 1920 a bird was seen constructing its nest at Gasparee by Mr. G. Thompson.

(8) Several nests were seen at Maracas under the overhanging leaves of a gru-gru palm in August 1920. Some of these nests were attached along one side to the almost vertically hanging tip of the leaf.

The egg is pale sky blue with a ring of narrow irregular black and dark brown streaks near the blunt end.

The food is indicated by the following observations :

(1) Shot among sugar cane on October 20, 1917 at Harmony Hall contained two froghoppers (*Tomaspis saccharina*), two caterpillars several small beetles and small pieces of vegetable matter.

(2) Shot alongside its nest in a tree on La Fortunee sugar estate on July 11, 1918 contained one froghopper, two moths (one apparently *Castnia licus*) and several small beetles.

30. *Molothris atronitens*. Cab. Lazy Bird.
Molothris bonariensis. Leotaud No. 149.

This uniformly blue black bird resembles the European cuckoo in that it lays its eggs in the nests of other birds, usually choosing that of the house wren.

I have no absolutely certain records of its eggs, but on October 6, 1920 I found a nest of the house wren on verandah of a house in Maracas Valley containing one typical house wren egg and one about the same size but less shiny and with a distinctly blue ground colour unlike any house wren egg I have seen. This is possibly that of the lazy bird.

In August 1920 O. Calvert saw a lazy bird enter the nest of a house wren in Tobago which contained nine eggs. Later one of these eggs was found on the ground beneath the nest and he believes that it was thrown out by the lazy bird.

According to Mr. H. P. C. Strange, who resided for some years in Tobago, this bird is not always parasitic, as he has on more than one occasion seen them feeding their own young.

The bird is both insectivorous and vegetarian.

One bird shot at Harmony Hall on July 1, 1919 contained a few froghoppers (*Tomaspis saccharina*) remains of two beetles (one a weevil) and several seeds (?corn).

Guppy (*Bull. Dept. Agr.* 1914 XIII 153) records it as injurious to rice fields.

31. *Agelaius icterocephalus*. The Golden Head.
Chrysonus icterocephalus. Leotaud No. 151.

This is a remarkably beautiful bird ; blackish-brown with a golden-yellow head and neck in the male.

It is chiefly seen in the more open parts of the Island and in the neighbourhood of ponds and swamps, where it breeds.

The nest is deep cup shaped and is slung between several reeds over the surface of the water, usually where it is about a foot deep. It is made of leaves of reeds wound circularly.

(1) A nest was found on July 14, 1919 about 18 inches from the surface of the water in rushes round the edge of a pond at Harmony Hall. The rushes were about two feet above the surface and the water was about one foot deep. There were no eggs. A bird was seen carrying nesting material . On July 23 this nest had two eggs.

(2, 3, 4, 5) On August 12 four nests were found round the edges of a pond at the Usine Ste. Madeleine. None contained eggs and some were dilapidated, so that the breeding season was evidently just over.

(6, 7) Two more nests were found in the pond at Harmony Hall on September 8, 1919 one containing two eggs ; but these were found to be bad, so that in all probability it was a nest deserted in July.

The egg is ovate, pale blue, spotted dark brown at base, sometimes scrawled.

The bird has two very distinct notes—a sharp " tsek " and a long drawn out " zzzeee."

The food consists of both insects and seeds and from the latter habit the bird is sometimes injurious to rice fields.

Stomach observations have been made as follows.

(1) Shot at Williamsville on July 13, 1918 contained various beetles including a weevil related to *Metamasius* some beetle grubs, some moths, one or two small stones and doubtful vegetable matter.

(2) Shot at La Fortunee sugar estate on September 12, 1918 contained remains of about six beetles, three seeds and miscellaneous vegetable matter.

(3) Shot at Harmony Hall on June 30, 1919 contained about 20 froghoppers (including one nymph) a small beetle and some seeds and vegetable matter.

32. *Leistes guianensis*. Linn. The Soldier Bird.
Leistes americanus. Leotaud No. 150.

This bird is also known as the " red-breast " from the colour of the male, but the above name seems better as it introduces no confusion with the English " Red Breast."

It is not uncommon in open pastures and is one of the few ground nesting and ground feeding birds. In spite of the mongoose it exists in considerable numbers in some localities, chiefly in the Naparimas. At certain times of the year (January and February?) it collects in large flocks of both sexes, at other times it is more solitary.

The flight is rather heavy with rapid flapping of the wings.

The nest is on the ground in a tuft of grass or at the base of a small bush.

According to Mr. Shannon they were nesting on pastures at Harmony Hall in the beginning of December 1918, and Vivian Todd recorded to me finding a nest at the Usine Ste. Madeleine on August 1, 1919 with two eggs in it.

On August 25, 1919 I saw a pair on the Harmony Hall pasture the hen carrying a caterpillar obviously for the purpose of feeding young, but I was unable to locate the nest.

According to Guppy (*Bull. Dept. Agr.* XIII 1914 153) this bird is injurious to rice fields and "seldom, if ever, eats insects." However, the only two stomachs that I have examined contain, as shown below, only insect remains.

(1) Shot at Craignish June 18, 1918 contained a grasshopper, several beetles, a caterpillar and a froghopper.

(2) Shot at Harmony Hall June 2, 1919 contained remains of several small beetles, including two weevils, and about ten heads of a small species of Heteroptera.

33. *Quisqualis lugubris*. Swains. The Boat-Tail.
Quisqualis barita. Leotaud No. 144.

This is one of the most abundant and conspicuous of Trinidad birds being found both in the towns and in the country. It is particularly frequent in Port-of-Spain where, in company with the tick bird (*Crotophaga ani*) it may be seen following the cattle on the savannah.

It gets its name from the remarkable position which the tail feathers take up during flight and particularly when alighting, the feathers on each side being progressively raised and sloping from the middle so that the tail forms a deep V-shaped groove somewhat recalling a boat.

There is a prevalent idea in Trinidad that the boat-tail has been recently introduced from Barbados. While this may be true of a few specimens, there is no evidence that it is not an old established species. It is recorded as common by Leotaud in 1860 and he makes no reference to any introduction.

It nests in tall trees, usually well away from the ground and appears to like the wild pines (*Bromeliads*) that grow commonly as epiphytes in these trees.

(1) A nest was found just completed but without eggs on June 12, 1918 in a Bromeliad in a tree at Williamsville about fifteen feet from the ground.

(2) O. Calvert recorded to me that he found a nest near Port-of-Spain on June 24, 1919 containing eggs.

(3) On September 3, 1920 a bird was seen carrying food to a nest in a Palmiste palm near Princes Town.

According to Mr. Strange more than one bird occasionally lays in the same nest, but I have not personally seen this.

The food is varied and includes insects, spiders and even lizards. The bird is frequently seen round the cattle pens or following the diggers in the fields. It is sometimes called the " pen-bird " by sugar planters. In Porto Rico it has been proved by dissection to at ticks and almost certainly does so here. It is one of the few birds that will take the nymphs of the injurious sugar cane froghopper from the froth with which they are surrounded.

Urich (*Bull. Dept. Agr.* Trinidad IX p. 160) records them feeding on caterpillars of *Remigia repanda* that were destroying sugar-cane at Couva in July 1909. According to Mr. Barnardo it frequently kills bees.

The following are actual stomach contents:

(1) Shot at Harmony Hall among sugar cane on October 20, 1917 contained the bones of a small lizard, remains of a froghopper, and numerous other insect remains chiefly beetles.

(2) Shot at Caroni among sugar cane on October 30, 1917 contained a large number of froghoppers and one or two small beetles.

(3) Shot at Wellington Estate on July 9, 1918 contained eight adult and two nymph froghoppers, three small spiders, one cockroach, one grasshopper and five termites.

Family TYRRANIDÆ. Tyrant Fly-Catchers.

34. *Fluvicola pica* Bodd. The Washer-woman.
Leotaud No. 108.

This pretty little black and white bird is generally common, particularly in the more open parts of the country devoted to sugar growing, and is frequently seen settling on the telegraph wires along the main roads.

Fig. 1.—The Washer-woman (*Fluvicola pica*).
About half natural size.

It makes a small covered nest with the opening near the top at one side on bushes, trees and even telegraph posts. The nest is made of grass stalks and cotton fluff and usually lined with feathers. Nests have been found on the following occasions.

(1) On October 26, 1917 at Harmony Hall about twenty feet from the ground in a large tree.

(2) On June 18, 1918 at Craignish in a Castilloa tree about twenty feet from the ground.

(3) On July 4, 1918 at La Fortunee Sugar Estate at the end of a long branch of a fiddlewood tree overhanging a pond. It contained three eggs.

(4) On July 11, 1918 at La Fortunee, a nest just commencing in a bush over a small stream about three feet from the ground. Both sexes were bringing nesting materials.

(5) On same date and locality another nest about seven feet from the ground on a tree stump. No eggs.

(6) On September 5, 1918 at La Fortunee, about eight feet from ground in a bush alongside the lagoon, containing three eggs.

(7) On same date and place another nest about nine feet from the ground in a "mapon" tree, containing three eggs. The hen was seen entering the nest with a feather in her beak so that these may apparently be added after egg laying.

(8) Another nest at same place and date about fourteen feet from ground in a tree. The hen bird was seen entering with food so presumably there were young.

(9) On September 8, 1918 a nest about twelve feet from ground in a large tree at Reform.

(10) On September 12, 1918 a nest containing broken eggs on a tree stump about seven feet from ground on the edge of the lagoon at La Fortunee.

(11) On June 27, 1919 at Harmony Hall at the end of a branch of a tree about nine feet from ground. No eggs.

(12) On June 30, 1919 at Harmony Hall in a guava bush about four feet from ground containing three eggs.

(13) On July 13, 1919 at Reform about thirty feet from ground in a large tree.

(14) On July 23, 1919 at Harmony Hall about twenty feet from ground in a large tree.

(15) On August 25, 1919 at Harmony Hall about twenty-five feet from ground in bamboos.

(16) On September 8, 1919 at Harmony Hall a nest just completed in reeds about six feet from edge of pond and about two feet above the water. On October 7 this nest contained young.

(17) On October 20, 1919 at Tarouba about eight feet from ground in mango tree, containing one egg.

(18) On September 3, 1920 at Malgretoute in a large tree about twenty feet from ground.

The above records show nests in June, July, August, September and October, which months are all in the wet season.

The egg is pale cream, almost white, with a very few very smal pale brown spots and still fewer dark brown spots scattered chiefly at the blunt end.

The food is indicated by the contents of the stomach of one shot at Caroni on October 30, 1917 which contained about ten froghoppers and two small beetles.

35. *Arundinicola leucocephala*. Linn. The White-Headed Widow. Leotaud No. 108.

This conspicuous black bird with a white head is almost as common as the preceding species and frequents similar localities.

The nest is very similar to that of the Washerwoman and I can give no distinguishing characteristics.

Nesting was observed as follows.

(1) On July 14, 1918 at La Fortunee sugar estate at the end of a long branch of a fiddle wood tree overhanging the pond and about four feet above the water. (N.B. a nest of *Fluvicola pica* was on the same branch.) It was made of grass, cotton seeds and fluff and lined with feathers . It contained three eggs.

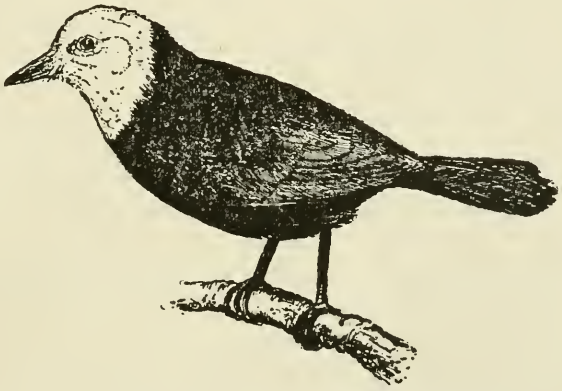


FIG. 2.—THE WHITE-HEADED WIDOW (*Arundinicola leucocephala*). About half natural size.

(2) On September 5, 1918 at La Fortunee sugar estate in a Hog-plum tree about ten feet from the ground. It contained four eggs.

(3) On August 25, 1919 a hen bird was seen carrying grass at Harmony Hall so presumably a nest was being constructed.

(4) On September 3, 1919 a nest at Couva in a pigeon-pea about seven feet from ground and containing one fresh egg.

The egg is pale pinkish cream without any markings.

The food is shown by the following three stomach contents.

(1) A cock bird shot at Brechin Castle sugar estate on November 19, 1917 contained two froghoppers (*Tomaspis saccharina*), one small beetle (a blue chrysomelid) and numerous unidentifiable insect remains, chiefly beetles.

(2) A hen shot at the same time as the above contained *Tomaspis saccharina*, and various insect remains mostly beetles.

(3) One shot at Williamsville on June 11, 1918 among sugar cane contained one *Tomaspis* and a small brown beetle.

