1921.

QUEENSLAND.

TWENTY-FIRST ANNUAL REPORT OF THE BUREAU OF SUGAR EXPERIMENT STATIONS

(AS REQUIRED BY "*THE SUGAR EXPERIMENT STATIONS ACT OF* 1900").

Presented to both Houses of Parliament by Command.

TO THE HONOURABLE THE SECRETARY FOR AGRICULTURE AND STOCK.

SIR,—I have the honour to submit the Annual Report of the General Superintendent of Sugar Experiment Stations up to the end of October, 1921.

E. G. E. SCRIVEN,
Director.

Brisbane, 30th November, 1921.

GENERAL SUPERINTENDENT'S REPORT.

The Annual Report of the Bureau for 1921 comprises :—

1. Introduction.
2. Approximate Estimate of the 1921 Cane Crop, and Comparative Progress of the Industry during the past Twenty-two Years.
3. General Work, with Brief Survey of the various Sugar Districts.
4. Work of the Northern Sugar Experiment Station at South Johnstone.
5. Work of the Central Sugar Experiment Station at Mackay.
6. Work of the Southern Sugar Experiment Station at Bundaberg.
7. Work of the Laboratories.
8. Work of the Division of Entomology.
9. Sugar Canes, Seedlings, Varieties at Kairi State Farm in the Atherton District, &c.
10. Variety Plots.
11. Lime, Green Manures, and Fertilisers.
12. Economics of the Industry.
13. General.

1.—INTRODUCTION.

The sugar industry during the past twelve months has enjoyed a greater measure of prosperity than it has done for many years past, due to the Agreement with the Federal Government for a much fairer price than that paid during the war period, which was only £21 per ton. The new price was fixed for three years from June, 1920, at the sum of £30 6s. 8d., being an increase of £9 6s. 8d. per ton, of which £5 6s. 8d. was to go to the growers and £4 to the millers. This Agreement effected, though only for a comparatively short period, what is so urgently needed by the Queensland Sugar Industry if it is to continue to exist and expand—namely, stability. While the price for sugar and cane is uncertain, growers will not risk putting in increased areas, nor can millers afford to bring their mills up to date and increase their efficiency. The effect of a guaranteed price for three years was immediately apparent. Farmers in nearly every district commenced putting new areas under cane, using in many cases land that had been lying unproductive for years. The millers had their plants overhauled, and put in much-needed improvements—in many cases increasing the capacity of their mills. Improved railway communication also assisted matters; and new districts—such as Camilla, near Mackay, and the Maria Creek Soldiers' Settlement, south of Innisfail—have been added to existing mills.

The present prosperity of the industry, however, did not come before it was needed. Due to the increased prices for all commodities and the high price of labour, farmers for some years prior to 1920 were unable to carry out the improvement of their land by better methods of cultivation and the use of fertilisers; and it may be added that a large number of our cane farmers were indebted to storekeepers, banks, and mills for financial aid. The present year, however, will see a great deal of this indebtedness wiped off, and a big advance in cultivation and the use of fertilisers has already taken place. It may be safely said that more fertilisers have been purchased this year than ever before in the history of

the industry. It has been the aim of the Queensland growers to endeavour to keep Australia supplied with sugar, and as long as a fair price is offered the industry will continue to do so.

The rich tropical belt of fine land comprised in the Banyan and Tully areas between Cardwell and Innisfail urgently needs developing by the erection of one or more large mills, and the sooner this can be accomplished the better. We require a great population in North Queensland along the coast to effectively settle and defend it if need be; and the more population we have there, the more will the back country be settled and developed. It has been recently stated in connection with the last census that the increase in the population of the Herbert Electoral Division, which embraces the comparatively newly settled areas of Babinda and South Johnstone, was 19·4 per cent., or 14,929 persons—a greater increase numerically than in any other part of Queensland. This shows what can be done.

It is, therefore, hoped by every well-wisher of Australia's future greatness that our Legislatures in their wisdom will make every effort to ensure the continuance of a fair price for sugar and the stability of the sugar industry upon which so much depends.

In addition to other favourable circumstances, the sugar belt in Queensland has this year been blessed with a good season generally, although too much rain has been experienced in the Innisfail-Babinda districts. The more or less droughty conditions of 1919-20—when poor crops were harvested in all the sugar districts south of Townsville—have given place to an abundant season with good crops for practically every mill. This, combined with the increased areas put under cane this year, will produce the largest crop ever harvested, except that of 1917, which, however, was due to exceptional circumstances, such as the closing of many mills for long periods in 1916 as a protest against what was known as the "Dickson Award," and which caused a large amount of cane to be carried over to the 1917 season.

2.—APPROXIMATE ESTIMATE OF THE 1921 CANE CROP.

The 1921 crop is approximately expected to be 2,298,384 tons of cane. The majority of the mills are not expected to finish crushing till towards the end of December. With the exception of one small mill in the Beenleigh district, the whole of the sugar mills in Queensland are operating this year.

The following table shows the rough approximate estimate of the crop in the month of May, together with the estimate of the mills made in October of the amount of cane to be crushed during the present season:—

Mill.	Rough Approximate Estimate Made April and May.	Approximate Estimate Furnished by the Mills in October.	Remarks.
Mossman	60,000	62,000	
Hambledon	88,000	84,000	Reduction due to grubs.
Mulgrave	80,000	92,000	
Babinda	160,000	130,000	Reduction due to excessive rainfall.
South Johnstone	145,000	130,000	Reduction due to excessive rainfall.
Goondi	120,000	112,000	Reduction due to excessive rainfall.
Mourilyan	90,000	80,000	Reduction due to excessive rainfall.
Victoria	120,000	118,000	
Macknade	100,000	100,000	
Pioneer	80,000	94,000	Increase due to late rains and better growing conditions.
Inkerman	90,000	107,000	Increase due to late rains and better growing conditions.
Kalamia	50,000	67,000	Increase due to late rains and better growing conditions.
Haughton (Invicta)	18,000	35,000	Increase due to late rains and better growing conditions, and additional cane sent from Home Hill.
Proserpine	60,000	60,000	
Hornebush	63,000	70,000	Increase due to cane cutting out heavier than anticipated.
Cattle Creek	38,000	40,000	Increase due to cane cutting out heavier than anticipated.
Pleystowe	53,000	55,000	Increase due to cane cutting out heavier than anticipated.
Marian	57,000	60,000	Increase due to cane cutting out heavier than anticipated.
Racecourse	48,000	52,000	Increase due to cane cutting out heavier than anticipated.
Palms	33,000	35,000	Increase due to cane cutting out heavier than anticipated.
Plane Creek	59,000	62,000	Increase due to cane cutting out heavier than anticipated.
Farleigh	50,000	50,000	Increase due to cane cutting out heavier than anticipated.
North Eton	40,000	42,000	Increase due to cane cutting out heavier than anticipated.
Millaquin	60,000	65,000	Increase due to cane cutting out heavier than anticipated.
Qunaba	43,000	43,000	
Bingera	65,000	88,000	Increase due to cane cutting out heavier than anticipated.
Fairymead	60,000	88,000	Increase due to cane cutting out heavier than anticipated.
Carried forward	1,920,000	2,021,000	

Mill.	Rough Approximate Estimate Made April and May.	Approximate Estimate Furnished by the Mills in October.	Remarks.
Brought forward ..	1,930,000	2,021,000	
Gin Gin	20,000	27,000	Increase due to cane cutting out heavier than anticipated.
Childers	90,000	86,500	
Doolbi	40,000	30,000	
Isis Central	50,000	52,000	
Maryborough	11,500	13,000	
Mount Bauple	20,000	21,500	
Moreton	35,000	36,000	
Logan and Albert	600	634	
Junction	..	..	Not crushing.
Steiglitz	2,000	2,000	
Rocky Point	5,000	5,200	
Eagleby	2,500	2,800	
Carbrook	700	750	
Total	2,207,300	2,298,384	

It will be seen that the estimates from the mills south of Townsville have been largely increased owing to the great improvement which took place in the Lower Burdekin, Mackay, and Bundaberg districts.

