

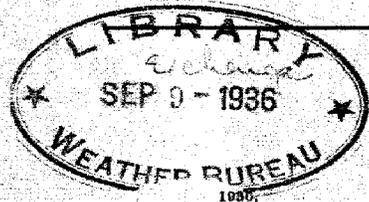
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TRINIDAD AND TOBAGO.

ADMINISTRATION REPORT
OF THE
DIRECTOR OF AGRICULTURE
FOR THE YEAR 1935.



TRINIDAD AND TOBAGO.
PRINTED AND PUBLISHED BY A. L. RHODES, M.D.F.
GOVERNMENT PRINTER.

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TRINIDAD AND TOBAGO.

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DEPARTMENT OF AGRICULTURE.

Administration Report of the Director of Agriculture
for the year 1935.

*Laid before the Legislative Council on the
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REPORT OF THE DEPARTMENT OF AGRICULTURE FOR THE YEAR 1935.

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DEPARTMENT OF AGRICULTURE.

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M.P. No. 33564.

I.—AGRICULTURAL EXPORTS.

For the year under review the total value of the agricultural exports was £1,696,423 as compared with £1,511,051 for 1934.

2. Sugar and its by-products held the premier position with an export value of £977,725, or £25,890 more than in the previous year; cocoa rose in value from £349,694 to £527,212; coconuts and coconut by-products fell to £50,414 from £88,823; and grapefruit exports amounted in value to £42,473 as against £18,634 in 1934. Striking a balance between these and other increases and decreases, there was a nett increase of £185,372 in the value of agricultural exports in 1935 over the previous year.

3. For purposes of comparison, the value of exports is given below for the years 1935 and 1934, as well as for the average of the three years 1926, 1927 and 1928; this average indicates the status of the agricultural industries of the colony before the malign influence of the world trade depression was felt.

Agricultural Exports.

Article.	1926-1928 average yearly value.	1934 Value.	1935 Value.
Sugar and By-products	£ 1,014,677	£ 951,835	£ 977,725
Cacao	1,531,148	349,694	527,212
Coconuts and Coconut Products	223,768	88,823	50,414
Coffee	12,833	10,595	18,290
Limes and Lime Products	6,056	28,594	18,398
Grapefruit and Oranges	2,028	22,777	49,047
Grapefruit and Orange Juices	—	1,711	502
Tonka Beans	1,824	14,822	12,320
Pulses, Beans and Peas	4,816	1,899	2,628
Livestock and Hides	8,441	5,967	4,446
Bitters	76,862	29,184	28,055
Miscellaneous	20,192	5,150	7,386
	2,902,645	1,511,051	1,696,423

SUGAR.

Sugar Production.

4. Production figures for the past ten years are given below; it will be noted that the year 1935, with a production of 117,780 tons, comes second to the record year of 1933 when the sugar crop yielded 120,763 tons of sugar:—

	Tons.
1926	73,561
1927	51,982
1928	81,551
1929	89,926
1930	79,848
1931	98,573
1932	97,598
1933	120,763
1934	105,342
1935	117,780

Exports and Values of Sugar and Sugar By-products.

5. The colony consumption of domestic sugar amounts each year to about 12,000 tons. The quantities and the values of the exports of sugar, rum and molasses are given in the table below which covers the period 1926-35:—

	SUGAR.		MOLASSES.		RUM.		Prices Grey Crystals f.o.b. per ton.
	Exports.	Value.	Exports.	Value.	Exports	Value.	
	Tons.	£	Gals.	£	Gals.	£	£ s. d.
1926	65,680	1,003,230	1,427,274	14,330	71,213	10,933	14 15 0
1927	41,805	762,366	1,188,840	14,471	35,699	8,155	16 10 0
1928	74,112	1,201,477	1,622,018	16,913	55,088	12,157	14 10 0
1929	81,503	1,049,803	1,373,420	18,227	73,841	13,639	11 10 0
1930	69,138	776,107	809,051	11,238	72,063	14,313	10 5 0
1931	86,054	902,990	1,599,414	15,924	86,260	15,719	9 0 0
1932	85,956	845,974	2,791,921	14,697	139,540	27,521	9 11 2
1933	108,516	1,115,567	3,026,077	31,634	63,907	12,853	9 10 0
1934	93,513	916,232	2,310,381	24,115	59,977	11,488	8 13 10
1935	105,699	942,171	3,199,524	32,226	6,282	3,328	7 12 6

Prices of Sugar.

6. World values of sugar continued to be low, and the f.o.b. price of grey crystals was £7 12s. 6d. From the above table it will be seen that for the past 5 years the f.o.b. price of sugar has been well below £10 per ton.

Cane Farming Industry.

7. In 1934 cane farmers sold 370,153 tons of canes to the Factories for which they received £203,583; in 1935 they sold 402,287 tons and were paid £221,226. The basic price was 11s. per ton of canes which was very much in excess of the amount due under the official Sliding Scale; cane farmers, in fact, received £115,626 more than the Sliding Scale value.

Importance of Sugar Industry.

8. Owing to the decline in the value of cocoa and the crop reduction in recent years, sugar has assumed a position of very great importance in the economic life of the agricultural labourer. Market values have remained deplorably low, but have been far in excess of the prices on the free market for sugar thanks to the preferential treatment accorded to empire grown sugars by the Imperial Government and the Canadian Government.

9. The result has been that sugar estates have been able to give employment to a large number of labourers. It has been calculated that four tons of sugar will provide employment for four days per week for one man for a year. Calculated on an acreage basis this is far in excess of the demand for labour on estates growing crops other than sugar.

10. Sugar cane is well adapted to large tracts of land on the fringe of existing cane areas, as well as in districts where canes have not been previously grown, and it is recognition of the difficult position of the sugar industry of other countries that has prevented a rapid and large expansion in this colony of the area under cultivation to canes.

COCOA.

11. Cocoa exports and the price per fanega (110 lb.) during the years 1926 to 1935 were as follows:—

	Exports.	Value.	Price per fanega (110 lb.)
	lb.	£	\$ c.
1926	50,067,881	1,270,335	12.99
1927	51,934,857	1,671,883	15.82
1928	58,008,156	1,651,179	13.21
1929	61,888,740	1,446,127	10.99
1930	53,825,120	1,136,056	9.34
1931	57,186,512	826,333	6.88
1932	41,822,127	579,170	6.94
1933	51,311,274	555,907	5.03
1934	26,803,149	349,694	6.44
1935	44,387,836	527,212	5.75

12. Over the greater portion of the colony weather conditions were very favourable for the cocoa crop and the swing back to a yield of 44,387,836 lb. after a drop to 26,803,149 lb. in 1934 has been the only bright spot in the cocoa situation during the past five or six years.

13. But, even this comparatively satisfactory yield was not able to bring appreciable relief to growers who had to struggle during the previous four years against low prices and the inroads of witchbroom.

14. Witchbroom has each year secured a firmer grip on cocoa estates in Trinidad and the number of mature pods affected by this disease in certain areas of high rainfall showed an appalling increase in 1935 and reduced the crops in these districts to negligible quantities.

15. The search for strains of cocoa resistant to witchbroom is discussed later in this report.

The Cocoa Subsidy.

16. In 1929 the price of cocoa fell to \$10.99 per 110 lb. and since then it has been as low as \$5.03. Coupled with depressed prices since 1929, has been the added difficulty of two years of poor crops. Further, the witchbroom disease has necessitated a new item of expenditure at a time when much embarrassment was being experienced in meeting the cost of normal maintenance.

17. Towards the end of 1935 the Legislature approved of a scheme, which had its genesis in proposals put forward by the Chamber of Commerce, for the payment of free grants to cocoa growers based on 1 cent per lb. of cocoa produced. This payment is to be made annually for four years, and it is estimated that a sum of \$500,000 will be distributed each year. The objects of the scheme are broadly :

- (1) to assist in the rehabilitation of areas under cocoa that appear to possess sound potentialities, and
- (2) to help in the establishment of alternative crops, either interplanted in cocoa or as pure cultivations in substitution for existing cocoa.

18. During the period of depression of world values for primary products cocoa alone of the major crops of the colony has been forced to struggle to make two ends meet on the prices obtaining in a free world market. Sugar has a substantial preference provided by the Governments of the United Kingdom and Canada ; grapefruit obtains a preference of about \$1.00 per box, and copra benefits by a local bonus.

19. It is fitting that the cocoa industry, to which every class of the community owes so much, should, at a time of urgent need, receive the help that has now been sanctioned.

COCONUTS.

20. There was a heavy decline in the production of coconuts during the year. The quantities purchased by the large oil factories was more or less equal to the purchases of the previous year, but the export of nuts, copra and oil, converted into terms of nuts, fell from 65,036,934 in 1934 to 32,339,783 nuts in 1935. The drought of the previous year was mainly responsible. Fortunately, there was a distinct advance in the value of copra which rose to an average of 8s. 6½d. per 100 lb. from 5s. 10d. in 1934. Exports of coconuts, copra and coconut oil for the past ten years are given below : —

	COCONUTS.		COPRA.		COCONUT OIL.		Price of Copra.	
	Exports.	Value.	Exports	Value.	Exports.	Value.		
	Nuts.	£	lb.	£	Gals.	£		
1926	...	5,041,036	25,135	13,858,996	166,263	82,791	15,373	23s.
1927	...	6,463,765	32,298	12,498,983	146,895	58,061	11,102	22s.
1928	...	6,799,655	34,824	21,351,860	227,555	65,285	11,860	20s.
1929	...	13,608,118	60,320	23,979,882	209,732	34,707	5,403	17s.
1930	...	5,886,127	25,830	21,891,259	175,965	41,154	5,938	14s.
1931	...	4,487,875	12,549	19,484,808	101,148	20,702	1,818	8s. 9d.
1932	...	3,847,245	12,822	15,418,906	91,444	26,461	2,520	10s. 2½d.
1933	...	7,888,980	21,406	19,357,980	82,945	45,565	3,658	9s. 5½d.
1934	...	9,850,299	29,128	17,928,775	57,451	31,118	2,244	5s. 10d.
1935	...	5,376,290	14,393	8,764,646	34,682	14,879	1,339	8s. 6½d.

Oil Factories and Bonus.

21. Under the agreement made in 1932 between Government and the Oil Factories, bonuses amounting in all to £18,107 were distributed to producers of copra, the bonus being at the rate of 2s. 9d. per 100 lb.

Coconut Wilt.

22. Appreciable numbers of coconut palms have died from wilt during the year, and it is clear that continued losses must be expected on the Caroni plain and in other areas where conditions are equally unfavourable to the longevity of the coconut palm.

LIMES AND LIME PRODUCTS.

23. The lime industry of Trinidad to-day depends almost entirely on the exports of lime oil. The market for concentrated juice and raw juice has dwindled to but small proportions, and the exports of green limes to the New York market amounted to no more than 565 barrels.

Co-operative Selling.

24. Towards the end of 1934 the value of lime oil on the world's market fell sharply to about 15s. per lb. Measures were taken by interested parties in Trinidad and St. Lucia for the co-operative organization of sales: the market was steadied and prices advanced. Negotiations were continued and the result was the formation of a Lime Oil Producers Association in St. Lucia and in Trinidad and a joint company with headquarters in Trinidad. The object is the regulation of sales with a view to securing reasonable—not excessive—prices for lime oil. Invitations to other colonies to join in this sound scheme have unfortunately not been successful.

25. Our colleagues in the production of lime oil prefer to reap the benefits of the St. Lucia-Trinidad organization without conforming to the restrictions, although it is obvious that gaps in the membership jeopardize the future for all concerned.

Exports of Limes and Lime Products.

<i>Lime Oil.</i>						<i>Exports</i>		<i>Value.</i>	
						<i>gals.</i>		<i>£</i>	
1926	....	....	....	....	....	431	5,312		
1927	....	....	....	....	....	104	1,454		
1928	....	....	....	....	....	495	5,894		
1929	....	....	....	....	....	797	9,516		
1930	....	....	....	....	....	1,647	19,457		
1931	....	....	....	....	....	2,413	32,071		
1932	....	....	....	....	....	929	12,840		
1933	....	....	....	....	....	1,889	22,575		
1934	....	....	....	....	....	2,882	25,055		
1935	....	....	....	....	....	1,949	15,497		

<i>Lime Juice.</i>						CONCENTRATED JUICE.		RAW JUICE.	
						Exports.	Value.	Exports.	Value.
						Gals.	£	Gals.	£
1926	....	....	....	....	....	7,886	1,926	Nil.	Nil.
1927	....	....	....	....	....	4,488	1,154	Nil.	Nil.
1928	....	....	....	....	....	5,653	1,487	Nil.	Nil.
1929	....	....	....	....	....	55,455	11,562	Nil.	Nil.
1930	....	....	....	....	....	21,762	3,759	17,554	4,096
1931	....	....	....	....	....	4,013	458	22,931	2,007
1932	....	....	....	....	....	8,583	417	46,629	4,250
1933	....	....	....	....	....	11,709	622	17,375	1,203
1934	....	....	....	....	....	9,110	535	3,479	294
1935	....	....	....	....	....	4,422	393	11,807	806

Green Limes.

						<i>Barrels.</i>	
1932	189
1933	2,101½
1934	1,439
1935	565

GRAPEFRUIT.*Acreage.*

26. A recent census of grapefruit plantations shows that there are 2,700 acres under cultivation to this crop as compared with 1,504 acres in the previous year. The greater proportion of the plantings are budded Marsh.

Exports.

27. Although still on a comparatively small scale, exports have risen rapidly : 10,973 cases in 1932, 23,518 in 1934, and over 50,000 in 1935. It is of interest to note that the value of the grapefruit exports in 1935 was £42,473 compared with £50,414 the value of coconuts and by-products exported. The quantities and value of the exports for ten years are given below :—

				<i>Exports.</i>	<i>Value.</i>
				<i>boxes.</i>	£
1926	....	....	....	54	50
1927	....	....	....	1,649	1,427
1928	....	....	....	23	45
1929	....	....	....	807	606
1930	....	....	....	2,184	910
1931	....	....	....	4,377	1,874
1932	....	....	....	10,973	8,978
1933	....	....	....	3,433	2,586
1934	....	....	....	23,518	18,634
1935	....	....	....	51,119	42,473
	(loose fruit)	....	....	7,724	

28. Trinidad fruit continues to receive a premium on the English market where the excellent eating qualities are recognized and appreciated.

COFFEE.

29. Both in quantity and value there was a marked increase in the exports of coffee.

30. Robusta coffee grows and produces well under a wide range of conditions in Trinidad and increasing use is being made by planters of this crop for inter-planting in cocoa fields, the yields of which are depreciating on account of witchbroom or for other reasons.

				<i>Exports.</i>	<i>Value.</i>
				<i>lb.</i>	£
1926	....	....	....	497,688	20,371
1927	....	....	....	164,072	7,246
1928	....	....	....	265,410	10,883
1929	....	....	....	817,983	32,309
1930	....	....	....	491,988	12,525
1931	....	....	....	857,920	16,276
1932	....	....	....	908,492	20,822
1933	....	....	....	339,196	7,416
1934	....	....	....	525,115	10,595
1935	....	....	....	1,187,867	18,290

TONKA BEANS.

31. As in the case of Robusta coffee and limes, there have been extensive plantings of Tonka Beans as a supplementary crop on cocoa estates.

				<i>Exports.</i>	<i>Value.</i>
				<i>lb.</i>	£
1926	....	....	....	83	8
1927	....	....	....	10,015	1,669
1928	....	....	....	884	147
1929	....	....	....	15,266	2,544
1930	....	....	....	9,219	1,538
1931	....	....	....	22,950	3,583
1932	....	....	....	69,276	12,993
1933	....	....	....	9,979	3,004
1934	....	....	....	45,450	14,822
1935	....	....	....	37,968	12,320

BANANAS.

32. Regular fortnightly shipments of bananas have been made during the year and 66,369 bunches were purchased under contract by the Canadian Banana Company for which a sum of £6,205 was paid. In 1934 the shipments amounted to 33,701 stems.

33. Every assistance possible has been given by the Banana Board to growers. Bananas are purchased at various centres along the main roads and transported by the Board. Purchase is also made at various railway stations. It is consequently disappointing that the development of the industry has not been more rapid.

34. The causes of the slow progress can be best examined from three angles in the light of the experience of the past two years :

- (1) Cultural conditions.
- (2) Incidence of disease.
- (3) Harvesting and handling.

Cultural Conditions.

35. It is quite clear that bananas will not produce count bunches in soils of medium or low fertility. It has also been proved that development will not be satisfactory under shade. If planted in cocoa that has been pruned to let in light the plants will do well, but as the cocoa closes in the growth of the 1st ratoons will be seriously retarded. Those who wish to interplant in cocoa, should select fields where a portion of the cocoa can be partly sacrificed.

Incidence of Disease and Pests.

36. As forecasted Panama disease is widely scattered in Trinidad and is the major limiting factor to the rapid expansion of the crop. With this menace well in mind planters are wise not to cut down large blocks of other crops on the gamble that they will escape from this disease.

37. The leaf spot disease, to which fuller reference is made by the Mycologist, has been much in evidence but fortunately up to the present has been destructive only in areas with a rainfall below the minimum—80 inches per annum—considered suitable for the Gros Michel banana.

38. Banana weevils continue to prove a source of loss in certain areas in particular. Meticulous attention to plant sanitation is imperative if this pest is to be combated. The procedure is simple, but any slacking off will result in serious losses.

Harvesting and Handling.

39. Criticism of growers in this connection cannot be avoided and become more forcible when it is prefaced by reference to the excellent results obtained by some growers. Rejections at the wharf are deplorably high and yet the fruit that is selected is reported upon less favourably than that from some of the northern islands.

40. Lorries are used with insecure sides ; unloading and reloading without supervision is done on the road ; and attendants sit or lie on top of the bananas. We are still far from being banana minded.

41. It is unquestionable that more skill in the selection of the right grades and greater care in the handling and packing would have resulted in the shipment of at least 25 per cent. more bananas last year.

42. I cannot advise more than a cautious interest in this crop, but, within the restrictions that available knowledge dictates, I feel justified in urging that far more advantage be taken of the opportunity offered by the contract with the Canadian Banana Company, under which no limit is placed on the number of bunches that will be purchased and under which the price is known beforehand.

II. DISTRICT WORK, DEPARTMENTAL INSTITUTIONS AND OTHER ACTIVITIES.

43. A brief review of the work of the departmental institutions and of the technical officers, the inspectors of the plant protection service and the district staff is given in this section of the report. In Part II will be found detailed reports by the officers in charge of the sub-branches of the Department.

DISTRICT AGRICULTURAL WORK.

44. Much routine advisory and other district work has been carried out during the year by the district staff, the plant protection inspectors, and technical officers of the Department.

Bananas.

45. Banana work has taken up an appreciable amount of the time of the district staff officers. The cultivation of this crop for export is new to the majority of the growers and guidance has been necessary. The services of the Banana Officer, who combines with his field duties those of selector at the wharf, have been in constant demand, and have proved very helpful.

46. The Agricultural Advisers and the Witchbroom Inspectors have, under the supervision of Mr. J. R. Foster, Chief Inspector under the Plant Diseases Ordinance, been responsible for the purchase of bananas in the districts.

47. A survey was made of the incidence of the banana leaf spot disease (*Cercospora musae*); and the free destruction of Panama affected stools was carried out on the properties of small proprietors.

Food Crops.

48. Encouragement of the planting of food crops for family use is an important duty of the district Agricultural Advisers. In successive years, attention has been drawn in my annual report to the heavy bill paid by the colony for imported foods, and the table given last year, which included six of the principal items imported as food, is brought up to date below. Compared with 1928, there has been in recent years a substantial reduction in expenditure, although not in quantities. In 1935 the expenditure was greater by £32,879 than in 1934. The increase is doubtless due to the money put into circulation as a result of the Central Water Scheme, the Deep Water Wharf Scheme, and the improved revenue from cocoa.

49. Agricultural labourers who appeared before the Wages Committee gave evidence that brought out in a forcible manner the importance of food gardens as a supplementary means of revenue or as a method of curtailing expenditure. On one large estate—an exception to the rule—over 300 labourers are given land for gardens which are maintained in reasonably good condition. This method of assisting labourers could with advantage be extended throughout the Colony.

50. One of the conditions laid down for small proprietors who receive assistance under the Cocoa Subsidy Scheme is that attention is to be given, where land is available, to the growth of food crops for family use. The enforcement of this regulation should have a marked beneficial effect on the domestic economy of small proprietors.

	1928	1933	1934	1935
	£	£	£	£
Flour	440,237	282,640	288,305	306,089
Rice	215,197	147,855	164,262	172,040
Condensed Milk	106,043	83,317	94,709	98,373
Meat	74,778	72,606	72,372	87,430
Vegetables (Onions, Irish potatoes, &c.)	68,030	55,256	56,668	55,019
Beans and pulses	40,899	34,825	27,591	17,835
Total	945,184	676,499	703,907	736,786

Peasant Proprietors' Competition.

51. Judging of the peasant proprietors' competition organized under the auspices of the Agricultural Society was undertaken by special judges and the Agricultural Advisers of the three districts in which the competition was held. Much credit is due to the Agricultural Society for having inaugurated this competition which undoubtedly did much to stimulate the work of rehabilitation in the hurricane damaged area. In all, there were 230 entries, and \$1,011.00 was distributed in prize money.

Government Fermentaries.

52. During the season that closed at the end of June, 190,436 lb. of wet cocoa were brought to the Government Cocoa Fermentary at Biche from which 454 bags (165 lb.) of cured cocoa were prepared and sold through the Cocoa Planters' Association. Two hundred and thirty-two small proprietors brought all, or a proportion of, their cocoa to the Fermentary and appeared to be very well satisfied with the results.

53. At the Rock-Penal Fermentary 120,832, lb. of wet cocoa were received on behalf of growers and 283 bags of cured cocoa were sold. The support of proprietors in the neighbourhood was not satisfactory owing to the competitive buying of shopkeepers. The prices offered were more attractive than those that the Fermentary could pay and were in fact above the value of the cocoa. One purpose of the Fermentary was not fulfilled—namely, the improvement in the quality of the cocoa; the other object—enhancing the value—was.

Co-operative Organizations.

54. An active part is taken by Officers of the Department in the various co-operative organizations. The Director is a member of the Board of Management of the Citrus Growers' Co-operative Association; the Agricultural Adviser, Mr. F. D. Davies, in Tobago is a member of the Committee of Management of the Tobago Producers' Association and supervises the work of the thirteen Agricultural Credit Societies and the five Co-operative Cocoa Fermentaries in the island-ward; Mr. C. K. Hutchinson, Agricultural Adviser, has direct responsibility for organizing the work, and checking the accounts of the Agricultural Credit Societies in Trinidad; and the Agronomist is on the Board of Directors of the Cocoa Producers' Association.

55. Brief notes relating to the work of the co-operative organizations are given later.

Plant Protection Service.

56. Constant visits were made to cocoa properties by witchbroom inspectors. The disease was found on 261 new properties during the year. Fifty-seven plant protection orders were issued. A vigilant outlook was kept for black bees which are very destructive to citrus plants; 75 nests were destroyed, and 29 plant protection orders were issued. During the year 97 plant protection orders were issued and 626 parasol ant nests were destroyed of which 37 were on Crown Lands; three proprietors were prosecuted for non-compliance. A keen lookout has been kept for Panama disease and 3,788 stools were treated with Banana Disease Killer Oil by inspectors.

Miscellaneous Duties.

57. As usual, the Agricultural Advisers have undertaken inspections for the Agricultural Bank, valuations for the Public Works Department, and the preliminary judging of school gardens.

DEPARTMENTAL INSTITUTIONS.

River Estate.

58. The report of the Manager, Mr. R. O'Connor, is appended and reflects the varied work now carried out at River Estate. The subsidiary crops are becoming of increasing importance, and of a revenue of over \$15,000 the sum of over \$4,000 was realized for produce other than cocoa.

59. Yields were satisfactory and a comparison with 1932 and 1933 show that in every case—cocoa, grapefruit, limes, tonka beans, coffee, and oranges—the crop of the year under review was the highest in the past three years. The 600 acres under timber received as much attention as has been practicable.

60. Witchbroom of cocoa, which up to the last year was negligible in incidence has made rapid strides.

61. In view of the increasing interest in the colony in tonka beans more attention has been given to this cultivation; crop records of individual trees are being kept and fertiliser and pruning tests are under progress. Distance apart of planting with its bearing on over-crowding in later years appears to be a matter of much importance. The method of propagation by layering continues to give satisfactory results and over 400 layered plants were sold. The area in tonka beans now comprises 60 to 70 acres including the blocks being established by contractors.

62. The grapefruit block indicates what can be done with soil of poor fertility. In 1934 the crop amounted to 1,177 crates; in 1935 it was 2,766 crates.

Cocoa Experimental Work.

63. As stated in recent reports, a far stronger bias is now being given to experimental work with cocoa, and this has largely been in co-operation with the Cacao Research Staff of the Imperial College of Tropical Agriculture. The fertiliser experiments have been continued. The twelve-acre field planted by

the Department in 1933 with the progeny of 6 selected heavy bearers has made good growth, and, as the plots have been carefully laid out, much light should be thrown on progeny behaviour when seedlings are planted.

64. Progress has been made by the Cacao Research Staff in the preparation of vegetatively propagated planting material of 100 selected cocoa trees for the 35 acres set aside at River Estate at the request of Sir Geoffrey Evans and Professor Cheesman. Planting out at River Estate will not commence until 1937.

65. In co-operation with Professor Briton-Jones, pruning experiments were commenced for the purpose of testing the effect on yield and on the cropping period in relation to black pod incidence.

66. *Distance Planting* : Crop yields have been recorded for the past eighteen years. For sixteen years, up to 1933, the plots planted 12 and 14 feet apart were practically identical, viz.: 443 and 440 lb. of commercial cocoa per acre per annum, respectively. These yields are appreciably higher than those recorded for the plots planted at 16 and 18 feet. During later years the wider plantings have made considerable progress. In 1932, the plot planted 16 feet apart gave the highest yield, and in 1933 and 1935 the highest yield was obtained for the plot planted at 18 feet. The average yields for the past five years, from 1931, are 670, 646, and 663 lb. of commercial cocoa per acre for the plots planted 14, 16 and 18 feet apart, respectively.

67. The average yield, for the first ten years, for the more recent plantings, 6 and 8 feet, compare favourably with the yields obtained for trees of the same age planted at double the distance in the first experiment. The comparative yields are 353 and 309 lb. of commercial cocoa per acre per annum, for the plots planted 6 and 8 feet apart, respectively, against 340 and 245 lb. for the plots planted at 12 and 16 feet.