36. *Elania pagana*. Licht. Tillon or White-Crested Fly catcher. Myiobius martinicus. Leotaud No. 168.

One of this species was seen at Harmony Hall on July 1, 1919.

37. *Legatus albicollis*. Black-Banded Flycatcher. Myiobius leucophanis. Leotaud No. 120.

This species was found nesting in an old nest of a corn bird (*Icterus xanthornis*) on the end of a leaf of a tall gru-gru palm in the Maracas Valley on August 11, 1920.

The stomach of one shot on August 17, 1920 contained about ninety-nine per cent. vegetable matter, some greenish berry or fruit, and a small quantity of insect remains.

38. *Pitangus sulphuratus*, Linn. The Common Keskadee. Saurophagus sulphuratus. Leotaud No. 111.

This is perhaps the most obvious bird in Trinidad, both from its abundance and its noisy cry which is heard from early morning to dusk. It is abundant in the towns and common in the cacao districts, but in the more open sugar cane districts it is largely replaced by the Grey-Headed Keskadee (*Tyrannus melancholicus*).

Nesting records are as follows :

(1) On April 15, 1920 in Maracas Valley in a large tree about fifteen feet from the ground in the fork of the main and side branch. On April 26 it contained three eggs.

(2) On July 7, 1920 in Port-of-Spain in a Cabbage Palm a nest containing fully fledged young (G. Thompson).

(3) On August 5, 1920 a bird was seen entering the nest No. 1 in Maracas Valley but there were no eggs in it.

The nest is a very deep cup with a slight dome so that the opening is at one side of the top.

The egg is elongate oval pale coffee coloured spotted dark brown some of the spots are pale brown and there are more markings at the broad end.

I have no actual records of stomach contents of this species but it appears to be omnivorous. Guppy (*Bull. Dept. Agr.* XIII 125 1914 says that they eat Capsicum peppers and also Honey Bees and the large Moth Borer of sugar cane (*Castnia Licus*).

Mr. Barnardo tells me that it is difficult to keep bees in the Tamana district as the keskadees eat all the queen bees on their nuptial flight.

The bird has been frequently accused of eating lizards and Mr. Urich considers that the great number of lizards in the cacao districts of Grenada is due to the absence of this bird.

39. *Myiarchus tyrannulus*. Muller. Black-Billed or Foolish Flycatcher Myiobius nigriceps. Leotaud No. 122.

One of these was shot at La Fortunee on July 11, 1918 in the Lagoon on the edge of the cane cultivation.

The stomach contained one froghopper (*Tomaspis*) and two small green seeds with a red coating (?black sage).

40. *Tyrannus melancholicus*. Licht. Grey-Headed Keskadee. T. verticalis and T. vociferans. Leotaud No. 112.

As noted above this bird replaces the Common Keskadee in the open sugar growing districts of the Island, and is seldom seen in the towns. It is distinguished from the Common Keskadee by the greyish head (not black with a white eye streak) and by its quieter habits. It is fond of sitting on the topmost branch of a low bush or on the telegraph wires that run through the sugar estates.

It nests in trees and bushes but the nest is a more normal cup than that of the common keskadee without any attempt at a roof. They have been found on the following occasions.

(1 and 2) Two nests on March 26, 1918 at Craignish in a tree about fifteen feet from the ground, each close to the nest of the common Jack Spaniard (*Polistes*).

(3) On June 27, 1918 at La Fortunee in a guava bush about four feet from the ground, containing one young apparently less than a week old.

(4) On July 4, 1918 at La Fortunee in a wild pine (*Bromeliad*) in a large Fiddlewood tree alongside a pond. The nest contained no eggs and appeared to be in the process of construction.

The food is chiefly insects as shown by the following dissections.

(1) Shot at Caroni on September 28, 1917 among sugar cane contained several dung beetles (*Scarabeidae*), two weevils, one *Chrysomelidae* (?*Ceratoma* sp.) one moth and one butterfly.

(2) Shot at Caroni on October 30, 1917 contained several froghoppers (*Tomaspis*), one Scarabeid, one weevil and several small beetles.

On July 23, 1919 one was observed with field glasses to catch and eat a large dragon-fly.

41. *Milvulus tyrannus*. Linn. The Scissors-tail Flycatcher. Leotaud No. 114.

This striking bird is in many ways one of the most interesting of the Trinidad species.

Apart from its economic importance as the most important enemy of the injurious sugar cane froghopper its annual migration, and its daily journeys to and from its roosting places are of the greatest interest.

FIG. 3.—THE SCISSORS-TAIL FLYCATCHER (*Milvulus tyrannus*). About half natural size.

The long tail feathers of the male make it a conspicuous object in the open country which it frequents and most sugar planters are familiar with it and recognise it as a friend.

It usually appears each year shortly after the beginning of the wet season but the date of its first arrival does not seem to be definitely connected with the date of the first rains. The following table shows what little information is available on this question.

Year.	*First Rains.*	*First Record of Bird.*
1918 ..	May 25-27 ..	Reported at La Fortunee at middle of May, first seen June 7.
1919 ..	First Week May	First seen, June 10.
1920 ..	June 15 ..	Already present, June 29, no previous observation.

It increases rapidly in numbers and is usually in very great abundance from July to September, often congregating in enormous numbers in the sugar cane fields attacked by froghopper.

By the end of September the numbers begin to lessen and by the end of October only a few stragglers remain. In 1918 none were seen after October 27 ; in 1919 three males were seen on November 11, one on 14, and two on November 24.

In 1918 there was an interesting departure from the normal routine in the appearance of four individuals at La Fortunee Sugar Estate about the middle of March. They were reported to me by Mr. Creteau and were seen by myself on March 20 and 26. It is further remarkable that the cane field in which they were seen was suffering from an abnormal attack of froghoppers during the dry season.

It will be seen from the above that the birds usually reach the Island about the beginning of June and leave about the middle of October, during which time they do not nest.

So far as I can find information, they breed during the remainder of the year somewhere in Venezuela or Colombia. That is to say their movements are entirely within the tropics. But the changes of season in Trinidad are from dry season to wet about the middle of May to the beginning of June, and from wet season to dry at the end of December or during January. So that while the arrival of the birds corresponds more or less to one change, its departure does not correspond to the other. Its movements therefore are apparently not determined by the seasonal changes in Trinidad. It is possible that they follow seasonal changes in the country where breeding takes place, but it is also worth pointing out that the migrations take place almost at the same time as those of the birds of temperate climates migrating North in Spring and South in Autumn, and we may have here a relic of a much longer migration in past times.

Daily Movements. This bird is often seen flying in large numbers in one direction. Careful observation shows that in any one locality these are almost always in the same direction every morning and in the opposite direction every evening. In fact the birds from a very large area congregate every evening in some special roosting locality and from there spread each morning to the surrounding country. Two of these roosting places I have located approximately, but have not had an opportunity to see either of them.

One of them is in the mangrove swamp between Caroni and Port-of-Spain and is located by observations of the birds in Port-of-Spain flying to the west in the morning and to the east in the evening (F. W. Urich), and by several observations by C. M. Roach of enormous numbers flying to the east between San Juan and Caroni at 5.30 to 6.30 a.m. in August 1920. On August 7 he states that there must have been over 20,000 birds, while on August 14 there were about three times as many as this. These must have been flying from some roosting place near the mouth of the Caroni river.

The second roosting place is somewhere near the coast near Couva and probably near where the Monkey Point road reaches the sea. Most of the birds from the greater part of the Naparimas return here every night to sleep. From Princes Town to the Oropuche Lagoon they can be seen flying northward every evening about 5.30 to 6.30 p.m. in great numbers, gradually converging to the coast by Claxton Bay. The reverse flight takes place every morning about 5.30 to 6 a.m. and the approximate position of the roost was ascertained on September 17, 1920, while driving from San Fernando to Port-of-Spain in the early morning. It was then observed that from Claxton Bay (at about 5.45 a.m.) to about half a mile south of the Monkey Point Road all the birds were flying almost due south; from here to the Monkey Point Road there was a gradually increasing number flying towards the east; just north of this road all were flying due east, by Couva village many were flying north-east, and a mile further north a few were flying still more towards the north. They were therefore radiating from a point near the coast just north of Monkey Point Road.

The directions of these early morning flights and the approximate positions of the two roosts are given in the adjoining map which shows the greater part of the east coast of the Island.

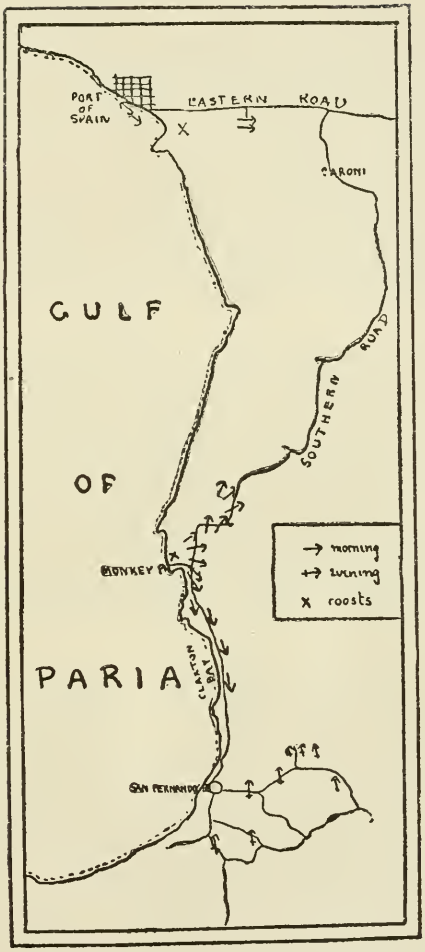


FIG. 4.—MAP SHOWING DAILY MOVEMENT AND ROOSTING PLACES OF SCISSORS TAIL FLY-CATCHER. (*Milvulus tyrannus.*)

Not all the birds come to these roosts each night and, in the Naparimas at least, numbers may be seen settling to sleep about 6 p.m. on the black sage bushes.

The females and young have much shorter tails than the males. In a northward evening flight crossing the road between San Fernando and Princes Town on September 19, 1920 I counted 78 with long tails and 18 with short.

The food consists almost entirely of insects, but occasionally seeds are taken as the following three dissections show.

(1) Shot at La Fortunee on July 4, 1918 on the edge of the lagoon, contained 7 froghoppers, 4 winged ants, a number of beetles including some elaterids, and the remains of a millipede.

(2) Shot at Harmony Hall on August 12, 1920 contained 14 froghoppers some small beetles and three seeds.

(3) Shot at the same time as the above contained one winged ant and several seeds which appeared to be those of the Black Sage, which is a common weed on abandoned cane fields.

Family PIPRIDÆ. Manakins.

42. *Manacus manacus* Linn. White-Throated Manakin.

Pipra gutturalis. Leotaud No. 136.

One bird believed to be this species was seen at Maracas on March 4, 1919 and another on April 5, 1920.

A nest with four just hatched young was reported to me at Erin on September 18, 1920 by G. Thompson.

I have no record of its food nor had I an opportunity to observe the " dancing " in which it indulges.

Family COTINGIDÆ. Cotingas.

43. *Chasmorhynchus variegatus.* Gmel. The Bell Bird.

Procnias variegata and nivea. Leotaud No. 139.

This bird, judging by its anvil like note is fairly common in the forests of the Northern range, but the sound is extremely difficult to locate and I have only once actually seen the bird.

I have no records of food or nesting habits.

Family DENDROCOLAPTIDÆ. Wood Creepers.

44. *Synallaxis spp.* Giouiti, Rootie or Kri-kri-kri.

There are four species of the genus *Synallaxis* in Trinidad. They are very difficult to distinguish and in most cases I have had to make observations without being certain to which species they refer.

The local name Kri-kri-kri comes from the harsh grating sound that they make when disturbed.

The nest is a remarkable retort-shaped structure made of small and large twigs interlocked. It is very large for the size of the bird and has a narrow tube entrance at one side at the top. It is remarkable that a number of the nests have pieces or the whole of a snake skin in among the twigs, but I do not know if this is brought

by the birds or whether snakes about to cast their skins find the mass of twigs forming the nest a convenient brush for removing the old skin. The presence of these skins is sufficiently frequent to earn for these birds the name of " snake bird " in some places.

Nests have been found on the following occasions :

(1) On July 4, 1918 at La Fortunee sugar estate about twelve feet from ground in a fork of a mangrove tree on the edge of the Oropuche Lagoon. It contained four eggs, two of which were distinctly larger, more pinkish, more oblong and with thinner shells than the other two. Each of these contained a large embryo without feathers on the head.

The other two eggs were slightly smaller, more greenish in colour, rounder in outline, had a thicker shell and contained embryos with a row of feathers on the head above each eye.

The two birds attending this nest were shot and identified with comparative certainty as the Marsh Rootee (*S. cinnamonea* Gmel.).