The quality of the cane in most of the sugar districts is good this year, and it should be safe to reckon on 1 ton of sugar being made from not more than 8¼ tons of cane. If this is correct, then we should have a yield of sugar in the region of 278,500 tons. Sugar is being rapidly produced this year, but not quite so rapidly shipped. It is to be hoped that the contractors for the removal of the sugar will be able to get the sugar away before the wet season sets in; otherwise loss is certain to ensue.

The production in New South Wales should be somewhere about 152,000 tons of cane, or, say, 17,000 tons of sugar. This added to the Queensland crop should provide a surplus for this year, reckoning our consumption at 285,000 tons; but for some reason that has not been explained the consumption of sugar this year is stated to be lower than usual. This may be due to the manufacturers not using so much sugar owing to the overseas demand for jams, &c., having become less.

The prospects for next year at the present time are excellent. As pointed out in previous reports however, so much depends upon climatic factors that the yield cannot be anticipated with safety until the wet season and the cyclone period are over. Having experienced a run of poor seasons, it is now hoped that we may look forward to a number of good years again.

Comparative Progress of the Industry during the Past Twenty-two Years.

Taking the yield of cane and sugar per acre and the tons of cane required to make 1 ton of sugar over twenty years as shown in the following table, it may be noted that during the ten years, from 1909 to 1918, there has been an average increase in the production of cane and sugar and a decrease in the amount of cane required to make 1 ton of sugar. The last figure is even better than it appears, as it is only during recent years that the yield of sugar has been calculated to the basis of 94 net titre:—

Table showing Yield of Cane and Sugar per Acre and Tons of Cane Required to make One Ton of Sugar during Twenty-two Years.

Year.	Tons Cane per Acre.	Tons Sugar per Acre.	Tons Cane to 1 Ton Sugar.
1899	14·81	1·55	9·54
1900	11·68	1·28	9·44
1901	15·10	1·55	9·76
1902	10·86	1·30	8·38
1903	13·65	1·52	8·97
1904	16·04	1·78	8·99
1905	14·73	1·59	9·27
1906	17·61	1·88	9·38
1907	17·64	2·00	8·84
1908	15·54	1·64	9·49
Ten Years' Average	14·76	1·60	9·20
1909	14·53	1·68	8·65
1910	19·45	2·23	8·73
1911	16·02	1·81	8·85
1912	12·72	1·45	8·79
1913	20·29	2·36	8·59
1914	17·80	2·09	8·51
1915	12·20	1·49	8·20
1916	20·81	2·33	8·93
1917	24·88	2·83	8·79
1918	15·01	1·70	8·82
Ten Years' Average	17·37	1·99	8·68
1919	14·83	1·91	7·76
1920	15·03	1·88	8·0

It will be seen from the above figures, after allowing for better efficiency in the mills, that the work of the Sugar Experiment Stations—in constantly advocating and demonstrating better methods of cultivation, the use of green manures, lime, and fertilisers, together with the introduction and distribution of improved varieties of sugar-cane—has been highly successful, and will be still more so in the future.

In the following table is shown the improvement in area and amounts of cane harvested and sugar made during the past twenty-two years :—

TABLE SHOWING TOTAL ACRES CRUSHED AND TOTAL YIELDS OF CANE AND SUGAR PER ACRE FOR A PERIOD OF TWENTY-TWO YEARS.

Year.	Acres Crushed.	Yield.	
		Tons Cane.	Tons Sugar.
1899	79,435	1,176,466	123,289
1900	72,651	848,328	92,554
1901	78,160	1,180,091	120,858
1902	59,102	641,927	76,626
1903	60,375	823,875	91,828
1904	82,741	1,326,989	147,688
1905	96,093	1,415,745	152,722
1906	98,194	1,728,780	184,377
1907	94,384	1,665,028	188,307
1908	92,219	1,433,315	151,098
1909	80,095	1,163,569	134,584
1910	94,641	1,840,447	210,756
1911	95,766	1,534,451	173,296
1912	78,142	994,212	113,060
1913	102,803	2,085,588	242,837
1914	108,013	1,922,633	225,847
1915	94,459	1,152,516	140,496
1916	75,914	1,579,514	176,973
1917	108,707	2,704,211	307,714
1918	111,572	1,674,829	189,978
1919	84,877	1,258,760	162,136
1920	89,142	1,339,455	167,401

3.—GENERAL WORK, WITH BRIEF SUMMARY OF SUGAR DISTRICTS.

The Bureau of Sugar Experiment Stations attains its twenty-first birthday this year. Originally commenced with one Sugar Experiment Station at Mackay and a Chemical Laboratory at Bundaberg, it now embraces Sugar Experiment Stations at South Johnstone and Bundaberg, in addition to Mackay, with Laboratories attached, and an Entomological Laboratory at Meringa, near Cairns. All this has added very materially to the work of the General Superintendent in the supervision and administration of experimental work.

In the canefields outside the Experiment Stations, the General Superintendent is assisted by Messrs. J. C. Murray (Southern) and Mr. E. H. Osborn (Northern), Field Assistants.

The Field Assistants constantly move from farm to farm, in order to assist cane farmers with instructions and advice. The General Superintendent gives frequent addresses to cane-farmers on methods of cultivation, fertilising, and general treatment of cane lands. Growers requiring analyses of their soils and advice as to manuring are assisted by the Bureau.

Both Field Assistants have carried out their duties in an able and conscientious manner; and their visits and instructions to growers, particularly beginners in cane cultivation, are much appreciated. They are both carrying out good work in the interests of the industry, and it is satisfactory to know that this is acknowledged generally by growers.

In addition to instructing farmers, the Field Assistants are instructed to make observations on the following details at each farm visited; these notes are tabulated and sent to the General Superintendent every month :—Soils, crops, lime, green manures, fertilisers, drainage, irrigation, weather, ploughing, planting, cultivation, harvesting, labour, trash, ratooning, pests, and diseases, varieties of cane grown, climatic conditions, and arrowing of cane.

In pursuance of these instructions, the Field Officers have so far sent in reports upon 2,304 farms. Upon these 230 farmers have used lime, 493 have practised green manuring, and 462 have used fertilisers. The percentage of growers using lime, green manures, and fertilisers is much higher in the North than in the South.

There has been a great increase in the number of farmers using fertilisers this year.

Since the publication of the last Annual Report the General Superintendent has visited practically every district in Queensland—the more important, three or four times. District visits also comprise inspection of canefields generally, estimating probable yields, noting of cane varieties in use, their health and vigour, and the introduction of new varieties. The latter are sent out in packages and carefully packed crates from the Sugar Experiment Stations of Bundaberg, Mackay, and Innisfail. A large number of farmers' meetings have also been held in various centres at which addresses on cane cultivation and fertilising are given by the General Superintendent. These are followed by conversational discussions which are of great value in bringing out useful information. Good results invariably follow these meetings, and they enable the writer to come into touch with a large body of practical cane-growers.

It is found that a much larger interest is being taken in the sugar experimental work as its methods are brought before the farmer and discussed. There is not the slightest room for doubt

that an upward tendency towards improvement has been made in cane cultivation during the past few years, which is directly attributable to the constant advice of the Sugar Bureau in the direction of better methods of cultivation.

In addition to the above, the clerical work of the Bureau has largely increased. Farmers are being constantly invited to submit their difficulties, and they are now doing this to a very much greater extent than hitherto, either by writing direct or putting their questions to the Field Assistants for transmission. A large number of samples of soil have been analysed during the year for cane-farmers by the Agricultural Chemist and the Mackay and South Johnstone Laboratories, With each of these a letter of advice is also sent. Every possible effort is now being made to assist cane-farmers, and it is gratifying to record that the efforts made in this direction are appreciated.

The supervision of the Sugar Experiment Stations at Bundaberg, Mackay, and South Johnstone, and the initiation of new experiments upon these stations, occupy a large part of the writer's time.

Highly successful Field Days, to which allusion will be made later, were held at Bundaberg and Mackay during the year.