68. *Budded Plants vs. Seedlings* : This experiment was started in 1914 and for the past four years the Budded plants, in the section with Immortel shade, gave better results than the Seedlings. The average yield from the commencement of bearing in 1918 up to 1935 for the plot budded at stake has exceeded that of the Seedling plot to a greater extent than previously. In the section without Immortel shade the Seedlings are still giving a better yield than the Budded plants.

69. *Colour of Pods* : There has been no change in the results of this experiment for 1935. The plots grown from trees bearing red pods have again given appreciably higher yields than those bearing yellow pods.

70. *Experiment with Superphosphate of Lime* : It has been found that a single 3 x 3 Latin Square layout is not satisfactory for determining the significance of relative yields of cocoa. Consequently, the experiment started in 1932, on the plot planted 12 feet apart in the Distance Planting Experiment, Field 8, has been discontinued, although the analysis taken over several years shows that phosphates are significantly beneficial in this area.

71. *Experiments with Nitrogen, Potassium and Phosphorus* : These experiments are being conducted in Field 8 and also in Fields 20 and 21, on shaded and unshaded cocoa.

Field 8.—The results show that Potash in the absence of Phosphate and Nitrogen increased the yield of wet cocoa by 69.4 per cent. The addition of Phosphate alone did not give a significant increase but when Potash was added the increase in yield of wet cocoa was 102 per cent.

Fields 20 and 21.—The results for the first year show that on both sections large increases in yield have been obtained for Potash applied both alone and in combination with Nitrogen and Phosphates. Nitrogen gave a larger increase in yield and Phosphate a smaller increase for the unshaded block compared with the shaded block. A detailed report on these experiments will be published in due course.

Marper Witchbroom Estate.

72. With the object of reducing the cost of witchbroom control at Marper, the brooms, &c., were cut out every alternate month instead of monthly as in the past. The cost of cutting out brooms, &c., was reduced from \$5.00, in 1934, to \$4.00 per acre, in 1935. Of this amount \$0.90 per acre was for extra supervision and keeping of records of individual trees on the experimental section, which is not part of ordinary estate practice.

73. The following figures show the incidence of brooms, mushrooms and infected mature pods, for the 92 acres under cocoa cultivation, for the past 5 years :—

	1931	1932	1933	1934	1935
Brooms	250,538	195,595	223,328	194,459	166,495
Mushrooms	2,637	665	68	166	26
Crops—bags	196	211	202	204	292
Mature pods affected with witchbroom—per cent.	6.5	0.9	1.2	1.3	1.3

74. It will be noted that the crop for 1935 was the highest obtained in the past five years. The percentage of mature pods affected with witchbroom for 1931 to 1933 is computed from records on three separate acre-blocks representing average conditions. The figures for 1934 and 1935 are for the whole estate.

75. Results of the fertiliser experiments at Marper are discussed by the Agronomist in his report for the year.

76. The effect of witchbroom disease, in the broad aspect of the relation of this disease to the future of the cocoa industry, is discussed on page 47.

St. Augustine Nurseries and Experimental Station.

The Nurseries.

77. In 1935, economic plants to the number of 70,462 were sold, or distributed free to Government institutions, in comparison with 86,000 in 1934. These included over 7,500 grapefruit as against, approximately, 11,000 in 1935: in addition, a large number of grapefruit buds were sold.

78. The distribution of West Indian limes was restricted to about 10,000 in agreement with Departments of Agriculture in certain of the Northern Islands as a result of the fear expressed at the Fruit and Vegetable Conference in 1933 that these islands were heading towards serious over-production. In 1934, close on 40,000 West Indian limes, which had been previously booked, were distributed.

79. There has been a fairly keen demand for T.I. limes because of the habit of this type of fruiting earlier than the West Indian lime.

80. The Guatemalan avocado pear Panchoi, imported in 1922, fruited for the first time and appeared to be superior to the West Indian pear in shipping qualities, but not in flavour or texture.

81. The Mauritius pea (*Pisum sativum*), which was recently introduced from Barbados, is proving a useful addition to the vegetable garden and seeds were distributed for trial in various districts.

82. On the ornamental side, there have been several introductions of decorative value, e.g., *Cassia splendida*, *Barleria cristata*, and *Pentas carnea*.

83. A report by the Manager, Mr. F. C. Butha, on the work of the Nurseries is appended.

The Experimental Station.

84. Grapefruit is the dominant crop under experimental growth at this Station and work was largely concentrated on the care of the large experimental block of citrus (mainly grapefruit) planted out in 1932. There are now 47 acres under citrus.

85. The protracted drought of 1933 gave rise to conditions that result in a severe attack of scale insects which necessitated constant spraying as an immediate measure of control, and windbreaks were put in as a fundamental protection for the future.

86. Growth measurements were taken on the grapefruit blocks and proved of very great interest. The results are referred to by the Manager, Mr. E. J. Gregory, in his report and were the subject of a bulletin prepared by Mr. R. O. Williams and Mr. E. J. Gregory, with an Appendix by Professor F. Hardy of the Imperial College of Tropical Agriculture.

87. Three outstanding results can be reported in as far as the various manurial and fertiliser treatments affected the growth of the grapefruit plants on the experimental blocks at the Station. These are :—

- (1) The benefits of adding manures and fertilisers.
- (2) The value of farmyard manure.
- (3) The importance of Potash.

Government Stock Farm.

88. The report by the Officer-in-Charge gives full details of the working of the Government Stock Farm during the year under review.

89. Owing to normal rainfall there was no shortage of fodder as was the case in the previous year.

90. Interest was maintained in the breeding and testing of Zebu-Holstein crosses and the $\frac{1}{2}$ - $\frac{3}{4}$ and $\frac{7}{8}$ bred crosses have as usual been kept separate. In addition, a Zebu dairy herd is being built up.

91. It is with regret that the death of the Holstein-Friesian bull "King Butter Girl Walker" is recorded; as a sire this bull proved of the greatest value to the Farm. Towards the end of the year a pure bred Holstein-Friesian bull calf was imported from the well known Carnation Milk Farms, Seattle, Washington, at a landed cost of \$1,000. This young bull is extremely well bred having been sired by Sir "Inka May".

92. Mortality during the year was abnormally high. There were in all 77 deaths including twenty-four animals that died from Paralytic Rabies and twenty-eight that had to be slaughtered as they reacted to the tuberculin test. Two animals died from Anthrax, but owing to the taking of prompt measures there were no further cases of death.

93. Three British Alpine goats of the famous Didgemere strain were purchased from Mrs. Abbey.

94. Stud animals have been stationed for the convenience of the public in the Farm at St. Joseph, in Port-of-Spain and in certain centres in the districts, as well as in Tobago. It is hoped to extend this means of improving the livestock of the Colony.

95. The Annual Sale of Stock was held early in December and the prices paid brought the amount realized up to £397.

96. There has been a noticeable decline in recent years in the demand for pure bred Zebu bulls due, as far as local interests are concerned, to the increasing use of water buffaloes for draught purposes.

97. Public institutions were supplied with 29,855 gallons of milk and the revenue received from this source was \$17,136.15.

98. The operating expenses of the Farm, as shown in detail in Captain Metivier's report, amounted to £5,876.15s. 0½d. and the revenue to £5,654 11s. 8d.

WITCHBROOM DISEASE OF COCOA.

99. This serious disease of cocoa gets a firmer grip from year to year on cocoa estates. Heavy foliage infestation has been prevalent for some years over large tracts of cocoa, but prior to 1934 the infection of mature pods with the consequent destruction of the beans had not been serious. In certain areas, mature pod infection rose during 1934 to 50 per cent. or more of the main crop. Evidence of this nature points clearly to the need for substitute crops in such areas pending the discovery, if possible, of a witchbroom resistant strain of cocoa.

Search for Strain Resistant to Witchbroom.

100. Some 150,000 trees in an area heavily infested with witchbroom were thoroughly combed in 1934; of this number 124 trees were found without witchbroom infection at the time of the search. These trees have been regularly examined during 1935 and 108 became infected, leaving only 16, of which 14 are fully grown, that have not yet been attacked by the disease.

101. Resistance of these trees to witchbroom cannot be regarded as positive pending further examination over a longer period as escape from the disease may have been accidental, and in any case the trees in question are not of a satisfactory type.

102. In an earlier report an account was given of the visit to Ecuador of Mr. F. Stell, Mycologist, to enquire into the report that strains of cocoa resistant to witchbroom had been developed in that country. Mr. Stell was impressed by the power of resistance in trees that were shown to him and obtained a promise of planting material. Six fair-sized young trees were received in 1935 and were placed in the Plant Quarantine Station and tests will be made as soon as buds develop.

103. The problem of following up the possibility of securing resistant strains can be regarded as the most important of the many agricultural problems of the colony and the obvious lines of investigation are :—

- (1) Continued local search.
- (2) Testing of the material from Ecuador.
- (3) Exploratory search in other countries for resistant strains.
- (4) Breeding work if resistant strains are found in cocoa of poor commercial value.

Alternative Crops.

104. The question of alternative crops calls for immediate consideration on the part of owners of estates in those sections where pod infection has reached alarming proportions.

105. The first consideration is a crop that is suited to the conditions of soil and rainfall—on this point the advice of the Department of Agriculture can be obtained. The second consideration is a far more difficult one; it is the question of the market prospects, and the proprietor must himself accept the responsibility of a choice that cannot but be a gamble on future world prices. Critical examination of such statistics as are available regarding existing world production and contemplated plantings are far from encouraging no matter what crop is selected, and the only justification for planting at all is the past experience of all countries that in spite of the ups and downs of agricultural enterprise some measure of prosperity from time to time rewards the planter.

106. Prophecies may prove false now, as has been the case in the past when views expressed about the future of some crops were optimistic and other crops were pessimistic. Some thirty years ago few would have believed that sugar would one day be the most important agricultural industry of this colony.

107. A number of local planters have already accepted that cocoa, in the absence of witchbroom resistant strains, can no longer be profitable in certain areas and the planting of Robusta coffee, tonka beans, limes, grapefruit, and oranges is being actively carried out, either interplanted with the cocoa or in substitution of blocks of cocoa that are being cut out.

108. The Department must emphasize the importance of soil and environmental suitability and repeat the caution that future prices cannot be forecasted no matter which crop is selected.

INTRODUCTION OF A THRIPS PARASITE.

109. Thanks to the kindness of the Government of the Gold Coast arrangements were made for the introduction of a thrips parasite (*Dasyscapus parvipennis*) found on the west coast of Africa. Mr. G. S. Cotterell, Entomologist of the Department of Agriculture, collected the specimens and shipped them in the pupal stage by steamer to Bathurst. From there they came by seaplane to Brazil and onward by air to Trinidad covering a period of ten days.

110. The material was in the first place taken care of by Professor Ulrich and was afterwards handed over to Mr. Adamson, Reader in Entomology of the Imperial College of Tropical Agriculture.

111. Much success has attended the handling of the material and the numbers have rapidly multiplied in captivity. A number of liberations have been made in cocoa fields by Mr. Adamson and parasitized thrips have been found.

112. The initial stages of this work have been most encouraging but it is early yet to forecast what measure of practical control of thrips will result.

SUGAR CANE INVESTIGATION COMMITTEE.

113. The work of this Committee was continued with funds provided by Government and the Sugar Manufacturers with a contribution from the Colonial Development Fund.

114. Mr. P. E. Turner, Sugar Cane Agronomist, was in charge of the soil and fertiliser investigations.

115. The Entomologist, Mr. A. Pickles, was transferred to the Department of Agriculture, but will continue to work on sugar cane pests as his major line of research.

116. An expedition to the hinterland of British Guiana with the object of collecting a parasite of *Castnia licoides* was financed by the Committee and the work was undertaken by Dr. J. G. Myers who forwarded a number of consignments of the parasite. These arrived in good condition, but unfortunately proved very difficult to rear in captivity and the outlook of success is not at all encouraging.

117. The froghopper outbreak of 1935 was not of exceptional severity, but serious blight was apparent in most districts and according to observers reports over two thousand fields were infested by froghoppers and severe blight developed in seventy-five fields representing an area of nearly six hundred acres. Loss of cane in such fields has been estimated to amount to from seven to nine tons of canes per acre.

118. Moths of the genus *Diatraea*, which seriously hinder efficient sugar production in other West Indian islands, are of less importance in Trinidad, according to the 1935 crop survey. On the average only 2.44 per cent. of the cane joints are bored by these insects, although on certain estates over six per cent., are bored. The larger borer, *Castnia licus*, damages 1.18 per cent. of the joints, about 9 per cent. of the canes being affected.

119. Young plant canes on one estate were damaged by the larvae and adults of a hard-back beetle, *Ligyrrus tumulosus*. This attack was found to be due to the application of infected pen manure and passed away without special treatment after the lapse of one generation.

COCONUT WILT.

120. As stated in my report of last year a definite correlation has been established between certain broad geological soil types associated with unfavourable soil-moisture conditions and the occurrence of wilt.

121. A report by Mr. F. M. Bain, Agricultural Officer, will be found in Part II and a departmental bulletin embodying his investigations and conclusions will be published later.

PARALYTIC RABIES.

122. There were 331 deaths of animals from Paralytic Rabies as compared with 312 in 1934. The majority of the cases occurred to the west of Arima, to a point not far east of Port-of-Spain, in Santa Cruz area, and to the north-west of Port-of-Spain.

123. During the year only 4,500 animals were inoculated as compared with not far under 13,000 animals in 1934. Several cases of anthrax in inoculated herds led to a temporary scare on the part of livestock owners and, also, it was considered wisest to withhold the issue of vaccine until the anthrax position was cleared up.

124. A new phase in the campaign against this fatal disease was entered upon—the destruction of bats. The work was in the early stages supervised by Professor Urich in co-operation with the Acting Medical Officer of Health. Later the supervision and organization of the work was taken over by the Medical Department and a staff of special Sanitary Inspectors was engaged for the purpose. In addition to the destruction of bats in caves, under culverts, in trees, &c., poison bait was put around the wounds of animals that had been bitten.

125. Two memoirs on Paralytic Rabies were published during the year, "Paralytic Rabies in Livestock", by Captain H. V. M. Metivier, and "The Study and Control of Paralytic Rabies Transmitted by Bats in Trinidad, British West Indies," by Professor F. W. Urich and Dr. Eric de Verteuil.

AGRICULTURAL CO-OPERATIVE SOCIETIES.

Agricultural Credit Societies.

126. *Tobago.*—During 1935, the thirteen Agricultural Credit Societies, with a membership of over 500, repaid to Government the sum of \$1,323, together with interest accruing to November 30th but the sum of \$8,450 was outstanding at the end of the year. No new loans were made. Even allowing for the lean years that have followed one another, the position is unsatisfactory.

127. *Trinidad.*—Twenty-two of the Credit Societies in Trinidad operated under the supervision of the Ste. Madeleine Sugar Company and with funds provided by that Company.

128. Mr. C. K. Hutchinson, Agricultural Adviser, supervises the sixteen other agricultural credit societies in Trinidad. The amount owing to Government at the beginning of July, 1934, was \$4,834; the amount loaned during the year was \$4,916; the sum repaid was \$7,285; and the balance due to Government at the end of June, 1935, was \$2,942.

129. These Societies have, for the most part, been in active operation and, with the exception of one Society, have met their obligations in a fairly satisfactory manner.

Tobago Producers' Association.

130. The year's working of this Association reflects credit on the management. Tobago has now been given an ice factory; co-operative selling of copra has proved profitable to the members, and for the first time fish figures among the exports of the island owing to the enterprise of the Association.

Tobago Lime Growers' Co-operative Association.

131. During 1935 this Association with a membership of 470 purchased, on account for the members, 4,232 barrels of limes or nearly three times as much as when the factory was opened; the purchasers were almost equally divided between large producers and small peasant proprietors.

Tobago Co-operative Cocoa Fermentaries.

132. There are now five co-operative fermentaries in Tobago and credit is due to Mr. F. D. Davies, Agricultural Adviser, for the development of this important form of co-operation. The older fermentaries at Pembroke and Roxborough marketed 746 and 604 fanegas of cocoa as against 383 and 295 fanegas in the previous years. The younger fermentaries at Parlatuvier and Delaford handled 170 and 244 fanegas, respectively. The fifth fermentary which was built by the Tobago Producers' Association was completed towards the end of the year.

Co-operative Citrus Growers' Association Limited of Trinidad and Tobago.

133. The judgment of the management in enlarging the Packing House and installing additional machinery proved to be well founded as there was a marked expansion in the operations of this Association which shipped 49,776 cases of grapefruit compared with 17,068 cases in the previous season.

COMMITTEE WORK.

134. More work than usual was thrown on the Director of Agriculture as Chairman or member of various committees owing to the fact that for seven months of the year there was no Assistant Director.

IMPERIAL COLLEGE OF TROPICAL AGRICULTURE.

135. I have again to place on record the indebtedness of the Department to the Principal and Staff of the Imperial College of Tropical Agriculture for assistance in many directions. In particular, I would refer to the citrus soil investigations of Professor Hardy and his studies of the Trinidad soils in general, to the thrips parasite work of Mr. Adamson and to the cocoa pruning methods advocated by Dr. Briton-Jones.

PUBLICATIONS.

136. The following publications by Officers of the Department were issued during the year:

- "Citrus Experiments" by Mr. R. O. Williams and Mr. E. J. Gregory.
- "Sugar Cane Variety Trials, 1934" by Mr. E. J. Gregory.
- "Recent Investigations on Sugar-Cane and Sugar-Cane Soils in Trinidad"
- I.—General Effects of Ground Limestone—by Mr. P. E. Turner.

III. REVENUE AND EXPENDITURE.

137. Annexure "A" contains a detailed statement of the accounts of the Department for the year 1935. The total expenditure amounted to £43,885 and was less than in the previous year; the total revenue was £13,335, and was £3,403 less than in 1934. The Stock Farm brought in £5,654, River Estate £3,214, the St. Augustine Nurseries and Experimental Station £1,651 and Veterinary Fees £1,512.

138. The work under the Plant Protection Ordinance was responsible for the large sum of £5,062. Upkeep of the Royal Botanic Gardens, the Queen's Park Savannah and other Government grounds cost £2,752; and £2,126 was a contribution to the work of the Sugar Cane Investigation Committee.

IV. STAFF.

139. Mr. R. O. Williams, Assistant Director of Agriculture, was transferred on promotion to Palestine as Chief Horticultural Officer, and left the colony on the 8th May. The Department loses with great regret an officer who combined administrative duties with those of a specialist in a manner that was of peculiar value to the colony.

140. Mr. H. Bruins-Lich, Curator, Royal Botanic Gardens, resigned his appointment as from the 30th September, to take up a position with the Municipality in Pretoria. Mr. Bruins-Lich, in the short time that he was in Trinidad, did much to foster interest in horticulture and his decorative work was of outstanding merit.

141. Dr. F. J. Pound was appointed Agronomist on the 21st September, and Mr. A. Pickles was appointed Entomologist on the 18th October.

142. Mr. K. F. S. Sealey, was selected for the vacant post of 4th Class Clerk at the Head Office.

143. The following officers went on leave during the year: Captain H. V. M. Metivier, Mr. F. Stell, Mr. B. G. Montserin, Mr. F. M. Bain, Miss C. M. Seheult and Miss S. M. Atteck.

144. In conclusion, I desire to acknowledge gratefully the keen interest of the officers in their work and their close application to their duties.

E. J. WORTLEY,
Director of Agriculture.

1st April, 1936.

PART II.

DIVISIONAL REPORTS.

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REPORT OF THE MANAGER, RIVER ESTATE.

Weather conditions prevailing during the latter part of 1934 and the early part of 1935 were favourable for most of River Estate's crops and despite adverse weather conditions during the latter part of 1935 crops were record ones. During the year the dry season which was pronounced was accompanied by high north-easterly winds and the rainfall during the middle and latter parts of the year was somewhat badly distributed. Over ten inches of rain fell during May while the months of June and July which normally should be a very wet period were exceptionally dry. The total rainfall during the year was 67.33 inches.

2. The crops during the last three years were as follows:—

	1933.	1934.	1935.
Cacao (bags of 165 lb.)	1,164	1,199	1,232
Limes (brls. of 160 lb.)	572	760	901
Tonka Beans (lb.)	254	135	308
Coffee (lb.)	4,530	4,331	5,280
Grapefruit (crates)	148	1,177	2,766
Oranges (crates)	294	488	620

Revenue and Expenditure.

3. Despite this increase of crops, revenue has not shown any improvement over that of 1934 owing to the poor prices again realized for most agricultural products, except Tonka beans, which crop, however, is only now becoming productive at River Estate.

4. There was a decided drop in the price of all other produce.

5. The total revenue for the year amounted to \$15,433.78 and the total expenditure to \$24,626.24.

6. Of the revenue cacao sales amounted to \$11,080.16 and other crops and sources realized a sum of \$4,353.62.

7. Non-recurrent expenditure, improvements, crops other than cacao, experimental work and timber plantations accounted for a sum of \$7,079.03.

8. The policy of a gradual extension of all subsidiary crops, timber plantations and a reduction of the area under unprofitable cacao by a process of supersession or substitution with other crops has been proceeded with throughout the year. This has resulted in a still further increase of the total area under cultivation.

Cacao.

9. The cacao crop amounted to 1,232 bags of 165 lb. each and was delivered to the Cacao Planters Association. First grade cacao fetched an average price of only 4.9 cents per lb. as against 5½ cents in 1934. Although not actually the greatest production, this crop represents the highest over-all yield per acre for first grade cacao in the history of the estate. The record crop of 1929, which amounted to 1,411 bags, included a total of 91½ bags of black cacao and passie and was obtained from an area of 466½ acres. The 1935 crop was reaped from an area of 418.7 acres and contained only 12 bags of wings and passie. Besides the much lower percentage of second grade cacao obtained now as compared with some five or six years ago owing to improved field sanitation and lessening of the intervals between pickings during the heavier cropping period, it has been found uneconomic to extract, transport, dry and market any diseased or immature pods which can with more profit be turned into the soil as manure.

10. The cacao cultivation received the usual routine attention with particular care paid to pruning which work was carried out on a somewhat heavier scale than usual, and supplying of cacao and ground shade. Trenching with manure of fields Nos. 23B and C, which was commenced late in 1934, was completed as also the whole of No. 22D and about three-quarters of No. 22A. Field No. 12B comprising a small area of 1.7 acres of very poor cacao was cut out and replanted with coffee and tonka beans. A large portion of Field No. 24 has been cut out by contractors for the planting of West Indian limes and the whole of the remaining portion was independently lined and planted with T.1. limes, the cacao trees being heavily pruned back or removed as the limes develop. The gradual conversion of Field No. 18B into a tonka bean and coffee field is being proceeded with and is making satisfactory progress.

Diseases and Pests.

11. These have been more prevalent than during the previous two years. Witchbroom disease has taken a firm grip of the whole area and the rate of increase may be gauged from the number of brooms collected in 1934 and 1935. These were 875 and 5,287 respectively, an increase of over 600 per cent. It may be mentioned that from 1st January 1936 to date 25th March, 1936, a total of 15,055 brooms have been removed and destroyed. Pod infection has so far been slight but a number of infected cushions have been cut away. Algal disease has given and is still giving some trouble to the young trees in the cacao variety trial plots field No. 19. Rosellinia root disease persists as usual but is of minor importance as compared with the other afflictions of the cacao industry. Cacao beetles were also more active than usual causing much damage to young trees and it is likely that this pest contributes largely to the spread of algal disease by carrying infection from tree to tree.

12. Thrips appeared in November and December and continued well into the current year, particularly along the roadsides of Fields Nos. 2, 7A, and 8B. Other fields were not badly affected. Accompanying this thrips attack, was a rather severe epidemic of leaf-eating beetles. A combination of these pests is likely to prove very damaging by their repeated and persistent attacks in exposed areas.

Experimental Work on Cacao.

13. This work is increasing steadily and there are large areas under manurial and other treatments. All records have been carefully kept and submitted to the Agronomist whose detailed account of the results is dealt with independently by him. The cacao variety trial plots in Field No. 19 comprising 12 acres are progressing satisfactorily but have been somewhat hampered by cacao beetles and algal disease.

Grapefruit and Oranges.

14. These crops were record ones but unfortunately, owing to a number of causes, results were again most disappointing. The following is a resumé of the citrus crop results as dealt with by the Co-operative Citrus Growers Association:—

GRAPEFRUIT:	2,848 field crates—2,766 packed crates	...	...	...	\$984.59
ORANGES:	677 field crates—620 packed crates	...	...	...	353.99
Total amount received from Association					\$1,338.58

Besides this, local sales for shaddock, navel, king and cacao oranges sold outside of the shipping season realized a sum of \$226.01 making a total in all of \$1,564.59.

14. The whole orchard was maintained in good order throughout the year. With the exception of the eastern portion of No. 1 section south of the mango field and which is mostly planted with oranges, the whole area received a surface dressing of pen-manure. Fertiliser consisting of 2 lb. Ammo-phos and 1 lb. Sulphate of Potash per tree was applied throughout. This was at the rate of 300 lb. per acre.

15. It is unfortunate that this orchard was not originally planted with Marsh and contains a large number of various seeded varieties. All the Marsh trees were, however, tagged accordingly some years ago and are picked separately, and owing to the poor demand for seeded fruit the question of eliminating a percentage of such trees each year and replacement by Marsh must soon be considered. Gummosis disease was more or less persistent, all badly affected trees were removed and their vacancies supplied. Fruit damaging insects caused some losses towards the end of the season, oranges suffering more in this respect than grapefruit.

Mango Plot.

16. The Julie Mango Field again failed to produce a crop. Flowering was profuse but mango midge and anthracnose completely defeated every attempt at a setting of fruit, even on a portion of the field which received a similar dressing of fertilizer as the adjoining citrus orchard.

Other Economic Plants.

17. Two small plots of 50 trees each of *Pimento officinalis* and Clove (*Eugenia caryophyllata*) were put out late in the year on the hillside to the east of the Manager's quarters overlooking the old water-wheel. Both have made a favourable start.

Limes.

18. This crop was a record one amounting to 901 barrels of 160 lb. each and bringing in revenue to the extent of \$1,285.13 at an average price of approximately \$1.42 per barrel. This crop which was obtained from a total of 1,538 bearing trees is being considerably extended and during the year five small contracts were taken over and several new areas were planted including 1,000 T.I. limes in Field No. 24 which is being thrown out entirely as a cacao field.

19. Fertilizer consisting of 2 lb. Ammo-phos and 1 lb. Sulphate of potash per tree was applied to the older sections and a smaller dressing to the young trees. It is anticipated that within the next three or four years this crop will be in the vicinity of 2,000 barrels per annum.

Tonka Beans.