(2) On the same date and at the same locality another nest of the *Synallaxis* sp ? was seen on a post projecting about two feet above the surface of the water in the middle of a pond. The water in this pond gradually rose during the wet season, but Mr. Creteau informed me that the young hatched out and flew before the nest was submerged.

(3) On September 12, 1918, some birds (?the same) had built another nest on the top of same post which was now only about six inches above the water level.

(4) On September 12, 1918, a nest was found just above the door inside a shed on La Fortunee estate. A bird was seen near the nest evidently excited and on examination the nest was found to contain a large rat and the remains of a small bird. The rat was killed and on October 3, the nest contained two eggs, both white.

(5) On September 29, 1918, a nest was found at Reform in the fork of a tree about eight feet from ground. It contained two eggs. On October 2 these were examined and one was smaller and with a bluish tinge, the other larger and quite white.

(6) On February 16, 1919, a nest about six feet from ground in a citrus tree in San Fernando. It contained four bluish white eggs. There was a snake skin in the material of the nest. On February 19, all the eggs had hatched.

(7) On June 26, 1919, at Tarouba in a lime tree about four feet from the ground, containing four eggs, three bluish green, the fourth slightly larger and paler. One green egg examined contained a large embryo. The white egg contained a much smaller one.

(8) On June 27, 1919, Mr. Shannon reported finding a nest in a low bush in a pasture at Harmony Hall, containing a snake skin in the materials. The nest was scarcely above the level of the grass.

(9) On June 29, 1919, a nest quite exposed in a small bush in a garden at Reform about four feet above the ground. It contained three eggs two of which were typical pale blue-green, the third about the same shape, slightly larger and pale pinkish white. One blue green egg was taken and found to be quite freshly laid.

(10) On September 15, 1919, a nest in a bush about six feet from the ground at Tarouba contained one egg. It appeared from the outside of the nest to be of the "blue-green" variety. On September 19, the nest was examined again and contained three eggs, two pure white and one pale bluish yellow. There were pieces of snake skin in the nest materials.

It will be seen from the above records that in nests of *Synallaxis* there are very commonly two different types of eggs :

(*a*) Smaller, bluish white or greenish white, rounder and with a thicker shell.

(*b*) Larger, pinkish white or white, more oblong and with a thinner shell.

I can throw no light on the meaning of this. The difference in the embryos found in the first nest would indicate that they belong to two different species of bird, but whether it is two species of *Synallaxis* occupying the same nest or whether one is a parasitic bird I do not know. There is in some birds a great variety of egg colour and according to Mr. A. H. Clarke in some pigeons the first laid eggs have more pigment than the later ones, but it is difficult to imagine the same bird regularly laying eggs different in size, shape, colour and thickness of shell, in addition to the differences found in the embryos.

Of the nests containing eggs :

No. 1 contained	2 of type (*a*)	and 2 of type (*b*).
No. 4	0	2
No. 5	1	1
No. 6	4	0
No. 7	3	1
No. 9	2	1
No. 10	1	2

If one of the eggs is laid by a parasitic species it is difficult to say from these figures which egg belongs to it and which to the host.

Food. Two birds identified as the Marsh Giouiti (*S. cinnamonea*) were shot on July 4, 1918, at La Fortunee on the edge of the Oropuche Lagoon. One contained two froghoppers, a small spider, several small beetles and numerous other insect remains ; the other contained one froghopper, one ant, one red mite (Trombidium), and miscellaneous insects, chiefly beetles.

45. *Dendrornis sussurans.* Jardine. Cacao Insect Pecker.
Nasica sussurans. Leotaud No. 83.

This bird is not uncommon in the cacao districts of the Northern range and doubtless elsewhere, but it is not found in the open country.

The stomach of one shot on December 31, 1920, in the Maracas Valley contained one grasshopper and one weevil. According to Guppy (*Bull. Dept. Agr.* XIII 1914 119) it feeds on insects including ants and beetle larvæ.

46. *Dendrocinchla meruloides* Lafr. Little Cacao Insect Pecker.
Dendrocops meruloides. Leotaud No. 86.

One of these was shot in the Maracas Valley on July 22, 1920. According to Guppy it has the same habits as the last species.

47. *Thamnophilus major* Vieill. Cou-cou.
T. stagurus. Leotaud No. 143.

One of these birds was seen at San Fernando on March 12, 1919.

48. *Thamnophilus doliatus* Linn. Pin'adé.
Leotaud No. 142.

A pair of these were seen at Palo Seco on July 5, 1919, a cock bird was seen at Moruga on September 4, 1919, and a pair near Princes Town on March 14, 1920.

I have no record of food or habits, but according to Guppy (*Bull. Dept. Agr.*, XIII 1914 119) it is insectivorous.

Family TROCHILIDÆ. Humming Birds.

Seventeen species of Humming Birds have been recorded from Trinidad but some of these are now very scarce and possibly no longer occur.

The slaughter of them for skins for export has now been stopped for some years but the spread of civilisation and cultivation gradually lessens the numbers of the shyer species.

Owing to the loss of the Leotaud collection and the interest usually shown in this group I have added short descriptions of all the species, including those which I have not seen. It is hoped that this will encourage residents in the Island to study the habits of the remaining species before they too become rare.

The recorded species are given below. The ten species marked with an asterisk I have seen myself at various dates between 1918 and 1921.

*	(1) Brin Blanc	(Phœthornis guyi guyi, Less.)
*	(2) Rachette	(Phœthornis longuemareus, Less.)
*	(3) Balisier	(Glaucis hirsutus, Gmel.)
	(4) Carmin Throat	(Anthoscenus longirostris longirostris Viell.)
*	(5) White Breast	(Agyrtria chionopectus, Gould.)
	(6) Lessons Emerald	(Agyrtria viridissima, Less.)
*	(7) Common Emerald	(Saucerottea tobaci erythronotus, Less.)
	(8) Woscal	(Anthracothorax gramineus, Gmel.)
*	(9) Plastron	(Anthracothorax nigricollis, Viell.)
	(10) Brown Violet-Ear	(Colibri delphinae, Less.)
	(11) Carib Emerald	(Chlorostilbon caribbaeus, Lawr.)
*	(12) Jacobin	(Florisuga mellivora, Linn.)
*	(13) Amethyst	(Calliphlox amethystena, Gmel.)
*	(14) Ruby-topaz	(Chrysolampis mosquitus, Linn.)
	(15) Saphir	(Chlorestes coerulens, Viell.)
	(16) Pearl	(Polytmus thaumantias chrysobronchus, Shaw)
*	(17) Coquette	(Lophornis ornatus, Bodd)

Leotaud, (*Oiseaux de l'isle de Trinidad*, 1860) describes fifteen of these species and one other (the Saphir-Savan) which may possibly refer to the Carib Emerald, but cannot be determined with certainty from his description.

Chapman in 1894 notes ten species and remarks on the habits of several of these . (*Bull. Amer. Museum Nat. Hist.* VI 1894 pp. 1-86).

Hellmayr in his collection from Trinidad described in *Novitat Zool.* XIII (1906) had fifteen species represented, the missing ones being the Amethyst and Lesson's Emerald.

In spite of a general supposition that humming-birds sip the nectar from flowers, they are in reality almost exclusively insect eaters which will be seen from the notes given below and which has been found elsewhere by other observers. They visit flowers almost entirely for the purpose of getting the small insects which are found therein.

The nests of humming-birds fall into two very distinct groups. First the " saddle " nests, which are attached to a branch or a fork of a branch in such a way that the opening of the nest is pratically always above the level of the branch which passes through it. A typical example of this is seen in Plate III fig. 6.

In the second type, the "hang" nest, the nest is attached by one side only to the underside of some overhanging leaf or fern frond and practically always has the nest material prolonged beneath into a long hanging tail-like attachment. Typical examples of this are seen in Plate II and Plate III fig. 5.

So far as can be ascertained from previous records and my own observations, the two types of nests are made by the following birds:—

Hang Nest.	*Saddle Nest.*
Brin Blanc	White Breast.
Rachette	Common Emerald.
Balisier	Ruby-Topaz.
	Carib Emerald.
	? Plastron.
	? Coquette.

No records are available of the other species, so there is still plenty of opportunity awaiting anyone who is sufficiently interested to study the group for a few years.

49. *Phœthorni guyi guyi*, Less. The Brinc Bl nc.
Phœthornis guyi. Leotaud No. 63.

This and the next species are comparatively dull coloured humming-birds, usually found close to the ground in wooded localities near water. Both are characterised by having the two central tail feathers tipped with white and distinctly projecting beyond the other tail feathers. This white projection is noticeable even in flight. The present species is half again as big as the next.

The back dull golden green ; an orange eyebrow and an orange line beneath the eye ; between these two a dark line. The throat reddish outlined with black. The rest of the body beneath grey, tinged with reddish in the middle of the abdomen. Tail steel green to black, and edged with a narrow white border. The two centre tail feathers 3 or 4 mm. longer than the rest and more than twice as long as the outer pair. The bill very long and slightly curved. Total length about 170 mm. The female resembles the male.

Nests of this species were found on two occasions in the Maracas Valley.

The first nest was found on June 7, 1920 attached to the end of a leaf of an aroid creeper *Philodendron* sp. close to the edge of the river. It was about nine feet above the level of the water. It contained no eggs but the bird was constantly flying in its vicinity.

The second nest was found on December 31, 1920 hanging from a leaf of the same creeper over a bank of the river about three feet above the normal water level. This last nest contained two eggs, so presumably had been made within the previous few weeks.

The nest is of the hanging type with a long tail beneath (Pl. III fig. 5). The nest proper is about two inches wide by about two and a half inches deep, the tail about six inches long. The cup of the nest is about 1¼ inches across by one inch deep.

The material of the nest is very thickly woven light brown fibres (?surface roots of ferns and plants) mixed with other material and thickly covered with spiders web. The tail consists of fibres together with dried leaves and various rubbish and is thickly coated with spiders web. The nest is lined with brown hairy seeds something similar to those found in the nest of the Rachette (*see* below).

50. *Phœthornis longuemarcus*. Lesson. Rachette.
Pygmornis longuemarcus. Leotaud No. 62.

This humming bird is, in the Maracas Valley, distinctly more common than the previous species, but it resembles it in general appearance and habits.

Its total length (tip of tail to tip of bill) is only 110 mm. so that it is about two-thirds the size of the previous species.

The back dark bronze green, the head a little darker than the back. A line over the eye, the under surface and the upper tail coverts rufous. Chin and a line behind the eye blackish. Central tail feathers bronze green tipped with white and projecting beyond the rest, outer ones blackish edged with rufous. Wing feathers brown.

The bill, as in the previous species, is long and distinctly curved.

The female resembles the male.

The nest (Pl. I and Pl. II, fig. 3) is half cup shaped with a long pendant tail and is attached to the underside of a leaf of an Aroid (*Spathyphyllum*) or more rarely a fern, usually over the water and within a few inches of it.

The main part of the nest is about 1¾ inches across, outside measurement, by 2½ inches deep. The tail is 5-6 inches long tapering to tip. The inside of the nest is about 1½ inches wide by 1½ inches deep.

The material of the nest is thickly matted green and brown moss lightly coated with spiders web, which is thick only along the edge of the leaf at the line of attachment to the nest. The tail includes various materials such as hairy seeds and strips of dead banana leaves. The nest is thickly lined with hairy seeds apparently belonging to plants of the genus *Echites* (*Apocynaceæ*).

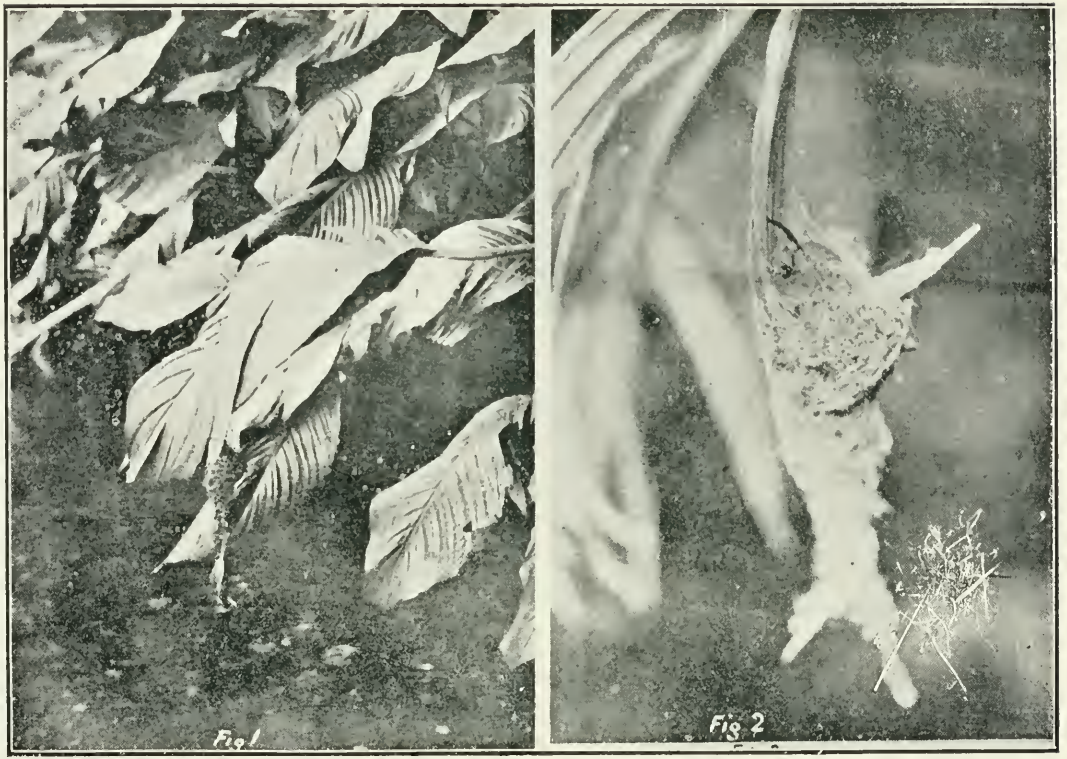


Fig. 1.—Nest of Ratchette Humming Bird (*Phœthornis longuemarcus*) on end of Aroid just overhanging stream.