Brief Survey of Sugar Districts Visited.

Mossman.—One mill. This district is the most northern in the State, and contains an area of good land suitable for cane-growing. The crop this year has been a fair one, amounting to some 61,500 tons. The mill, which is a fine large factory, completed its crushing about the third week in October. They have had a very satisfactory run, and experienced good weather during the harvesting. The young cane for next season, of which there is a very large area, looks exceedingly well, and there is every promise at the present time of a good season for 1922. The directors of the mill are turning their attention to supplies of lime, and they already buy and supply quantities of fertiliser to their farmers.

Cairns.—Three mills. At Cairns the devastation by grubs has been most deplorable this year. Old growers state that such an outbreak has never been seen for years. The principal damage has been at Green Hills and around Hambledon and Mulgrave, and it has resulted in the estimates of the Hambledon and Mulgrave Mills being reduced considerably. This only shows the magnitude of the problem and the enormous losses that the unfortunate grower has to suffer in given years. Floods have also caused a good deal of damage on the Mulgrave and Babinda flats. The cane not damaged by flood or grubs is looking magnificent, and large crops comparatively will be harvested both at Hambledon and Mulgrave. At the latter place many improvements have been made in the mill, and its capacity is being largely augmented in order to deal with about 50,000 tons more cane which is expected next year due to a rearrangement of areas.

A later visit paid to this district showed that in the Gordonvale district, near Cairns, the young plant cane appeared excellent in growth, the cultivation had been exceptionally good, and all fields presented a clean attractive appearance. There has been a large area planted for next year. The crops now being treated at Mulgrave and Hambledon were lighter than estimated in the earlier parts of the year, owing to damage by grubs. Some delay was caused at Mulgrave by a cutters' strike; this, however, had ended after about three weeks' lost time at the best part of the season. Preparations for the enlargement of the crushing capacity of Mulgrave next year were going on apace. Matters generally were going smoothly at the Hambledon Mill; and here also the young plant cane for next season looked well cultivated, and clean while the area was large. The Entomological Laboratory at Meringa was inspected and the buildings and surroundings were in good order. The work is now under the charge of Mr. Edmund Jarvis, who is exceedingly busy in laying out his campaign for the ensuing grub season and also fighting the weevil borer of sugar-cane and other insect pests. At Freshwater the cane also looked particularly well; and this fine area of land should produce large crops of cane in the future.

The estimate of the crop at Babinda had also been reduced, owing to excessive rains. From the beginning of January up to the 14th October, 230 inches of rain had fallen. This had exercised a most prejudicial effect on the late-cut ratoons of last season. The heavy rainfall also caused a good deal of the other cane to fall and die Up to the time of the General Superintendent's visit towards the end of October, 86,000 tons had been crushed, and it was considered that another 44,000 tons remained to be put through. The mill authorities expect to finish before Christmas, and this will give the ratoons a far better chance of coming on for next year. The sugar output is expected to be about 13,000 tons. The fibre content at Babinda in the Badila cane is very high this year, ranging up to 15 per cent. On the whole the mill has worked very smoothly this year, and has done slightly better than last year. Owing also to the heavy rains, the plantings for next season have not been so good as last year.

Innisfail.—Three mills. The rainfall on the Johnstone River has not been so great as at Babinda, but it has been an excessive rainfall nevertheless, amounting to 180 inches. This has made the plantings for next season very late. Two strikes have occurred in this district—namely, at South Johnstone and Goondi—which have further delayed matters generally. However, both have been settled, and work is now being rapidly pushed on with. The young cane is looking well and growing rapidly. The whole district is in a most flourishing state at the present moment, and large sums of money will be circulated this year. The cane at present being harvested is cutting out well, but owing to heavy rain and high winds a good deal of it fell, and much of it rotted and was eaten by rats.

There has been a great increase in population in Innisfail recently, and accommodation and houses are very difficult to obtain. The 2-feet tramway is kept busily engaged night and day, and is paying its way. The Soldiers' Settlement at Maria Creek, which is to send its cane to the South Johnstone Mill, is now being linked up with Innisfail by rail.

A considerable improvement at this Settlement was noted since previous visits, and evidently a vigorous development policy has been carried out by the Supervisor (Mr. Martin).

The soldiers are now very busy clearing and burning off new blocks, and were taking advantage

of some fine weather to get through as much work as possible. There are at present some fifty settlers in residence, some fifteen of them having their wives with them. New men are continually arriving, and the place promises to be a very busy one in the near future. The cane seen is backward, but looks fairly healthy and very green.

In the Goondi area the principal cane grown is Badila, with some small quantities of H.Q. 426 and 7 R. 428. The demand for new varieties from the South Johnstone Experimental Station has been very keen; and a good deal of E.K. 1, E.K. 28, H. 109, Tableland Badila, Hybrid No. 1, Q. 903, Q. 813, Q. 855, and various other new canes has been supplied. At the Experimental Station the Chemist in Charge has been kept very busy supplying plants to the local centres, and also to the Herbert River, Babinda, and Cairns growers. Adjoining the Goondi area a good deal of liming has been carried out. Good quality coral sand is being sold at £3 per ton locally, whilst burnt coral lime is worth £4 per ton. A number of the Goondi farmers are manuring heavily, and quite a number of tractors are in use in this prosperous centre. Amongst these are a couple of the caterpillar type which are spoken most highly of by the owners.

The borers are very bad this year throughout the district, both plant cane and ratoons suffering. The rat pest is, of course, more apparent on low-lying river and creek banks.

At Mourilyan conditions are practically similar to Goondi. As regards a supply of lime, however, they are not so well situated as the Goondi growers, as the extra cost of it on the Mourilyan side of the river makes it very expensive to handle. With regard to manure, some 500 tons are already ordered on account of next season's crops, consisting principally of basic super., three sevens, meatworks, dried blood, and sulphate of ammonia. This is said to be the largest quantity ordered so far for one year by the Mourilyan growers.

At South Johnstone the crop to be harvested will probably fall below the earlier estimates. Rats and borers have caused considerable damage in the districts, but luckily the damage from grubs is mainly confined to the 17-Mile. Badila represents nearly 95 per cent. of the cane now growing here, but full advantage is being taken of the proximity of the Experiment Station to obtain plants from there. Not many tractors are in use in the area, but one is doing a lot of work for Mr. Sugden. This gentleman is now trying the effects of a dressing of lime earth upon one of his cane paddocks.

The areas of Japoon and Liverpool Creek have also suffered from too much wet, the cane not throwing the growth that it should. In places the trash clings very tightly to the cane, and top shoots are very noticeable. Arrowing here is also as prevalent as in the surrounding areas.

Considering the weather, it is pleasing to know that the c.c.s. of the cane is very steadily improving. A lot of ploughing and planting is being gone on with, and a large area should be got under for 1922.

Taking the Innisfail district throughout, it is a very busy one. At South Johnstone especially everything is in a very active state, and all hands are doing their best to make up for the enforced idleness of the late strike.

Herbert River.—Two mills. At the Herbert River, although the cane was not cutting out quite so well as anticipated some months ago, it was of good quality, and sugar was being rapidly produced in large quantities for shipment South. Considerably over 1,000 tons per week were being conveyed by tram to the Lucinda Jetty, the large sugar stores were filled and steamers were being loaded, the whole scene presenting one of the greatest activity. The cane was being sent in remarkably clean to the Victoria and Macknade Mills. No bad topping, adhering trash, or dirt was apparent. Owing to the large amount of rain experienced the planting of cane for next season was late, but a large area was being put under.

Disease in the shape of what is known as "gumming" was seen in many places, notably in connection with the variety known as Clark's Seedling. Grubs were also doing damage in places. Recently the Sugar Experiment Stations shipped Tableland Badila to the Farmers' Associations at Macknade and Halifax; and this had germinated excellently, and was vigorous and healthy. A variety known as H.Q. 409, distributed by the Colonial Sugar Company, has been planted out to some extent this year also.