20. There has been a considerable extension of the area under this crop which now comprises some 60 to 70 acres between estate and contract owned. Revenue from this source amounted to \$536.50 inclusive of \$110.50 derived from the sale of layered plants of which some 442 were sold to various planters. This method of propagation continues to give promise and there are now actually in production some half-dozen plants of three years of age, one of which is carrying its second crop. The main 6-acre block in Cascade was treated with fertilizer at the rate of 4 lb. per tree, 2 lb. Ammo-phos and 2 lb. Sulphate of potash. This response to this treatment has been very noticeable in the vegetative appearance of the trees and the yield was considerably higher than that of the other plot bordering Field No. 2 which received no manurial treatment. Planters are showing great interest in the various methods of cultivation of this crop as practised at River Estate and visitors have been very numerous.

Coffee.

21. The Robusta coffee crop, most of which is obtained from the trees interplanted in the old cacao fields Nos. 14, 15 and 16, was also a record one. The crop amounted to 5,280 lb. which realized a sum of \$319.81. Extension of this crop is also proceeding apace but, unfortunately, market conditions do not hold out much promise for the future. The practice of planting coffee along the hedge rows in place of *Hibiscus* has been continued and quite a number of young trees in these positions are now coming into bearing.

Timber.

22. This branch of development continues to progress and extend satisfactorily. More contracts were taken over and a number of new areas cleared for planting. During the past couple of years some attention has been given to the planting of Olivier and Yoke both plants proving very adaptable to our dry hillsides. Pruning and thinning of the older sections was proceeded with as opportunity offered. As usual and wherever accessible all thinnings were sold or used for fuel wood.

Stock.

23. The stock all kept well. These comprise at present four horses, three mules, three cows, four calves, and one bull. Two young bull calves were sold for \$50.00 and the old mare "Lady Lamont" was destroyed, she was 24 years of age. There is need for another working mule owing to the age and feeble condition of one of the animals now in service. Pasture and Service fees amounted to \$129.00.

Truck.

24. The motor truck was kept very busy throughout the year and transported all produce as well as large quantities of pen-manure from Port-of-Spain, fertilizers, stock-feed, building materials, &c. The total inclusive cost of operating the truck was \$1,347.46.

Buildings and Compound.

25. Rather extensive repairs were carried out to the stables by the Public Works Department as also some painting and slight repairs to the cacao houses. Another large section of the yard was oiled and the pasture was improved by some levelling and stumping. The encouragement of a cricket club composed mostly of the estate's employees has helped in this respect. It is hoped during the current year to have all the labourers barracks painted and repaired where necessary. The buildings generally are in good order.

Staff.

26. Owing to the ever increasing activities of River Estate many new duties have fallen on all members of the staff who worked willingly and conscientiously throughout the year.

27. The usual statements in connection with the working of the estate are attached.

25th March, 1936.

RODERICK O'CONNOR,
Manager, River Estate.

RIVER ESTATE.

Progressive Abstract of Expenditure for the year 1935.

	\$	c.	\$	c.
" A "—STAFF :				
Manager... ..	2,160	00		
Ovesecr, Drivers, Watchmen	3,266	90		
Travelling, Messenger, &c.	366	82	5,793	72
" B "—MAINTENANCE:				
Roads and Bridges	332	49		
Buildings, repairs, &c.	331	03		
Yard and Sanitation	696	73		
Grass Field				
Pastures... ..	87	24		
Water—Service and River	35	08		
Materials (Tools, Bags, &c.)	555	10		
Visitors and other Public Services	521	90		
Miscellaneous	44	94	2,604	51
" C "—STOCK :				
Labour (Stock-keeper, Grass-cutter, &c.)	588	02		
Materials (Stock-feed, Repairs, Harness)	624	29	1,212	31
" D "—LORRIES :				
Labour, Chauffeur and Attendant	571	40		
Upkeep, Gasoline, Oil, Repairs, Insurance, &c.	776	16	1,347	56
" E "—NURSERIES :				
Establishment	7	50		
Maintenance	66	90	74	40
Total " A " to " E "			11,032	50
" F "—COCOA CULTIVATION :				
Cutlassing	1,023	95		
Weeding and Stumping	843	94		
Trenching and Mulching, Manuring	565	04		
Supplying Cocoa and ground shade	212	71		
Pruning	837	61		
Draining and Roundridging	3	07		
Burying Pods—Bury Cacao Shells	266	29		
Shade Control	7	65		
Hedges and Borders	88	25		
Diseases and Pests, ants, beetles, squirrels	192	52		
Witchbroom	9	02		
Miscellaneous	—	—	4,100	05
" G "—COCOA MANUFACTURE:				
Reaping	1,896	20		
Curing and bagging	518	46	2,414	66
Total " F " and " G "			6,514	71
" H "—COCOA EXPERIMENTS :				
Labour	1,572	04		
Materials	5	00	1,577	04
" I "—ORCHARD—GRAPE FRUIT ORANGES AND MANGOES :				
Upkeep, cutlassing, weeding supplying	920	40		
Manuring	290	03		
Reaping	185	68	1,396	11
" J "—LIMES :				
Upkeep—Cutlassing, Supplying, &c.	333	35		
Manuring, including Artificial Manure	152	50		
Reaping	3	18	803	86
" K "—TONKA BEANS :				
Upkeeping—Laying experiment, Cutlassing... ..	513	35		
Manuring				
Reaping	17	86	531	21
" L "—COFFEE :				
Upkeep—Cutlassing &c.	92	88		
Manuring				
Reaping and hulling	154	13	247	01
Total " I " to " L "			2,978	19
" M "—TIMBER CULTIVATION :				
Upkeep—Classing, Thinning, Clean vines	481	38		
Roads and Bridges	87	72		
Reaping, Sawing and transport of timber	108	16	677	26
" N "—EXTRAORDINARY :				
New Cultivations—				
Limes	119	69		
Banana Experiment	59	98		
Tonka Beans and Coffee	486	46		
Timber	31	86		
New Roads and New Bridges and Railway	245	67		
Purchase of Contracts, advances, &c.	515	03		
Miscellaneous—Oiling yard	387	85	1,846	54
Grand Total			24,626	24

RIVER ESTATE.

Statement of Revenue and Expenditure for the year ended 31st December, 1935.

Particulars.		Revenue.		Particulars.		Expenditure.	
		\$	c.	\$	c.		
						\$	c.
By sale of :—				Personal Emoluments 5,028 00			
Cacao (Manuf.)	...	11,047	72	62—Maintenance 13,428 76			
Cacao Pods	...	32	44	11,080	16	63—Travelling (Motor Lorry) ... 1,174 62	
Grape Fruit	...	1,037	14	64—Incidentals 273 34			
Oranges	...	481	01	65—Timber Contracts 959 38			
Shaddocks	...	46	44	1,564	59	66—Improvements 1,749 08	
Limes	...			1,285	13	67—Fertilizers 240 00	
Tonka Beans	...			536	50	68—Materials 597 96	
Coffee	...			319	81	69—Stock 584 41	
Pasture and Service Fees	...			129	00	70—Cacao Varieties 590 89	
Miscellaneous :—							
Firewood, prov., &c....	...	272	78				
Bananas	...	245	81				
				\$15,433	78	\$24,626 24	

RIVER ESTATE.

Rainfall for the year ended 31st December, 1935.

Date.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.,	Sept.	Oct.	Nov.	Dec.	Totals.
1	.00	.00	.00	.00	.30	.00	.18	.00	.06	.00	.12	.29	
2	.00	.00	.00	.00	.60	.08	.10	.30	.00	.00	.00	.75	
3	.00	.00	.00	.00	.00	.01	.35	.60	.08	.45	.00	1.03	
4	.00	.00	.00	.00	.00	.10	1.04	.24	.00	.00	.38	.31	
5	.00	.00	.00	.00	.24	.00	.34	.06	.35	.32	.21	.10	
6	.00	.00	.00	.00	.52	.14	.00	.20	.92	.44	.04	.00	
7	.00	.04	.50	.49	.00	.68	.32	.18	.00	.00	.09	.20	
8	.00	.00	.00	.00	1.12	.00	.42	.00	.00	.00	.00	.00	
9	.00	.00	.00	.00	.62	.00	.25	.42	.00	.19	.00	.00	
10	.00	.00	.20	.00	1.04	.00	.11	.45	.28	2.00	1.80	.14	
11	.00	.00	.00	.00	.62	.00	.28	.21	.88	.30	.32	.00	
12	.30	.00	.22	.00	.00	.00	.10	.07	1.35	.18	.00	.00	
13	.00	.00	.00	.00	.06	.25	.46	.27	.00	.07	.26	.00	
14	.00	.00	.12	.00	.24	.35	.16	.40	.00	.09	.00	.07	
15	.44	.10	.30	.00	.00	.25	.00	1.26	.32	.00	.70	.00	
16	.00	.00	.00	.00	.00	.38	.00	.24	.38	.00	.00	.10	
17	.00	.38	.00	.00	.00	.05	.47	.08	.85	.09	.10	.00	
18	.00	.00	.00	.00	.00	.00	.11	.40	.00	.00	.12	.21	
19	.00	.00	.00	.00	.04	.00	.21	.23	.00	.00	.54	1.10	
20	.00	.52	.00	.09	.62	.00	.00	.07	.60	.00	.08	.00	
21	.60	.00	.00	.00	.22	.34	.10	.00	2.70	.00	.00	.00	
22	.30	.00	.05	.08	.00	.00	.00	.00	.30	.00	.62	.00	
23	.00	.00	.00	.00	1.80	.00	.00	.00	1.60	.00	.20	.00	
24	.00	.00	.00	.00	.09	1.75	.00	.00	.00	.00	.00	.00	
25	.00	.00	.04	.00	.45	.00	.00	.31	.00	.00	.06	.80	
26	.00	.00	.14	.00	.32	.00	.10	.76	.00	.00	.09	.21	
27	.00	.00	.24	.00	.35	.00	.00	.07	.60	.00	.67	.00	
28	.00	.00	.64	.00	.00	.00	.00	.20	1.62	.00	.95	.00	
29	.00	—	.00	.00	.00	.00	.75	1.81	.00	.31	.15	.00	
30	.00	—	.00	.00	.72	.10	.00	.50	.15	.00	.25	.10	
31	.00	—	.00	—	.04	—	.32	.00	—	1.00	—	.00	
Totals	1.64	1.04	2.45	.57	10.01	4.48	6.17	9.33	13.04	5.44	7.75	5.41	67.33

COUNTING AND CROP RETURNS.

Field No.	Bearing Trees.	Half Trees.	Quarter Supplies Trees.	Dead or missing Trees.	Total.	Acreage.	Approx. Age.	1935		REMARKS.
								No. of bags of 105 lb. acre.	No. of bags per acre.	
1 A ..	2,394	215	161	40	3,362	11.8	32-38	32.55	2.7	Trenched without manure, 1931-32, completed 1933 : 2 acres of bad cacao to be thrown out in 1936.
B ..	1,145	114	117	24	1,777	6.2	32-38	8.80	1.4	Trenched without manure, 1931-32, completed 1933 : 4 acres of bad cacao to be thrown out in 1936.
2 A ..	1,444	247	171	179	2,189	11.1	62-68	29.88	2.7	Experimental field, replacement of poor bearers.
B ..	1,331	276	139	100	1,901	9.6	62-68	20.00	2.1	do.
3 A ..	1,824	361	141	196	2,651	13.3	62-68	38.00	3.8	Part trenched without manure, part trenched with manure, part treated with fertilizer, 1931.
B ..	1,572	250	67	25	2,205	11.3	62-68	25.66	2.2	No special treatment, about 4 acres to be planted in Tonka Beans and Coffee, 1936-1937.
4 A ..	967	64	9	299	1,332	5.0	52-63	13.93	2.7	No special treatment, 4 acres of derelict cocoa, not included here, to be planted in Timber, 1936.
B ..	1,854	46	13	578	2,515	8.0	52-63	22.60	2.8	No special treatment, 2 acres of derelict cocoa, not included here, to be planted in Tonka Beans and Coffee in 1936.
5 ..	2,484	189	147	174	3,106	16.4	62-68	55.36	3.3	Shade and fertilizer experiment.
6 A ..	2,726	68	99	21	3,069	10.2	32-38	40.20	3.9	Trenched with manure, 1933.
B ..	1,849	52	76	8	2,203	7.3	32-38	31.89	4.3	do.
C ..	1,727	47	69	10	1,974	6.6	32-38	31.00	4.7	Trenched with manure, 1932.
7 A ..	2,314	112	118	50	2,683	8.6	32-38	30.24	3.5	Trenched with manure, 1925.
B ..	2,074	81	91	10	2,318	7.5	32-38	29.51	3.9	do.
8 A ..	3,557	79	306	179	4,335	14.5	32-38	48.76	3.3	Trenched with manure, 1927.
B ..	1,398	66	105	95	1,772	6.0	32-38	24.50	4.1	do.
C ..	1,768	66	206	171	2,333	7.8	32-38	22.73	2.9	do.
9 A ..	1,839	119	158	74	2,305	7.8	32-38	22.60	2.9	Trenched with manure, 1928.
B ..	1,794	60	71	9	2,108	7.0	32-38	24.80	3.5	Trenched with manure, 1928-1929.
C ..	2,461	129	138	249	3,114	10.4	32-38	28.41	2.7	Trenched with manure, 1929-1930.
10 A ..	1,574	87	73	585	2,319	7.5	32-38	18.33	2.4	Trenched with manure, 1930-1931.
B ..	2,034	107	103	533	2,777	9.2	32-38	22.36	2.4	do.
11 ..	2,233	198	169	505	3,105	10.3	32-38	22.39	2.1	Trenched without manure, 1933, about 1 acre interplanted with Tonka Beans and Coffee, 1935.
12 ..	1,675	191	753	767	3,478	13.8	32-43	26.38	1.9	No special treatment, about 5 acres to be planted in Tonka Beans and Coffee from 1936.
13 A ..	2,371	105	141	185	3,475	14.0	32-43	49.86	3.5	No special treatment, very good natural conditions.
B ..	1,573	96	82	215	1,967	7.8	32-43	30.80	3.9	do.

COUNTING AND CROP RETURNS.—CONTINUED.

Field No.	Bearing Trees.	Half Trees.	Quarter Trees.	Supplies missing Trees.	Dead or missing Trees.	Total.	Acreage.	Approx. Age.	1935		REMARKS.
									No. of bags of 16½ lb. per acre.	No. of bags per acre.	
14 ..	982	56	27	1	17	1,083	4.1	62-68	6.23	1.5	Two acres cut out during 1935 for planting limes, remaining portion interplanted with Robusta Coffee.
15 ..	1,140	40	26	—	365	1,571	4.7	33-93	9.89	2.1	Part interplanted with Robusta Coffee.
16 ..	1,888	44	50	232	512	2,726	8.7	33-68	33.54	3.8	No special treatment, part interplanted with Robusta Coffee.
17 A ..	2,603	290	168	489	533	4,083	13.3	32-37	26.33	1.9	Part trenched without manure, 1931, very poor soil.
B ..	2,086	149	137	34	40	2,446	8.0	32-37	21.03	2.7	Part trenched without manure, 1931, very poor soil: Cocoa to be cut out gradually to plant Tonka Beans and Coffee from 1936.
18 A ..	2,722	251	161	148	90	3,372	8.5	12-38	28.00	3.3	Distance spacing experiment, 1 plot treated with Superphosphate.
B ..	2,449	172	37	—	—	2,658	7.0	12-38	21.63	3.1	No special treatment, bad sections interplanted with Robusta Coffee and Tonka Beans.
19 ..	1,301	101	66	10	70	1,548	5.1	27-38	16.31	3.2	Trenched with manure 1934.
20 A ..	2,089	106	140	24	92	2,451	7.9	27-38	22.43	2.8	Light shade, trenched with manure 1926; fertilizer experiment from 1936.
B ..	1,361	26	38	63	69	1,557	5.1	27-38	21.44	4.2	No shade, trenched with manure 1924; fertilizer experiment from 1934.
C ..	918	13	33	17	78	1,059	3.4	27-38	10.44	3.0	Mostly no shade, old fertilizer experiment.
D ..	1,084	11	29	6	124	1,254	4.0	27-38	12.00	3.0	Mostly no shade, trenched with manure, 1932.
21 A ..	1,839	96	58	221	—	2,214	7.6	27-38	31.53	4.1	Partial shade, trenched with manure, 1931-1932. Fertilizer experiment from 1934.
B ..	1,787	156	71	582	—	2,596	8.7	27-38	25.47	2.9	Partial shade, trenched with manure, 1931-32. Part fertilizer experiment from 1934.
22 A ..	1,576	29	166	161	197	2,129	6.6	27-38	18.96	2.8	Three-quarters trenched with manure, 1935.
B ..	2,442	142	288	113	270	3,264	10.2	27-38	34.00	3.3	Trenched with manure, 1935.
C ..	787	17	77	46	218	1,145	3.5	27-38	11.54	3.3	do.
D ..	2,004	107	55	49	134	2,349	7.7	27-38	12.09	1.5	Trenched with manure, 1935.
E ..	1,50	10	30	3	123	1,216	3.8	27-38	6.23	1.0	No special treatment.
23 A ..	2,399	44	61	46	208	2,758	10.1	27-38	31.16	3.1	Trenched with manure, 1934.
B ..	804	38	56	228	90	1,216	4.4	27-38	9.00	2.0	Part trenched with manure, 1934, completed 1935.
C ..	1,330	39	61	320	438	2,188	8.1	27-38	17.41	2.1	do.
24 ..	1,421	159	11	—	290	1,881	6.0	27-38	13.00	2.1	3.2 acres cut out during 1935 for planting West Indian Limes, remaining 6 acres interplanted with T.I. Limes late 1935.
25 A ..	963	10	2	66	123	1,164	3.9	12-33	11.72	3.0	Mulch and Fertilizer experiment.
B ..	2,270	106	67	179	169	2,791	9.3	12-33	28.60	3.0	Propagation, Progeny and Colour plots, trenched with manure, 1934.
	91,217	5,637	5,638	8,105	8,535	119,132	418.7	—	1,232.12	2.94	

REPORT OF AGRONOMIST FOR 1935.

The report for this year comprises:

- I. Results of Cacao Experiments at River Estate.
- II. General Cultivation and Experimental Work at Marper Estate.

I.—CACAO EXPERIMENTS AT RIVER ESTATE.

2. The experimental work at River Estate consists of:—

- (a) Distance Spacing Experiments.
- (b) Propagation Experiments.
- (c) Seedlings from Heavy Bearing Tree No. 4927.
- (d) Colour of Pods Experiment.
- (e) Manurial Experiments.

3. All results are computed for the experimental year, *i.e.* from 1st September of one year to 31st August of the following year.

Distance Spacing Experiments.

4. The Distance Spacing Experiments comprise two sections in Field 18: (i) plots planted in 1914 and (ii) plots planted in 1922.

5. *Experiments Started in 1914.*—Four plots of approximately one acre each were planted with seedlings, one year old in October 1924, at distances of 12, 14, 16 and 18 feet apart, respectively. The seedlings were raised in bamboo pots from mixed seed obtained from heavy-bearing trees of the Forastero type which produced large beans of good quality. Immortal trees were planted at distances of 24, 28, 32 and 36 feet apart, respectively, for shade in the centre of four cacao trees.

6. *Results.*—Cropping started in 1918 and for the first six years the plot planted with cacao trees 12 feet apart, gave the highest yield per acre. From 1924 to 1931, with one exception in 1929, and again in 1934, the highest yield was obtained for the plot planted 14 feet apart. In 1932 the plot planted at 16 feet apart gave the highest yield, whereas in 1933 and 1935 the plot planted 18 feet apart took the first place. This shows that with increasing age the trees planted further apart are bearing more heavily. In 1932, the plot planted at 12 feet had apparently reached its maximum production. It was then converted into a manurial experiment and super-phosphate of lime in varying quantities has been applied annually to the sub-plots. The results for this plot being no longer comparable, they are omitted. The average yields for 18 years (1918-35), *i.e.*, from the first year of fruiting, for the plots planted 14, 16 and 18 feet apart are given below.

Average Yield for 18 Years (1918-35.)

	14×14 ft. 227 trees.	16×16 ft. 173 trees.	18×18 ft. 130 trees.
Lb. commercial cacao per acre per annum . .	461	410	391

7. From the above results it will be seen that after 18 crops the average yield for the plot planted 14 feet apart is still appreciably higher than those for the plots planted at 16 and 18 feet. During the past seven years, the crops for the wider plantings have been steadily increasing and the results shown below are interesting.

	Lb. Commercial Cacao per acre per annum.		
	14×14 ft.	16×16 ft.	18×18 ft.
5 years average (1919-23)	220	135	123
5 years average (1924-28)	531	451	397
5 years average (1929-33)	653	647	626
2 years average (1934-35)	630	598	640

The total yields to date, in pounds commercial cacao per acre are given below and they show that approximately 1,000 lb. more cacao has been reaped for the plot planted 14 feet apart:

14 feet apart.	16 feet apart.	18 feet apart.
8,303	7,375	7,034

8. *Experiments Started in 1922.*—Three plots of approximately one acre each were planted without Immortal shade, in July, 1922, with seedlings one year old at distances of six, eight and ten feet apart, respectively. The seedlings were raised in a nursery and each plot contains:—

40 per cent. of trees raised from Tree No. 808 of Field 5.	
30 do. do. do. 1,285 do.	
15 do. do. do. 716 do.	
15 do. do. do. 646 do.	

These parent trees are a good type of Forastero and heavy bearers.

9. *Results.*—Cropping started in 1926, and the average yields for ten years (1926-35), show that the plot planted six feet apart has given the highest yield. It may be mentioned, however, that the soil on which the trees are planted ten feet apart is of inferior quality.

Average Yield for 10 Years (1926-35).

	6×6 ft. 1,210 trees	8×8 ft. 680 trees.	10×10 ft. 436 trees.
Lb. commercial cacao per acre per annum . .	353	309	164

10. The average yield for the first ten years for the plot planted six feet apart is slightly better than that for the plot planted at 12 feet in the first experiment at the same age, *i.e.*, 353 against 340 lb. of commercial cacao per acre per annum. Likewise, the plot planted eight feet apart has given a better yield than the plot planted at 16 feet, *viz.*: 309 against 245 lb. of commercial cacao per acre per annum. The average yields for two complete periods of five years are now available and they are given below:—

Yields for Periods of 5 Years.

	Lb. Commercial Cacao per acre per annum		
	6×6 ft.	8×8 ft.	10×10 ft.
5 years average (1926-30)	230	160	75
5 years average (1931-35)	476	459	252

11. The above results show that there has been a substantial increase of crop for the second period of five years on the previous five years and these yields compare favourably with those obtained for trees of the same age planted at double the distance.

Propagation Experiments.

12. The object of this experiment is to test the comparative merits, under estate conditions, of seedlings, budded and grafted cacao trees. Six plots of approximately one acre each, were planted in November-December, 1914. Full particulars of the experiments are to be found on page 30 of the Annual Report for 1931.

13. *Results*—The average results for 18 years (1918-35), *i.e.*, from the first year of bearing to date, and for 1934 are as follows:—

	Lb. Commercial Cacao per acre per annum.	
	1918-35.	1935.
<i>With Immortel Shade :</i>		
(a) Budded at Stake	447	972
(b) Budded in Nursery	403	833
(c) Seedlings at Stake	429	710
(d) Grafted	421	866
<i>Without Immortel Shade :</i>		
(e) Budded at Stake	384	835
(f) Seedlings at Stake	420	991

From the above it will be seen that, on the section planted with Immortel shade, the budded and grafted plots, as for the previous year, gave a higher yield than the seedling plot. The average yields for eighteen crops, from the time the trees came into bearing, show that the plot budded at stake has exceeded the yield of the seedling plot to a greater extent than previously and that the other budded and grafted plots are gaining ground. In the section without Immortel shade, the seedling plot is still producing larger crops than the budded plot.

Seedling from Heavy Bearing Tree No. 4927.

14. The average yield of this parent tree for four years (1913-16) was 332 pods per annum. In 1917 a plot of 178 stakes was planted with seed from this tree. The average yield of the progeny for 12 years (1924-35) amounted to 644 lb. of cured cacao per acre. In 1935 it produced 963 lb. of cured cacao or practically six bags per acre.

Colour of Pods Experiments.

15. The object of this experiment is to try and ascertain:—

(i) Whether cacao trees raised from parent trees bearing yellow pods are more, or less prolific than those raised from trees bearing red or dark red pods. This experiment is being made with both seedling and budded trees.

(ii) Whether a better yield per acre would be obtained by having the two trees at the same stake, one raised from trees producing yellow and the other dark red pods. This experiment is also being made with seedling and budded trees.

16. There are two plots of budded trees. On one plot, buds from trees bearing yellow and dark red pods are on separate stock, on the other, both buds are on the same stock. The plants required were raised in a nursery and planted out in July, 1921, in part of Field 25 when the plants were one year old. There are 50 cacao trees in each plot, spaced 13 feet apart, without Immortel shade.

17. *Results*.—The average yield for twelve years (1924-35), *i.e.*, from the first year of bearing to date, and for 1935 are given below:—

	Lb. Commercial Cacao per acre per annum.			
	1924-35.	1935.		
(a) Seedlings from yellow pods	391	956		
(b) Seedlings from light red pods	297	631		
(c) Seedlings from dark red pods	349	653		
(d) Single bud from yellow pods	367	1026		
(e) Single bud from light red pods	335	629		
(f) Single bud from dark red pods	737	1135		
	<i>Yellow</i>	<i>Red.</i>		
(g) Two buds on same stock, one yellow and one red	125	329	454	669
(h) Two buds on separate stock, one yellow and one red	133	206	339	549
(i) Two seedlings at same stake, one yellow and one red	59	219	278	509

From the results recorded above it will be seen that the budded plants have given better yields than the trees raised from seed, both for the twelve-year period and for 1935. The budded plots for trees bearing dark red pods have given very high yields, *viz.*: four and a half and seven bags of commercial cacao per acre for the 12-year period and for 1935, respectively, and these yields are much better than those of any of the other plots. It will also be observed that no advantage has been gained by planting two budded or two seedlings at the same stake, and that the yield for the red is greater than that of the trees bearing yellow pods.

Trenching Experiments.

18. The Trenching Experiments are being made in Fields 3A and 20.

19. *Experiments in Field 3 A.*—The cacao trees are 60 to 65 years of age, planted 15 feet apart and sparsely shaded with immortal trees. Three plots aggregating 6.55 acres were trenched two feet wide by 18 inches deep, filled with available material found on the spot and covered with earth from the trenches from January to May, 1931, at a cost of \$18.96 per acre. Two other plots comprising 2.9 acres were similarly trenched and 18 tons of pen manure per acre were added, from June to August, 1931, at a cost of \$31.29 per acre. The natural yield of each plot for one year is known and three crops subsequent to trenching have been obtained.