Fig. 2.—Ratchette Humming Bird (*Phœthornis longuemarcus*) asleep on nest with eggs.

Nests of this species have been found on the following occasions.

(1) Maracas river, January 2, 1921, not quite completed, on end of fern about a yard from edge of river and about two feet above water level. January 4 nest almost complete. January 6 one egg laid. On January 8 the bird was shot for identification and the nest, which had now two eggs, was photographed (Pl. II, fig. 1).

(2) Maracas river, January 2, 1921, nest just completed on end of leaf of aroid (*Spathiphyllum*) overhanging the water and about ten inches above water level (Pl. I, fig. 2, shows bird asleep on nest with eggs). On January 4 there was one egg. On January 5 there were two eggs. January 18, still eggs.

(3) Maracas river, January 7, 1921, nest on end of *Spathiphyllum* leaf overhanging water about 6 inches above surface (Pl. I, fig. 1) January 9, one egg. January 11, two eggs. January 18, still eggs. January 29, two very small young with down just showing. This gives an incubation period of about 18 days.

(4) Maracas river, January 7, 1921, nest on end of *Spathiphyllum* leaf overhanging water with two eggs.

No other fresh nests were found up to the middle of February 1921, so it would appear as if nesting started rather suddenly about the middle of December. This is towards the end of the wet season, and after all chances of the river flooding, which frequently occurs in September and October. Owing to the position of these nests, usually within a foot of the water level, they would be destroyed if built during the flood season.

One bird shot in Maracas Valley on January 9, 1921, contained in its stomach a spider.

51. *Glaucis hirsutus.* Balisier or Hairy-Hermit.
Polytmus hirsutus. Leotaud No. 70.

This is a large dull species easily recognised by its long strongly curved bill, the absence of metallic colouring, and its habit of frequenting flowers of *Heliconia Bihai* locally known as Balisier, from which it gets its popular name.

In the male the upper surface is dull bronze green, lower surface dull rufous, paler in the middle, throat dusky, wings brown, central tail feathers and tail coverts bronze green, outer tail feathers brown, entire tail tipped with white.

Bill long and curved.

The female is slightly more bronzy on the back and entirely rufous beneath.

It is comparatively common in the Maracas Valley and nests apparently during the dry season from about the end of February to the early part of the wet season in June.

The nest, (Pl. II, fig. 4) is attached to the inner (under) side of the end of a leaf or portion of a leaf of a large fern, or more rarely to a leaf of Heliconia (Balisier or Wild Banana). It is half cup shaped, with a long thin tail like mass hanging beneath.

The outside measurement of the nest is about 2¼ inches across and about 2½ inches deep with, in addition, 5 to 6 inches of tail, averaging a little over half an inch across and tapering to the tip. The inside of the cup of the nest is about 1½ inches across and 1½ inches deep.

The nest is loosely woven of dried brown surface roots chiefly of fern, with a very thin coating of spiders web, but this is thicker behind the leaf and at the point of attachment of nest to leaf and also thicker on the tail. There is no distinct lining and the eggs are visible through the loosely woven nest.

The nest is usually about five to seven feet above the ground (distinctly higher than the two last species) but occasionally lower and is always within a few yards of a stream, frequently actually overhanging the water.

In 1920 nests were found as follows.

(1) On March 21, one nest without eggs, on end of frond of fern leaf.

(2) On March 27, one partly constructed, one with young, and one probably old nest, all on ferns close to or overhanging river, one within two feet of the surface of the water.

(3) On March 28, one nest on end of torn strip of leaf of Heliconia about six feet from ground, containing two eggs.

(4) On April 3, a nest on end of fern leaf in overhanging bank of river, which had been under construction for about two weeks, had one egg in it.

(8) On April 8, one of the nests first seen on March 27, (believed to be the one that then had young in it) had one egg in it. On April 9, two eggs, on April 18, still two eggs, on April 26, eggs had hatched. This gives an incubation period of under seventeen days and doubtful evidence of two successive broods in the same nest.

(6) On April 28, a nest was under construction on the end of a fern frond. On May 5, it had one egg, on May 6, still one egg, on May 7, two eggs, on May 24, two eggs, on May 25, the eggs had hatched. This gives an incubation period of 17-18 days.

(7) On June 27, one nest with two eggs.

(8) On July 10, one nest with one egg.

In 1921 a careful search failed to produce a single nest up to February 15, so that it is probable that the breeding season had not commenced by that date.

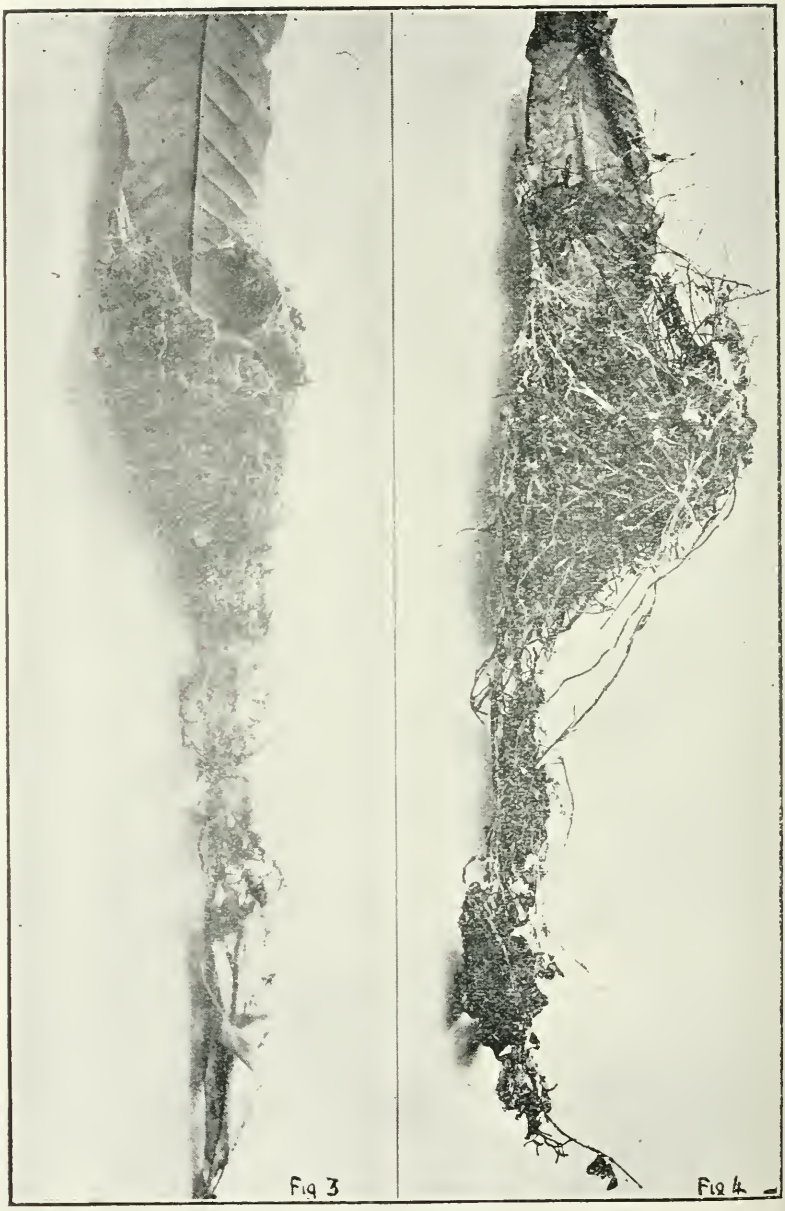


Fig 3.—NEST OF RATCHETTE HUMMING BIRD (*Phœ hornis longuemarcus*) ON END OF FROND OF FERN.

Fig. 4.—NEST OF BALISIER HUMMING BIRD (*Glaucis hirsutus*).

52. (*Anthoscenus longirostris* Vieill.) Carmine Throat or Star Throat.

Mellisuga longirostris. Leotaud No. 75.

This species I have not seen, nor can I find any reference to its nesting habits.

In the male the whole of the back is dark bronzy green. The crown steel-blue and the throat bright ruby red. The breast, sides of abdomen, and mid-abdomen green and the rest of the abdomen white. Wing quills dark brown. Outer tail feathers black with a white spot at the tip. Under tail coverts green edged with white. Under wing coverts green.

The female is brighter green above, but has no blue on the crown or red on the throat, and is grey beneath.

The bill in both sexes is very long and straight.

Leotaud says the species is not common. Hellmayr obtained one at Caparo.

53. *Agyrtria chionopectus*, Gould. White Breast.

Polytmus chionopectus. Leotaud No. 71.

The male is green above and white beneath, with scattered green spots on breast and flancs. The tail is coppery-bronze, black towards the end with narrow whitish tip.

The female resembles the male.

The bill is straight and shorter than the preceding species (less than half the length of the wing).

On January 28, 1921 I shot two specimens in the Maracas Valley. The first was 110 mm. in total length, and had no white edging to tail. In the second the white edging to tail was quite distinct. The stomach of one of these contained several small flies and beetles and one spider.

Several other specimens were seen. Some catching insects over the river and others visiting the flowers of *Inga* sp.

I did not find the nest of this species, but Chapman (l.c.) says "A nest found on March 3, was about twelve feet from ground saddled on a small twig near the end. Only one bird, apparently the female, was ever seen near the nest. She apparently began to sit about March 5. I did not learn at what date the one young bird was hatched but it left the nest April 10."

There are three species of "Emerald" in Trinidad which are difficult to separate. In all the predominant colour is various shades of metallic green above and beneath. All are rather small with comparatively short straight bills.

They can be most simply distinguished from each other by the characters given in the following table, which was made from identified specimens in the British Museum.

Lessons Emerald. (No. 54).

Rump greenish-bronze.
Tail greenish-bronze.
Slight traces of white on breast due to base of feathers showing through.
Breast, when viewed from beneath, grey-brown.
Both sexes alike.

Common Emerald. (No. 55).

Rump coppery-bronze.
Tail purple-blue.
Breast, when viewed from beneath, brown.
Both sexes alike.

Carib Emerald. (No. 59).

Rump green.
Tail steel blue-black.
Breast, when viewed from beneath, blue.
Female dull green above. Under parts brownish grey fading to white behind, two outer tail feathers tipped with grey.

54. *Agyrtria viridissima*, Lesson. Lessons Emerald.

This species is recorded by Chubb (*Birds of British Guiana* Vol. I. p. 395), under the name of *Agyrtria fimbriata*, as occurring in Trinidad, but it is not mentioned by Leotaud, Chapman or Hellmayr, nor have I seen it myself.

Unless care is taken it will probably be confused with the Common Emerald.

The back bronze-green, darker on the head and tail. Top of head and lower parts emerald green. Vent white. Tail very dark greenish-bronze. Middle of abdomen has slight traces of greyish-white. Breast feathers, when viewed from beneath, appear grey-brown. Under tail greyish-white.

The female resembles the male, but has the outer tail feathers tipped with grey.

The bill is straight and comparatively short.

55. *Saucerottia tobaci erythronotus*, Less. Common Emerald. Polytmus erythronota. Leotaud No. 68.

This species is probably common, but I can give but little information owing to the difficulty of separating it from the other "Emeralds," before the above mentioned characters were obtained from an examination of accurately identified specimens at the British Museum. For help in this matter I am indebted to Mr. C. Chubb.