An excellent cane-planter invented by Mr. W. J. Enticknap, of Macknade, was inspected and found to be doing fine work. It makes the drill, plants the cane, covers it, and applies fertilisers in the one operation.

The germination of some of the young cane at Macknade this year has been somewhat irregular, but, as the cane is still coming through, this may yet make a good strike. The farmers generally are alive to the importance of liming and fertilising, and large quantities of these materials have been purchased this season.

A good deal of interest is being taken here in the work of the Experimental Stations. A quantity of plants from the South Johnstone Station has been received and distributed amongst the growers. This should be of a decided benefit to them and give them an opportunity of noting how the different varieties suit local conditions. Mr. Wilkinson, the manager of Macknade, is also carrying out some very interesting experiments in connection with new cane varieties; and at present he is growing Kopi, Naremo, Oramboo, and H.Q. 409.

Regarding pests on the Herbert, Long Pocket and Hawkins Creek seem to have suffered more from grubs than other parts of the area. It will be remembered that Mr. F. S. Skinner, of Victoria, used a dressing of about 40 lb. of arsenic mixed with lime on a two-months' old crop of plant cane, running it through a manure distributor, alongside the cane and covering over with a disc cultivator. Later on he dressed the cane with 2 cwt. sulphate of ammonia to the acre. Although the paddock had been previously eaten out by grubs, the cane got well away and continued growing, and at time of writing promises to cut out a very good crop of cane, whilst adjoining blocks have suffered severely from the effects of grubs. In some paddocks borers were noticed to be doing damage, whilst "gumming" was seen in many places.

It must be emphasised most strongly that the utmost care should be taken in selecting plants for seed from any area in which the presence of

gum is noticed. If plants are cut from a healthy portion of an infected paddock, it is recommended that the plants be cut a day or so before using, kept under shelter from rains or heavy dew, and closely examined at both ends before planting, and any showing the slightest trace of gum discarded.

Lower Burdekin District.—Three mills. This district in the first four months of the year was exceptionally dry, only 15 inches of rain having fallen up to the 30th April; and many of the pumps were hard at work providing water for the cane. Although the cane was backward for the most part, it looked well and healthy. An interesting feature in this district is the introduction of windmills for the irrigation of cane. So far there are not many of these, and they are only being used on small areas. It is stated, however, that 24-ft. mills to work 18-inch pumps, giving a flow of 15,000 to 20,000 gallons per hour, are to be erected; and the work done by these mills will be watched with keen interest, as they would tend to considerably lessen the cost of the application of water.

Since the 30th April, weather conditions greatly improved, and the estimated tonnages of the different mills have been considerably increased. The mill removed from Invicta, near Bundaberg, to the Haughton River district between Townsville and Ayr is crushing for the first time this year in its new home. The cane being harvested in the Lower Burdekin district is very good, as the following returns to some of the growers will show :—

Plant H.Q. 426	18·67 c.c.s.
Plant Badila	17·40 c.c.s.
Ratoon Badila	17·20 c.c.s.
Plant S. Singapore	16·00 c.c.s.
Plant Q. 855	14·50 c.c.s.

So far the Burdekin district has not suffered from pests very much. Borers were noticed in a few places, and grubs were noticed on the south-east side of Plantation Creek.

The Inkerman Mill is now in full swing, and promises to have a better tonnage than was expected earlier; the average density is good. About 5,320 acres of plant cane will be cut this year, but so far only about 4,400 acres are planted for 1922. The Irrigation Scheme is going ahead as rapidly as possible, and its successful completion is anxiously awaited by the growers. Quite a number of new houses are being built, and, with the above scheme in full operation, Home Hill will be a very busy place.

Up the river from the mill Mr. D. Horwood has been growing several varieties obtained from the Mackay Sugar Experiment Station on an unirrigated farm. He has Q. 813, Q. 855, Badila Seedling, Hybrid No. 1, Q. 903, Q. 1121, and one or two others. This year he is cutting some of it as first ratoons, and amongst the varieties the Q. 903 stands out on its own for vigorous growth, looking remarkably well and healthy.

The Haughton Mill is crushing a good supply of cane, part of it coming from the Home Hill district. At present, with the exception of the railway cane, all the hauling is done per drays. With a tramway system in operation the cane supply would certainly be more assured. At time of visit the mill was doing fair work, but the management are confident of doing much better when all the machinery gets into smooth working order.

At the State Farm at Home Hill a section is being devoted to cane-growing, and a couple of crates of proven new varieties from the Mackay Experimental Station, and also some Tableland Badila, have been planted out. Irrigation experments will also be carried out with cane crops.

Proserpine District.—One mill. During an inspection of the Proserpine area in April, rain was falling every day during the time of inspection; and farmers were being sadly hampered in their preparatory cultivation. Due to this fact, the early planting this year was negligible. The district of Kelsey Creek had very greatly improved, and a number of new areas have been brought under cane. Some very fine crops of Badila were seen here along the creek banks. There is still a good deal of land in the Proserpine district that might profitably be put under cultivation when means of transport can be provided.

Amongst the varieties of cane grown locally H.Q. 426, Malagache, Green and Red Goru (24B and 24), Badila, Striped Singapore, D. 1135, 1900 Seedling, and Q. 813 were noticed. The latter cane has evidently come to stay, and seems to suit the district well. All the farmers here take a keen interest in any new varieties, and their Association is getting a large number of plants from the Mackay Experiment Station next month. The varieties asked for include Q. 970 and Q. 1121 amongst others. On various parts of the area some fine crops of 24B were noticed growing; 1900 Seedling was also looking well.

Regarding pests, this district has so far been fairly immune, only light traces of grubs being noticed throughout the cane areas.

Borers were noticed in several parts of the district, H.Q. 426 seeming to be paid more attention to by them than any other variety. Too much care cannot be taken in using healthy plants in connection with this pest.

Very little liming or green manuring has been carried out in this locality; the cost of the former has to a certain extent been the reason. With more liming and draining, better crops should certainly be grown.

With reference to the cane supply, when the large area of idle land adjacent to the mill's tramlines is noticed, it makes one hope that the "Drainage Scheme" now spoken of will very soon be put into effect, enabling some hundreds of acres of good quality land to be put under cultivation, and so adding much-needed tonnage to the mill and consequently to the prosperity of the district.

Mackay.—Nine mills. A comparison of the average maximum temperature at Mackay in 1919, 1920, and 1921 for the first three months of the year gives the following results :—

	1919.	1920.	1921.
January ..	90·2 ..	89·5 ..	87·1
February ..	90·0 ..	87·2 ..	84·9
March ..	91·0 ..	88·9 ..	82·7

The above show that the temperatures in 1921 for February and March were considerably lower than in either 1919 or 1920, and must have had a marked influence on the making of the cane during the best growing period. Fortunately more favourable conditions have been experienced latterly, and the estimate of sugar to be made has been raised from 50,000 tons to 57,000 tons.

New land is being brought under cultivation at Mackay, principally to the south along the new line of railway to Rockhampton. There are about 3,000 acres of fine land near Carmilla, and a good deal of this is already settled and producing cane. The Plane Creek Central Mill are putting in about 4 miles of tramway from the main line to the area in question. About twenty settlers have taken up land, and it is expected that next season about 15,000 tons of cane will be sent in to the mill. There are other good pockets of land along this line which are being brought under cane also. The opening up of these new lands and the additional cane to be supplied to the Plane Creek Mill will add largely to the prosperity of the Mackay district, and will also increase our annual sugar production.

The work at the Sugar Experiment Station at Mackay has been most successful, and heavy crops are being cut. The distribution work has also attracted considerable attention. The variety known as Q. 813, sent out from the Station a few years ago, is coming into great prominence, and large areas are being planted. The Chemist in Charge of the Mackay Station (Mr. F. Keogh) has made over 300 tests of cane juices for farmers as well as analyses of soils and fertilisers.