20. *Results.*—The plot trenched *without* pen manure has this year, the third after trenching, given an appreciably higher yield than that obtained previous to trenching, and the plot trenched with the addition of pen manure gave a further increase in yield, which shows that the benefit derived from trenching is maintained for several years. The yields of the plots are as follows:—

<i>Trenched without Pen Manure.</i>			
<i>Lb. Commercial Cacao per acre.</i>			
	<i>Natural Yield.</i>		<i>Yield after Trenching.</i>
1932	... 409		1935 ... 542
	<i>Average.</i>		
	1933-35 ... 443		
<i>Trenched with Pen Manure.</i>			
<i>Lb. Commercial Cacao per Acre.</i>			
	<i>Natural Yield.</i>		<i>Yield after Trenching.</i>
1932	... 475		1935 ... 682
	<i>Average.</i>		
	1933-35 ... 646		

21. *Experiment in Field 20.*—The cacao trees are 30 to 35 years old, planted 12 feet apart, without Immortel shade. A block of 2.7 acres, comprising four plots was trenched from June to September, 1932, and heavily pen-manured, at the rate of 47 tons, costing \$49.07 per acre. This high dressing of pen manure was not intended, but when the amount actually applied was calculated it was found to be at the rate specified above. This may, however, prove to be a useful error. The *natural* yield of each plot for one year is known and three crops subsequent to trenching have been obtained.

22. *Results.*—The trenched plots gave an increase of 108 lb. of cured cacao per acre for 1933 over its *natural* yield and a further increase of 96 lb. for 1934. The yield for 1935 is disappointing and shows an increase of only 85 lb. of cured cacao over and above the *natural* yield of the plots. The average yields for the four plots are as follows:—

<i>Lb. Commercial Cacao per Acre.</i>			
	<i>Natural Yield.</i>		<i>Yield after Trenching.</i>
1932	... 561		1935 ... 646
	<i>Average.</i>		
	1933-35 ... 693		

Manurial Experiments.

23. These comprise a number of experiments of the Latin Square type which are being run in conjunction with the Cocoa Research Department of the Imperial College. Detailed descriptions of each experiment are not necessary here since they have all been reported on in full in the Annual Reports on Cocoa Research. A note on the results to date for each experiment is given below.

(1) *Superphosphate of Lime—Field 18 on 12×12 Spacing Block.*

24. This experiment has been discontinued. The results obtained prove that the 3×3 type of Latin Square is not good enough for demonstrating the significance of relatively large increases in yield of cocoa. The analyses taken over several years does show that phosphates *are* significantly beneficial in this area.

(2) *Experiments to Test the Gross Effect of Applications of Nitrogen, Potassium and Phosphorus—Field 8.*

25. Potash in the absence of Phosphate and Nitrogen increased the yield of wet cacao by 69.4 per cent. representing a profit at the rate of more than \$5.60 per acre assuming the wet cacao is valued at two cents per lb. in the field. When Phosphate is added alone the increase is not significant but when added with Potash the total increase in yield of wet cacao equalled 102 per cent. and represents on the above basis a net profit at the rate of more than \$9.00 per acre. The four sub-plots which received both Potash and Phosphate yielded at the rate of 24.5 bags per 1,000. (Trees planted at 12×12 feet.)

26. The effect of fertilisers on the incidence of Black Pod is interesting for in this experiment Potash tends to decrease and Phosphate to increase the loss caused by this fungus.

27. The increase of yield shown by high and low bearers is not constant for all fertilisers. Thus Nitrogen may be detrimental to high bearers and beneficial to low bearers and Potash may give a greater actual percentage increase when applied to low bearers than high bearers although the net increase in yield is always less.

28. There is evidence to show that neither fertiliser advances or retards any of the rhythmic processes of the tree with regard to time. The effect seems entirely to be along the lines of increased intensity rather than prolonged action over a greater period of time. Thus setting is not hastened or retarded but increased in intensity over the normal period.

(3) *Experiments with Nitrogen, Potash and Phosphate Manures on Shaded and Unshaded Cultivations.*

29. The results of the experiments discussed here are based only on the yields for the first year after applying fertilisers. They may be divided into two heads:

- (i) The results common to both experiments.
- (ii) The results which differ in the two experiments.

30. Under the first heading there has been a large increase in yield due to Potash applied both alone and in combination with Nitrogen and Phosphates. The greatest increases in yield came from plots receiving 2 lb. of Ammonium Sulphate plus 2 lb. of Superphosphate plus 3 lb. of Potassium Sulphate per tree. With full shade the increased yield from this treatment was four bags per acre. Although this does not represent a financial profit with cocoa at less than eight cents (seven cents in the field) per lb. there is evidence from other experiments to show that these increased yields can be maintained afterwards with smaller annual applications of fertilisers.

31. Under the second heading it appears that there is a bigger response to Nitrogen and a smaller response to Phosphate on the unshaded block compared with the shaded block. The Nitrogen response may not be entirely due to shade conditions for the shaded block was recently trenched with pen manure and should have relatively more Nitrogen in the soil.

32. The results suggest that the presence of shade trees may have little effect on the response of cacao trees to fertilisers.

II.—MARPER ESTATE.

33. *Cultivation*.—The cultivation has been maintained in good condition during the year. Every field on the estate has been cutlassed twice or weeded and cutlassed once. Ground shade has been planted where necessary and young cultivations have received continued attention.

34. *Pruning*.—The whole estate was more or less lightly pruned according to the condition of the trees in each field from April to June. Suckers were cut out later in the year.

35. *Drainage*.—Comparatively little drainage was done during the year but the whole of field 6 was forked in July.

36. *Windbreaks and Hedges*.—These have continued to make good growth. They are now well established and need little attention.

37. *Thrips*.—Up to October, 1935, thrips were scarce and more so in Fields 1 to 5 which were sprayed with Bordeaux Mixture. But, in November-December a severe attack developed in fields 6 to 10, the unsprayed section of the estate, resulting in a complete change of leaf and consequent loss of crop. The trees in the sprayed section have, up to the time of writing, been little affected and they carry quite a good crop. The cost of spraying including materials was \$4.38 per acre as against \$4.58 in 1934.

38. Cacao Beetles, Squirrels and Rats were scarce. Black pods (*Phytophthora*) were plentiful in November and December owing to very heavy rains and floods.

39. *Witchbroom*.—Previous to 1935, Witchbroom was cut off from the trees and burnt, monthly, at a cost of \$5.00 to \$6.00 per acre. With a view to reducing the cost, only seven rounds were made, one each in January and February, and thence every other month, *i.e.*, in April, June, &c. The cost of cutting out and destroying diseased tissues, including supervision, amounted to \$4.00 per acre. The total number of diseased tissues found for the calendar year was 166,495 or 1,800 per acre, a decrease of 17 per cent. on the previous year. The loss of crop due to matured pods affected with Witchbroom was again very small. An actual count, for the whole estate, shows a loss of 1.31 per cent. as against 1.33 for 1934. From the above, it is apparent, that not only has the cost of controlling Witchbroom been appreciably reduced, but that the disease has been satisfactorily kept under control.

40. *Rainfall*.—The rainfall for the year was 108.69 inches against 83.65 inches in 1934 and 141.88 inches in 1933. Weather conditions were very favourable up to October, but very heavy rains and floods, during the last ten weeks of 1935, have materially affected the outlook of the crop for the early months of 1936, especially on the section which has not been sprayed with Bordeaux mixture.

41. *Crops*.—The crop reaped for the year was 45,459 lb. of plantation cacao and 2,734 of black cacao including siftings. This constitutes a record, due partly to favourable weather conditions, an increased yield from the manurial experiment plots and last but not least to the spraying with Bordeaux of the 40-acre block under shade reduction experiments. The produce is sold through the Cocoa Planters' Association of Trinidad, Ltd., and the price realised for the plantation cacao was \$6.05 per fanega, as against \$6.49 per fanega in 1934. The total crops (plantation and inferior cacao) in bags of 165 lb. for the six completed years since the property was purchased by Government have been as follows:—

1930.	1931.	1932.	1933.	1934.	1935.
251	196	211	202	204	292

42. *Buildings, Yard and Stock*.—The buildings are in good repair and the yard has been maintained in good condition. The health and condition of the stock have been very satisfactory.

43. *Roads and Bridges*.—No extension of roads was undertaken during the year but it is proposed to complete, at an early date, the road system whereby every field will be tapped by a gravelled track two and a half feet wide, which will greatly facilitate the crooking of the cacao to the estate's building.

44. *Gros Michel Banana Plots*.—The banana plot planted in May 1934 has been extended so that there are now 984 stools or approximately three and a quarter acres under cultivation. The cost of establishing and maintaining the cultivation during the nineteen months was \$274.04. The first bunch of bananas was cut at the end of March, 1935, and the 229 bunches reaped realised \$57.11.

Experimental Work.

45. The chief objects of the experiments are to ascertain the effect of the various treatments on Witchbroom incidence and on crop production. All results are given for the experimental year, *i.e.*, from 1st September of one year to 31st August of the following year. The crop yields are given in pounds commercial cacao and Witchbroom incidence, in number of affected material per acre.

46. The experiments consist of:—

- (a) Cultivation Experiments.
- (b) Manurial and Lime Experiments.

(a)—Cultivation Experiments.

47. The Cultivation Experiments consist of draining and shade reduction on (i) flat lands or vega, and (ii) on undulating lands. Details were given in the annual report for 1930. The first and second instalments of shade trees were cut out in 1930 and 1931, but this treatment proved too drastic, from a cultural point of view, and no shade trees were cut out subsequently. The drains were dug in 1930, re-opened in 1932, and cleaned out with a hoe in 1933 and 1934. The average results for five years ending 31st August, 1935, are as follows:—

48. *Results on Vega:*

	50% Shade Reduction Crop.		33½% Shade Reduction. Crop.	
	Witchbroom.		Witchbroom.	
Drains 25 feet apart	493	5,113	354	2,688
Drains 50 feet apart	347	3,415	456	4,427
Drains 100 feet apart	220	1,038	215	1,065
No drains	272	1,865	307	1,728

(a) *Spacing of Drains*.—The results recorded above show that draining has had no effect in controlling Witchbroom. It has been observed, however, that the plots showing the highest Witchbroom incidence are those adjoining the River and it is highly probable that their situation has a greater effect on Witchbroom production than the actual draining of the plots. The results show that lack of drains has adversely affected the crop.

(b) *Shade Reduction*.—The results tend to show that Witchbroom incidence is higher on the plots with greater shade reduction. With regard to crop production, there is not much difference on the average yields for the plots on which 50, or 33½ per cent. of shade trees were cut out, but the advantage is in favour of the smaller shade reduction.

49. *Results on the Undulating Land :*

			33½% Crop.	Shade Reduction. Witchbroom.	No Shade Crop.	Reduction. Witchbroom.
Drains 25 feet apart	..	..	305	2,147	354	1,279
Drains 50 feet apart	..	..	391	935	316	1,012
Drains 100 feet apart	..	..	246	1,287	471	1,160
No drains	..	..	341	1,579	420	949

(a) *Spacing of Drains.*—The results tend to show that the spacing of the drains has had no effect on Witchbroom control. The plots showing highest Witchbroom incidence are situated on the lower slopes and it is probable that the altitude and situation of the plots have a greater influence on Witchbroom incidence than the spacing of the drains. With regard to crop, the spacing of the drains has had no effect on crop production.

(b) *Shade Reduction.*—The results show that there has been less Witchbroom where no shade has been cut out. With regard to crop production, as in the previous year, the results show a better average yield for the section on which no shade has been reduced.

50. *Trees not Affected with Witchbroom.*—Records of Witchbroom incidence on 4,035 individual cacao trees in the Manurial Section have been kept.

From these records the number of trees which have been immune to Witchbroom for five years (1931-35) are shown below :

			Trees in Plot.	Trees not affected with Witchbroom.
Lime Series	(Vega)	..	243	0
Nitrogen Series	(do.)	..	483	1
Nitrogen and Potash	(do.)	..	441	0
Nitrogen and Phosphate	(do.)	..	473	0
Potash	(Undulating)	..	462	1
Phosphate	(do.)	..	494	5
Complete Fertiliser	(do.)	..	473	16
Lime	(do.)	..	486	12
Potash and Phosphate	(do.)	..	480	65

From these records it will be observed that out of 1,640 cacao trees in the vega, only one tree has been immune to Witchbroom during the past five years, *i.e.*, tree No. 1,686 in the Nitrogen Series. Six brooms were found in 1934 on tree No. 724 of the Nitrogen plus Phosphate Series. No brooms had been found on this tree for three years (1931-33), and none were found in this year. The number of trees resistant to Witchbroom on the undulating land section is being gradually reduced from year to year.

51. *Progeny of Trees highly Resistant to Witchbroom.*—Seed from trees Nos. 1,686 and 724, respectively, have been sown in highly infested areas to ascertain whether their progeny will be immune to Witchbroom. 25 other trees which so far have shown high resistance to Witchbroom are kept under close observation.

Manurial and Lime Experiments.

52. These experiments were commenced in 1930 with the object of ascertaining whether by adding suitable fertilisers to the soil cacao trees would become more resistant to Witchbroom disease or if not whether yields could be increased to pay for the cost of control of the disease.

53. The experiments consist of eight trials, the layout, &c., of which has already been described in the Report for 1930 and need not be repeated here since a description of the whole experiment and results obtained will be published separately later.

54. At the end of the fifth crop obtained after adding fertilisers the whole results were analysed and the conclusions arrived at are as follows :—

- (1) The most beneficial fertiliser is undoubtedly Potash applied at the rate of 300 lb. per acre in alternate years. The net profit after allowing for the expensive method of application and reckoning the increased wet cacao at a value of two cents per lb. amounted to \$3.28 per acre per annum.
- (2) Lime at the rate of five tons per acre applied every fourth year gave a 40 per cent. increase in yield but no profit.
- (3) Phosphate applied at the rate of 325 lb. per acre in alternate years gave a profit on the same basis amounting to approximately \$1.00 per acre per annum.
- (4) Nitrogen gave no benefit and Potash plus Phosphate did not give increases in yield anticipated from the effects of the single fertilisers applied separately.

55. The results are on the whole somewhat inconsistent and soil tests show that the experiments were unfortunately laid down on an area where several different soil types converge. This may account for some of the inconsistencies.

56. Also experiments on other estates where soil type is uniform show that larger increases in yield and also profits can be obtained from heavier applications of fertilisers.

J. DE VERTEUIL,
Agronomist.

REPORT OF THE MANAGER, ST. AUGUSTINE NURSERY.

Plant Distribution.

Plants distributed in 1935 were 70,462 as compared with 86,260 in 1934. Revenue for all plants and other products was \$7,398.69 as compared with \$8,236.56 in 1934 being \$837.87 less than 1934 but \$799.40 more than 1933.

The number of plants distributed free to Government Institutions in the colony is 3,782 comprising Budded and Grafted fruits, flowering, and ornamental trees and plants.

A detailed list of plants, seeds, cuttings, &c., distributed, is given below :-

CITRUS BUDDED :						
Grapefruit (Marsh)	..	..	..	..	7,010	
Do. (Assorted)	..	..	..	..	538	7,548
Other Citrus	..	..	..	..	..	5,500
T.I Limes ..	..	..	..	..	..	7,190
						20,238
OTHER FRUIT :						
Mangoes (grafted)	..	..	..	..	..	1,448
Avocados (budded and grafted)	..	..	..	..	..	829
Cocoa (budded)	..	..	..	..	..	10
						2,287
Limes seedlings W.I.	..	..	..	..	..	10,504
Cocoa, do.	..	..	..	..	..	22,690
Miscellaneous fruits	..	..	..	..	..	1,374
Timber trees	..	..	..	..	..	3,324
Other economic plants	..	..	..	..	..	1,494
Decorative plants	..	..	..	..	..	8,551
						70,462
Total No. of plants distributed						
Budwood (No. of buds)						
T.I lime buds	..	..	..	..	..	15,680
Other citrus buds	..	..	..	..	..	25,098
Avocado buds	..	..	..	..	..	650
						41,428
Cuttings :						
Derris ..	..	..	..	..	..	2,820
Other cuttings	..	..	..	..	..	83
						2,903
Seeds :						
Countable ..	..	..	..	..	..	12,931
Miscellaneous	..	..	..	..	..	23 pkts. and 23 lb.
Produce :						
Fruits, Miscellaneous	..	..	..	..	..	1907 and 9,542 lb.
Vegetables do.	..	..	..	..	..	16 lb.
Miscellaneous :						
Prepared tape	..	..	..	..	..	2,223 yds.
Leaf mould	..	..	..	..	..	8 bags and 2 loads.

Citrus.

Orders for Grapefruit and Orange plants have been supplied in full. A drop is again recorded in the number of Grapefruit plants distributed; this is partly accounted for by several large estates in different parts of the Colony now growing their own plants.

The number of Orange plants distributed shewed an increase over 1934.

The demand for T.I lime plants has been met, 7,190 being distributed which completed orders outstanding since 1934. The distribution of seedling and budded lime plants has been limited to 10,000 for the coming year, this was decided in view of the recommendation of the Fruit and Vegetable Conference of 1933. Orders now received over the amount will be supplied on a quota basis.

The weather at the beginning of the year was very dry and scale (*Lepidosaphes gloverii*) was very prevalent on the young plants many being checked in growth and stunted. Special measures had to be adopted to clean them, spraying having little effect. Two ounces of blue mottled soap was dissolved in a gallon of water and the plants washed with a soft domestic cloth.

Sour Orange Stock.

Scab (*Cladosporium citri*) has again been less severe on the sour orange stock though the rainfall for 1935 is higher than 1934 but less than 1933.

Scale (*Lepidosaphes gloverii*) has been severe and checked the growing plants, a number of the badly affected ones being killed.

Cocoa.

The distribution of cocoa seedlings has increased being 22,690 plants as against 14,244 in 1934.

Avocados.

The demand for these has been less than the previous year. From reports received it appears that the Avocado Pear does not adapt itself to conditions in all parts of the island. Distribution for 1935 is 829 and 1934 is 843.

Mangoes.

Grafted mangoes of all our varieties were distributed but Julie has again been in the greatest demand. 1,984 plants were distributed in 1934 and 1,448 in 1935.

Orchard plots planted for propagating material in 1931.

T.1 Limes.

A half acre block was planted in July and September, 1929, of which the yield is given in the table below for the years 1933, 1934 and 1935. Scale (*Lepidosaphes gloverii*) was very severe on the trees at the beginning of the year, branches were defoliated and a quantity of dead branches were removed; they recovered again when the rains commenced and at the end of the year were carrying a good crop of fruit.

The trees were planted 12 feet apart, a heavy annual pruning has to be given to allow picking and transporting of the fruit from the field.

The number of buds distributed from the plot in 1935 is 15,680.

TABLE.

Months	1933.			1934.			1935.		
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	
January	1,165	1,320	413	1,015	875	424	1,818	1,276	762
February	1,015	875	424	1,002	537	746	1,002	537	746
March	1,818	1,276	762	486	319	547	1,792	1,209	541
April	1,002	537	746	486	319	547	1,792	1,209	541
May	486	319	547	1,046	724	699	876	426	628
June	1,792	1,209	541	62	201	902	638	162	1,103
July	1,046	724	699	184	726	525	184	726	525
August	876	426	628	135	464	52	135	464	52
September	62	201	902						
October	638	162	1,103						
November	184	726	525						
December	135	464	52						
Total	10,219	8,239	7,342						

In barrels of 160 lb. per acre this is equivalent to:—

Year.	Barrels.
1933	127.72
1934	102.98
1935	91.76

The half acre block of T. 6 which was cut out in July 1934 was replaced by T. 1 plants in August, 1935.

Mangoes.

Late in the year a severe infection of Thrips was observed on the trees, spraying was commenced at once which helped to control the outbreak. The variety Buxton Spice has been added to the collection.

Avocados.

The trees have now completely recovered from the long dry season experienced last year. The Guatemalan variety Panchoi introduced in 1922 through the U.S.A. Department of Agriculture has fruited for the first time. It is a medium size round fruit with a rough thick skin and small stone. It would appear to be better suited for purposes of an export trade than are the West Indian form.

Citrus.

The following were introduced from Washington, U.S.A. in 1929:—

Williams Tangelo, New Tangelo, Sunrise Tangelo and Sampson's Tangelo. These have not yet fruited.

General.

Mauritus Pea.

The pea "*Pisum sativum*" was grown and allowed to ripen its crop, the seeds were distributed for trial. It grows to a height of three feet and should be supported, the pods are small not containing more than seven peas, usually less, but they are of good flavour if used when freshly gathered. It is a useful addition to the kitchen garden.

Bougainvillea.

Seeds were collected from four varieties: Brick Red, Pink, Lady Watts, and a seedling of Lady Watts between the months of March and June, several have declared themselves as follows:—

Name.	No. of plants in beds.	Flowered.
Brick Red	21	.. 4—colour and growth similar to Mrs. Butt.
Pink	12	.. 5— do. do. do.
Lady Watts	25	.. 3— do. do. do.
Seedling of Lady Watts	34	.. 2— do. do. Lady Watts, Mrs. Butt.

Tung Oil.

The *Aleurites montana* trees planted in 1931 have again flowered but produced no fruit.

Flowering and Ornamental plants.

The following have been tried out and are useful additions to our collections:—

Cassia splendida.—A small tree, flowers yellow in terminal sprays.

Barleria cristata.—The deep pink and white flowering varieties.

Pentas carnea.—The white flowering form.

Allamanda.—With large primrose yellow flowers.

Ipomoea.—A small tree form, covered with large white flowers until midday.

Alternanthera ficoidea.—A white and green variegated leaf variety useful for baskets.

Derris.

Cuttings of the three following varieties have been distributed and additional plantings made:—

Derris malaccensis, erecta, and climbing, *Derris elliptica*.

Lonchocarpus Nicou.

Plants of the Black and White Haiari have been established and are making good growth.

Visits of Societies and Schools.

The annual visit of the Principal, Professors and Students of the Imperial College of Tropical Agriculture was made in January.

Visits were made by the pupils of the E.C. School, St. Joseph, St. Joseph Boys' R.C. School, Siparia and Erin District Agricultural Society, Cedros District Agricultural Society.

Instructions.

The following persons attended for instructions:—Messrs. J. F. Van Emden, B. B. Humphrey, N. Sutherland and E. Gibbs.

Donors.

Seeds and planting material were received from the following:—Royal Botanic Gardens, Calcutta; Botanic Gardens, British Guiana; Department of Agriculture, Palestine; Harvard University, Cuba; The Pataa Nursery, India; Vilmorin Andrieux & Co., Paris; and John Dean, Esq., of Canada.

Propagators.

Trained budders have been loaned to various estates throughout the year being away from the station 239 days.

Buildings.

The Glasshouses and other buildings have been attended to by the Public Works Department. Temporary shelters had been erected for growing seedlings and were covered with Radiolite; this does not last more than 18 months when the covering material peels away from the wire.

The Sanitary Authorities have been allowed the use of a portion of land as a dump for the house refuse collected in St. Joseph and Tunapuna, this being converted into manure by the method laid down by the Medical Officer of Health.

Weather.

The highest flooding of the St. Joseph river occurred on Sunday the 22nd September; it overflowed its banks and the whole station was covered with several inches of water for several hours.

F. C. BUTHN,
Manager.

REPORT OF THE MANAGER, ST. AUGUSTINE EXPERIMENT STATION.**Rainfall.**

The year 1935 has been a normal year for rainfall with a total of 61.34 inches, as compared with 47.02 inches in 1934, and 55.30 inches average over a 19-year period.

During August and September rainfall was particularly heavy and on two separate days in September most of the citrus area was covered with water for a few hours.

3. Rainfall as recorded at the adjacent Government Farm is given.

Rainfall, 1935.

January	..	..	1.17 ins.	July	..	..	7.75 ins.
February	..	..	0.53 "	August	..	..	12.32 "
March	..	..	1.00 "	September	..	..	11.95 "
April	..	..	0.47 "	October	..	..	5.67 "
May	..	..	5.40 "	November	..	..	7.32 "
June	..	..	2.65 "	December	..	..	5.05 "
				Total	..	..	61.34 inches.

Citrus Experimental Block.

4. The citrus experimental block now covers more than 47 acres owing to the addition of a new experiment as well as a collection of miscellaneous trees. The experiments are conducted in accordance with the programme outlined in *Tropical Agriculture*, Vol. IX, No. 10, pp. 301-306, 1932. The experiments comprise manurial and cultivation trials and investigations as regards stocks and methods of propagation in relation to gummosis.

5. Throughout the year the trees have steadily improved in growth, and a year of normal rainfall combined with careful trimming, spraying, and cultivation has considerably lessened the attacks of scale insects.

6. Eleven trees in Experiment VII—Stocks for Oranges, which were not available at the time of planting the experiments, were planted in their respective positions. 24 trees in Experiment VI, which had failed to grow, were rooted up and replaced. Twenty-one of these trees were Marsh budded on Wild Grapefruit stock. On examination of the trees in every case the root system was found to have been badly formed. Ten trees still remain to be planted in various experiments.

7. *Cultivation*.—A good standard of cultivation has been maintained throughout the experiments. Certain modifications were adopted in order to lower the cultivation expenses. Two hoe-weedings in January and June were followed by two cutlassings in August and October, instead of two more hoe-weedings, at a saving of \$4.00 per acre. The annual forking in November, which cost on an average \$4.80 per acre, was substituted by circle forking an area two feet wide round the outside limits of the spread of the branches at a cost of \$1.60 per acre, saving \$3.20 per acre.

8. *Application of Manures and Fertilisers*.—During the first two applications in May and August the manures were applied according to the original programme. Partly owing to a shortage of pen manure the standard manurial treatment throughout the experiments, except Experiment V, Cultural, and Experiment VI, Manurial, was modified. The use of pen manure was discontinued and Superphosphate was temporarily excluded. An additional amount of Sulphate of Ammonia and Sulphate of Potash was added to make up for the loss of the pen manure (0.5 lb. Sulphate of Ammonia plus 1.2 lb. Sulphate of Potash for every 100 lb. of pen manure previously used). This treatment is only a temporary measure and may be modified at a later date.

9. Experiment V, Manurial, received the usual dressings of pen manure and fertiliser. Experiment V, Cultural, received the first dressing of fertiliser from the time of planting in 1932. The dressing consisted of 1½ lb. Sulphate of Ammonia and 2 lb. of Sulphate of Potash.

10. *Modification of Experiment V, Cultural.*—Observation of the plots and results of growth measurements recorded in this experiment have shown that the sub-treatments in each group are not sufficiently different to be worth continuing as such. After careful consideration it was decided to combine the sub-treatments in each group, so that the four treatments now consist of:—

1. Cutlassing alone.
2. Cutlassing plus circle fork and dust mulch.
3. Cutlassing plus cover crop.
4. Cutlassing plus cover crop plus circle fork and dust mulch.