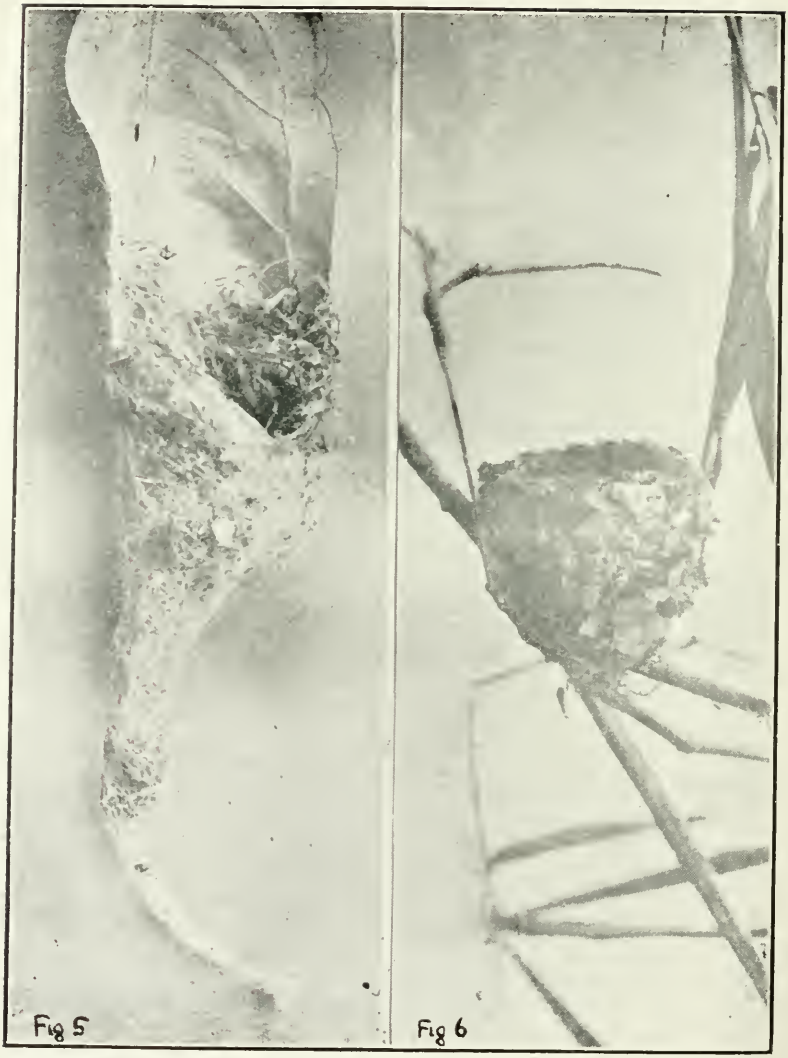


Fig. 5.—Nest of Brin-Blanc Humming Bird (*Phœthornis gugi*).

Fig. 6.—Nest of Common Emerald Humming Bird (*Saucerottia tobaci*).

Back dark bronze-green. Head and breast emerald. Rump coppery-bronze. Tail very dark bluish-purple. Breast feathers, when viewed from in front, emerald, when viewed from beneath, brown. Under tail coverts coppery-bronze.

A nest of this species, containing two almost fully fledged young was found on January 29, 1921, in the fork of a bamboo overhanging the river in Maracas Valley and about seven feet above the surface of the water.

The nest (Pl. III, fig. 6) is deep cup shaped, about $1\frac{3}{4}$ inches across and about the same depth in outside measurement, and about 1 inch across and 1 inch deep inside. It is saddled in the fork of a twig.

The nest is made of brown dead moss-like material (?*Selaginella*) It is covered on the outside with small pieces of grey-green lichen and green moss, lightly covered with spiders web, particularly towards the base. The inside is lined with dried scale leaves of young ferns and dark brown hairy seeds.

The stomach of the adult bird feeding the young in the nest mentioned above, on January 29, contained the remains of several small flies of the genera *Diloplous* and *Scatopsa* (Diptera. Scatopsidæ).

56. *Anthracothorax gramineus.* Woscal, Haussecol or Green Throated Mango.

Lampornis domincus. Leotaud No. 65.

This and the next species are distinctly larger humming birds than the emeralds, with a larger slightly curved bill.

The present species is, in the male, dark green above, middle tail feathers purple with dark edging, throat and sides of abdomen dark rich green, abdomen and under tail coverts and under-wing black tinged with green, wing feathers dark brown, thighs and a patch on each side of body white. Length about 120 mm.

The female differs from the male in being white on under surface with a broad black line slightly edged with dark green on the throat and middle of abdomen, also white tips to outer tail feathers. Bill rather long and slightly curved.

I have not met with this species and found no record of its nesting. Hellmayr records it from the Caroni swamp.

57. *Anthracothorax nigricolles.* Plastron.
Polytmus mango. Leotaud No. 64.

This species resembles the previous one in size and general appearance, but can be distinguished in the male by the black (not green) throat, slightly tinged at the edge with steely blue.

In the male the head, back, upper wing coverts, upper tail coverts, and middle tail feathers are bronze green. The outer tail feathers are purple margined with black. Throat, breast and middle of abdomen black, throat margined with steely blue. Sides of abdomen and under wing coverts green. Under tail coverts black A white line on sides of abdomen.

The female is white on the under surface with a broad black line, slightly tinged with blue at the sides, on the throat and extending down the middle of the abdomen. The outer tail feathers have white tips.

This species was common in January 1921 in Maracas Valley both over the river and far from it on the top of a small hill. In the latter locality they were frequently seen hovering just beneath leaves of coconut and picking off small insects from beneath the leaves. The stomach of one shot in this position on January 14, was found to contain a number of small *Hymenoptera*, probably parasites of scale insects, etc., on the coconut leaves.

Another shot whilst hovering over the river in the late afternoon contained remains of small *Diptera*.

I have not seen it nesting.

According to Chapman it frequents the flowers of the Bois Immortelle (*Erythrina*).

58. *Colobri delphinæ.* Brown Violet-ear or Blue-Eared Hummer.
Polytmus delphinæ. Leotaud No. 66.

This species according to Leotaud is rare and I have not noticed it.

Hellmayr records it at Aripo between 1,600 and 2,000 feet.

It is greenish-brown above. Feathers on side of rump and upper tail coverts rufous with dark centres. Tail greenish-brown with a dark band near the tip. A patch of shining purple at the ears and upper sides of the neck. General colour beneath dull greyish-brown feathers margined with paler. Throat metallic green. Under tail coverts rufous.

The female is similar but smaller.

I have no record of either feeding or nesting habits.

59. *Chlorostilbon atala*, Lesson. Carib Emerald.

The separation of this species from the other two Emeralds has been given above.

The male is golden-green to grass-green above. Rump green. Tail steely blue-black. Under parts golden-green. Breast, when viewed from behind, distinctly bluish. Bill black, short and straight.

The female is distinct from the male. Dull green above Under parts brownish-grey fading to white behind. The two outermost tail feathers tipped with grey.

I have not met with this species. It is not recorded by Leotaud unless it is the species referred to by him as the " Saphir-Savan " *Polytmus mellisugus*), but his description is insufficient to settle the point definitely.

It is mentioned by Chapman and Hellmayr records specimens at Laventille and Tacarigua.

It is also found in Barbados, where it is known to build a small cup nest saddled on a twig.

60. *Florisuga mellivora*, Linn. Jacobin.
Topaza mellivora. Leotaud No. 72.

This is a comparatively large humming bird easily recognisable by the conspicuous white markings on the tail.

In the male the head, neck and chest are uniform dark metallic blue. A narrow white collar on lower neck. Back, lower neck, upper and under wing coverts, central tail feathers, and sides of breast bronze green. Abdomen and under tail coverts white. Outer tail feathers white edged with dark brown. Wing feathers purplish brown.

The female is bronze green above. Chin white. Throat and chest bronze green with some white edges to the feather. Breast abdomen and flanks white. Tail green, blackish before the tip and tipped with white, which is most conspicuous on the outer feathers. Bill straight.

According to Leotaud this species is not common. I have seen one specimen at the Usine Ste. Madeleine in 1919, but have no records of its habits or nesting.

Hellmayr records it from Caparo, Valencia and Laventille.

61. *Calliphlox amethystina.* Gmel. Amethyst.
Calothorax enicuous. Leotaud No. 73.

This is one of the smallest and one of the rarest of the Trinidad humming birds.

Neck bronze green above. Tail brown edged with cinnamon inside. Throat brilliant amethyst followed by dull white. Abdomen rusty brown. The total length only about 80 mm.

The female differs from the male in having the throat white, sides of neck brown and abdomen pale chestnut.

This humming bird is recorded as rare by Leotaud and was not seen by either Chapman or Hellmayr. I saw a single specimen feeding at the flowers of *Leonotis neptaefoliæ* at Williamsville on June 17, 1918. I have no further record of its habits or nesting.

62. *Chrysolampis mosquitus*, Linn. Ruby Topaz.
Mellisuga moschita. Leotaud No. 74.

This brilliantly coloured species is apparently not uncommon. The male has the crown of the head and hind neck metallic red. Chin, throat and chest bright metallic golden orange. Sides of neck, back, rump, upper wing coverts and upper tail coverts chestnut. Tail chestnut with dark edges. Upper parts of body greyish-brown. White tips on thighs. Upper tail coverts cinnamon. Bill dull black, short and comparatively short.

The female is bronze green above and dusky grey beneath the throat with a median darker stripe slightly metallic. Centre tail feathers bronze green. Others chestnut at base, then darker and tipped with a triangular spot of white.

The species frequents the flowers of Immortelle in the dry season and I shot one (a female) at these flowers in Maracas Valley on January 28, 1921.

I have not seen the nest but Schomburgk (*Reis. Guian.* III 705) describes a nest found in British Guiana as being in the fork of an isolated *Melphigia* bush. The inside of the nest was lined with vegetable down and the outside was covered with lichen.

63. *Chlorestes coerulens*, Viell. Saphir.
Hylocharis coerulens. Leotaud No. 77.

According to Chapman this is the commonest of the tree haunting hummers, but I have never been able to identify it for certain without shooting specimens.

The male is dark green above and bright glittering green below. Wing feathers brown. Tail steel blue. Under tail coverts green.

The female is whitish on the under surface with green tips to feathers.

I have no records of nest or habits.

64. *Polytmus thaumantias chrysobronchus*, Shaw. Pearl. Polytmus viridis. Leotaud No. 67.

Hellmayr records this species from Caroni Swamp, but I have not met with it myself..

The male is pale bronze green above, brighter and more glittering in the throat and breast, which have a pearly lustre. Tail feathers bluish with the tips and a portion of the outer web green. Wing feathers brown. Vent and under tail coverts white.

The female is similar but not so bright and the abdomen is for the most part white.

I know of no records of its habits or nest.

65. *Lophornis ornatus*, Bodd. Coquette, Whiskerando, Huppe-col, King or Queen. Leotaud No. 76.

The smallest of the Trinidad humming birds is known by several different local names although it is by no means common.

It is immediately distinguished from all the other Trinidad humming birds by its small size and the presence of a light band across the rump. The male has also the characteristic crest and whiskers.

In the male the back, upper tail coverts, and abdomen are bronze green. Forehead, face and throat glittering green. A crest on head pale chestnut. Tufts of feathers on side of face white tipped with green. A line of white across the lower back. Tail deep chestnut. Wing feathers brown.

The female has no crest or tufts, and the under side is entirely cinnamon.

I saw one specimen of this species feeding at flowers of *Inga* sp. in Maracas Valley on February 8, 1921.

Hellmayr records having shot eleven specimens at Laventille.

In the British Museum of Natural History there is exhibited a small deep cup nest covered with lichen externally, which is said to belong to this species.

Family CYPSELIDÆ. Swifts.

66. *Panyptilia cayennensis*, Gmel. White-collared Swift. Cypselus cayenensis. Leotaud No. 37.

In the *Bull. Dept. Agr.* Trinidad and Tobago, VI, 1907, 127, there is an account of a nest of this species.

"The nest is flask shaped, over twelve inches in length, five inches in diameter at the larger or upper end, hanging with a circular opening or entrance at the base. At the inside of the larger end and close to the point of attachment to the branch is a small shelf or nest in which the eggs are laid, the bird entering by the opening at the base."

The nest described was hanging from the underside of a branch of a silk cotton tree and was made of the plumose seeds of a species of Bromeliad *Catopsis nutans*.

I watched for some weeks a nest which corresponded closely to this description hanging from the middle of an archway in the Court House in San Fernando, but was never able to see the bird itself to confirm.

67. *Chætura spinicauda* Temm. Grey-Rumped Swift.
Acanthylis polioura. Leotaud No. 40.

A specimen of this bird flew into a house in Maracas Valley after dark in the evening of December 27, 1920.

The stomach contained small broken remains of various insects particularly beetles.

Family CAPRIMULGIDÆ. Night Jars.

68. *Nyctodromus albicollis, Gmel.* Road Night Hawk.
Caprimulgus albicollis. Leotaud No. 33.