The opening of the train service to Mackay is attracting considerable notice to the Mackay district, and will undoubtedly prove the greatest blessing to the town and country. Many land seekers held off Mackay in the past owing to its difficult port, but now it is in railway communication with the Southern capitals this fine cane district will come into its own. The change from the discomfort so often experienced at Flat Top anchorage to the certainty of train travelling is greatly appreciated by all whose business takes them to Mackay.

Bundaberg and Gin Gin.—Five mills. In the Bundaberg district the cane looks well. The season, especially since the hurricane on 6th April, has been a very good one, and the farmers should have nothing to complain of regarding tonnage for the coming season. Although the high wind which occured at that time blew a lot of the cane down, it still continued to grow strongly, probably on account of the heavy rain at the time and subsequent good growing weather.

The different Queensland Seedlings mentioned in previous reports are expected to give splendid results. Some very fine blocks of Q. 813 are in evidence at the present time. Cane pests, such as borers and grubs, are fortunately not numerous just now. There appears to be a higher percentage of mortality amongst the cane grubs this season than previously. Borers are being greatly checked perhaps by the ravages of small ants which are swarming in the cane.

The cane has improved during recent months, and the mills were dealing with larger crops than originally anticipated. Rain, however, is now urgently required for the young cane, of which a great deal has been planted for next year. The Sugar Experiment Station has nearly completed its cutting for this year, a fine average crop having been harvested. Gin Gin is also experiencing a fairly good season.

Isis District.—Three mills. This district has every prospect of a good harvest. Farmers are paying careful attention to cultivating and the checking of weed growth. There is a general feeling of satisfaction in the district, the people considering the difficulties caused by the drought about at an end. Live stock and pasture land also look well, and unemployment is not so rife as in other centres.

Speaking generally on cane varieties and methods associated with cane culture, there is nothing outstanding to comment upon. 1900 Seedling and D. 1135 are still the staple varieties, although Q. 813 is beginning to find considerable favour amongst the growers. A row of this cane planted by Mr. F. Perski in a field of 1900 Seedling has made good growth, outstripping the Mauritius variety, notwithstanding they were both planted at the same time in the autumn of 1920.

Very little cane is grown at Booyal now, the farmers following other pursuits. The soil, however, is good; and, with the exception that light frosts occur now and again, the district is suitable for cane-growing. Varieties that have been introduced to Booyal include Badila, Goru, D. 1135, Rappoe, Black Innes, Mahona, H.Q. 426, Cheribon, and Striped Singapore. Of these, Rappoe, Striped Singapore, and D. 1135 did about the best. Heavy tonnages have been obtained at Booyal, and could be again grown, if farmers took planting up again seriously.

Dallarnil was also gone over. A little cane is at present being grown, though more is now being planted. D. 1135 is the principal variety, the farmers being satisfied that this is the best cane for the Dallarnil district. A drawback here is the distance from the mill.

Maryborough, Pialba, and Yerra.—One mill. The Maryborough district is at present in a promising condition as far as sugar-cane culture is concerned. The areas planted are not extensive, but the cane is well grown, and at present the sugar content is fairly high.

Regarding cane pests and noxious weed growth, not sufficient trouble is being caused by these for comment, although gumming is evident in places. An inspection of the various canes showed that D. 1135, 1900 Seedling, and M. 87 were probably doing better than any.

The soil needs lime and green manures. More care requires to be taken in selection of plants, and farmers should make the question of cultivating their young plant cane a more serious one, and not use heavy implements in the early processes.

There are at present some good crops in the Pialba district. The heavy rain has given the soil a thorough soaking, and this, combined with occasional bursts of warm sunshine, has caused the cane to make strong growth. Some of the plant standover cane should go 40 tons per acre, and the great bulk of the crop should average between 20 and 30 tons at the time of cutting. This does not include, however, that cane which was practically killed by the drought. There is a small acreage in the latter condition that should be ploughed out as soon as the useful cane has been cut from it.

Nothing serious with regard to insect or bacterial attack could be detected in the fields; and if farmers watch their planting operations carefully, the coming season should produce a fine crop of healthy cane. As previously mentioned, these lands want lime and green manures.

Regarding varieties, D. 1135 and 1900 Seedling are both making a fair showing. The former is the staple variety at Pialba. Such canes, however, as Q. 813, E.K.[1], E.K.[28], and 100 Bont—all recently distributed from the Experiment Station—are making good growth, and are well worth looking after. Shahjahanpur No. 10 is also a cane lately brought from Bundaberg, and has struck fairly vigorously. It has a reputation as being a frost-resister, and is worth watching. Satisfactory conditions prevail at Yerra. Most of the cane is vigorous and showing little signs of disease. Clearing of virgin land is in progress, and, generally speaking, the farmers are to be congratulated on their efforts to make the farms pay. Bad roads are still their greatest drawback, but no doubt these will be reconstructed in the near future and the agricultural country made more accessible.

Mount Bauple.—One mill. The growers at Mount Bauple are going to have a fairly good yield this crushing. In common with other areas, the good rains have pushed the crops ahead and given the ground a thorough soaking. Some of the plant standover crop looks especially well. Insect pests are well under control, with the exception of a borer attack in isolated patches.

Regarding the soil, some remarkably good crops are being produced at Bauple on the forest loams, the clearing and stumping of which are causing the farmers much hard work. These soils (*i.e.*, forest loams) have no great powers to sustain crop after crop, but they are prolific for a few years and then require green manures.

Moreton.—One mill. At Nambour the cane harvest is proceeding satisfactorily. The cane is cutting with good weight per acre, and the c.c.s. tests are well up to the average. Of the varieties that are being milled from immediately round Nambour, D. 1135, H.Q. 285, and M. 1900 Seedling are making the best showing. Other varieties grown on a lesser scale are giving satisfaction, and are Reintroduced D. 1135, Q. 813, Petit Semneville, N.G. 16, and Malabar.

The Nambour area is at present remarkably free from disease and natural enemies to the cane, with, perhaps, the exception of water rats The latter come up out of the creek, and loss on a minor scale occurs, although the farmers use every effort to check them

Up at Mapleton there is considerable activity with regard to sugar-producing. The growers here have some good land for this purpose, free from frosts with an abundant rainfall. 1900 Seedling is a variety that should do well on these altitudes. D. 1135 is at present the staple variety. The growers are recommended to try Q. 813, Reintroduced D. 1135, Q. 970, Q. 1098, E.K. 1, and Shahjahanpur No. 10. Owing to their natural characteristics, these varieties should do well upon the range.

An inspection was made while here of the Maroochy River and Coolum areas. At the latter place several energetic men are busy draining big areas that are virtually swamp, but nevertheless very rich land. If the water is successfully taken off, and there is no reason why it should not be, then some big crops of cane should result. That cane will grow on the drier lands has been demonstrated also. Mr. White, a farmer in this locality, has a very fine plant crop of D. 1135. There are also several other growers who have good plant crops to their credit.

The Maroochy River is going to yield some extra heavy crops of cane this year. Varieties such as N.G. 16, H.Q. 285, D. 1135, and Malabar are all cropping heavily, especially the latter. One crop of this cane on Mr. Fahey's place will give close to 100 tons per acre. The average yield on the river this year ought to be from 35 to 40 tons per acre. A feature noted during the inspection was the absence of disease, although in places, on N.G. 16, a fungoid parasite indicated by a red rusty spot is attacking the leaf. If this spreads, growers would do well to give this variety a rest. They can do so without hardship, as there are several other good growing canes to choose from.

Logan District.—Six mills. These are all small mills, with the exception of Mr. W. Heck's Rocky Point Mill, which is capable of dealing with about 40,000 tons of cane.

Much of the country in this fertile district is devoted to pursuits other than cane-growing, but there are still a number of farmers who grow cane, though they are not entirely dependent on it. Most of the land around Beenleigh would produce sugar, although it is not ideal, owing to the likelihood of frosts which sometimes occur with considerable severity between May and October.

However, the different varieties of cane that are being raised at present look well. Probably the best grown of these, and the most promising, is the Q. 813. One grower—Mr. Rose—has a particularly fine planting of this cane, and growers would be well advised to give it a fair trial. Other varieties such as 1900 Seedling and D. 1135 are making good headway. The soil requires lime and green manures, also, a little more drainage on the river farms would be beneficial. The cane is practically free from injurious pests.