Cutlass three or four times annually as required; circle dust mulch at end of January and March, circle fork in May and November; cover crops of a semi-permanent type to be established, cutlassed after seeding and replanted when necessary.

11. *Pests and Diseases.*—Scale insects which were very bad in the early part of the year have been kept in check by heavy spraying with "Citromulsion". A normal dry season and heavy rain in the wet season have increased the number of entomogenous fungi present. Trimming poor and dead branches has improved the shape of the trees and they have filled out well.

12. The three most troublesome scale insects were *Prontaspis (Chionaspis) citri*, the Orange snow scale; *Lepidosaphes gloveri*, the long scale; and *Lepidosaphes beckii*, the purple scale. The long and purple scales are fairly easily controlled with "Citromulsion", but the orange snow scale is much harder to control and has increased somewhat. It attacks chiefly the trunk and main branches, causing splitting of the bark, but does not appear to cause defoliation, as is the case with long scale.

13. Resin wash was tried in an attempt to produce a cheaper spray material but its effect was not nearly as good as "Citromulsion".

14. The cost of applying the sprays was considerably reduced during the year and the work speeded up by the substitution of a "Friend" double-acting platform pump, for the previous bucket pumps.

15. Rust mite (*Eriophyes oleivorus* Ash.) has caused a fair amount of damage to young fruit and the problem of finding a suitable spray material will have to be seriously considered. Minor pests have been Parasol Ants, Stinging Ants, Weevils, and Mealy Bugs.

16. *Windbreaks.*—Cutting out the *Tephrosia candida* windbreak in August, 1934, combined with an exceptional year of drought and high wind in 1934, caused considerable damage to young trees.

17. In July it was decided to replant a system of temporary and permanent windbreaks throughout the citrus cultivation. A line of Pomeracs (*Eugenia malaccensis*) was planted on each of two traces running north to south through the citrus cultivation, spacing at ten feet apart. As a temporary measure *Tephrosia candida* and *Gliricidia maculata* were planted in lines running north to south on the west side of each guard row in the Manurial experiment and, wherever possible, in the other experiments. Considerable difficulty was experienced in getting these windbreaks established, but they are now making fair growth.

18. *Trimming and Pruning.*—Trimming and pruning were carried out at intervals in order to cut out dead branches, low-hanging branches and sucker growth. The trees are shaping well now and nearly all have a good canopy.

19. *Crop.*—A few boxes of fruit were reaped in February from the experimental blocks. These were roughly divided into culls and good fruit, and the yield of each tree recorded. No attempt was made to grade such young fruit.

20. *Nursery Work.*—A small nursery to supply special trees needed for the experiments was maintained. During October the trees were planted out in their respective positions.

21. *Spacing Experiment.*—A new experiment was planted at the beginning of October in co-operation with Dr. H. R. Britton-Jones. The object was to test the value of close planting grapefruit trees and cutting out alternate trees when branch interference takes place.

22. For this purpose a one-acre block in Field 27 was laid out in randomised plots of two spacings with eight replications of each. Spacings were 15 feet by 30 feet and 30 feet by 30 feet, making 72 trees in all. The experimental block was completely surrounded by *Tephrosia candida* and Pomeracs, with a centre line of these wind-breaks dividing the experiment in two. The trees used were Marsh grapefruit budded on to sour orange stock.

23. *Miscellaneous Planting.*—Twenty grapefruit and 15 orange trees, of various combinations of stocks and scion, were planted out with the object of having a suitable supply of trees for any future problem which might arise.

24. *Measurements.*—Measurements of girth below and above bud union, of spread in two directions, and of height were taken in January and July on all the trees in the experiments. The measurement of trees in the guard row was discontinued.

25. *Publication of Results.*—Results of three years growth measurements collected on the grapefruit cultural and manurial experiments and the demonstration block, were published in a Bulletin of the Department, by Mr. R. O. Williams, Assistant Director of Agriculture, and Mr. E. J. Gregory, Manager, St. Augustine Experiment Station, with an Appendix by Professor F. Hardy, M.A. (Imperial College of Tropical Agriculture).

Summary.

(a) The effects of various cultural treatments is discussed for Marsh, Duncan, and Foster on Sour Seville stock. Marsh has made the best growth while Duncan and Foster are about equal.

(b) Very small growth differences have been recorded between the various treatments. The clean weeded plots appear to be slightly more vigorous than any of the other plots.

(c) The effect of the wind on the shape and growth of the trees is discussed. It is shown that while many of the trees are badly shaped, especially as regards spread, there is practically no difference in growth dimensions between trees in the cultural block without windbreaks and similarly treated trees in the demonstration block and the manurial experiment.

(d) The effect of the different manurial treatments on the growth rate is shown for Marsh on Sour Seville, "Wild" grapefruit, and Rough lemon, and for the mean of the three stocks as a group. Rough lemon has made the greatest growth and "Wild" grapefruit is slightly better than Sour Seville.

(e) The unmanured plots gave the least growth response. No very marked difference was recorded for either single or double Nitrogen when applied alone. Better growth was obtained upon the trees receiving Nitrogen and Potash than those receiving Potash alone, but double Nitrogen appears to give no greater benefit than single Nitrogen.

(f) There is a marked result from the use of Potash alone whilst little or no effect is recorded from the application of Superphosphate alone. Some result has been obtained from Phosphate in the presence of Potash.

(g) In the group treatments a single application of Nitrogen proved better than no Nitrogen, whilst no increase in growth was obtained from a double application.

(h) Of the treatments without pen manure single Nitrogen and Potash gave the best results and is apparently better than Nitrogen, Potash and Phosphate, or single Nitrogen and pen manure.

(i) The treatments with pen manure generally gave the best response; of these Phosphate, Nitrogen and pen manure was the best and was rather better than Nitrogen and Potash alone.

(j) An account is presented of a demonstration of tilled and manured versus untilled and unmanured plots. The growth records show that the trees have grown almost twice as fast in the manured part of the demonstration.

(k) In the Appendix Professor F. Hardy discusses the "Application of chemical analysis of leaf ash as a means of identifying the best manurial treatments on grapefruit in the St. Augustine experiment".

26. *Records.*—Records of the incidence and effect of insect pests, spraying, flowering, and reaping of fruit were kept.

27. *Lime washing.*—In September the trunks of all the guard row trees in Experiment VI were lime-washed up to the first fork of the branches. The object was to note the effect on scale insects and stinging ants, to clean up the bark and to lessen the effects of the hot sun.

28. *Yearly Costs.*—In order to show clearly normal expenditure, *i.e.*, cutlass, weed, ronder, &c., as distinct from extraordinary expenditure, *i.e.*, experimental records, Experiment V., Cultural, dig para grass, etc., the following table has been compiled. The total cost, apart from supervision, under each head for grapefruit and oranges combined, in 1935, has been compared with the expenditure for 1934 under the same heads.

		<i>Total.</i>	
		1934.	1935.
		\$ c.	\$ c.
Drain	.. .. .	66 21	43 39
Cutlass	.. .. .	87 95	185 56
Weed	.. .. .	673 95	372 02
Ronder	.. .. .	161 23	200 20
Fork	.. .. .	173 71	—
Circle fork	.. .. .	—	59 55
Fertilisers	.. .. .	258 60	366 04
Pen Manure	.. .. .	319 88	177 43
Spraying	.. .. .	285 75	435 30
Supply plants	.. .. .	38 10	18 10
Windbelts	.. .. .	52 22	147 71
Prune, &c.	.. .. .	33 89	68 95
Miscellaneous	.. .. .	1 08	18 30
Experiment V, Cultural	.. .. .	146 74	110 60
Experimental Records	.. .. .	394 86	247 78
Dig Para grass	.. .. .	—	411 07
		2,694 17	2,862 00

29. As a matter of general interest the cost per acre and per tree of the general operations performed in 1934 and 1935 is given.

Cost of Principal Operations Per Acre and Per Tree for 1934 and 1935 Grapefruit (80 ft. × 30 ft.)

	1934.		1935.	
	Cost Per Acre.	Cost Per Tree.	Cost. Per Acre.	Cost. Per Tree.
	\$ c.	c.	\$ c.	c.
Cutlass	1 60	3.3	2 09	4.3
Weed	3 60	7.5	4 80	10.0
Ronder	78	1.6	—	2.0
Fork	4 80	10.0	—	—
Circle fork	—	—	1 60	3.3
Spray and material	2 30	4.8	1 82	3.8

30. *Citrus Root Studies.*—A preliminary study of the root systems of citrus trees in Trinidad was started in September at the Station. It is hoped that it will be possible to develop this work to citrus trees in other areas. The results up to the present were published in a short article in *Tropical Agriculture*, Vol. XII, No. 10, p. 278.

31. *Lime Backcrosses.*—About 60 lime backcrosses were planted out in Field 16 during October. This completes the collection of young backcrosses. The following table shows the number of plants of each cross with the male and female parents.

<i>Backcross.</i>	<i>Male.</i>	<i>Female.</i>	<i>No. of Plants.</i>
First	T. I.	W. I.	37
	W. I.	T. I.	23
	T. I.	Everglade	47
Second	T. 22	W. I.	52
	W. I.	T. 22	132
	W. I.	T. 171	2

These plants are receiving careful attention but it will be some time before their possibilities can be determined.

Minor Crops.

32. *Ground nuts*.—Two small plots were reaped from Field 1 in February. Yields: Virginia Bunch, good nuts 75 lb. (525 lb. per acre), poor nuts 4 lb. (28 lb. per acre), discarded 45 lb. (315 lb. per acre), total 124 lb. (868 lb. per acre); Running Variety, good nuts 286 lb. (858 lb. per acre), poor nuts 13 lb. (39 lb. per acre), discarded 85 lb. (255 lb. per acre), total 384 lb. (1,152 lb. per acre).

33. The yields are decidedly low partly due to poor land and partly to poor seed. No seed was available for supplying. The expense of cultivation was considerably more than the revenue obtained from the sale of the seed.

34. *Pigeon Peas*.—Four beds of selected heavy bearing Trinidad pigeon peas were planted in July. Two were of the "Lasiba" type and two the Tobago type. Selection work this year will be confined to testing how far nine years of selection has fixed a good type of heavy bearing peas, which ripen at one time and are suitable to the local market.

35. The dried peas from 50 plants on each bed, selected at random are to be counted and weighed. The average yield obtained will be taken as a test of the selected strains. No other varieties of pigeon peas have been planted this year as the Trinidad selection is much better than any previously grown.

36. *Cover Crops*.—A small area of a selection of cover crops and plants suitable for green manures were planted and reaped for the purpose of keeping up a small stock of the best varieties.

37. *Cassava*.—The following varieties are being grown and kept for stock:—

Bitter Cassava.—Sellier, Parasol, Turkey Claw, Mama l'enfant.

Sweet Cassava.—White Stick, Black Stick.

There is practically no demand for planting material and only a very small demand for the roots.

38. *Banana Varieties Collection*.—A collection of most of the local varieties and some imported varieties are being kept. These include: Ananica, Congo, I.C.T.A., Canary, Giant Governor, Giant Demerara, Giant Moruga, Burma, Silk Fig, Cliquito, Gros Jean, Fig Bandia, Moko, Red Fig.

39. *Melons*.—A small area of various melons was planted in September. They all grew well and formed fruit quickly. Much damage was done to the fruit by caterpillars which attacked all the plants when the fruit was formed. Heavy rains combined with caterpillar damage prevented any of the fruit from maturing. A small amount of seed was collected and out of the 13 varieties tested only Rocky Ford, Cantaloupe, and Honey Dew seem to be worth further trial.

40. *American Sweet Corn*.—A variety of American sweet corn, bred and selected by Dr. S. C. Harland as suitable to tropical conditions, was planted out in October.

Sugar-Cane.

41. The sugar cane crop for 1935 was small as most of the old cane cultivation has been changed to other crops. The total crop from Field 19, of 89 tons, 3 cwt. 2 qrs. realised a sum of \$246.12 and was sent to Orange Grove Factory.

42. *Multiplication of New Varieties*.—The area reserved for multiplication of new varieties has been nearly all taken up. From May onwards to the end of the year new varieties were received in small quantities from the Quarantine Station at the Imperial College of Tropical Agriculture. At the end of the year a total of 25 introduced varieties were being grown. Small quantities of most of these varieties should be available for distribution to the sugar estates by May-June, 1936. All plants received were put in as single-eyed plants and given special nursery treatment.

43. *Germination Test*.—A small trial was made to test the relative merits of treating single-eyed plants before planting, in order to obtain the maximum germination. For this purpose a randomised block of eight treatments with four replications of each treatment was planted in October. Each plot contained 25 plants, the variety used being F.C. 916.

Treatments were:—

1. Control, no treatment.
2. Soaking in water for 24 hours.
3. Soaking in water for 24 hours plus Magnesium Sulphate.
4. Soaking in water for 24 hours plus Lime.
5. Soaking in water plus Lime plus Magnesium Sulphate.
6. Varnishing the cut surfaces.
7. Smearing cut surfaces with cart grease.
8. Hatching plants under straw, until the shoots were four to six inches long.

44. A final germination count was made on 23rd November, 1935:—

Treatment.	I.	II.	III.	IV.	Total (%)
1	7	7	12	10	36
2	19	17	15	14	65
3	12	13	11	18	54
4	23	18	19	21	81
5	14	21	16	20	71
6	5	3	11	6	25
7	20	12	8	13	53
8	18	18	18	17	71

The results were treated statistically by Fisher's method. A difference of 13 per cent. in germination is significant (1 in 20).

45. Treatments 4, 5 and 8 are significantly better than all others but not significantly better than each other. Treatment 2 is significantly better than treatments 1 and 6, but not significantly better than treatments 3 and 7. Treatments 3 and 7 are significantly better than 1 and 6, but not significantly better than each other. No significant difference between treatments 1 and 6.

46. Conditions at the time of the trial were very dry and the best germination is lower than should be expected earlier in the wet season.

47. *Variety Trials on Sugar Estates*.—Only three trials were reaped during the crop season, one each at Orange Grove, Waterloo and Esperanza, on first ratoon canes and one time of reaping. A report on the results of these trials was made. During the wet season new variety trials were laid down at Caroni and Woodford Lodge Estates.

48. *Sugar Cane Growth Measurements*.—From March to the end of the year, growth measurements were taken at fortnightly intervals at Brechin Castle Estate, on B.H. 10(12), and P.O.J. 2878, and at Caroni Estate on B.H. 10(12). These measurements were made as a preliminary investigation, to see if the information revealed would be of any use in determining the suitability of a particular variety to a definite ecological area. The results will be reported after the crop has been reaped in February-March, 1936.

Stock.

49. At the end of the year two aged oxen "Redman" and "Patloo", valued at \$60.00 were disposed of to a butcher in exchange for a young working ox, "Shamrock". Another young ox, "Lawyer", was purchased for \$45.00 in December.

50. A large concrete drinking trough was installed by the Public Works Department, and an open bamboo pen was constructed for making further supplies of pen manure.

51. Both mules and oxen were maintained in good health throughout the year, except the new mule "Blackbird" which appeared to be in rather poor condition. After rest and treatment the mule improved considerably and was fit for work again.

St. Augustine Rice Lands.

52. In April 13 acres, comprising the whole of the St. Augustine rice lands, were rented out in half-acre blocks for rice growing, on the basis of a yearly tenancy. The lands have been abandoned for some time and have only been a source of expense.

E. J. GREGORY,
Manager.

REVENUE, 1935.

								Heads.	\$ c.
Cane and cane plants	..	..	..	..	..	..	..	252	60
Grapefruit	..	..	..	..	..	..	..	8	31
Oranges	..	..	..	..	..	..	..	14	29
Grapefruit plants	..	..	..	..	..	..	..	16	00
Cover crop seeds	..	..	..	..	..	..	..	98	24
Bananas and plants	..	..	..	..	..	..	..	1	20
Miscellaneous	..	..	..	..	..	..	..	137	03
Total	..	..	..	..	..	..	..	527	67

EXPENDITURE, 1935.

					Heads	Expenditure.	Savings.	Total Vote.
						\$ c.	\$ c.	\$ c.
Personal Emoluments :—Manager	2,040 00	—	2,040 00
Field Assistants	1,320 00	—	1,320 00
Other Charges :—Maintenance and Materials	2,948 91	41 09	2,990 00
Cultivation, Cane and other Crops	4,418 39	511 61	4,930 00
Stock	615 14	8 86	624 00
Extraordinary :—Calculating machine	173 00	—	173 00
Total	11,515 44	561 56	12,077 00

REPORT OF CURATOR, ROYAL BOTANIC GARDENS.**Royal Botanic Gardens, Government House, St. Clair, Government Lands and Red House.**

Mr. H. Bruins-Lich, Curator, went on leave on 10th June and later resigned his post: I was appointed to act.

Royal Botanic Gardens.**General.**

2. The routine work of the Gardens has been carried out, and the lawns have been maintained in good condition.

3. Very heavy rains caused damage to roads and paths on several occasions which were repaired as early as possible.

4. An addition has been made to the north of the garden by the purchase of three acres of land.

Flower Gardens.

5. These were well kept throughout the year. Planting of annuals and perennials being made to make a continuous show throughout the year.

6. A useful addition is the semi-double African Marigold—Guinea Gold—which makes a very attractive plant for beds, and is also most useful for cut flowers both in the dry and wet seasons.

Government House.

7. The disused Lily tank to the east of the grounds has again been brought into service and there are now established growing plants of the White, Pink and Blue Nymphaea, *Victoria regia*, *Limnocharis Humboldtii*, *Eichhornea speciosa*, *Pistia Stratiotes*.

8. Old portions of the Hibiscus hedge surrounding the kitchen garden have been replaced by *Murraya exotica* and *Flacourtia Ramonichi*.

9. The lawns were again damaged by mole crickets, but the measures adopted for their control were effective.

St. Clair.

10. The lawn surrounding the Head Office building has been regularly mown and the area well maintained.

11. The Overseer's office, Carpenter shop and Stable were removed to a site on the road leading to Emperor Valley in the Royal Botanic Gardens.

Trees on Government Lands.

12. Routine care was taken of all the trees under the care of the Department during the year, and necessary pruning and felling were subsequently done.

13. Trees attended to on reports received from the Public Works Department at the following Institutions were trimmed or removed :—

The Colonial Hospital.
St. Ann's Mental Hospital.
Queen's Royal College.
The Government Printing Office.
Besson Street Constabulary Station.
General Post Office.

Red House.

14. The Flagstaff lawn planted with Java Grass (*Polytrias praemorsa*) in 1931 has grown well and appears suitable to conditions there : it has been extended and planting has been made on other lawns as far as material allowed.

15. The Department is indebted to the following persons and institutions for gifts of plant material :

Royal Botanic Gardens, Kew.
Messrs. Vilmorin, Andrieux & Cie., France.
The University of Florida, U.S.A.
Paul J. Howards, Esq., California.
The Coconut Grove Arboretum, U.S.A.
F. G. Walsingham, Esq., Cuba.
Department of Agriculture, British Guiana.
D. Barry, Esq., California.
Royal Botanic Gardens, Calcutta.
E. H. Finch, Esq., Venezuela.
Botanic Gardens, Singapore.
W. Launder Millin, Esq., New Zealand.
Forest Officer, Bengal.
F. Higgins, Esq., Panama Canal Zone.
The University, Hong Kong.
C. Jinarajadasa, Esq., New Zealand.
Botanic Gardens, Straits Settlements.
M. Read, Esq., Brisbane.
Dr. Harold Lyon, Honolulu.
Harvard University, Cuba.

(Sgd.) F. C. BUTHN,
Acting Curator, Royal Botanic Gardens.

GOVERNMENT STOCK FARM, TRINIDAD.**General.**

Dr. J. L. Shannon, the Assistant Officer in Charge, proceeded on vacation leave to Barbados for three months (11th February, 1935 to 12th May, 1935). This Officer also visited Tobago on official duties for ten days during the month of January. During his absence his duties were performed departmentally.

2. Captain H. V. M. Metivier, the Officer in Charge, was away on vacation leave in the United Kingdom from 28th June, 1935 to 21st Nov., 1935. During his leave he spent three weeks study leave at the School of Agriculture, Cambridge—Animal Physiology Department—and also visited the Imperial Bureau of Animal Genetics at Edinburgh. In accordance with a request from the Governor of the Windward Islands this Officer proceeded to St. Lucia for three days in June on official business. His duties were performed during his absence by the Assistant Officer in Charge.

3. The salary of the Clerk at the Farm was regraded at £200 to £300 per annum

4. The rainfall was much heavier this year, 61.34 inches as compared with 47.02 inches in 1934. The driest month was April (.47 inches rain) and the wettest month August (12.32 inches). Although this amount of rain was still less than 1933 (88.47 inches), owing to the heavy showers in the Maracas Valley, the St. Joseph River overflowed its banks in passing through the Farm on several occasions and did considerable damage to our water system.

5. There was no shortage of fodder during the year and the returns from the canefields (cane tops), Uba cane and cultivated grass fields were much greater than in 1934. It was possible to sell some of the grass to East Indian peasants during the end of the year, besides carrying out our usual sales to the Constabulary and others, though, owing to two sporadic cases of Anthrax, one in August and one in September, the supply of grass to outsiders was suspended during these months. The pastures were also quite green from January to March and from May to December, as there was practically no Indian summer and the grazing good : there was no necessity to supplement bulky food to animals permanently pastured, during the year.

Water Supply.

6. There was considerable difficulty experienced with the intake pipe of the Blakes Ram, and the house in which the Ram is lodged was washed away by the river when in flood. The Public Works Department had to replace the wooden and corrugated iron housing with a more solid concrete building, and after clearing the choke in the pipes, fixed a stronger rose to the intake pipe. As soon as these repairs were completed the water supply was again good. Our supply of drinking water for the staff and the labourers as well as for the troughs in the pastures was as usual taken from the St. Joseph and Tunapuna Waterworks.

Cattle.

7. The cattle on the Farm were registered in the Herd Book of the Agricultural Society of Trinidad and Tobago and their markings branded on the off quarter—the Farm's private brands are on the near quarter—these markings of the Agricultural Society were used in the Farm Catalogue Sale this year, instead of our private brands. The number registered under each head was as follows:—

Pure Bred and Zebu Foundation	..	..	..	..	..	71
Grade Zebu	..	..	..	..	..	2
Pure Bred Holstein	..	..	..	..	..	20
Pure Bred Sussex	..	..	..	..	..	8
Grade Cattle	..	..	..	..	..	101

8. A pure bred Holstein Friesian Bull calf "Sir Inka May 45th"—calved 8th June, 1935—was imported from the Carnation Milk Farms, Seattle, Washington, U.S.A., at a landed cost of \$1,000.00. He is a son of the All-American Sire "Sir Inka May" from the highest record daughter of the well known All-American Sire "Matador Segis Walker 6th". This young bull's three nearest dams averaged for 365 days:—

Butter	..	..	..	..	..	1,247.39 lb.
Milk	..	..	..	..	..	30,078.60 lb.

He was landed at the end of the year in excellent condition and has now recovered from a natural attack of Piroplasmosis. It will be possible to use him on a few selected cows and heifers by the middle of 1936.

9. The Holstein Friesian Bull "King Butter Girl Walker", calved 1921, that proved himself such a great sire, died during the year, and two locally bred bulls "Lowlands Chief" and "Rutgers 2" have been used in his place. Besides these bulls, the two imported pure bred bulls "Prince Johanna Hartog" and "Segis Eco Rooker" stood for service on the Farm. Two pure bred Holstein Friesian Bulls were stationed at the Ste. Madeleine Company, Petit Morne, for service during the year and four were kept at the Government Service Station at Port-of-Spain. At the Annual Sale two pure bred bulls were sold and are now standing for service at Cascade and Maracas.

10. The small half bred, three-quarter bred and seven-eighths bred Zebu Holstein grade herds were again pastured in separate paddocks during the year, but this breeding work was interrupted during the dry weather and later in the year when two of the bulls reacted to the Tuberculin test and had to be destroyed.

11. The small Sussex herd has been maintained separately as in the past. The two pure bred bulls transferred to Tobago at the end of 1934 stood for service at Studley Park and the Stock Farm during the year and arrangements have been made for them to be removed to other districts in 1936. The number of pure bred Sussex cattle on the strength from the originally imported bull calf and two heifers (imported 1929) is as follows:—

Bulls	..	..	..	..	..	3
Cows	..	..	..	..	..	2
Heifers	..	..	..	..	..	3
Calf (Heifer)	..	..	..	..	..	1

12. The progeny of the Sussex Bull and grade beef type of cows (Shorthorns, &c.) were kept with the Sussex herd along with their dams, and in order to strengthen this herd, a cow and two heifers (Red Poll-Zebu crosses) were purchased this year. There were at the end of the year three young half bred bulls, one of which was sold to Lowlands Estate, Tobago, five half bred Sussex cows, two three-quarter bred and one cross bred heifer (Sussex-Zebu cross). The grade bulls from this herd will be transferred to Tobago as they become available, as in the case of the pure bred bulls.

13. The Zebu cattle on the Farm have been divided into three categories (a) Working Zebu Herd, (b) Dairy Zebu Herd (c) Zebu cows and heifers for breeding to pure bred Holstein bulls in our grading up work.

14. The Zebu Bull "Naipall" stood at the head of the working Zebu herd during the year and two selected bulls (1) Mooraley, (2) Chintamani were used in the milking Zebu herd.

15. Milking before calving was generally employed on all cows during the year, especially in the case of the Milking Zebu Herd, where the calves are removed as in the case of the ordinary dairy (grade Holstein Friesian) herd. The results in the milking Zebu herd have not been very successful, as only six out of 18 cows milked for any length of time, and their yields are low as compared with the ordinary herd and some good zebus when their calves are not removed. The work is still being continued to give it a fair trial over a definite period.

16. There was again very little demand for Zebu cattle during the year, and the only animals sold were the following:—

1	pure bred bull	to	Mr. Pencheon, Montserrat	\$180.00.
1	do.	do.	Mr. Asselin, Martinique	—\$200.00.
1	do.	do.	Mr. Murray, Trinidad	—\$100.00.
1	do.	do.	Mr. Forde, St. Vincent	—\$80.00.

17. Pure bred and grade service bulls were again worked on the Farm during the year in order to give them regular exercise. Owing to accidents (their feet seemed to get sore very readily) to the pure bred European bulls (Holstein Friesian and Sussex), it has been decided to stop working them but to work the Zebu bulls and the grade bulls.