What I take to be this species is commonly seen rising from the road in front of motor cars when driving in the dusk.

In the *Journal of the Trinidad Field Naturalists Club* II 109 there is a short account of its habits. It is recorded as breeding in May 1894. One egg was found in a slight depression in the ground. It had shades of salmon and reddish brown with a few grey marks towards the larger end.

69. *Nyctibius jamaicensis*, Gmel. Poor-me-one.
Leotaud No. 32.

According to A. B. Carr (*Journal Trinidad Field Naturalists Club* II, 1894, 137) this bird " calls only from February to June. It is a strictly nocturnal bird, feeding on night beetles, the large firefly being its chief victim."

I have heard the cry of this bird on several occasions chiefly in the wooded cacao districts, but have no recollection of it in the more open areas.

70. *Chordeiles acutipennis*, Bodd. Fork Tailed Night-jar.
Chordeiles minor. Leotaud No. 35.

A flock of about ten birds of this species was seen flying over the sugar cane at Harmony Hall on August 18, 1919 about 6.15 p.m., the sun having only just set and it being still quite light. They were flying fairly high and obviously hawking for insects. One was shot and the stomach found to contain nearly two hundred flying ants.

On the following evening one was seen flying just as the sun was setting.

71. *Podager nacunda*, Viell. Nacunda Night Jar.
Leotaud No. 36.

Five or six of these birds were seen flying at Harmony Hall in the evening of June 29, 1919. They were first seen at about 6.45 p.m., early twilight).

On July 1 and 4 they were roused during the daytime from the same place in one field, but a close search failed to reveal any nests. They were apparently only resting on the ground as feathers and droppings were found at the spot where one bird rose.

A flock of six birds was again seen at the same locality on October 17, 1919.

According to Leotaud this bird is a later flyer than the other species, but these were seen in early twilight.

Food. One bird was shot on June 29, 1919 at 6.50 p.m. and contained 26 froghoppers, 1 black weevil (Metamasius), 1 scarabeid, 1 elaterid, and 2 winged ants. It must have already been feeding for some time.

An examination was made of the droppings (?or casts) found on the spot where one bird rose on July 4, and these were found to consist entirely of the remains of insects chiefly beetles and ants.

Family STEATORNIDÆ. Oil Birds.

72. *Steatornis caripensis.* The Oil Bird or Guacharo.
Leotaud No. 31.

No account of the birds of Trinidad would be complete without some reference to this remarkable cave dwelling bird, first discovered by Humbolt in Venezuela and now known to be distributed along the north coast of South America.

The Oil Bird, Guacharo or Diablotin is the only known representative of its family, which is somewhat related to the night-jars; unlike these birds however it builds a distinct pillar like nest inside caves and feeds entirely on the fruits of various species of palms.

There are at least half a dozen nesting places of this bird in Trinidad and, if rumour can be believed, there may be many more. They are all in the northern part of the Island either in the mountains or in the cliffs facing the sea. Most of them are in true caves but in one case (see below) they were found nesting on the walls of a canyon. The common feature of all these places that I have seen is that they have a water floor, either the sea or a river.

The best known locality is probably the cave at the head of the Oropuche River in the north-east of the Island. It was known to Leotaud and is mentioned by Wall and Sawkins (*Geology of Trinidad* 1860 p. 29). This was the cave which the late President Roosevelt visited in 1916 and of which a short account, with some photographs taken by Mr. Urich was given in *Scribners Magazine* for 1917.

Another short account of this cave was given by Mr. Urich in the *Journal of the Trinidad Field Naturalists Club* II 1895 231-234 On p. 23 of the same Journal is a statement that 175 birds had been taken from this cave and that they were getting scarcer every year. "A very limited number are now offered for sale on the market." This last remark refers to the use that is made of the young birds both for eating and for rendering down in water over a fire to collect the oil and fat that they contain.

I visited this cave in company with Mr. Urich and Mr. Freeman on April 23, 1916. The opening is twenty or thirty feet in height and about twelve feet wide at the bottom, slightly oblique and margined with vegetation. After a few yards the cave takes a slight turn which produces extreme darkness and here the birds are nesting on the walls. After perhaps forty yards the cave becomes lower and a second part can be reached by stooping. There are however no birds in this portion.

In the front part of the cave there were thirty or forty nests on ledges on the walls from six feet above the level of the river to the highest parts of the cave. The nest is a low pillar about fourteen inches across, with a slight depression on the top not more than an inch deep in the middle. Judging from the appearance of the nests, successive layers must be added at successive nesting seasons, and the nest gradually rises to project out of the layers of guano with which it is surrounded. The material of which it is made appears to be largely wood fibre.

At the time of our visit the birds were nesting. Some nests contained one, two, or three white rounded eggs ; others contained young, some just hatched and naked, others with feathers developing and apparently two to three weeks old.

The birds feed during the night on the fruits of various trees, chiefly palms, and during the day remain in the cave sleeping and digesting. The kernels of the palm seed are not digested and are either evacuated or disgorged on to the heaps of guano with which the ledges and floor of the cave are covered wherever the water is not flowing. There the seeds germinate and grow to forests of etiolated palm seedlings which die off only to be replaced by fresh growth.

While we were at the cave there was a man there collecting the young birds from the nests. It is a disgraceful proceeding in addition to being contrary to the law. A long pole with, at the upper end, a torch and a long hook bent downwards is the weapon used. The upper nests are scraped with the end of this hook until something falls out. It may be an egg, (for the man cannot see what is in the nest) in which case it falls to the ground and breaks. It may be too old a bird, for only the very young are of value, in which case it is left to die. If however fortune favours the collector it is a nice plump youngster and then with a smile of pleasure he drops it into his bag, later to be boiled down to oil.

The adult birds make several different noises including a sharp kek-kek when annoyed and a sound that can only be likened to someone being sick. If it were not that the word " Guacharo " was used in Spanish for other birds it might be taken, when said suddenly and hoarsely, to represent the sound that they make.

The next best known nesting locality is a large cave in the Heights of Aripo, but I have not been able to visit it and have no particulars beyond the statement that it is the largest colony in the Island. It has been visited on several occasions by Mr. E. Andre but so far as I am aware no account of it has ever been published.

Another colony is in a large cave facing the sea on the Island of Huevos. This cave can only be visited on a calm day and I have made two attempts to reach it without success. F. M. Chapman visited this and the next locality on May 5, 1893 and according to his account (*Bull. Am. Mus. Nat. Hist.* 1894 60) it contained about 200 birds one of which was laying on this date.

There is an account of a visit to this cave by Mr. W. I. Hornaday in the *Standard Natural History* IV, Birds, p. 386, but no date is given. He states " We set off early one morning when the sea was calmest, pulled westward along the south shore of Monos, then out through the Huevos passage into the open sea. Half an hour's pull along the precipitous side of Huevos Island brought us to a tiny bay hemmed in by the same wall of rock. A turn to the left round some half sunken rocks and we were at the entrance of the cave, a black semicircular hole at the base of a cliff, six feet high and twelve feet wide, into which the swells of the sea dashed at every moment."

" The oarsmen held the boat carefully in position until a big wave came rolling in, when they sent the boat flying in on its crest. We passed safely over the sunken rocks, and the next roller, which lifted the boat so high that we had to crouch down in order that our heads might escape from the roof of the tunnel, brought us to terra firma.

Scrambling out on to the pebbly beach we found rising before us a huge dome-like cave. The moment we entered there arose a perfect storm of rasping cries coming from the throats of about two hundred guacharo birds that circled round the top of the cave."

" The walls of the cave were smooth bare rock, but at one side a huge mass of fallen rock formed a series of ledges from the floor to a height of thirty feet. Climbing upon these we found numerous nests of the guacharo. The rocks were covered to a depth of several inches with guano. Wherever a smooth spot offered a safe resting place the nests were built up like so many cheeses while others were built half swallow like on the slopes."

" As nearly as we could estimate there were seventy or eighty nests, nearly all of which we searched for eggs. In different nests we found the number of eggs to vary one to four, so that we are unable to say what the usual number is."

In December, 1918 when I tried to reach this cave the boatman told me that the mouth of the cave had fallen in, but owing to the rough weather I was not able to get close enough to say if this was so.

A second sea-cave nesting place of this bird is a small cave on the east side of the First Boca, that is to say on the cliffs of Trinidad. It is about a quarter of a mile to the seaward of the small bay locally known as L'Ance Pawa. I visited this cave on May 12, 1918 and again in January 1921 but on the latter occasion the sea was too rough to enter.

The rock of the cliff is a sandy schist and the cave is one of several formed by the breaking away of the rock along the stratification and in cleavage planes at right angles to this. The entrance is about ten feet high at low water, but just inside it becomes considerable higher. It is about fifty yards deep narrowing behind into a low tunnel.

About half way back in the cave I climbed out of the boat and found the water about two feet deep, getting shallower to the back of the cave. About a dozen or twenty birds were nesting on ledges high up on the walls but all were out of reach so that I cannot say if laying was taking place or not.

One specimen was shot on this occasion. It was moulting. On the feathers were a number of mites of the genus *Megninia*.

The next locality that I visited was in the Arima Valley where we heard rumours that there was a cave with Guacharos. However on searching in company with Mr. Urich on June 2, 1918 we found that it was not a cave but a deep narrow canyon that had been chosen by the birds. The river has cut a deep ravine, forty to fifty feet deep and less than ten feet wide in the soft schist that forms so much of the

northern range and in the semi-gloom near the bottom of this, and ten to fifteen feet above the level of the water seven nests were found. One of these contained one moderately large youngster and another three young, all with short black feathers just showing. Three or four pairs of adult birds were seen.

Although the bottom of the canyon was gloomy there was sufficient light for the seeds dropped by the birds to germinate in the guano and produce small green forests of palm seedlings on the ledges a few feet above the level of the water. These would be washed away by the first floods of the wet season, which was already commencing.

I was not aware at the time that the Guacharo had ever been recorded as nesting in such situation, but later I found that Wall and Sawkins in their *Geology of Trinidad* (1860) p. 29 say one nesting place of the Guacharos " at Acono, is not in the limestone at all, being produced by the water having eroded a passage through very hard mica slates which arch over the stream."

I made a close search of the Acono Valley (a branch of the Maracas Valley) and found one spot exactly similar to the Arima Valley locality and apparently quite suitable for the Guacharos, but none were present. A small breeding locality like this could easily be exterminated by the treatment to which these birds are usually submitted by the natives when discovered.

I heard rumours of a number of other localities, where there were said to be nesting places of the Guacharo, several being on the north coast, but these are the only ones about which the information has been verified or is sufficiently certain to be worth recording.

It might be as well to record here that in connection with the visit of Mr. Urich and myself the following have been described from our collections made in the Oropuche Cave.

Diptera.

Trichobius coecus. Edwards. (*Annals & Mag. of Natural History* Series 9. Vol. I (1918 p. 424) on a bat.

Erioptera troglodyta. Edwards. (l.c. p. 425) sitting on walls of the cave.

Chilopoda. (Centipedes.)

Psalliphora cavincola. Chamberlain. (*Bull. Museum Comparative Zoology* Cambridge Mass. Vol. LXII. p. 168) on the walls of the cave.

Onychidae (Woodlice).

Family MOMOTIDAE Mot-mots.

73. *Momotus swainsoni*, Grey King of the Woods
Momotus bahamensis. Leotaud No. 47.

This bird has been much persecuted by cacao planters under the impression that it damages cacao, but the contents of seven stomachs given in the *Bull. Dept. Agr.* XI. 324 showing 2 per cent. wild berries and 98 per cent. insects, centipedes and scorpions should be quite sufficient to show the value of this bird to the agriculturist.

A short account of its habits, with a photograph of one of its tunnel nests is given by A. B. Carr in the *Proc. Agr. Soc. Trinidad* XII. 1912 173.

As it is a frequenter of high woods and as most of my observations have been made in the open country I have only come across it on one occasion, at King's Bay, Tobago on November 22, 1916.

The battledore shape of the two long tail feathers has been found to be caused by the bird deliberately biting off the barbs from both sides of the base of the stalk of these feathers.

Family GALBULIDAE Jacamars.

74. *Galbula ruficauda*, Cuv. The Jacamar.
Leotaud No. 56.

This bird is apparently not uncommon but frequents the wooded country and I have only met with it on one occasion, on November 22, 1916 in Tobago. Its brilliant colouring makes it resemble a gigantic humming bird.

I have seen the eggs of this species, taken by R. Collens. They are white and almost round and are said to be laid at the end of a long tunnel in an overhanging bank. In the nest from which these were taken there were three eggs and a few twigs but my informant states that in some nests there are no twigs.

Family CUCULIDAE Cuckoos.

75. *Crotophaga ani*, Linn. The Tick Bird, Old Witch or Merle Corbeau.
Leotaud No. 194.

This is one of the commonest birds of Trinidad, always conspicuous by its black colour, its heavy beak and its noisy habits.