4.—WORK OF THE NORTHERN SUGAR EXPERIMENT STATION AT SOUTH JOHNSTONE, NEAR INNISFAIL.

The piece of land used as a site for the Northern Sugar Experiment Station was selected owing to its being Crown land. It is situated at the foot of the Basilisk Range, upon the opposite side of the river from the South Johnstone Mill. The land is of poor quality, low in available phosphoric acid and lime, and, like most of the soils in the neighbourhood, contains a larger percentage of magnesia than lime.

The Chemist in Charge of this station is Mr. P. H. McWalters, a returned soldier with considerable experience both in chemistry and agriculture.

Mr. McWalters has carried out his duties, which have been of an exceptionally arduous and exacting nature, with commendable zeal, ability, and energy. This station, due to its situation is a difficult one to deal with in some respects, as all

stores and materials have to be transported across the South Johnstone River. With the linking-up of the North Coast Railway by a branch line to the South Johnstone Mill, which will run through the Experiment Station area, part of the difficulty, it is hoped, will be solved. One of the principal drawbacks at present is the getting away of cane varieties to farmers between Innisfail and Cairns, from which places numerous applications are received. This has all to be packed, sent across the South Johnstone River, conveyed by train across the North Johnstone River, and loaded into the broad gauge at Garradunga.

A commencement with Experiment Station work was made in 1919, when a number of varieties were sent to this station from Mackay and Bundaberg, as under :—

From Mackay.—Q. 1133, 1098, 1092, 855, 812A, 1121, 970, 903, 813, N.G. 24, 24A, 24B, Badila Seedling, Hybrid No. 1, Petite Senneville, Q. 695, M. 87, M. 89, N.G. 16, H.Q. 426, 458, 7 R. 428, and 8 R. 431.

From Bundaberg.—Hawaii 109, 227, 146 ; Java E.K.[1], E.K.[2], E.K.[28] ; 100 Bont, 247, H.Q. 77, Mauritius 168[04], South Africa Yuban or Uba.

Canes were also sent down from the Kairi State Farm, near Atherton, where they had been sent in 1913. During the interval they have been grown on the Tableland, in the hope that they would throw off disease and become sound, healthy canes. The varieties which came down to Innisfail were—Rose Bamboo or Rappoe, Meera, Striped Singapore, Goru, and Badila.

In addition to the planting out of these canes, experiment plots of Badila were also laid out.

A well-appointed laboratory has been installed, so that Northern farmers will be able to get soils, waters, limestones, fertilisers, and sugar-canes tested free of charge.

Meteorological.

The following notes upon weather conditions during the growing period of this year's crops have been supplied by the Chemist in Charge :—

The weather conditions for the period—September, 1920, to the end of August, 1921—were most abnormal for the Johnstone River.

In the beginning of the season—from September to December, 1920—very fine rainfalls were recorded. The plant cane and ratoons made a good commencement, and with the further rainfalls of January and February the canes had assumed a very advanced stage in growth by the beginning of March.

The excessive rainfall of 62 inches in March had a depressing effect on the rate of the cane's growth, and with the further squally weather which continued right into the winter months the cane received numerous checks which led to abnormalities in growth and, in the case of early canes of advanced stage, much tillering and throwing of aerial shoots, together with the deterioration of the fallen stalks. These unfavourable conditions not only reduced the cane tonnages considerably but also made it impossible to obtain any high sucrose content for the season.

Rainfall Registered at the Sugar Experiment Station, South Johnstone, during the Growing Period, September, 1920, to August, 1921.

September, 1920	2·90
October, 1920	3·30
November, 1920	7·12
December, 1920	6·62
January, 1921	17·44
February, 1921	22·40
March, 1921	62·09
April, 1921	18·04
May, 1921	18·96
June, 1921	12·67
July, 1921	7·11
August, 1921	4·92
Total	183·57

Experiment Work.

The experiments dealt with in the following section comprise :—

1. Continuation of fertilising experiments with a first ratoon crop (Badila).
2. Experiments in different methods of ratooning first ratoon crop (Badila).
3. Experiments with subsoiling against no subsoiling with and without mixed fertilisers.
4. Tests of different variety canes.
5. Experiments in raising Seedling canes.

1.—Fertilising Experiments with N.G. 15 or Badila—First Ratoons.

In September of 1919 a series of plots were laid out on a large scale to test the effect of fertilisers. At that time manures were very difficult to obtain, and it was not possible to lay out complete fertiliser tests. All that could be done was to make use of such fertilisers as could be then obtained.

The series consisted of fourteen plots occupying about 5½ acres. The cane used for the experiments was Badila or N.G. 15. It was planted towards the end of September, and came away well. The land had been well worked, having been ploughed four times to 12 inches deep, prior to planting. The results of the plant crop were given in last year's report, but will also be found lower down in the total crop results.

After the cutting of the plant crop, the cane was ratooned in October.

The exceptional weather experienced during the season considerably affected the experiments, and the year was not altogether favourable for arriving at the true value of fertilisers. This was due in the first place to the effects of the heavy weather of March on the cane which was very advanced in growth, and also the strong winds of a cyclonic nature that occurred in the middle of June, which considerably straddled and brought down the cane.

The rain that continued to fall during the winter months did not improve the cane, but caused much deterioration of the fallen stalks; and this reduced the sucrose contents considerably. Plots, therefore, that had responded to manures and advanced in growth were at a disadvantage, and this was further accentuated by the delay in harvesting, occasioned by the strike at the South Johnstone Mill, which took up about four weeks of the best part of the year.

In the following table the results of the analytical examination will be found :—

ANALYTICAL RESULTS OF EXPERIMENTS, WITH AND WITHOUT MANURES—N.G. 15 OR BADILA 1ST RATOONS—SEPTEMBER, 1921.

Plot Number.	Variety of Cane.	Treatment.	Age of Cane.	Date of Analysis.	Density of Juice (Brix).	% Sucrose in Juice.	% Glucose in Juice.	Purity of Juice.	% Fibre.	% Sucrose in Cane.	% C.C.S. in Cane.
1	N.G. 15 or Badila	No Manure	12 months	23 Sep.	20·2	18·81	·50	93·1	10·5	15·89	15·10
2	N.G. 15 or Badila	Holbourne Island Phosphate, containing 27·6 per cent. P_2O_5 and 34 per cent. lime. Rate, 300 lb. per acre	12 months	23 Sep.	19·4	17·73	·72	91·4	10·5	14·98	14·08
3	N.G. 15 or Badila	No Manure	12 months	23 Sep.	20·5	19·19	·43	93·6	10·5	16·21	15·45
4	N.G. 15 or Badila	Superphosphate, containing 15 per cent. P_2O_5. Rate, 550 lb. per acre	12 months	23 Sep.	19·9	18·31	·69	92·0	10·5	15·47	14·60
5	N.G. 15 or Badila	No Manure	12 months	23 Sep.	18·5	16·52	1·02	89·3	10·5	13·95	12·93
6	N.G. 15 or Badila	Sulphate of Ammonia, 200 lb. per acre	12 months	23 Sep.	18·3	16·42	·96	89·7	10·5	13·87	12·90
7	N.G. 15 or Badila	No Manure	12 months	23 Sep.	18·4	16·67	·70	90·6	10·5	14·08	13·17
8	N.G. 15 or Badila	Nitrate of Soda, 266 lb. per acre	12 months	23 Sep.	18·8	17·20	·80	91·5	10·5	14·53	13·67
9	N.G. 15 or Badila	No Manure	12 months	23 Sep.	18·6	16·56	1·13	89·0	10·5	13·99	12·95
10	N.G. 15 or Badila	Sulphate of Ammonia, 250 lb.; and Superphosphate, 550 lb. per acre	12 months	23 Sep.	19·2	17·41	·86	90·7	10·5	14·71	13·77
11	N.G. 15 or Badila	No Manure	12 months	23 Sep.	18·5	16·41	1·04	88·7	10·5	13·86	12·79
12	N.G. 15 or Badila	Holbourne Island Phosphate, 300 lb.; and Sulphate of Ammonia, 250 lb. per acre	12 months	23 Sep.	18·6	16·46	1·35	88·5	10·5	13·91	12·81
13	N.G. 15 or Badila	No Manure	12 months	23 Sep.	18·9	16·88	1·20	89·3	10·5	14·26	13·22
14	N.G. 15 or Badila	Holbourne Island Phosphate, 300 lb. per acre	12 months	23 Sep.	19·5	17·78	·78	91·2	10·5	15·01	14·10

The crop results are given below :—

CROP RESULTS OF EXPERIMENTS, WITH AND WITHOUT MANURES—N.G. 15 OR BADILA 1ST RATOON CROP—SEPTEMBER, 1921.