18. Fifty-three privately owned cows were bred to pure bred bulls at the Farm during the year (39 to Holstein Friesian bulls and 14 to Zebu bulls) in addition to the Government Farm cows and heifers. The service fee for the Holstein-Friesian bull was \$2.00 and \$1.80 for Zebu bulls.

19. There were three selected grade Holstein Friesian bulls besides four pure bred bulls of the same breeding stationed at the Bulls' Service Station at Mucurapo during the year for the dairying districts around Port-of-Spain. One of the pure bred bulls was turned out in the Mucurapo Pasture every evening and removed the following morning. At the Station 274 cows were bred to these bulls during the year. The Farm received \$240.00 for the services of these bulls from the Pasture vote.

20. A grade Holstein Friesian Bull (seven-eighths) was loaned to the Cascade Dairy for six months for use in that district. This bull was withdrawn for the annual sale and sold to the Aranjuez Estate for use on their public pasture in the neighbourhood of a large dairying district.

21. There were no cattle pastured on the St. Ann's Pastures during the year, but the Mucurapo Pasture was opened to the public for this purpose and owing to weather conditions the grazing was better than usual. An average of 78 head per month was pastured during the year, made up of 36 cows, 36 heifers and 6 heifer calves.

22. At the Annual Sale on the 30th November, 15 grade heifers averaged \$40.00, three grade bulls \$55.00, one Zebu heifer \$80.00 and two pure bred Holstein Friesian bulls \$60.00.

23. *Dairy Herd*.—The dairy herd produced 35,994 gallons of milk, approximately 1,500 less than in 1934. The Public Institutions were supplied with 29,855 gallons, including milk supplied to the Bacteriological Laboratory for feeding calves used for making paralytic rabies vaccine. Each cow's milk was recorded daily and the weekly total transferred to a record book. The butter fat test was carried out once for the year and the average for the mixed milk was 4.15. The revenue received from the sale of milk was \$17,136.15.

24. During the year 101 cows calved normally and five aborted. All cows heavy in calf were stabled entirely and their udders massaged and stripped as stated above twice daily before calving. All aborting cows were segregated from the herd for two months.

25. The death rate was abnormal as 24 head of cattle died from paralytic rabies (bat-transmitted), the incidence of the disease in the colony being greatest in this district (St. Joseph). There were also two deaths from Anthrax, following which all the cattle were inoculated against the disease and the Farm placed under quarantine restrictions for a short time: further, owing to the death of two bulls from tuberculosis, it was decided to test all the cattle in the Farm and to repeat the test after an interval of three months (end of August and early December). It was found that the incidence was highest in the oxen and bulls that had not been tested for some time—the dairy cows and heifers having been tested in the middle of 1934. The bulls had worked regularly with the oxen from 1933 and had been in close contact drinking out of the same trough. It is believed that the infection spread from the oxen to the bulls and then through the bulls to the heifers and cows with which they were pastured. It is intended to test the cattle on the Farm at 3-monthly intervals during 1936, and also to isolate and tuberculin test all bovines sent to the Farm for pasturing, stabling and breeding. Altogether 28 animals reacted, 22 in the first test and six in the second, and including the two bulls that died, the incidence in the different classes of bovines was as follows:—

Oxen—6 in 13, about 50 per cent.
Bulls—7 in 48, about 15 per cent.
Heifers—7 in 80, about 9 per cent.
Cows—8 in 121, about 6.5 per cent.
Calves—2 in 50, about 4 per cent.

There were five deaths in calves due to Pneumonia and two from weakness; eight bovines including five calves died from enteritis and other losses were: two cows from parturition, two old age and general debility and two cases of septicaemia, making a total of 77 deaths.

Horsekind.

26. The thoroughbred stallion "Bachelor's Tut" was transferred to the Tobago Farm for service in the island ward during the year on the 30th January, 1935. The thoroughbred stallion "Knight of St. Patrick (K.P.)" returned to Trinidad on February 1st in time for the breeding season. He served 16 outside mares during the season at a fee of \$10.00 and 60 cents groom's fee. Six Farm mares were also bred to him. The thoroughbred stallion "Nelsweep" also stood for service at the Farm during the year and served six mares on the strength of the Farm.

27. His Excellency the Governor kindly communicated to Lord Derby the great loss the colony had suffered through the death of the thoroughbred stallion "Daddy" in December, 1934. It was the intention of Lord Derby to present the colony with another suitable stallion, but one was not available at the end of the racing season. It will be necessary to import another stallion during 1936 and the necessary funds are available as the insurance money for "Lundy Light" and "Daddy" has been paid into the Treasury, pending the decision about the new stallion.

28. The Missouri Jack Donkey "Emperor 2" stood for service at Hindustan Estate, Princes Town, and at the Farm where he served seven mares and one mare, respectively, at a service fee of \$7.50 plus 60 cents groom's fee. This Jack Donkey was also bred to the jenny donkeys on the Farm that foaled for the young Kentucky Jack Donkey during the year. The Kentucky Jack Donkey has developed into an excellent animal, and, as "Emperor 2", he serves both mares and jenny donkeys. During the year he served five jennies at a service fee of \$5.00 plus 60 cents groom's fee and nine mares at \$7.50 and 60 cents. The smaller Jack Donkey "Big Six" served eight jennies during the year at \$1.00 each and 60 cents groom's fee. The young Jack Donkey foaled in June, 1934, is growing splendidly, and in order to train him for mule breeding he was turned out into a paddock with a filly of his age as soon as he was weaned early in the year. In order to transfer "Big Six" to the Tobago Farm for donkey breeding it has been decided to reduce the service fee in future for the large Jack Donkeys for Donkey breeding to \$2.00 for Large Jennies and \$1.00 for Small Jennies.

29. The thoroughbred mare "First Offence" was transferred from the Constabulary in March and was bred to "Nelsweep". The thoroughbred mare "Miranda" that failed to hold last year was also bred to "Nelsweep" and both these mares were settled in foal at the end of the year. The thoroughbred mare "Saturnia" foaled a colt by "Bachelor's Tut" during the year and it was sold at the annual sale for \$48.00. The thoroughbred mare "Barbara" foaled twins (colts) one of which was born dead: the other colt foal has grown well and will be handed over to the former owner of "Barbara" early in the year in accordance with the agreement made when the mare was handed over to the Farm. The thoroughbred mare "Eastern Flower" was handed over to the Farm on the same conditions as "Barbara", during the year. These three thoroughbred mares "Saturnia", "Barbara" and "Eastern Flower" were all bred to "Knight of St. Patrick" this season, and the first two should foal early in 1936.

30. The half bred mare "Nellie" foaled a colt by "Daddy" and this foal was sold at the annual sale for \$80.00. The old half bred mare "Cavel" was not in foal and has been pensioned off. The brood-mare "Cowbell" in foal to "Daddy" was purchased from Mr. Fogarty early in the year: she foaled a filly and this realised \$72.00 at the sale. The half bred mare "Wistaria" foaled late in the year a colt by "Daddy" and the foal was sold at the annual sale for \$35.00: this mare's yearling colt by "Knight of St. Patrick" (K.P.) was also sold at the annual sale and fetched \$80.00. "Nellie", "Cowbell" and "Wistaria" were all bred to "K.P." this year. The brood mare "Marama" foaled a mule colt and this fetched \$57.00 at the sale, but she died during the year from paralytic rabies.

31. Besides the thoroughbred mare "First Offence", the Constabulary transferred to the Farm the following animals during the year:—

- "Valerian"—8th March, 1936.
- "Naparima"—6th March, 1935.
- "Haig" (gelding)—18th April, 1935.
- "Blarney"—11th September, 1935.
- "Moruga"—21st October, 1935.

"Naparima" and "Valerian" were both bred to "Nelsweep", and "Blarney" and "Moruga" will be served by the same stallion in 1936. The gelding "Haig" died during the year.

32. The two-year old colt by "Bachelor's Tut" out of "Wistaria" was badly injured in an accident and had to be destroyed.

33. Donkey breeding has been most successful, and it will be possible to breed all our Jack Donkeys, on the Farm in the future. Two large Jenny Donkeys, bred to the Kentucky Donkey foaled a Jack and a Jenny during the year and were rebred to the Missouri Jack: the other large Jenny is due to foal in March for the same Jack, as well as a half bred Jenny transferred from the Botanical Gardens and they will then be rebred to the Missouri Jack. The younger of the two small Jennies on our strength foaled a Jack by the Kentucky Donkey during the year and was rebred to the Missouri Jack as well: the other small Jenny did not foal and appears to be barren.

Pigs.

34. An order was sent to Canada for Large Black gilts in pig, but they could not be obtained and arrangements have been made to order two from England through the Quarantine Station at the Port of London early in 1936. The two young boars (one Large Black and one Berkshire) selected last year have grown quite well and were mated to the sows during the year.

35. Nineteen outside sows were bred to the pure bred boars during the year at a service fee of \$1.50.

36. At the annual sale 31 young pure bred pigs were offered and they fetched \$275.00, an average of approximately \$9.00 each, as compared with \$13.00 last year. The highest prices paid were \$14.00 for a Berkshire Boar and \$13.00 for a Large Black sow. The private sale of young pigs during the year realised \$55.00, making a total of \$330.00 for all sales.

Dairy and Mutton Goats.

37. The Officer in Charge purchased during his leave in England three English Alpine goats (two bucks and one goatling) of the famous "Didgemere" strain from Mrs. Abbey of Roydon, Essex. The bucks "Didgemere Snapdragon" and "Boddington Whisk" were landed in the colony in November in good condition. "Snapdragon" has two does in his pedigree that have given 4,000 lb. in an officially recorded year and four with 3,000 lb.: "Boddington Whisk" has three with 4,000 lb. and five with 3,000 lb. official yields. The goatling "Didgemere Delmoney" that has two 4,000 lb. does and four with 3,000 lb. in her pedigree, was left with Mrs. Abbey to be mated before shipment, and should arrive early in 1936.

38. The first importation of British Alpine goats from England in 1932 had given excellent results and there is now a nice herd at the Government Farm made up of three does, two goatlings, three doe kids and one buck kid. There are also five pure bred bucks, four of which were imported and one purchased from Dr. Lyon. Two of these bucks were stationed at the Farm, one in Tobago, one in Port-of-Spain and one in Sangre Grande at the end of the year. We sold during the year two pure bred bucks, one for \$60.00 and the other for \$33.60.

39. During the year the Assistant Officer in Charge purchased in Barbados a doe with British Alpine markings, a goatling by the imported British Alpine Buck "Waddington Watchman" and two doe kids by the same buck. The goatling kidded two bucks by "Didgemere Raven" and the other three were all in kid at the end of the year. We had on our strength at the end of the year the following grade British Alpines: 4 does, 6 goatlings, and 2 buck kids.

40. Forty-eight outside goats were bred to the pure bred British Alpine bucks "Didgemere Raven" (36), "Didgemere Snapdragon" (9), "Boddington Whisk" (2), "Didgemere Monarch" (1) at the Farm at a service fee of \$1.50 and in Port-of-Spain 13 does were bred to a British Alpine buck and seven to the Indian Buck.

41. At the annual sale three British Alpine-Saanen bucks, three Saanen does and seven Indian goats were sold for \$142.00.

Blackhead Persian Sheep.

42. There was little demand for these sheep locally during the year and the only sales were a ram, a ewe, a ram lamb and a ewe lamb early in the year to the Dutch West Indies.

43. We have now got the originally selected hardy ewe, her three daughters and her son on our strength: two of these ewes and the old ewe were heavy in lamb at the close of the year, and it is hoped to fill an order in 1936 for a ram lamb for Tobago where these sheep crossed with the woolless African sheep are doing very well.

Poultry.

44. Three pens of Barred Plymouth Rocks imported from Canada in 1934 arrived in time for the hatching season in 1935: one of these pens was sent to the Tobago Farm. A Rhode Island Red cock and six Rhode Island Red pullets (Abbott's strain from England) were purchased locally from Mr. Dumoret for \$30.00.

45. Our hatching season was quite successful in spite of an early outbreak of pox, the number of chickens reared was greater than in former years. The chicks were again kept on wire from the time they left the incubator until they were feathered (eight to ten weeks) when they were put on the ground.

46. At the annual sale 40 lots of pure bred poultry were offered including trios and cockerels, and the amount realised was \$197.75. The amount of eggs laid during the year was 4,752 and the revenue from the sale of eggs was \$136.39.

47. Our pens were made up (two of each breed) in November for the hatching season and the first lot of chicks for the 1935-1936 season were hatched at the end of the year.

Sale of Stock.

48. It was again decided to hold the annual sale on a Saturday instead of the usual Friday, due to the request from many members of the public. The sale was held on Saturday, 30th November, and the attendance was quite good in spite of the agricultural depression.

49. The sale was conducted by the Officers of the Farm for the 12th occasion, and the amount realised was \$1,907.55. Private sale of stock amounted to \$2,932.39, making a total of \$4,839.94 for the year.

REPORT OF THE VETERINARY DIVISION, 1935.

General.

Paralytic Rabies was again responsible for the death of a number of animals, but fortunately it was confined to the northern area of Trinidad, where the animal population is considerably less than in the central and southern districts. The incidence of the disease bore a close relation to the infectivity in bats in the colony, but a few infected bats were discovered in areas where no cases of Rabies occurred. A small number of cases also occurred in human beings in the same districts where animals were affected.

2. It was found necessary to station the Veterinary Officer, formerly posted in Tobago, in Trinidad during the whole year once more, with headquarters at the Government Stock Farm, due to extra veterinary duties caused by (a) Anti-rabies vaccination work, and (b) Tuberculin testing of dairy cows in the areas surrounding Port-of-Spain, and extending eastwards to the Tunapuna River.

3. The Department has under consideration the question of veterinary work in the island of Tobago: Three visits were paid by departmental veterinary officers to the island during the year and it is hoped that it will soon be possible to have a veterinary officer residing permanently in Tobago. With the present staff and the amount of duties to be carried out in Trinidad, an officer cannot be stationed in the island-ward at present.

4. The Assistant Officer in Charge of the Government Stock Farm, who is a qualified veterinary surgeon, had his salary regraded from \$1,920.00 per annum to \$2,160.00-\$2,400.00 per annum, on the same scale as the other assistant veterinary officer in the department, during the year, and he also assisted in the rabies campaign and other veterinary duties.

5. In accordance with a request from the Governor of the Windward Islands, I proceeded to St. Lucia on 5th June and returned on the 8th June.

6. Vacation leave was granted me for five months in the United Kingdom for the period 28th June to 21st November. During my leave I spent three weeks doing general Bacteriological work at the Institute of Animal Pathology, Cambridge, and 10 days at the Laboratories of the Ministry of Agriculture and Fisheries at Weybridge studying the work that had been carried out with the Trinidad virus that causes Paralytic Rabies. In July I also attended the meeting of the Colonial Advisory Council of Agriculture and Animal Health at the Colonial Office, when this disease was discussed and a report of the work in Trinidad to date was given.

7. I also attended the Congress of the Royal Sanitary Institute at Bournemouth in July as the representative from Trinidad.

8. During my leave I submitted a paper "Paralytic Rabies in Livestock" to Sir John McFaydean for publication in the Journal of Comparative Pathology and Therapeutics. It was accepted and published in the December number of the Journal—reprints have been ordered for distribution by the Department.

9. The duties of the Government Veterinary Surgeon were performed by Dr. J. L. Shannon, D.V.M., the assistant officer in charge of the Government Stock Farm, during my absence on official duty to St. Lucia and for the period of my vacation leave in the United Kingdom.

10. The work of the bat investigation sub-division was continued this year in conjunction with the Medical and Agricultural Departments. A sum of \$1,000.00 was provided in the Estimates for the destruction of bats which was carried out by this sub-division. The cages for the confinement of bats kept under artificial conditions, were removed at the end of the year from the Government Farm to the grounds of the Head office of the Department of Agriculture, so that they could be near at hand to the Government Bacteriologist.

11. A fully qualified Sanitary Inspector of the Health Department was attached to the Veterinary Department during the year to assist the Veterinary Officers in their field work with Paralytic Rabies.

12. The Government Veterinary Surgeon attended all the meetings of the Board of Agriculture (7) during the year, and presented reports on Paralytic Rabies for the information of the Board: these reports were published in the daily papers and printed in the Minutes of the Board of Agriculture.

13. There were again no applicants for registration to the Secretary of the Veterinary Surgeon's Registration Board during the year.

14. The Government Veterinary Surgeon attended two meetings of the Animal Husbandry Committee of the Agricultural Society when the question of the registration of livestock was discussed.

15. Two more Holstein-Friesian bull calves were imported from the Carnation Farms, Seattle, Washington, one for the Government Stock Farm and one for the Ste. Madeleine Sugar Company. There are now three of these high class bulls in Trinidad. A pure bred bull and heifer of the same breed were also imported by a proprietor in the island-ward of Tobago from Lord Rayleigh's herd in England. The dairying industry has made great improvement in the colony recently, and the further introduction of such animals will be of immense value to dairying.

16. Lectures with demonstrations were given during the year to the Diego Martin District Agricultural Society at the R.C. School in the district and to teachers and students of Government Schools at the Government Stock Farm.

17. Dr. T. W. M. Cameron, D.Sc., Ph.D., M.R.C.V.S., Professor of Parasitology at McGill University and Director of the Institute of Parasitology at McDonald College, Canada, visited the colony early in the year and was very interested in Paralytic Rabies: he very kindly made arrangements for the Department to be supplied with rabies vaccine from the Connaught Laboratories at Toronto at cost price, on his return to Canada.

18. Dr. Cameron investigated the internal parasites of some of our wild animals, and published part of the work later in the year "Studies of the Endoparasitic Fauna of Trinidad Mammals" I. Some Parasites of Trinidad Deer.

Proclaimed Diseases.

Anthrax.

19. There were four outbreaks of Anthrax in the Caroni, St. James, Santa Cruz and St. Joseph districts during the months of July and August: the necessary preventive measures including the vaccination of all in-contact stock, were at once enforced and no further deaths occurred after August. There were no deaths at the Quarantine Station from this disease, but 290 cattle were vaccinated there before their removal to other parts of the colony for slaughter.

Glanders and Epizootic Lymphangitis.

20. A suspicious case was reported by a Veterinary Surgeon, but the animal was negative to the Mallein test. All mules and horses imported from the Southern States of the United States of America were accompanied by Mallein certificates.

Swine Fever.

21. No cases were reported during the year: the owners of a large piggery at Santa Cruz had their animals immunized against the disease as a preventive measure early in the year.

Tuberculosis.

22. In accordance with the requirements of the City Council of Port-of-Spain for the granting of licences for the sale of milk in the city, 390 dairies (small and large) containing 1,160 cows and heifers, were visited and tuberculin tested during the year. There were 10 reactors and they were all slaughtered. There were five cases of Tuberculosis in animals imported for slaughter—four in bovines and one in a pig. Owing to the death of two bulls from Tuberculosis on the Government Stock Farm it was decided to test all the cattle at the end of August and to repeat the test in December and from then onwards every three months. 22 animals reacted in the first test and six in the December test; the incidence being highest in the oxen (50 per cent.) and bulls (15 per cent.) that had been working together. Eight cows (six per cent.) also reacted. All the reactors were slaughtered.

Foot and Mouth Disease.

23. A permit was granted to import a Holstein-Friesian bull and a heifer of the same breed from England: the animals were passed through the Farm attached to the Laboratories of the Ministry of Agriculture and Fisheries at Weybridge. Two British Alpine bucks imported from Roydon, Essex, were also landed in the colony after a period of detention at the Quarantine Station at the Port of London. No frozen meat was allowed to be landed in the colony from the Argentine Republic or other South American States, unless veterinary certificates, countersigned by the British Consular Authorities, accompanied it.

Rabies.

24. Twenty-four dogs (four intransit), including 15 from the United States of America, were quarantined during the year, and four cats (three intransit) were also detained. The Quarantine Station for dogs and cats was removed during the year from the old Powder Magazine site to a more suitable locality at St. James. There were no cases in dogs during the year.

Paralytic Rabies in Bovines, &c.

25. Paralytic Rabies occurred again chiefly in the northern part of Trinidad, and the number of cases, in which the incidence was again highest in cattle, was 331: the areas chiefly affected were the Santa Cruz, St. Joseph and Maraval Valleys. The Bat Investigation Department included in their programme a campaign of bat destruction by shooting and poisoning: the killing of bats by painting their biting sites on animals with a strychnine solution, was tried in the field with success. The number of bats destroyed during the year was 3,669. From the results of examinations of bats by the Government Bacteriologist, it appears that the disease is widespread in the island, but the percentage of infection in bats is extremely slow. Vaccination has been carried out again as a protective measure, and inasmuch as this work has now passed the experimental stage, it has been arranged to import a regular supply of vaccine from the Connaught Laboratories in Canada and to relieve the Bacteriological Department of this work. The total number of animals vaccinated during the year was 4,500, including inoculations carried out by veterinary surgeons not in the Department. In 1934 the corresponding number of animals treated was 12,793: this difference was due to the outbreaks of Anthrax in July and the peasants refusing to have their animals protected. The disease has been produced at the Research Laboratories of the Ministry of Agriculture and Fisheries at Weybridge in cattle, sheep and in experimental laboratory animals, from virus forwarded from natural cases in the field in Trinidad: so far the disease has not been produced in dogs. Dr. W. Horner Andrews, D.Sc., the Director of the Laboratories, is to continue with work on protective measures (vaccinating) against the disease, and has promised to send on this and any other results as soon as they are available. Shortage of staff has held up his work. The disease was discussed by the Colonial Advisory Council of Agriculture and Animal Health at their meeting at the Colonial Office in July last, and I was asked to be present to give an account of the disease and the results we were obtaining with protective measures (i) vaccination (ii) destruction of bats. The question was raised as to the possibility of the regular invasion of *Desmodus* bats from the Mainland, and this has already been referred to Professor Ulrich of the bat sub-division.

Non-Proclaimed Diseases.*Strangles and Influenza.*

26. All horsekind imported from the United States are now vaccinated against this condition before shipment, as well as mallein tested: the result is that the incidence of these diseases in these animals on arrival is very much less and consequently the number of cases on the large Sugar Estates has been lower than in former years. In the case of horsekind imported from the neighbouring West Indian islands and the Mainland of Venezuela, the crossing is of short duration and very few animals develop Strangles or Influenza on arrival.

Parasitic Gastritis.

27. Stock owners were advised to dose their stock regularly with Copper Sulphate solution once monthly against this condition, but on the whole few cases were reported.

Tetanus.

28. On one cocoa plantation several animals housed in the same stable, died from the disease in spite of ordinary routine methods of disinfection: the animals were removed to a neighbouring estate and Tetanus Toxoid has been imported from the United States for use in the district to confer a more lasting immunity (active immunity), and the owner has been advised to thoroughly disinfect his pen before using it.

Ulcerative Lymphangitis.

29. This condition is chiefly seen in the large American mules on the Sugar Estates; it is hardly ever seen in small mules used for crooking work. With preventive measures, chiefly dressing of wounds about the legs, the number of animals affected with the disease decreases every year.

Bovine Piroplasmosis.

30. The pure bred bull calf (Holstein-Friesian) imported from the Carnation Dairy Farm by the Trinidad Dairies early in the year has become naturally immunized without showing any active symptoms of the disease. A bull calf and a heifer calf of the same breed were imported from England, but they were vaccinated with Trinidad blood at the Laboratories of the Ministry of Agriculture and Fisheries, Weybridge, before shipment to Trinidad: there were no cases recorded in dairy cattle imported from Barbados during the year.

Contagious Abortion in Cattle.

31. Fewer cases were reported during the year, and no further ones reported from Tolago. The disease is chiefly seen in large dairy herds and it is intended to use a formalized vaccine made at Cambridge on the cows and heifers at the Government Stock Farm next year.

Pneumonia in Calves.

32. It can be recorded that now that calves are better housed with lathed flooring or good dry bedding, especially during the cooler months of the year, that the death rate in young hand-reared calves in dairies has dropped considerably.

Dermatitis in Horsehind.

33. This condition is only seen during the rainy season in animals that are permanently pastured. As a preventive measure owners are advised to stall-feed or shelter their animals during the day and to turn them out at night. The condition easily yields to treatment and a simple sulphur dressing gives good results.

Ophthalmia in Calves.

34. This disease was again responsible for a great deal of trouble in young calves, and in two large dairies the condition gave considerable trouble during the year. At the Stock Farm, where calves had been collected from all dairies for making rabies vaccine, several cases were seen. It is essential to avoid overcrowding of calves and to keep pens as clean as possible as a preventive measure, and to treat the eyes with a lotion of Zinc Sulphate (six grains to the ounce) twice daily, when animals are affected.

Importation of Animals.

35. The following animals were imported into the colony during the year and inspected:—

Cattle, including two Holstein-Friesian bull calves from the Carnation Farm, one bull and one heifer of the same breed from the United Kingdom, four pure bred Guernseys from Barbados and 7,982 oxen from Venezuela for slaughtering purposes	8,282
Horses, including 12 thoroughbreds from England, nine Canadian Riding Horses for the Constabulary and four American Saddle Horses	123
Mules, including 110 from America and 16 from the Argentine	181
Donkeys	46
Dogs, including 12 American hounds	53
Pigs, including 97 from British Guiana	3,631
Sheep	1,328
Goats, including two British Alpine Bucks from England and 26 dairy goats from Barbados	3,517
Domestic cats	7

Quarantine Station.

36. The following animals were admitted to the Quarantine Station during the year:—

Cattle	8,246
Horses	8
Mules	25
Donkeys	26
Dogs (including four intransit)	24
Pigs	55
Cats (including three intransit)	4

37. Two hundred and ninety head of cattle were vaccinated against Anthrax before they were removed from the Station. Three oxen were slaughtered due to accidents on arrival (emergency slaughter) and 20 deaths occurred—nine animals were trampled in the punts before landing, eight died from exhaustion and collapse and three from injuries.

38. The revenue received by Government for the services of the Government Veterinary Surgeon for the inspection of animals and for the supervision of the Quarantine Station was as follows:—

Fees for examination of animals on arrival	\$6,696 84
Grant from City Council (Port-of-Spain)	480 00
Fees for inspection of animals leaving the colony	80 28

7,257 12

39. Owing to the Paralytic Rabies work (Bat investigation, vaccination of livestock and destruction of bats) it was necessary for special expenditure to be allocated as follows:—

1. Bat Investigation (including salary of Entomologist)	\$ 5,584 00
2. Preparation of vaccine and experiments	2,640 00
3. Allowance for assistance	720 00

The amount collected for the sale of vaccine was \$951.84.

H. V. M. METIVIER,
Government Veterinary Surgeon.

REPORT OF MYCOLOGIST, 1935.

General.