The nesting habits are of interest in that, (far from resembling the European Cuckoo) several of the females construct a common nest and frequently lay so many eggs in it that they overflow on to the ground below. It is not known if more than one cock bird is present.

The nest is a loose structure made of twigs, sometimes without any definite lining and very variable in size—apparentl / according to the number of birds taking part in the construction.

Fig. 5.—The Tick-Bird (*Crotophaga ani*).
About two-fifths natural size.

I have found the following nests :—

(1) On August 8, 1918 at La Fortunee sugar estate on the edge of the Oropuche Lagoon about ten feet from ground in a clump of " Black Roseau." Beneath it on the ground were the broken remains of two eggs, but owing to the spines on the Black Roseau we were not able to ascertain its contents.

(2) On July 18, 1919 at Port-of-Spain in a camphor tree, about twenty feet from ground. This was quite a small nest and contained only one egg which was lying in a very small depression.

(3) On August 12, 1919 at Usine Ste. Madeleine in a mass of creeper on a tree about fifteen feet from ground. It was a deep cup nest made of large twigs and lined with leaves of the creeper and it contained nine eggs—exclusive of one which had been knocked out by the birds and was found undamaged on the ground below.

(4) On September 8, 1919 at Hermitage in a tree about ten feet from ground. Several birds were round the nest, but owing to the presence of a large wasp's (*Polistes*) nest alongside, I was unable to examine it.

(5) On February 29, 1920 at Maracas in the creeper over the porch of an empty house. It contained a number of young birds.

(6) On October 6, 1920 at Caroni in a large black sage bush only about three feet from ground, but in rather treeless country. It contained ten eggs.

(7) On the same date and in the same locality a nest about eight feet from ground in a clump of bushes. Contents not noted but a bird was sitting alongside.

A nest is recorded by Chapman (*Bull. Am. Mus. Nat. Hist.* VI. 64) as being completed on April 14, 1893.

The eggs are greenish blue in colour, but covered over entirely with a thick white incrustation. In a newly laid egg this hides all the blue, but it is easily scratched and as the egg gets older the blue beneath gradually becomes more visible.

The food consists chiefly of insects as shown by the following dissections.

(1) Shot at Brechin Castle on October 4, 1917 contained beetles (chiefly *Chrysomelidae* and two *Cassidae*), several large Coreid bugs and 4 spiny caterpillars.

(2) Shot at Caroni on November 6, 1917 in sugar cane badly infested with froghopper, contained 1 large grasshopper, 1 large spider, 1 large black Coreid bug, 1 small green Pentatomid nymph, remains of one froghopper and several grasshoppers.

(3) Shot in the Oropuche Lagoon on October 12, 1919 contained one large red-bodied grasshopper only.

Kershaw (*Special Circular No. 4. Dept. of Agr.*) gives the contents of a stomach examined by him as four froghoppers, seeds of a weed and other insects.

Urich (*Bull. Dept. Agr. Trinidad* IX.. 161) records them as eating the caterpillars of *Remigia repanda* during an outbreak of this pest on Sugar Cane at Couva in July 1909.

According to T. I. Potter a bird of this species killed a small sugar bird (*Coereba luteola*) which he had just liberated from a cage.

In spite of the name Tick Bird, by which the species is so generally known, it appears to eat ticks rarely. In Porto Rico A. Wetmore examined the contents of 41 stomachs and found only one tick (*Bull.* 15 *Porto Insular Experiment Station* p. 60). The habit that the bird has of following cattle on the pastures appears to be more with the intention of eating grasshoppers disturbed by the animals in their wanderings, than with any idea of removing their ticks.

76. *Crotophaga major* Gmel. Greater or Marsh Tick Bird.
Leotaud No. 195.

This bird is much rarer than the preceding and differs from it in its slightly larger size, more glossy colouring, less shrill cry, and by the keel on the upper mandible ending about half way down instead of being continued to the point of the beak.

I have only seen this bird on one occasion on July 4, 1918, at La Fortunee and know nothing of its habits.

77. *Piaya cayana* Linn. Bucutu or Coucou-manioc.
Leotaud No. 188.

I shot a specimen of this bird at Palo Seco on March 7, 1920, which was, in company with several others, following an army of hunting ants and catching the various insects which tried to escape.

The stomach was much distended with food and contained six large grasshoppers, six cockroaches of two different kinds, one cricket, one winged ant, two small beetles and one centipede.

78. *Diplopteryx naevius*, Linn. Trinity.
Leotaud No. 187.

A group of five birds of this species was seen at St. Augustine on November 5, 1920. I have no record of food or nesting habits.

Family RHAMPHASTIDAE Toucans.

79. *Rhamphastes vitellinus*, Licht. Yellow-and-White-Breasted Toucan.
Leotaud No.177.

The bird is not rare in the forest districts.

I saw one pair at Palo Seco on July 5, 1919, and again on March 7, 1920.

I examined the stomach of a specimen shot on Tucuche on April 1, 1918 and it contained half a seed and a few small pieces of the skin of some red fruit.

Family PSITTACIDAE Parrots.

80. *Psittacula passerina.* Blue winged Parrakeet or Love Bird.

At certain times of the year small native boys add to their income by catching small green love birds which they sell for a few cents each. On trying to identify one of these I was surprised to find that it was not recorded in any of the published lists of the Birds of Trinidad. It is common in British Guiana, but neither Leotaud, Chapman nor Hellmayr record it. It is now widely distributed in the Island and I saw one apparently nesting in a hollow bamboo in 1916 but did not note the date.

The first pair I saw after I realised their interest was at Caroni on August 21, 1919. On September 30, 1919 I shot one hen bird at Caroni, the stomach of which contained seeds and vegetable matter. It is also not uncommon near San Fernando.

This bird must have been introduced since the time of Leotaud or else has become much commoner in the intervening time as it is difficult to believe he overlooked such a conspicuous bird.

Family STRIGIDAE Owls.

81. *Pulsatrix torquata* Daud. Collared Owl.
Athene torquata. Leotaud No. 26.

In the *Bull. Dept. Agr. Trinidad and Tobago* II. 164 there is a note that a specimen of this bird was shot in the Botanic Gardens and made a noise like " a Barn Owl with a sore throat or slow flapping of the wings of a large bird."

82. *Glaucidium phalaenoides.* Daub. Little Owl or Jumby Bird.
Athene phalaenoides. Leotaud No. 27.

The somewhat plaintive piping cry of this bird is frequently heard during the day time issuing from some tree or clump of bushes. It also makes a sharp clicking noise.

It is held in great awe by many of the natives, who have given it the name of Jumby Bird—" Jumby " being the local name for evil spirit.

According to G. Thompson a pair of these birds were nesting in a hole in a mango tree in Port-of-Spain at the end of May 1920. By the beginning of July four fully fledged young were flying round, and he repeatedly saw the mother bird bringing lizards to feed them with.

Family CATHARTIDAE Vultures.

83. *Coragyps foetens* Wied. Black Vulture, or Black Corbeau
Cathartes foetens. Leotaud No. 3.

These scavengers are one of the most conspicuous objects of the towns in Trinidad—to which however they are by no means confined —and their antics when drying themselves in the sun after heavy rain are well worth watching.

The question is sometimes raised as to whether these big birds of prey hunt by sight or smell. While there is no doubt whatever that sight is the chief sense which draws them to their food from a distance—particularly by watching the movements of others of their own kind—the following observations are of interest.

Hart (*Bull. Dept. Agr.* II. 155) records that these birds used to collect in the morning hours on trees near a plant of *Aristolochia gigas* v. *Sturtevantii* which was flowering and has a particularly strong odour.

On September 20, 1918 I observed large numbers of this bird collected on and around a field in the Naparimas which had been experimentally manured with liquid slaughter-house refuse which, though invisible, could be smelled a quarter of a mile away.

Another observation that I made—although not in Trinidad—was that they quickly found the dead body of an animal that I laid close to the trunk of a thick tree—quite invisible from above.

I have records of this bird nesting on the following occasions.

(1) On December 19, 1917 a pair were beginning to nest inside the base of a hollow tree on La Fortunee sugar estate. On February 1, 1918 there were two eggs, one of which contained an almost fully developed young.

(2) On May 22, 1918 two young birds, downy white with the beginning of black feathers, were found between two buttress roots of a tree stump about a hundred yards from the previous locality.

(3) On November 23, 1918 a pair appeared to be nesting on the rocks opening out of the roof of the big cave at Gasparee, but the spot was inaccessible and I cannot say if eggs or young were present.

(4) On February 24, 1919 Mr. P. Jarvis reported having found a pair of young in the downy white stage on a small cliff just south of San Fernando.

The egg is ovate, dull creamy white, spotted and blotched sepia ; some eggs are unmarked.

84. *Cathartes aura.* Linn. Red Headed Vulture or Red Headed Corbeau.

Leotaud No. 2.

This bird is often erroneously called the King Corbeau, a name which should strictly be applied to *Sarcoramphus papa* which is much rarer and has never come under my observation.

The Red Headed Vulture, although not so common as the Black Vulture, is quite frequently seen, usually solitary or one or two in company with numbers of the black headed species.

One or two were present in the field recorded above as manured with blood manure.

A specimen was seen on the Island of Patos on May 22, 1918.

I have no record of nesting.

Family FALCONIDAE Hawks.

85. *Elanoides forficatus.* Linn. Scissors-tailed Kite or Swallow-tailed Kite.

Mauclerus furcatus. Leotaud No. 16.

I have only seen this species on one occasion in Trinidad, when a pair was seen at Palo Seco on August 29, 1920.

In British Guiana in 1916 I observed them closely for several weeks and from their method of swooping in the air just above the level of the trees I came to the conclusion that they feed on some large insect—possibly beetles or dragon flies.

Sometimes the prey—whatever it is —is held in the foot and pulled to pieces with the beak during flight.

Belt in *A Naturalist in Nicaragua* Chapter XII says he shot several and found their crops full of cicadas.

Family COLUMBIDAE Pigeons.

86. *Columbina rufipennis,* Bonap. Red Ground Dove.

Chamaepelia rufipennis. Leotaud No. 198.

This is a small reddish brown dove with a greyer head and back. It is common and occasionally abundant in most of the sugar-cane growing districts of the Island. I have the following nesting records :

(1) On August 11, 1919 at Tarouba in a hibiscus hedge, about five feet from the ground. The nest is small for the size of the bird and is made of twigs and grass. It contained two young with black quills showing. By August 18 the young had left the nest.

(2) On August 20, 1919 at La Fortunee, a nest in a hog-plum tree, about twelve feet from the ground. The bird was on the nest but I could not see if eggs or young were present.

(3) On August 17, 1920 near Princes Town in a plum tree about twelve feet from the ground reported to have contained eggs the day before, had two just hatched young.

(4) On August 11, 1920 several nests were seen in hedges and bushes near Princes Town, mostly with young but a few with eggs.

The eggs are white without markings.

(87) *Columbina griseola*, Spix. Little Grey Ground Dove.

On June 29, I shot a small, grey ground dove which I could not identify as any species mentioned in Leotaud's or Chapman's lists. Nor was it represented in the collections in the Royal Victoria Institute. Finally I identified it as *Columbina griseola* from Mr. Chubb's book on the Birds of British Guiana, and Mr. Chubb himself kindly confirmed the identification.

It is quite common in the open sugar districts, particularly in the Naparimas and has been seen on many occasions even as far north as Caroni.

A nest was found on August 11, 1919 at Tarouba in a hibiscus hedge, about six feet from ground and containing one whitish egg.

A second nest was found near Princes Town on March 5, 1920 in a hibiscus hedge, about six feet from ground and containing two whitish eggs.

The bird is now so common that it is difficult to understand that it was not recorded by either Leotaud or Chapman. However it may have increased in numbers lately (? in spite of the mongoose) and we must remember that the Naparimas were much less easily accessible thirty years ago than they are to-day.

Family PARRIDAE JACANAS or SPURWINGS.

(88) *Jacana spinosa*. Linn. The Spur Wing.
Parra jacana Leotaud No. 204.

I have seen this bird on several occasions in the marshes or near ponds. It nests here, but I have not myself seen any nests.

I have it noted down as being seen on August 13, 1919 at the Usine Ste. Madeleine on March 31, 1920 at Palmiste, and on August 29, 1920 on the Oropuche Lagoon.

Family CHARADRIDAE PLOVERS, SANDPIPERS, etc.

89. *Gallinago delicata* Ord. Wilson's Snipe.
Gallinago wilsoni. Leotaud No. 253.

Seen at Harmony Hall on July 3, 1919.

90. *Heteropygia pectoralis* Say. Chirp, Couchant or Pectoral Sandpiper.
Tringa maculata Leotaud No. 247.

These birds are common in the fall of each year on their migration southward.