Plot.	Variety of Cane.	Treatment.	Age of Cane.	Yield of Cane per Acre in English Tons.	Total Yield of Sugar per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.
1	Badila ..	No Manure	12 months	37·64	6·0	5·68
2	Badila ..	Holbourne Island Phosphate, containing 27·6 per cent. Phosphoric Acid and 34 per cent. Lime, 300 lb. per acre	12 months	46·80	7·02	6·59
3	Badila ..	No Manure	12 months	45·58	7·38	7·02
4	Badila ..	Superphosphate, containing 15 per cent. Phosphoric Acid, 550 lb. per acre	12 months	46·16	7·20	6·74
5	Badila ..	No Manure	12 months	43·80	6·11	5·66
6	Badila ..	Sulphate Ammonia, 200 lb. per acre	12 months	44·55	6·18	5·74
7	Badila ..	No Manure	12 months	42·00	5·91	5·53
8	Badila ..	Nitrate of Soda, 266 lb. per acre	12 months	45·19	6·57	6·18
9	Badila ..	No Manure	12 months	41·71	5·83	5·40
10	Badila ..	Sulphate of Ammonia, 250 lb.; and Superphosphate, 550 lb. per acre	12 months	42·80	6·33	5·89
11	Badila ..	No Manure	12 months	46·80	6·48	5·98
12	Badila ..	Holbourne Island Phosphate, 300 lb. per acre; and Sulphate of Ammonia, 250 lb. per acre	12 months	41·3	5·74	5·29
13	Badila ..	No Manure	12 months	40·1	5·72	5·30
14	Badila ..	Holbourne Island Phosphate, 300 lb. per acre..	12 months	46·1	6·91	6·50

From the above it will be noticed that the application of Holbourne Island phosphate has again given a high yield, as it did on the plant crop in comparison with its companion unmanured plot. The increase for the different fertilisers is as follows :—

Plot 1.—No manure ..	Increase for manures— 9·16 tons of cane per acre	
,, 2.—300 lb. Holbourne Island Phosphate per acre		
.. 3. No manure ..	Increase for manures ·58 tons of cane per acre	
.. 4.—550 lb. Superphosphate per acre		
.. 5.—No manure ..	Increase for manures— ·75 tons of cane per acre	
.. 6. 200 lb. Sulphate of Ammonia per acre		
.. 7.—No manure ..	Increase for manures— 3·19 tons of cane per acre	
,, 8.—Nitrate of Soda, 266 lb. per acre		
.. 9.—No manure ..	Increase for manures 1·09 tons of cane per acre	
.. 10.—Sulphate of Ammonia, 250 lb.; and Superphosphate, 550 lb. per acre		
,, 11.—No manure ..	Decrease for manures— 5·5 tons of cane per cane	
.. 12.—Holbourne Island phosphate, 300 lb.; and Sulphate of Ammonia, 250 lb. per acre		
.. 13.—No manure ..	Increase for manures— 6 tons per acre	
.. 14.—Holbourne Island Phosphate, 300 lb. acre		

NOTE.—The amounts of phosphoric acid in Holbourne Island fertiliser and superphosphate and nitrogen in nitrate of soda and sulphate of ammonia were calculated to equivalents in the amounts applied.

The highest increase is in Plot 2 with Holbourne Island phosphate over Plot 1 no manure. In explanation of this, however, it has to be remembered that Plot 1 is poorer in quality than either Plots 2 or 3, being nearer the Basilisk Mountain. Therefore Plot 2 should be compared with the average of Plots 1 and 3, which is done below.

Plots 3 and 4 and Plots 5 and 6 show a very small increase for the use of fertilisers. In explanation of the remarkable difference between Plot 11 no manure and Plot 12 manured, where an actual decrease took place in using manure, even though a portion of the manure was Holbourne Island phosphate, it may be said that Plot 12 grew very rapidly after the application of the manures and was the first to come down after the heavy rains and wind. This plot contained a lot of dead cane, and was badly eaten by rats. Plots 7 and 8 show an increase for the use of nitrate of soda. In Plots 9 and 10 the resulting increase is small, while in Plots 13 and 14 the Holbourne Island phosphate again shows up remarkably well. The free lime in this manure and its lower solubility evidently were strong points.

In making a comparison between the manured and the unmanured plots perhaps fairer figures may be obtained by comparing three plots—*i.e.*, the manured plot and the average of the unmanured plots on each side—as under :—

No Manure.	Manure.	No Manure.	Average Increase.
Plots 1	2	3	5·19
,, 3	4	5	1·52
,, 5	6	7	1·65
,, 7	8	9	3·34
,, 9	10	11	*1·45
,, 11	12	13	*2·10
.. 13	14	..	6·0

* Decrease.

This still gives the Holbourne Island fertiliser the leading position in both the first and last series, with nitrate of soda in Plot 8 coming second. The Holbourne Island fertiliser was of high quality containing 27·6 per cent. phosphoric acid, and was also rich in lime.

The crop results to date of this experiment will be found in the table hereunder :—

CROP RESULTS TO DATE OF EXPERIMENTS WITH AND WITHOUT MANURES—N.G. 15 OR BADILA—1920, 1921—BOTH CROPS 12 MONTHS OLD.

Plot Number.	Variety of Cane.	Treatment.	Plant Crop 1920.		First Ratoon Crop, 1921.	
			Yield of Cane per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.	Yield of Cane per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.
1	Badila ..	No Manure	27·68	4·13	37·64	5·62
2	Badila ..	Holbourne Island Phosphate, containing 27·6 per cent. Phosphoric Acid and 34 per cent. Lime, 300 lb. per acre	32·51	4·76	46·80	6·59
3	Badila ..	No Manure	31·26	4·59	45·58	7·02
4	Badila ..	Superphosphate, containing 15 per cent. Phosphoric Acid, 550 lb. per acre	33·24	4·81	46·16	6·74
5	Badila ..	No Manure	32·28	4·61	43·8	5·66
6	Badila ..	Sulphate of Ammonia, 200 lb. per acre	33·37	4·76	44·55	5·74
7	Badila ..	No Manure	33·63	4·47	42·00	5·53
8	Badila ..	Nitrate of Soda, 266 lb. per acre	35·23	4·74	45·19	6·18
9	Badila ..	No Manure	35·00	4·47	41·71	5·40
10	Badila ..	Sulphate of Ammonia, 250 lb.; and Superphosphate, 550 lb. per acre	39·73	5·06	42·80	5·89
11	Badila ..	No Manure	39·54	5·36	46·80	5·98
12	Badila ..	Holbourne Island Phosphate, 300 lb. per acre; and Sulphate of Ammonia, 250 lb. per acre	42·80	5·97	41·30	5·29
13	Badila ..	No Manure	40·76	5·08	40·10	5·30
14	Badila ..	Holbourne Island Phosphate, 300 lb. per acre ..	41·81	5·83	46·10	6·50

Taking the comparisons between the plots again, we find the average increases for manures in the two crops to be :—

No Manure.	Manure.	No Manure.	Average Increase in Plant and First Ratoon Crops.
Plots 1	2	3	4·11
,, 3	4	5	1·49
,, 5	6	7	1·03
,, 7	8	9	2·13
,, 9	10	11	1·01
,, 11	12	13	·55
,, 13	14	..	3·52

On comparing the table of crop results, it will be noticed that in spite of all drawbacks the first ratoon crop gave a heavier yield than the plant crop, although both crops were the same age.