Low prices for the staple crops of the colony have persisted throughout the year. Such conditions make it very difficult for the planting community to control and handle the several diseases and pests which menace to a major and minor degree the agricultural crops. As an indication of the great influence which rainfall has on crop production one may instance its relation to cacao. In 1934 the export crop of cacao was 27,000,000 lb. In the year under review (1935), the cacao exports equalled 44,000,000 lb. The writer is of the opinion that a large part of the increase in 1935 was due to the low rainfall in December 1934. Almost without exception the rainfall in November and December is high, but the December precipitation in 1934 was only about half the usual amount. The result was that the young crop survived and yielded the big increase above indicated.

CACAO.

Witchbroom Disease (Marasmius perniciosus).

2. It is notable that notwithstanding the fact that this disease has now been present in Trinidad for fully eight years, there are still substantial areas where there is no record of its presence. This is in striking contrast to the incidence and distribution of the malady in other countries where the disease manifested itself. In Surinam, British Guiana, and Ecuador, in the space of four to five years, the disease was widespread and effecting very serious damage to the crops. The main reasons why the incidence in Trinidad differs from what occurred in the other territories is that topographical, meteorological, and physical factors favour the Trinidad planters. Not only is the disease still absent in certain large areas; in other still larger areas, the disease is present only in a mild and sporadic form. Another group of districts has a somewhat higher incidence. And one has to record that certain low-lying cacao estates in the vegas (flats) with streams running through them and occupying in the aggregate a large acreage, can be classed as being heavily infected. This last group calls for special consideration.

3. If there is no assurance that the market price of cacao is going to improve, then the cacao planters in the zones of heavy infection should seriously contemplate the growing of a crop (or crops) other than cacao. The repeated and irregular flushing of cacao with its accompanying infection and its rapidly increasing loss of crop can easily render cacao growing definitely uneconomic. The recently inaugurated Cacao Subsidy Scheme is a fairly elastic one and provides for the growing of alternative crops. The scheme is for a period of four years and enterprising planters should make full use of it and pursue a policy of crop diversification. Only the most suitable soils should be used for cacao growing; other necessary conditions should be lands not subject to flooding and not liable to landslips. Moreover, adequate windbreaks are essential and also efficient drainage. Given these factors, then the planting of blanks can be undertaken and "dud" trees replaced by the best plants available; and the routine of weeding and annual pruning receive attention.

Marper (Government) Estate.

4. The control work for witchbroom on this estate situated in a heavily infected district was continued throughout the year on a modified scale. Hitherto the collection and destruction of diseased tissues was a monthly practice. The system was changed at the beginning of the year to alternate monthly "rounds" i.e. six combings instead of 12 were made. The object of this modification was to effect economy without detracting from efficiency. It can be claimed that the new method is quite effective and if its adoption could be general on infected cacao properties, then the Island would benefit.

5. In contrast to the previous year (1934) when 194,459 "brooms" were collected and destroyed, the year under review yielded 166,495 diseased tissues. It cannot be denied that the incidence remains high and the expense appreciable and there appears to be no escape from this position. The economic status of the industry will undoubtedly determine future activities on the part of the planting community.

6. The cacao crop on the Marper Estate in 1934 was 204 bags of 165 lb. each. This year (1935) the figure was 293 bags, i.e. upwards of three bags per acre, which is a very high figure for Trinidad cacao estates and far above the average.

7. As regards loss of mature pods from witchbroom disease, the figure for the year is still below two per cent. at Marper. This figure is exceptionally low in comparison with what obtains on other properties in the areas of heavy infestation.

Trees Resistant to Witchbroom.

8. It will be recalled that last year a search was instituted in the worst affected areas for trees showing resistance to witchbroom. The number of trees inspected was on areas totalling 500 acres and occupied by 150,000 trees. During this year monthly inspections of the non-infected trees have been made and at the end of the year two quarter trees and 14 full trees were still free of disease. This makes a total of 16 "free of disease" trees as compared with 92 at the end of the previous year. The writer is not optimistic as to success being achieved from this source because the few "free of disease" trees now remaining are only of poor to moderate quality and show indications of being somewhat bark-bound and static, thus having relatively few tissues susceptible to witchbroom.

Black Pod (Phytophthora Sp.)

9. Almost every year there is considerable loss of pods from this pathogen. This loss is usually markedly operative in November and December, two typically wet months when in normal years there is an appreciable crop on the trees. The year 1935 was a normal one in this respect and produced an average failure of young and maturing pods.

10. But another outstanding feature was the heavy floods in September and October. In a period of about five weeks three floods occurred. The first and second were of moderate volume; and the third was very severe.

11. Large areas of cacao lands were flooded to a depth of three to five feet and many of them remained in that condition for two or three days. This state of affairs was very injurious and resulted in a great loss of crop.

12. The writer has previously called attention to the need of an agricultural engineer being called upon to explore the possibility of minimising flood damage by attention to main drainage problems. This is a task of great importance and if amelioration can be effected it would materially help to increase the cacao crop of the colony.

13. The above applies to Crown lands particularly ; but there is still the problem of the drainage of estate lands where flooding is common. In the ordinary course of events, estate proprietors should attend to this part of the problem but in recent years, because of the depressed condition of the cacao industry, little attention has been given to the matter. The result is that many main and secondary drains on cacao properties are blocked by tree trunks and debris. Attention to the drainage systems in areas where floods occur should greatly reduce the incidence of Black Pod disease.

Sanitation of Cacao Fields.

14. Much elementary, and yet fundamental work, requires to be done on the question of sanitation. There are some 10,000 small holdings in cacao ; also 5,000 ranging in acreage from ten to 50 acres ; and about 1,200 estates with acreages exceeding 50 acres, many of these being several hundred acres each. It should be a comparatively simple task for small properties, which are in the nature of family holdings, to be kept in a husbandlike state. Larger estates are handicapped to a much greater extent by overhead expenses, &c.

15. A good deal of interest has been shown this year by some of the enterprising planters making observations on their trees, especially the young supplies. In most years there is a heavy mortality of such supplies. Many of the survivors have a weak and sickly appearance and careful observation shows that there are two main reasons. They are (a) cutlass wounds and (b) cacao beetle damage. The former is the result of carelessness on the part of the labourers ; the latter can be controlled by increasing the ground shade and making use of Lead Arsenate and traps. One constantly sees evidence of maltreatment of young plants, and, in addition, cacao beetle infestation. Success in future will largely depend on a greater measure of strict application of the first principles of crop production.

Bananas.

16. Some extension in the planting of Gros Michel is to be recorded. Against this one has to report that certain small blocks of pure stands have practically ceased to crop to any appreciable extent and this after only one or two crops. The reason for this is soil poverty or Panama Disease, or both. Experience up to the present points to the fact that the commercial growing of Bananas can only be regarded as a catch crop. The wise planter who clears land to grow Bananas will promptly interplant a permanent crop to ensure the best results in the long run.

Scarring of Fruit.

17. Banana growers have been urged on many occasions to take steps to reduce the amount of scarring which takes place *in situ* in the fields. The best way is to grow Bananas in the open without shade, but a good percentage of locally grown fruit is produced under more or less shade with the result that small mammals, birds, and many species of insects make unsightly marks on the fruit bunches and render them unfit for export. A lot of this kind of blemish is unavoidable so long as the plants are grown under the above conditions. But there is one type of scarring which the grower can help to remedy, viz. : that caused by leaf friction. Where a leaf becomes entangled in the hands on a bunch it is necessary to remove it as early as possible, otherwise definite scarring results. But in the process of making this adjustment growers are requested not to mutilate and cut and remove any of the remaining leaves ; to do so might easily result in greater damage in the shape of sun scald. The banana plant needs a full complement of foliage to sustain and produce its fruit. Therefore only the obstructing material should be removed and no more.

Panama Disease (Fusarium cubense).

18. The whole of the planting community were notified at the inception of the project of growing Bananas for export that this disease would be a constant menace. Some planters seem to have a much higher incidence than others. Those planters who possess the more fertile soils and exercise the greatest care in the selection of disease free planting materials can be said, in some instances, to have appreciably good results. Further, in such cases, if the planter takes prompt action when disease appears, then the life of the banana fields is prolonged.

Banana Disease Killer Oil.

19. This locally made oil is apparently proving quite effective and satisfactory when properly applied according to instructions. Only the stools actually attacked by disease, are treated ; it is not the practice to dose surrounding and apparently healthy plants. But planters are recommended to place a few pickets around the stools after treatment so as to minimise the possibility of spread of the disease by labourers walking on affected sites.

'Moko' (bacterial) Disease.

20. In a general way this affection is comparatively unimportant. Most properties where bananas are grown are free of this affection. It is found that the highest incidence—and this is not very high—occurs in newly cleared lands. Presumably the pathogen is indigenous in such soils and secures access through the roots, to the first crop of bananas planted thereon. It is quite likely that soils infected in this way will become less and less dangerous for banana growing by the natural process of weathering.

Leaf-Spotting Fungi.

21. Two leaf-spotting fungi are now to be recorded on Gros Michel (a) *Cercospora musae*, and (b) *Cordana Sp.* *Cercospora musae* is found to be widely distributed in the colony on various varieties of bananas. Up to the present the Giant Governor, Governor, Gros Michel and Sucrier are known to be affected. The writer is of the opinion that in all probability the Sucrier is the chief culprit. This variety is severely attacked. It has been grown for generations in the cacao fields as ground shade when it had little or no economic importance. The recent planting of Gros Michel in cacao and other lands has supplied an additional source of infective material and no doubt the pathogen has migrated from the Sucrier to other varieties of bananas.

22. This species of *Cercospora* does most damage where the plants are located in poor soils and where exposure is pronounced. In such circumstances plant growth is slow and often arrested and at such times the parasite makes rapid advances.

23. On the other hand, where the soil is fertile, moisture abundant and well distributed, and where wind action is slight or negligible, then the pathogen does little damage. The fungus in question forms lenticular spots on the leaves. These spots are about one quarter to one-half inch in length and the width varies from one-eighth of an inch to one quarter inch. When young leaves are attacked the spots are somewhat larger.

24. It appears that this specific parasite has a lengthy incubation period, may be for three or four months. Eventually the centre of the spots assumes a grey-white colour and when conditions are favourable then sporulation sets in. Fructifications are found on both surfaces of the leaves. Large areas of leaf tissues are eventually killed by the parasite and it is this phase of premature failing of the leaves which constitutes a serious danger.

25. Dissemination of the fungus is undoubtedly mainly wind-borne aided to some extent by splashing of rain water. It is noteworthy that in Fiji, Queensland, and Surinam this species of *Cercospora* has assumed the role of a serious economic parasite and great losses of crops have been the result. Efforts in the above mentioned territories to control the disease have been largely unsuccessful. Spraying, dusting, wider spacing of plants, stripping and burning or burying infected foliage have been tried but with little success.

26. It is quite possible that the disease in Trinidad will not assume serious proportions: may be environmental factors such as low temperatures and the amount of dew deposition which make for the optimum conditions for the parasite will be less in evidence locally. However, it remains to be seen what will be the ultimate result.

27. In the meantime, one is reluctant in making definite and specific recommendations for the control of the affection in view of the non-success of multiple control measures tried in other countries. But on general grounds one can advocate the invigoration of the banana plants by improving the tilth and adding manures where possible. Also it should be sound policy to rid the cultivations of surplus suckers as they harbour the parasite in quantity and thus jeopardise the fruiting possibilities of the older cropping plants.

28. The *Cordana* leaf-spotting fungus produces oval spots or blotches much larger than those of *Cercospora*. Typically these blotches are on the marginal tissues of the leaves but not invariably. Zonation is conspicuous.

Tonka Beans.

29. The good market prices offered for this crop in recent years has stimulated quite a considerable amount of additional planting. Practically in all parts of the colony and on a great variety of soils and in very variable rainfall zones, one finds this crop being established. Much of the planting is done at stake; some from nurseries; and latterly the practice of layering has been introduced. In addition, a little budding has been undertaken.

Transplanting Experiment.

30. Most of the bearing Tonka Bean trees in the Island are planted at close distances, ranging from 15 feet to 20 feet. This spacing is now considered to be far too close and twice this distance is favoured. To give effect to this, some planters are thinning out their trees by a process of destruction. But one planter on his own initiative is trying two methods on a fairly extensive scale to secure increased crops without the destruction of undesirables. The two methods are (a) transplanting, and (b) pruning.

31. As regards transplanting, the procedure is to make a cutting between two to three feet from the hole of the tree. In this way the lateral roots are severed—there is practically no tap root—and the fibrous roots, together with a large ball of earth, secured. The tree is then carried to a new site prepared for the purpose and replanted. Some of the trees took five or six labourers to transport to their newly dug habitats. Since being transplanted in November last most of the trees have become defoliated and have assumed a "dry" appearance.

32. The trees in this experiment range from 5 to 15 years in age and are from 5 to 12 or 14 feet in height. If this experiment proves to be reasonably successful, say with 50 per cent. success, it will be of considerable value, because it is generally believed that root mutilation is fatal to the Tonka Bean tree.

33. With reference to the pruning experiment, the system is the same as in the pruning of cacao trees. Closely planted Tonka Bean trees have interlacing of foliage and branches. Heavy cutting gives each tree freedom from its neighbours and it is hoped in this way materially to increase the crop of all trees which undergo the process.

Thread Blight.

34. The writer some years ago discovered this affection doing considerable damage on a property in a heavy rainfall zone, where the shade was excessive and the trees planted at close distances. Reduction of shade and the collection and destruction of affected tissues materially improved the situation and controlled the trouble. The same Thread Blight is scattered to a small extent in several districts where the rainfall is high and the trees are too closely planted and where high woods are adjacent to the crop.

Root Disease.

35. During the year a few bearing Tonka Bean trees have died. The trees were approximately 12 to 14 years old. From information received the dying process is apparently slow, occupying some to 12 months. The symptoms are:—

- (a) A faint yellowing of the foliage sometimes commencing on the lower branches and in other cases in the terminal tissues.
 - (b) A progressive yellowing of the foliage followed by browning and die-back. When the soil is removed and the root system exposed it is found that the roots are dead.
36. There are probably two kinds of root failure involved:—
- (a) Where the rudimentary tap root and portions of the laterals are incrustated with a matted coating of soil and hyphae. Examination of the hyphae shows them to be hyaline and non-septate. This suggests that a species of *Fomes* may be the cause of failure but so far no fructifications have been found. In this type of failure a dry rot of the root system results.
 - (b) Where the symptoms are somewhat similar to (a), except that the wilting of the foliage is a quicker process. There is no incrustation on the root system when exposed. On the contrary, the roots are slimy and emit a foul smell. Possibly the cause of death in these instances is a bacterial disease.

Sugar Cane.

Mosaic Disease (Virus).

37. It is gratifying to report that this affection is apparently kept under satisfactory control by the system of roguing. And this practice is rendered necessary very largely by the inattention of the cane farming community to rid their holdings of affected plants. There appears to be very little, if any, secondary infection and this simplifies the problem of eradication of the disease.

38. The distribution of the affection is localized in the North and Central sugar cane belts; the large Southern belt is now apparently free from the malady. In the infected zones a limited and continuous inspection is exercised by Government, attention being chiefly directed to inspection and the imparting of information to small cane farmers. In proportion to the effectiveness of the roguing process this virus disease can be expected to be stamped out; but the task is not an easy one because of the above-mentioned psychological difficulties.

Root Disease.

39. Sporadic and numerous small areas, generally in districts where cane farmers are located, are found to be attacked by *Marasmius sp.* and allied root fungi. The writer is strongly of the opinion that cane farmers could do much to improve their holdings by adopting more intensive methods of cultivation. Root fungus parasites can generally be handled to the best advantage by more attention to cultural work such as drainage, improving the tilth by forking, and the application of manures. One sees too much mixture of crops in cane farmers' fields and the segregation of them should give a better result.

MISCELLANEOUS.

Nematodes in Bananas.

40. Material sent from Grenada showed heavy infestation with nematodes. This is a long-standing trouble with musaceous plants in Grenada. These nematodes are soil inhabiting organisms and gain access to the plants mainly through the rootlets. In cases of severe attack the affected stools are rendered valueless. But it is generally found that where the soils are rich and therefore suitable for the growing of bananas, then little is to be feared from nematodes. It is in comparatively poor soils that the nematode population is high, and bananas in such soils make a poor show. Something could be done in the way of control by cultural work, including manuring, but it must be realized that there are economic limits in this task. The best method is to abandon poor heavily infested soils and concentrate on efforts in securing optimum results from good, fertile soils.

41. It is interesting to note that there is practically no banana nematode problem in Trinidad, not that this Island possesses no poor soils but apparently this particular nematode is absent.

Tomatoes.

42. This crop is grown in a scattered way in many districts. Perhaps the largest area is to be found in the Debé district. Here it is grown as a rotation crop with pigeon peas, melons, rice, &c.

43. Considerable numbers of plants were affected with root rot (*Fusarium sp.*) producing typical cases of wilt. Associated with this trouble was a very severe infestation of *Aphis sp.*

Visits.

44. Considerable time was devoted to visiting properties in different parts of the colony and advising planters in the methods of controlling the diseases of crops.

Leave.

45. I was on vacation leave from the end of March to the 6th of September.

F. STELL,
Mycologist.

REPORT OF THE ENTOMOLOGIST FOR THE YEAR 1935.

I assumed my duties as Entomologist in the Department of Agriculture on the 4th November, when my appointment as Entomologist to the Sugar Cane Investigation Committee terminated.

2. By arrangement with the Principal, the Entomological Laboratory was located at the Imperial College of Tropical Agriculture. This arrangement places the library of the College at my disposal and facilitates close co-operation with the technical officers of that Institution.

3. Attention has been devoted to a variety of crops, as enumerated below.

Sugar Cane.

4. During my absence on leave, a parasite (*Zenillia palpalis* Towns.) had been introduced into the Colony for the control of the Large Moth Borer of sugar-cane (*Castnia licus* Drury). The collection of the material in British Guiana had been undertaken by Dr. J. G. Myers, and its reception and disposal by Mr. D. V. FitzGerald. The continuation of the breeding work in Trinidad was assigned to me immediately upon arrival owing to Mr. FitzGerald's departure from the Colony on the 8th November. The breeding technique, however, had proved to be unexpectedly difficult, and the laboratory stocks were very reduced in numbers when this work was assumed. There have since been no emergences of parasites sufficient to permit the work to continue. Areas in which parasites had been liberated were examined, but there is no evidence that the parasite has become established.

5. Arrangements were made with the Sugar Manufacturers' Association for a survey of damage caused by the borers, *Diatraea* spp. and *Castnia licus*, to be carried out during the 1936 crop season.

6. Arrangements have been made for a study of varietal resistance to froghopper blight of sugar cane to be carried out by myself and Mr. Fennah of the Imperial College of Tropical Agriculture.

Cacao.

7. The principal work on cacao pests is being carried out by Mr. Adamson of the Imperial College, who is in charge of the breeding and distribution of a parasite (*Dasyscapus parvipennis*) of the cacao thrips (*Selenothrips rubrocinctus*) which was recently introduced from the Gold Coast. Assistance is being given to this project wherever possible, particularly in the matter of liberation of the parasites on suitable cacao estates.

Citrus.

8. A study has been commenced of an insect pest puncturing fruits of orange and grapefruit. While this damage is popularly attributed to the Black Fruit Fly (*Anastrepha serpentina*), the primary cause of injury on the one estate most seriously affected, is due to a Lepidopterous larva. The lesions become secondarily infected by various Diptera, but to date, no specimens of *Anastrepha* have been observed in over two thousand fruits examined. Specimens of the moth are being reared for identification. It is found that the larvae are most readily kept alive and healthy in an agar medium containing honey, sugar and fruit juice.

9. A special study is proceeding at the St. Augustine Experiment Station in the hope of controlling a severe infestation of scale insects on grapefruit. In order to determine the optimum time for spraying, grease-band traps are placed on selected trees, from which weekly assessments of the "crawler" populations are made. Experimental spray applications have been made, with the object of finding a more economical spray fluid than the proprietary emulsion used at present. Owing to the prolonged wet weather at the end of the year, these have been of little utility.

10. Experiments are being conducted with poison baits for ants damaging citrus cultivations.

Bananas.

11. Banana fruits, especially when interplanted with cocoa, are frequently subject to disfiguring scars which render the fruits unsuitable for export. Many types may be recognised and their cause is being sought. The methods employed in the study include inspection of the bunches, especially from sunset to dark, and coating selected bunches with adhesive substances.

Stored Products.

12. Experiments have been commenced to discover possible means of reducing insect injury to stored cocoa, grains and pulses. In the case of cocoa, most of the injury is due to the moth *Ephestia* sp. An experimental trial of a proprietary light trap was made in a cocoa store as a possible means of control of this insect, but as other workers have found, *Ephestia* is only feebly phototropic.

13. Stored maize is extremely subject to attack by *Calandra oryzae*, which is responsible for considerable loss. The chief pest of cow-peas in store is the Bruchid *Pachymerus quadrinaculatus*. These commodities will probably increase in importance to small cultivators in the Colony, and some means of controlling injury to them is urgently required. The problem presents two aspects (a) commercial storage of products intended for sale, and (b) domestic storage of seed. A storage experiment has been commenced with these crops.

14. Owing to my appointment occurring near the close of the year, none of the experimental work has yielded results which can be communicated in the present report.

ALAN PICKLES,
Entomologist.

REPORT OF THE SUGAR-CANE AGRONOMIST FOR 1935.

The scope of the work in Trinidad during 1935 may conveniently be summarised under seven headings :

- (1) Manurial Experiments.
- (2) Cultural Experiments.
- (3) Growth Studies.
- (4) Biochemical Investigations.
- (5) Soil Investigations.
- (6) Addresses to Planters and Cane Farmers.
- (7) Publications.

(1) Manurial Experiments.

An account of the effects on yield of sugar cane of dressings of ground limestone of various grades of fineness of division, and of the interactions of lime with nitrogen, phosphate, potash and pen manure in relation to yield, has been published in *Tropical Agriculture*, Vol. XII, No. 10, pp. 262-268; No. 11, pp. 293-302; No. 12, pp. 320-332. The information recorded in these papers covers the period 1928-35.

A summary of the yield data for the manurial experiments harvested in 1935 has been published in a *Progress Report of the Sugar-Cane Investigation Committee of Trinidad*.

The main conclusions to be drawn from the investigations on limestone and the 1935 experiments are outlined below.

Ground Limestone.

Grade of limestone.

A dressing of ten tons to the acre (the lime requirement) of a finely divided limestone (65-70 per cent. through a 100 mesh B.S. sieve) increased the yield of the first crop series of cane (*i.e.* plant canes, first and second ratoons) by 19½ tons to the acre. The gain, which was equally divided between the three crops, has paid for the limestone and its application. In addition, the lime status of the soil has been greatly improved and there is good reason to believe that the beneficial effect of the dressing will persist over future crops.

Dressings of ten tons, 20 tons (the lime requirement) and 30 tons to the acre of a coarser grade of limestone (35 per cent. through a 100 mesh B.S. sieve) increased the yield of the first crop series by 13 tons of cane, a gain which has not paid for the limestone. The coarser limestone gave a large immediate gain in yield of plant canes, but the residual gains of the ratoon crops were small.

On a degenerated soil, dressings of limestone gave a very small gain in yield of plant canes, a somewhat larger gain of first ratoons and a still larger gain of second ratoons. This type of response is believed to characterise the effect of limestone on soils which previously have not been adequately drained and tilled.

A measure has been obtained under field conditions of rate of interaction of limestone with the soil and of depth of penetration into the soil.

Interaction of limestone with other manures.

The gain in yield due to limestone can be considerably diminished by the presence of sulphate of ammonia and *vice versa*. The extent of the diminution is dependent on the size of the dressing of sulphate of ammonia and of lime.

Yield of cane can be increased by increasing the dressing of limestone to a limiting value which lies in the region of the lime requirement. At dressings of lime in excess of this value, yield remains stationary in the absence of sulphate of ammonia, but can seriously fall if sulphate of ammonia is present.

Yield of cane increases in accordance with the law of diminishing returns by increasing the dressing of sulphate of ammonia to a limiting value. The yield curve approaches a maximum more rapidly if lime is present. At dressings of sulphate of ammonia exceeding the limiting value, yield remains stationary on lime-deficient soils but can seriously fall on overlimed and naturally calcareous soils.

The diminution in the beneficial effect of limestone caused by sulphate of ammonia, and *vice versa*, can be counteracted by small dressings of readily available phosphate but not by potash. On potash-deficient soils, however, the gain in yield due to lime in the presence of nitrogen can be increased by the addition of potash provided that ample phosphate is present.

Sulphate of Ammonia.

The 1935 results confirm those obtained in previous years in the following respects:—

- (i) Greater gains in yield are obtained by applying sulphate of ammonia to ratoon canes shortly after reaping (*i.e.* during the dry season) than by delaying the applications until the advent of the wet season, even though the dry season be severe and prolonged.
- (ii) No additional gain results from covering with earth the dressing of sulphate of ammonia to ratoon canes, whether the nitrogen is applied in the dry season or wet season.
- (iii) Sulphate of ammonia gives larger gains in yield of ratoon canes than an equivalent quantity of cyanamide.
- (iv) The variety of P.O.J. 2878 gives greater response to treatment with sulphate of ammonia than the varieties B.H.10(12) and Uba.

It is noteworthy that the gains in yield resulting from dressings of sulphate of ammonia to plant canes and ratoons during the very dry crop year 1934-35 were as large as those obtained in the previous more normal wetter years.

Potash.

It has been confirmed that:—

- (i) Single dressings of potash to potash-deficient soils can lead not only to a large and paying immediate gain in yield of cane but also to small residual gains which may persist over a number of crops.
- (ii) It is inadvisable to apply to plant canes a single dressing of potash adequate for the crop series of plant and ratoon canes, as part of the potash may be fixed by the soil. It is preferable to give to each crop of the series a dressing equal to its particular requirement of potash.
- (iii) In certain cases it pays to apply to sugar cane sulphate of ammonia in excess of the customary dressings, provided that potash also is added.

Evidence has been obtained to the effect that fixation of potash by the soil takes place mainly in the surface layers, and that it may be advisable to bury dressings of this manure.

Phosphate.

It has been shown that small dressings of water-soluble phosphate can lead to paying gains in yield on the more acid and more calcareous soils. Phosphate can fail to cause gains in yield on soils of intermediate lime status under otherwise identical conditions.

Pen manure.

In critical experiments, laid down on three of the major soil types of the island, dressings of 20 tons of pen manure to the acre supplemented with inorganic manures failed to give rise to greater yields of plant canes than inorganic manures alone, in spite of the unusually prolonged and severe spell of dry weather which prevailed during the life of the plant canes. This result is in complete agreement with previous experimental experience.