On October 12, 1919 I obtained the stomachs of ten specimens shot on the Oropuche Lagoon of which the contents were as follows :

(1) 36 Noctuid caterpillars (Cut-worms), two small beetles, a few small stones and traces of grass.
(2) About 40 caterpillars.
(3) 40 caterpillars and two small beetles.
(4) 34 caterpillars, 2 small stones and one small seed.
(5) 15 caterpillars, 10 small seeds and remains of a beetle.
(6) 29 caterpillars.
(7) 15 caterpillars, 3 small beetles, 4 small stones.
(8) 55 caterpillars, one small seed.
(9) 6 caterpillars, 20 small seeds, 2 small snails.
(10) 15 caterpillars.

When one considers that these ten birds were responsible for the death of two hundred and eighty-five caterpillars, presumably within a few hours, it seems a pity from an agricultural point of view that they are welcomed chiefly by the guns of sportsmen after their long flight across the sea.

91. *Ereunetes pusillus*, Linn. Becasse or Knit.
Heteropoda semipalmata. Leotaud No. 249.

Two specimens were shot at the Oropuche Lagoon on October 12, 1919. The stomach contents were as follows :

(1) Several small black beetles and seeds.
(2) About 20 small black beetles and five small beetle grubs.

92. *Totanus melanoleucus* Gmel. Greater Yellow Legs or Pika.
Leotaud No. 237.

The stomach of one shot in the Oropuche Lagoon on October 12, 1919 contained only parts of a small beetle.

93. *Totanus flavipes*, Gmel. Yellow Legs.
Leotaud No. 236.

The stomach of one shot in the Oropuche Lagoon on October 12, 1919 contained twelve caterpillars and the remains of a few small beetles

94. *Actitis macularia*, Linn. Spotted Sand Piper.
Tringoides hypoleuca and macularia. Leotaud Nos. 239 & 240.

One was shot on the shore at Palo Seco on September 21, 1919. The stomach contained two small wood boring beetles, 2 ants, 1 weevil, 1 small water beetle, remains of a grasshopper and other small insects.

95. *Numenius hudsonicus*, Lath. Hudson's Curlew.
Leotaud No. 230.

Six were shot on the Oropuche Lagoon on October 12, 1919. The stomach contents were as follows :—

(1) About 60 caterpillars and one small crab.
(2) 1 crab, 12 caterpillars and 1 pentatomid bug.
(3) 1 crab and six caterpillars.
(4) 1 crab, 1 small caterpillar, 1 small snail.
(5) 1 crab and 2 caterpillars.
(6) Crab.

Although 81 caterpillars were present, the preponderance of crab in the food is in marked contrast to the food of the Chirp (No. 90).

Family RALLIDAE Water Fowl.

96. *Gallinula galeata*, Licht. Red Seal Coot.
Leotaud No. 264.

Two of this species were seen on the Oropuche Lagoon on October 12, 1919.

Family ARDEIDAE Herons and Bitterns.

97. *Nycticorax naevius*, Bodd. Black Crowned Night Heron.
Leotaud No. 224.

A specimen of this bird was shot at Chatham by Inspector Carr on March 18, 1919 at dusk.

98. *Florida caerulea*, Linn. Blue Gaulding.
Ardea coerulea. Leotaud No. 216.

Not rare. Noted at Usine Ste. Madeleine on August 12, 1919 but seen on several other occasions. I have no records of food or nesting. In St. Vincent it is said to eat mole crickets.

99. *Ardea egretta*, Gmel. Large White Egret.
Leotaud No. 214.

One was seen at Harmony Hall pond on July 29 and 30, 1920.

Family COLYMBIDAE GREBES.

100. *Tachybaptus brachyrhynchus*, Chapn. Little Grebe or Diver.
Podiceps dominicus. Leotaud No. 276.

One was seen on a pond at La Fortunee estate on November 7, 1918 just a few feet from a young alligator. I shot at the alligator and both immediately dived and apparently met unexpectedly beneath the surface of the water, as the little diver shot up a few seconds after in a state of great commotion.

Family TINAMIDAE TINAMOUS.

101. *Crypturus pileatus*, Bodd. Caille or Quail.
Tinamus sovi. Leotaud No. 205.

The shining purplish eggs of this bird were brought in to me on October 16, 1920 by a man who found them on the ground in the forest in the Maracas Valley. They were recently laid.

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METEOROLOGY.

RAINFALL RETURNS—JULY TO SEPTEMBER, 1922.

STATIONS.	July.	August.	September.	January to September, 1922.	January to September, 1921.
North-West District.	Ins.	Ins.	Ins.	Ins.	Ins.
St. Clair, Royal Botanic Gardens	5.06	8.35	6.49	37.10	54.61
Port-of-Spain, Colonial Hospital	4.84	5.39	4.98	29.83	46.11
Do. Constabulary Headquarters ..	6.20	6.62	7.85	33.63	46 28
St. Ann's Reservoir	6.49	10.39	9.20	42.62	51.37
Maraval Reservoir	5.41	8.60	8.62	39.36	58.21
Do Constabulary Station	5.08	8.15	8.82	41.87	56.68
Diego Martin do.	6.17	11.18	11.16	51.98	68.46
Diego Martin Waterworks	5.82	9.09	10.98	44.59	60.16
Do. River Estate	5.99	9.20	10.13	45.11	60.39
Fort George Signal Station	5.87	7.44	6.92	39.21	53.72
North Post do.	5.81	7.07	5.52	26.94	34.61
Carenage Constabulary Station	8.40	11.57	10.92	64.75	67.45
Carrera Island Convict Depot	2.43	2.84	1.77	15.03	17.39
Chacachacare Light House	4.79	5.05	4.39	30.05	38.28
Santa Cruz—Maracas District.					
Santa Cruz Constabulary Station	7.52	10.78	13.61	53.65	64.55
St. Joseph Government Farm	9.08	10.26	5.51	39.73	61.60
St. Joseph Constabulary Station	7.35	6.07	3.05	24.12	41.23
Tunapuna St. Augustine Estate	6.70	7.38	4.43	31.04	54.30
Maracas Government School	8.01	13.59	9.10	48.16	58.01
Do. Ortinola Estate	7.08	11.03	7.15	41.29	54.73
Caura, Wardour Estate	7.73	11.60	8.02	41.58	52.84
Do. El Manacal Estate	10.48	14.02	11.60	62.94	..
Do. La Florida	9.28	12.96	8.22	47.42	..
Do. La Concordia	8.21	13.18	8.19	44.14	..

RAINFALL RETURNS—JULY TO SEPTEMBER, 1922.—*Continued.*

STATIONS.	July.	August.	September.	January to September, 1922.	January to September, 1921.
	Ins.	Ins.	Ins.	Ins.	Ins.
West Central District.					
Caroni, Frederick Estate	14.33	15.85	11.38	65.71	50.75
Chaguanas, Constabulary Station	2.74	3.84	3.22	21.00	52.58
Carapichaima, Waterloo Estate	8.28	9.98	13.63	55.75	55.15
Do. McBean Cacao Estate	8.23	7.29	8.46	43.28	47.35
Do. Friendship Hall Estate ..	8.87	8.90	8.40	46.22	53.16
Couva, Exchange Estate	5.10	8.04	6.90	31.55	46.74
Do Brechin Castle Estate	6.92	10.01	9.30	44.64	53.52
Do. Perseverance Estate	7.13	6.25	7.71	36.07	38.77
Do. Camden Estate	6.43	4.36	7.21	31.70	..
Do. Milton Estate	7.51	8.51	8.40	44.93	54 17
Do. Spring Estate	10.61	8.62	13.19	55.67	53.65
Do. Constabulary Station	7.61	9.16	7.46	41.28	43.96
Montserrat District.					
Brasso Piedra, Mamoral Estate	13.77	9.52	8.57	64.32	73.27
Do. La Mariana Estate	14.02	8.70	6.84	59.37	69.87
Montserrat, Constabulary Station	6.57	7.48	6.43	39.08	53.83
Brasso, La Vega Estate	12.66	10.49	6.73	60.53	76.47
Arima District.					
Arima, Warden's Office	7.67	11.53	12.57	53.62	56.73
Arima, Torrecilla Estate	17.23	15.01	14.07	82.46	77.01
Arima, Verdant Vale Estate	12.91	13.88	8.76	64.26	76.69
San Rafael, Constabulary Station	13.03	20.56	10.64	89.90	84.24
Guanapo, Talparo Estate	11.71	9.28	6.15	61.89	72.11
Do. El Quemado Estate	12.15	13.88	..	..	81.01
Tamana, Santa Marta Estate	12.55	16.55	13.27	84.36	105.02
Do. La Carona Estate	14.25	16.70	17.17	86.20	86.79

RAINFALL RETURNS—JULY TO SEPTEMBER, 1922.—*Continued.*

STATIONS.	July.	August.	September.	January to September, 1922.	January to September, 1921.
San Fernando and Princes Town District.	Ins.	Ins.	Ins.	Ins.	Ins.
Claxton's Bay, Forres Park Estate	4.68	9.60	7.93	34.15	41.32
Pointe-a-Pierre, Plein Palais Estate	6.15	7.44	7.24	36.54	39.96
Naparima, Picton Estate	5.67	7.46	4.46	36.77	45.15
Do. Usine Ste. Madeleine Estate ..	8.42	11.19	10.07	61.55	45.76
Do. Tarouba Estate	5.82	7.29	7.24	34.04	37.72
Do. Palmiste do.	8.07	8.45	6.46	40.49	50.96
Do. Lewisville House	8.62	10.88	8.12	47.46	48.74
Do. Petit Morne Estate	6.89	6.93	4.80	37.93	39.19
Princes Town, Craignish Estate	8.25	8.01	8.15	46.43	47.95
Do. Cedar Hill Estate	7.03	8.17	6.05	39.84	46.54
Do. Williamsville Estate	8.77	10.62	6.38	47.48	49.61
Do. Esmeralda Estate	8.05	9.37	5.95	46.36	59.51
Do. New Grant Estate	9.50	9.39	11.53	54.30	59.92
Do. Constabulary Station ..	6.21	2.38	.55	29.27	37.92
Do. La Retraite Estate	9.93	11.04	10.42	66.11	78.94
Do. Malgretoute	7.77	6.84	7.53	46.37	50.49
South-West District.					
Oropuche, Constabulary Station	2.22	3.11	3.49	16.45	21.42
Siparia, Constabulary Station	5.08	8.13	8.49	42.28	49.37
Do. Alta Gracia Estate	5.31	9.16	7.28	43.07	53.35
Guapo, Adventure Estate	6.69	10.26	7.47	45.85	45.47
Point Fortin Constabulary Station	10.70	14.78	7.83	61.26	64.59
Erin, La Ressource Estate	5.82	3.99	3.16	32.65	30.03
Industry Estate	5.08	6.82	5.21	42.17	44.82
Cedros, La Retraite Estate	9.67	11.77	7.46	64.68	67.06
Do. Perseverance Estate	6.98	9.08	4.99	48.04	41.02
Do. St. Marie Estate	7.05	8.04	4.24	47.65	40.22
Do. Constabulary Station	7.47	8.47	5.43	51.75	46.86
Do. St. Quintin Estate	5.47	9.36	4.65	45.90	44.19
Icacos, Constance Estate	7.32	7.69	6.05	47.12	33.71
Irois Government School	10.53	11.87	7.50	63.23	45.63

RAINFALL RETURNS—JULY TO SEPTEMBER, 1922.—*Continued.*

Stations.	July.	August.	September.	January to September, 1922.	January to September, 1921.
	Ins.	Ins.	Ins.	Ins.	Ins.
South Coast.					
Moruga, Constabulary Station	6.64	8.94	4.11	46.01	52.67
East Coast.					
Matura, La Juanita Estate	14.29	17.55	7.01	74.61	90.77
Manzanilla, Constabulary Station	10.71	10.42	6.45	50.04	67.53
Sangre Gande, Evasdale Estate	11.43	16.09	7.66	72.09	83.56
Do. Grosvenor Estate	12.12	13.18	8.00	73.58	80.62
Mayaro, Constabulary Station	8.37	6.80	8.88	49.77	50.28
North Coast.					
Blanchisseuse, Constabulary Station	10.56	8.80	8.68	60.06	63.81
Grande Riviere, Mon Plaisir Estate	12.39	15.87	13.25	80.52	84.00
Toco, Aragua House	9.74	10.99	11.22	55.72	60.36
Toco Constabulary Station	9.32	9.62	9.45	50.50	49.05
Tobago.					
Tobago, Hermitage Estate	6.63	10.77	11.72	58.72	86.19
Do. King's Bay Estate	6.02	7.45	10.45	50.51	62.29
Do. Roxburgh do.	6.83	8.59	10.27	53.85	65.79
Do. Botanic Station	6.46	7.33	4.54	36.70	40.55
Do. Government Farm	3.68	6.12	4.40	26.33	24.46
Do. Friendship Estate	5.88	9.23	3.39	35.71	36.35

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