Data have been obtained which indicate that the potash but not the phosphate of Trinidad pen manure becomes available to the crop to which the manure is applied.

Molasses.

Gains in yield of plant canes varying from 6.40 to 8.60 tons to the acre have resulted from dressings of molasses.

(2) Cultural Experiments.

The yield for the cultural experiments harvested in 1935 have been recorded in a *Progress Report of the Sugar Cane Investigation Committee of Trinidad.*

Preparatory Cultivation.

In the critical experiments on plant canes:—

- (i) Gyrotilling led to no greater yield than tractor-ploughing.
- (ii) Gyrotilling led to no greater yield than chiselling (knifing).
- (iii) Tractor-ploughing gave a yield of cane to the acre 5.15 tons greater than hand forking.

It should be noted that weather conditions during the life of the plant canes were unfavourable to heavy yields.

Method of Planting.

Planting in furrows gave an immediate yield of cane 2.09 tons less than planting without furrows in one experiment. Planting in holes gave a yield of cane 4.03 tons greater than planting without holes in another experiment. The effects of 'furrowing' and 'holing' on yield are dependent on a number of factors which probably include the texture and moisture relationships of the soil.

Mulching with Megasse.

A mulch of megasse, three inches in thickness, has been found to give an increase in yield of plant canes of 5.74 tons to the acre, in the presence of a basal dressing of 15-20 tons of pen manure. This gain due to mulching was obtained on a heavy clay soil under conditions of low rainfall.

Cultivation of Ratoon Canes.

No gain in yield was found to result from the cultivation of ratoon canes of the varieties B.H.10(12) and Uba, whether mechanical or hand methods were used. This result is in complete accord with previous experimental experience.

(3) Growth Studies.

Critical studies on the effect of manurial treatment on early tiller formation of plant canes of the variety B.H.10(12) have been published in *Tropical Agriculture*, Vol. XII, No. 7, pp. 179-186. Among other things it is shown that:—

- (i) It is possible to increase the number of tillers to the stool by 40 per cent. with a dressing of ground limestone; by 70 per cent. with sulphate of ammonia and by ten per cent. with sulphate of potash.
- (ii) Dressings of lime and nitrogen lead to greater tiller formation than either manure alone, but treatment with potash also is necessary for maximum early tillering in the presence of lime and high nitrogen.
- (iii) The effect of high nitrogen and potash together is greater than the sum of their independent effects, but treatment with phosphate also is required to obtain maximum early tillering in the presence of nitrogen and potash.

(4) Biochemical Investigations.**Juice Quality (°Brix, Sucrose and Purity).**

Under weather conditions favourable to ripening it has again been shown that:—

- (i) Dressings of ground limestone have no effect on juice quality.
- (ii) Dressings of pen manure can depress the amount of sucrose in juice and the purity of juice.

Leaf Analysis.

Leaf symptoms of potash deficiency have been diagnosed for the varieties B.H.10(12); B.726; Uba and Co.213. Coloured reproductions of the symptoms, which vary greatly with variety, have been made and filed for reference.

The leaf symptoms have been shown to be very closely correlated with chemical analysis of the leaves, and diagnosis of potash-deficiency by means of leaf analysis now appears to be well within the bounds of possibility.

I am indebted to Mr. R. A. Hamilton for his assistance in the leaf investigations.

(5) Soil Investigations.**Measurement of Potash Deficiency in Soil.**

Considerable progress has been made in relating response in yield of sugar cane to dressings of potash with the amount of exchangeable potash in the soil. The following data have been obtained by analysis of the plot-soils of potash experiments.

Exchangeable potash in soil (per cent.).	Gain due to manuring with potash.	Dressing of sulphate of ammonia.
0.009	Nil.	2 cwts. per acre
0.008	1.8 tons cane	3 cwts. do.
0.008	3.2 do.	5 cwts. do.
0.007	3.5 do.	3 cwts. do.
0.005	3.9 do.	3 cwts. do.
0.004	5.9 do.	2 cwts. do.

It will be noted that gain in yield due to potash is dependent not only on the amount of exchangeable potash in the soil but also on the size of dressing of nitrogen.

Soil Surveys.

Under my supervision certain of the sugar estates are now actively engaged in detailed soil surveys. At the present time special attention is being paid to lime and potash requirement. The methods of measurement in use have been standardised in my laboratory. Their reliability under Trinidad conditions has been established by field experiment. The data accumulated in the surveys are interpreted in the light of the results of manurial experiments laid down on the areas under examination.

These detailed soil surveys have been shown to be of definite practical value to the estates in that they have led to improved and more scientific manurial programmes.

(6) Addresses to Planters and Cane Farmers.**Planters.**

A survey of the results of recent investigations in Trinidad on sugar cane and sugar cane soils has been given to a joint meeting of the Sugar Manufacturers' Association and the Sugar-Cane Investigation Committee.

The results of the cultural and manurial experiments harvested in 1935 have been fully explained to and discussed with the Cultivation Sub-Committee of the Sugar Manufacturers' Association. An address on drainage problems has also been given to this Sub-Committee. The Sub-Committee consists of the senior members of the field staffs of the estates.

Farmers.

Talks on the use of sulphate of ammonia have been given to representative gatherings of cane farmers at Caroni, Todd's Road, Princes Town and Reform. The optimum method of use of sulphate of ammonia has been demonstrated in the field to farmers.

An address at the Naparima College entitled "The Cultivation of Sugar Cane" was largely attended by farmers. The address, which is simple in form, has been printed and widely circulated to farmers.

(7) Publications.

Recent Investigations on Sugar Cane and Sugar-cane Soils in Trinidad.

- I.—General Effects of Ground Limestone. *Tropical Agriculture*, Vol. XII, No. 10, pp. 262-268.
- II. Interactions of Lime with Nitrogen, Phosphate and Potash, and with Pen Manure, in Relation to Yield of Cane. *Tropical Agriculture*, Vol. XII, No. 11, pp. 293-302; No. 12, pp. 320-332.

Effect of Manurial Treatment on Growth of Sugar Cane.

I. Early Tiller Formation of Plant Canes in Relation to Manurial Treatment. The Variety B.H.10 (12). *Tropical Agriculture*, Vol. XII, No. 7, pp. 179-186.

Summary of Yield Data for Field Experiments Reaped in 1935.

Progress Report of the Sugar-Cane Investigation Committee of Trinidad.

The Cultivation of Sugar Cane.

An address at the Naparima College.

P. E. TURNER,
Sugar-Cane Agronomist.

REPORT ON WILT DISEASE OF COCONUTS, 1935.

During the year 1935 Coconut Wilt investigations were restricted to observations on field experiments laid down during the previous year. Due to my absence from April to October on vacation and study leave, during which time I attended the International Soil Congress and Tour held in Great Britain last summer as well as various research stations, the time available for detailed studies was greatly curtailed.

The subject will be discussed under the following headings:—

- A. Field Experiments.
B. General Observations.

A. Field Experiments.

In my previous report it was stated that field experiments had been laid down on three sites to try out trenching alone, and in conjunction with fertiliser mixtures on fields where "Wilt" was progressing rapidly as well as on fields where wilt was likely to occur in a year or so.

The following were the treatments tried out:—

- (1) Trenching + husks and organic matter.
- (2) " + husks + Potassium Sulphate.
- (3) " + husks + Superphosphate.
- (4) " + husks + Ammonium Sulphate.
- (5) " + husks + Ammonium Sulphate + Potassium Sulphate.
- (6) " + husks + Potassium Sulphate + Superphosphate.
- (7) " + husks + Potassium Sulphate + Superphosphate + Ammonium Sulphate.
- (8) " + husks + limestone.
- (9) " + limestone.
- (10) " + Potassium Sulphate.
- (11) " + Potassium Sulphate + Superphosphate.
- (12) " + Potassium Sulphate + Ammonium Sulphate.

I. FIELDS WHERE WILT WAS PROGRESSING RAPIDLY.

In these instances the treatments have not been successful in checking the progress of the disease. A certain number of trees have survived but in no way in excess of the number occurring under normal conditions. From the general conclusions previously drawn as to the factors predisposing the tree to the disease, this result is not unexpected, especially in view of the observation stated in a previous report, that it is probable that the absorbing area of the plant ceases to function sometime in advance of the appearance of the external symptoms of the disease.

2. AREAS IN WHICH WILT WAS LIKELY TO OCCUR.

In only one of the experimental areas has wilt appeared to any extent. Generally speaking deaths have been more severe in the treatments without organic matter. No definite conclusion as to the relative merits of individual treatments can be drawn as yet.

B. General Observations.

Large areas which were previously under coconuts are now growing different crops. The chief crop is cane, especially in areas where the rainfall is 60 inches and lower and which are in close proximity to sugar factories. This change is to be commended.

In a previous report wilt soils were classified as follows:—

- (a) Surface soil is close textured and overlies a subsoil which is impervious to water.
- (b) Soil and subsoil are open textured and free draining.
- (c) Friable top soil with an intolerant subsoil layer.

The majority of areas which have now been converted to cane fall under classes (a) and (c). The writer has stated previously that the detrimental factor to the growth of the coconut palm was to be found below the two feet level, the nutrient status of the top soil being as good, or in some cases better, for soils of classes (a) and (c) as was to be found in healthy areas. From these considerations, added to which the fact that crops grown in these areas tend to have a high nitrogen status, would lead one to the conclusions that these areas were eminently suited to the growth of canes. The excellent growth shown by canes in these areas is ample proof of the suitability of these soils for the growth of this crop. The anomaly of lands suitable to canes being cultivated in a crop obviously unsuitable to the soil conditions, whilst less suitable areas to the growth of cane at greater distances from the central factories than these areas were being planted in that crop, is rapidly being remedied.

There are areas at the foothills of the Northern Range planted in coconuts. Some of the soils are derived from river alluvium, the others from Northern Range detrital material.

River Alluvium.—In these areas coconuts bear good crops but succumb to wilt disease. Good cane crops are obtained on similar soils and presently these lands are being converted to that crop.

Detrital Soils.—Wilt does not occur to any great extent in these areas, but due to lack of soil fertility good crops are not harvested. The Tonka Bean and the Sapucaia Nut (*Lecythis Zabucajo*) are suitable crops for these areas.

Crops more suitable to the soil conditions existing in some areas presently under coconuts have been suggested. These conclusions are drawn purely from soil and climatic considerations and the planter is advised to study these crops in the light of the present and future economic outlook before making a final decision.

F. M. BAIN,
Agricultural Officer.

27th February, 1936.

PART III.

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PART III—ANNEXURES.

APPENDIX A.

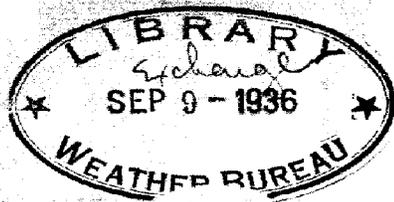
Revenue and Expenditure.

	Expenditure.		Revenue.	
	\$	c.	\$	c.
HEAD OFFICE :				
Personal Emoluments	35,853	39	96	00
Travelling and Other Charges	5,406	44	48	00
Laboratory Expenses and Field Experiments.. .. .	1,921	04		
BOTANICAL DEPARTMENT, TRINIDAD :				
Personal Emoluments	1,716	77		
Maintenance and Improvements, Royal Botanic Gardens and St. Clair Experiment Stations	6,349	12		
Care of Trees on Government Lands	450	05		
Maintenance, Red House Grounds	348	79		
Other Charges	50	04		
BOTANICAL DEPARTMENT, TOBAGO :				
Personal Emoluments, Travelling	2,909	06		
Maintenance, Botanic Station and Government House Grounds.. .. .	1,535	16	299	55
St. AUGUSTINE NURSERY :				
Personal Emoluments	3,515	67		
Maintenance, &c.	10,166	64	7,398	69
Other Charges	2,121	20		
RIVER ESTATE :				
Personal Emoluments	5,028	00		
General Maintenance, &c.	16,997	47	15,433	78
Improvements	2,579	97		
St. AUGUSTINE EXPERIMENT STATION :				
Personal Emoluments	3,660	00		
Maintenance, Cultivation of Crops, &c.	8,155	44	527	67
GOVERNMENT FARM, TRINIDAD :				
Personal Emoluments	3,712	00		
Maintenance	22,811	29	27,142	67
Purchase of Stock (Trinidad and Tobago)	1,685	12		
GOVERNMENT FARM, TOBAGO :				
Personal Emoluments	520	00	1,837	48
Maintenance	3,516	91		
GOVERNMENT VETERINARY SURGEON :				
Assistant Examiners and Contingencies	1,346	37	7,257	12
Paralytic rabies	3,388	16		
Bat investigation	4,812	27		
QUEEN'S PARK AND PASTURES :				
Personal Emoluments	1,213	93		
Maintenance	3,130	60	1,169	84
DISTRICT SERVICE :				
Personal Emoluments, Travelling, &c.	26,224	96		
PLANT PROTECTION ORDINANCE :				
Control of Plant Diseases and Pests	24,299	31		
AGRICULTURAL CREDIT SOCIETIES :				
Travelling, &c.	389	22		
TOBAGO ABATTOIR :				
Maintenance, Travelling, &c.	612	88	220	36
MARPER FARM :				
Maintenance	4,091	73	2,584	51
SOIL SURVEY :				
Maintenance	71	51		
Total	210,650	51	64,015	67

APPENDIX B.

Principal Agricultural Exports, Trinidad and Tobago.

	1934.		1935.	
	Quantity.	Value.	Quantity.	Value.
CACAO :		£		£
Raw Cacao	26,803,149 lb.	349,694	44,387,836 lb.	527,212
SUGAR CANE AND PRODUCTS :				
Vacuum pan, Grey Crystal	73,654 tons	643,156	81,888 tons	636,716
Do. White Crystal .. .. .	.. .. .	.. .. .	.. .. .	.. .. .
Do. Yellow Crystal	19,442 tons	269,694	22,355 tons	283,814
Molasses Crystal	417 tons	3,382	150 tons	2,001
Yellow Crystal Molasses .. .. .	.. .. .	.. .. .	1,304 tons	19,639
Molasses	2,310,381 gals.	24,115	3,199,524 gals.	32,226
Rum	50,977 gals.	11,488	6,282 gals.	3,328
Bitters	16,916 gals.	29,184	16,131 gals.	28,055
COCONUT AND PRODUCTS :				
Coconuts	9,850,299 No.	29,128	5,376,290 No.	14,393
Copra	17,928,775 lb.	57,451	8,764,646 lb.	34,682
Coconut Oil	31,118 gals.	2,244	14,879 gals.	1,339
COFFEE :				
Raw Coffee	525,115 lb.	10,595	1,187,867 lb.	18,290
TONKA BEANS	45,450 lb.	14,822	37,968 lb.	12,320
RUBBER :				
Raw Rubber	68,914 lb.	1,437	150,723 lb.	4,215
LIMES :				
Limes	1,439 brls.	1,991	565 brls.	801
Pickled Limes	25 brls.	78	.. .. .	.. .. .
Lime Juice	12,589 gals.	829	16,229 gals.	1,199
Lime Oil	2,882 gals.	25,055	1,949 gals.	15,497
Citrate of Lime	96,693 lb.	641	104,037 lb.	901
GRAIN, PULSE, STARCHES, &c.				
Corn (Maize)	33,621 lb.	135	68,544 lb.	242
Peas and Beans	302,257 lb.	1,899	610,536 lb.	2,628
FRUIT :				
Grapefruit	23,518 boxes	18,634	7,724 No. 51,119 boxes	42,473
Oranges .. .. .	.. .. .	.. .. .	2,850 boxes 3,753,446 No.	6,574
Other Kinds .. .. .	.. .. .	87	.. .. .	16
MISCELLANEOUS :				
Plants and Seeds .. .. .	.. .. .	110	.. .. .	315
Spices (Nutmegs)	12,759 lb.	222	7,620 lb.	83
Honey	35,573 lb.	497	47,198 lb.	392
Live Stock	48 No.	756	64 No.	572
Hides and Skins	9,710 No.	5,211	329,435 No.	3,874
Leather (unmanufactured)	9,240 lb.	405	8,017 lb.	234
		£1,502,940		£1,694,031



APPENDIX C.

ANNUAL RAINFALL 1862 TO 1935, PORT-OF-SPAIN, TRINIDAD.

1862 to 1899 at the Royal Botanic Gardens. January, 1900 onwards at the closely adjacent St. Clair Experiment Station.

YEAR.	JAN.	FEB.	MAR.	APRIL.	MAY.	JUNE.	JULY.	AUG.	SEPT.	OCT.	NOV.	DEC.	Annual Rainfall	
	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.		Inches.
186266	.77	.25	1.41	8.47	10.36	9.57	11.97	6.60	10.06	3.03	63.15
1863	..	1.54	2.71	1.45	.85	1.26	9.12	10.12	10.53	12.11	6.24	4.30	6.57	66.80
1864	..	2.51	.53	.36	.04	.85	4.96	7.17	12.06	8.04	6.53	5.94	6.61	62.90
1865	..	2.62	3.20	1.07	7.98	3.22	5.64	10.35	14.83	7.32	14.62	4.81	9.62	85.28
1866	..	2.24	3.91	1.44	1.09	1.45	6.59	7.83	12.34	5.87	10.11	8.17	6.82	67.86
1867	..	1.31	6.36	.83	1.32	2.33	5.30	12.20	15.21	10.45	7.87	.67	2.71	66.86
1868	..	2.06	.82	3.20	.64	4.17	7.78	11.35	6.73	5.46	4.66	8.31	1.03	56.21
1869	..	.08	.93	.74	.41	.69	5.52	10.17	8.74	8.86	5.15	6.30	5.87	53.46
1870	..	2.61	.56	1.46	1.51	4.65	8.81	11.91	9.00	10.63	3.98	5.94	8.29	69.35
1871	..	6.62	1.40	2.89	.92	3.97	8.84	11.73	12.97	7.87	4.37	10.73	3.27	75.58
1872	..	1.45	.07	.74	.39	3.14	7.09	5.45	10.82	3.07	4.80	9.89	3.04	49.95
1873	..	1.78	1.08	1.98	.53	..	4.31	5.04	8.37	5.80	10.34	3.48	1.31	44.02
1874	..	3.47	1.96	3.67	5.16	2.51	12.28	12.28	11.20	9.38	6.42	3.66	4.29	76.28
1875	..	3.39	.91	.56	.42	2.61	4.15	12.62	7.22	11.95	10.85	3.74	2.48	60.90
1876	..	3.26	1.03	1.78	1.67	6.65	11.17	12.23	15.18	12.03	7.04	5.95	3.96	81.85
1877	..	2.14	..	7.46	3.38	3.19	8.43	8.35	12.94	6.39	6.68	7.66	5.48	72.10
1878	..	3.44	.70	..	3.22	4.99	5.78	5.42	8.88	11.15	5.89	8.72	3.05	61.24
1879	..	1.52	2.76	4.56	3.03	3.08	14.92	6.86	10.35	6.15	3.54	4.28	4.38	65.43
1880	..	11.72	6.53	.67	2.32	3.90	7.83	6.30	17.39	7.47	5.74	10.51	1.96	82.34
1881	..	.57	.65	.23	1.60	4.66	11.05	7.82	10.90	10.59	3.36	12.06	2.23	65.72
1882	..	1.33	2.38	.73	1.57	3.74	6.33	5.93	8.40	4.93	5.86	10.29	1.50	52.99
1883	..	1.56	.71	.26	3.37	5.89	10.91	13.66	10.26	5.53	3.99	6.06	8.30	70.50
1884	..	3.43	2.50	4.40	1.51	2.91	6.84	5.71	8.70	5.03	5.05	5.14	5.66	56.88
1885	..	1.30	.89	1.49	.43	5.27	3.44	5.87	4.56	6.08	4.08	5.37	4.44	43.22
1886	..	3.32	1.97	3.27	3.83	4.49	9.70	17.48	8.15	6.73	12.59	8.54	6.75	86.82
1887	..	2.69	1.46	1.67	1.08	3.98	7.40	5.51	9.93	5.07	5.84	7.60	11.86	64.09
1888	..	8.37	1.79	2.41	2.28	3.46	11.92	6.89	7.02	5.53	5.06	7.76	2.95	65.44
1889	..	.94	.85	4.16	1.05	6.34	11.66	12.14	11.73	3.76	6.30	7.38	7.48	73.79
1890	..	7.76	.51	2.09	7.62	5.14	9.68	12.89	11.65	3.37	10.98	5.93	5.28	82.90
1891	..	3.17	.92	.03	1.44	2.54	5.54	11.88	4.26	7.44	5.77	6.66	4.09	53.74
1892	..	1.93	2.19	1.85	7.59	11.55	16.26	15.55	9.21	3.57	11.49	5.40	4.69	91.28
1893	..	3.43	1.85	.19	3.61	11.35	10.19	13.28	16.82	11.73	5.47	7.84	7.28	92.49
1894	..	3.22	2.36	3.12	1.22	2.69	3.26	4.53	12.06	5.48	3.93	7.28	3.16	52.31
1895	..	2.52	1.33	2.27	2.52	2.11	5.00	2.57	4.86	5.69	10.89	15.15	7.32	62.23
1896	..	7.08	.88	1.59	2.33	1.62	10.29	6.35	7.66	6.46	6.05	9.81	6.33	66.45
1897	..	1.67	.75	3.96	.26	5.58	11.19	13.88	7.90	9.83	8.87	9.39	4.40	77.66
1898	..	3.05	2.18	2.10	1.17	1.49	6.46	5.87	10.55	7.13	6.15	9.13	3.67	58.85
1899	..	1.95	1.92	1.00	.75	.52	7.63	4.44	8.45	2.18	6.34	8.07	3.61	46.76
1900	..	3.56	.76	2.72	4.10	4.14	12.99	7.95	11.07	5.52	6.53	5.41	2.61	67.36
1901	..	1.95	1.51	1.85	.35	6.45	9.21	8.38	7.53	4.26	4.97	7.93	4.83	59.22
1902	..	2.56	.51	1.18	1.78	2.14	10.05	5.20	11.67	7.22	7.40	2.74	2.89	55.34
1903	..	1.51	.68	1.54	2.17	.95	5.42	9.40	9.45	11.41	2.12	2.59	4.20	51.44
1904	..	3.00	2.56	4.24	2.50	2.76	6.23	8.03	4.72	8.81	5.65	3.61	4.32	56.43
1905	..	2.41	.59	3.74	1.79	4.34	6.01	9.49	11.09	10.43	6.94	10.69	4.16	71.68
1906	..	.43	.50	.73	.46	7.96	10.95	11.42	8.55	6.54	6.80	5.00	5.64	64.98
1907	..	5.22	.44	1.71	.09	4.58	11.01	11.02	5.77	7.76	7.65	10.69	4.10	70.04
1908	..	.75	.45	1.79	.95	5.82	5.22	5.87	7.72	5.45	5.45	2.65	8.68	50.80
1909	..	5.69	2.43	1.15	1.78	3.87	8.31	10.72	6.29	6.95	7.15	3.93	6.31	64.58
1910	..	2.79	4.38	1.75	2.01	2.76	6.34	6.40	13.89	8.27	9.21	8.49	1.90	68.19
1911	..	1.61	1.51	1.86	.74	1.27	7.15	5.20	13.68	4.03	10.22	3.57	3.53	54.37
1912	..	.62	Nil.	.74	.03	2.18	7.54	12.16	5.56	5.87	2.73	6.28	5.64	49.35
1913	..	2.80	.50	1.42	.42	1.79	2.80	2.86	6.48	6.52	3.51	8.61	1.82	39.53
1914	..	.50	.61	1.28	1.01	2.05	7.34	5.05	9.15	7.90	6.14	7.61	5.58	54.12
1915	..	2.10	.66	..	2.63	2.76	7.05	12.76	5.27	4.21	9.28	7.84	1.75	59.31
1916	..	5.29	1.35	1.57	1.91	.94	10.30	8.04	11.57	10.78	6.68	9.32	1.98	69.73
1917	..	1.17	3.06	1.38	.50	4.24	6.30	10.13	9.96	7.24	5.43	6.61	8.22	69.24
1918	..	3.15	1.18	1.48	1.27	2.94	5.87	14.42	8.56	8.93	5.51	7.56	3.85	64.24
1919	..	.62	..	1.78	1.67	3.50	6.78	5.17	6.82	7.96	7.79	8.42	6.67	67.44
1920	..	1.39	1.66	.94	.28	.56	4.13	4.93	6.70	10.98	5.74	6.03	1.60	44.24
1921	..	2.43	1.60	5.03	4.09	1.43	9.91	10.06	10.30	10.17	6.53	7.71	6.25	75.24
1922	..	4.01	1.13	1.41	2.39	2.18	6.10	5.06	8.35	6.49	2.92	11.17	7.10	58.24
1923	..	1.91	1.66	.96	2.97	1.46	3.48	10.76	9.37	6.23	4.41	7.38	7.32	57.84
1924	..	1.54	.90	.14	1.11	.73	4.95	7.53	7.27	4.59	7.81	8.56	2.15	47.21
1925	..	1.77	1.06	2.67	.10	1.21	4.20	7.58	8.87	6.37	5.85	5.36	4.36	49.40
1926	..	.69	.39	.54	.23	2.12	5.26	5.25	10.85	11.20	14.78	9.71	7.56	68.58
1927	..	4.71	4.44	3.62	5.04	7.15	6.95	9.40	11.67	9.11	6.13	5.64	7.21	81.07
1928	..	4.22	.69	2.31	2.02	.67	5.75	8.07	8.66	7.36	9.13	8.42	5.91	69.24
1929	..	.84	.84	1.78	.81	7.33	6.43	5.10	8.90	5.21	3.40	9.30	1.51	51.45
1930	..	2.70	.08	.31	2.38	1.85	6.35	7.12	4.94	5.82	6.27	2.59	4.87	45.28
1931	..	1.68	1.11	.07	.29	1.12	6.94	10.96	8.89	4.85	6.59	7.94	5.77	56.21
1932	..	5.61	1.72	4.33	3.99	9.25	10.53	5.80	16.04	3.85	4.60	10.23	8.01	83.98
1933	..	3.87	1.25	1.91	1.36	2.85	10.19	9.83	16.07	11.52	7.41	5.36	6.28	78.03
1934	..	2.51	.90	.74	.17	.82	3.05	9.43	7.24	6.55	8.50	10.08	5.30	55.35
1935	..	0.53	0.57	1.23	0.42	5.03	2.36	7.35	13.23	11.41	3.82	11.25	3.45	60.68
Grand Total	..	201.19	107.79	134.35	136.17	259.90	561.29	643.99	719.05	543.74	490.55	534.28	357.99	4,696.35
Av. for 74 years	..	2.72	1.46	1.81	1.84	3.51	7.58	8.70	9.72	7.35	6.66	7.22	4.84	63.38