From the analytical table it will be seen that the commercial cane sugar content varied a good deal.

The cost of the fertilisers and their application was as under :—

£	s.	d.		£	s.	d.	
Plot 2—1	14	8	per acre	Plot 10—5	15	3	per acre
,, 4—3	0	7	,,	,, 12—4	12	7	,,
,, 6—2	10	3	,,	,, 14—1	14	8	,,
,, 8—2	7	0	,,				

The conclusion to be drawn from the above experiment must not be deduced too hastily. At present it looks as if artificial fertilisers may be too soluble in the heavy rainfalls of Innisfail to be of the greatest value.

The experiment will be continued in a second ratoon crop.

2.—Experiments in Different Methods of Ratooning.

In 1919 a large area of Badila was planted for revenue purposes. On the harvesting of the plant crop, the methods of treatment of the ratoons were as under :—

Plot 1.—Cane allowed to volunteer through trash.

Plot 2.—Trash rolled into alternate interspaces, and every other interspace cultivated.

Plot 3.—Trash burnt, interspaces cultivated by ploughing four furrows.

Plot 4.—Trash burnt, interspaces cultivated by ploughing four furrows and subsoiling each furrow.

Plot 5.—Trash burnt, interspaces cultivated with disc harrow only.

Plot 6.—Trash burnt, interspaces cultivated by ploughing four furrows. Fertilisers applied as follows:—Sulphate of ammonia, 100 lb.; nitrate of soda, 100 lb.; muriate of potash, 100 lb.; and superphosphate, 200 lb. per acre.

The following table provides the analytical data, which in this case are fairly uniform :—

Analytical Results of Experiments in Different Methods of Ratooning First Ratoons Badila — October, 1921.

Plot Number.	Variety of Cane.	Treatment.	Age of Cane.	Date of Analysis.	Total Solids. (Brix.)	% Sucrose in Juice.	Purity of Juice.	% Fibre.	% Sucrose in Cane.	% Commercial Cane Sugar in Cane.
1	N.G. 15 or Badila	Cane volunteered through trash	12 months	12 Oct.	18·00	16·01	88·9	10·5	13·52	12·50
2	N.G. 15 or Badila	Trash rolled into alternate interspaces, and every other interspace cultivated	12 months	12 Oct.	17·85	15·60	87·4	10·5	13·18	12·05
3	N.G. 15 or Badila	Trash burnt, interspaces cultivated by ploughing four furrows	12 months	12 Oct.	18·20	16·31	89·6	10·5	13·78	12·80
4	N.G. 15 or Badila	Trash burnt, interspaces cultivated by ploughing four furrows and subsoiling	12 months	12 Oct.	17·95	15·96	88·9	10·5	13·48	12·46
5	N.G. 15 or Badila	Trash burnt, ratooned with disc harrow only	12 months	12 Oct.	18·40	16·60	90·2	10·5	14·03	13·08
6	N.G. 15 or Badila	Trash burnt, interspaces cultivated by ploughing four furrows. Fertilisers applied—Sulphate of Ammonia, 100 lb.; Nitrate of Soda, 100 lb.; Muriate of Potash, 100 lb.; and Superphosphate, 200 lb. per acre	12 months	12 Oct.	19·20	17·59	91·6	10·5	14·86	13·99

The table below gives the crop results :—

CROP RESULTS OF EXPERIMENTS IN DIFFERENT METHODS OF RATOONING—FIRST RATOONS BADILA—OCTOBER, 1921.

Plot Number.	Variety of Cane.	Treatment.	Age of Cane.	Yield of Cane per Acre in English Tons.	Total Yield of Sugar per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.
1	N.G. 15 or Badila	Cane volunteered through trash	12 months	40·6	5·48	5·07
2	N.G. 15 or Badila	Trash rolled into alternate interspaces, and every other interspace cultivated	12 months	37·3	4·91	4·48
3	N.G. 15 or Badila	Trash burnt, interspaces cultivated by ploughing four furrows	12 months	41·2	5·68	5·27
4	N.G. 15 or Badila	Trash burnt, interspaces cultivated by ploughing four furrows and subsoiling	12 months	43·3	5·84	5·39
5	N.G. 15 or Badila	Trash burnt, ratooned with disc harrow only	12 months	42·7	5·98	5·58
6	N.G. 15 or Badila	Trash burnt, interspaces cultivated by ploughing four furrows. Fertiliser applied as follows :—Sulphate of Ammonia, 100 lb. ; Nitrate of Soda, 100 lb. ; Muriate of Potash, 100 lb. ; Superphosphate, 200 lb. per acre	12 months	44·8	6·65	6·27

The remarks prefaced to the fertilising experiments and the consequences of heavy rains and winds apply to this experiment also. Plot 6, to which a light mixed fertiliser was applied, has given the heaviest results—viz., 44·8 tons of cane and 6·27 tons of c.c.s. per acre. This is followed by the subsoiled plot which reached 43·3 tons of cane and 5·39 tons of sugar per acre. Contrary to expectation, the volunteer plot gave a heavier yield than where every alternate interspace was cultivated; while the ratooning with the disc harrow gave better results than where the plough was used on Plot 3. This experiment will also be continued into a second ratoon crop.

3.—EXPERIMENTS TO DETERMINE THE VALUE OF SUBSOILING WITH AND WITHOUT MIXED FERTILISER.

The following table comprises the analytical results of the above experiment :—

ANALYTICAL RESULTS OF EXPERIMENTS TO DETERMINE THE VALUE OF SUBSOILING—PLANT CANE BADILA—OCTOBER, 1921.

Plot Number.	Variety of Cane.	Treatment.	Date of Analysis.	Age of Cane.	Total Solids. (Brix.)	% Sugar in Juice.	Quotient of Purity.	% Fibre.	% Sucrose in Juice.	% C.C.S. in Juice.
1	Badila ..	Plant crop subsoiled, and succeeding ratoon crops will also be subsoiled. No fertilisers	18 Oct.	13 months	18·50	16·70	90·2	10·0	14·19	13·24
2	Badila ..	Plant crop not subsoiled. No fertiliser	17 Oct.	13 months	19·48	18·04	92·6	10·0	15·33	14·52
3	Badila ..	Fertilised by Ammonia Sulphate 1, Soda Nitrate 1, Potash Muriate 1, Superphosphate 2—500 lb. per acre. Plant crop subsoiled, and succeeding crops will also be subsoiled	18 Oct.	13 months	18·80	17·20	91·48	10·0	14·62	13·75
4	Badila ..	Ploughed to 12 inches. Fertilised by Ammonia Sulphate 1, Soda Nitrate 1, Potash Muriate 1, Superphosphate 2—500 lb. per acre	17 Oct.	13 months	17·83	16·26	91·19	10·0	13·82	12·90

The results of subsoiling at the Mackay Station have uniformly proved profitable and successful. It was, therefore, determined to lay down subsoiled plots versus no subsoiling with and without manure. The opinion was expressed by old farmers in the Innisfail district that, owing to the large quantity of rain falling during the year and the porous nature of the soil, subsoiling would not be found of any great advantage. Judging from the results shown hereunder of the plant crop, this verdict appears to be supported, as it will be seen that the unsubsoiled plot without fertilisers yielded practically 2 tons per acre more cane than where the subsoiler was used. It may be said however that the unsubsoiled plots were ploughed very deep—*i.e.*, to 12 inches. In the subsoiled and unsubsoiled plots with fertilisers the difference is not so marked.

CROP RESULTS OF EXPERIMENTS TO DETERMINE THE VALUE OF SUBSOILING—PLANT CANE BADILA—OCTOBER, 1921.

Plot Number.	Variety of Cane.	Treatment.	Age of Cane.	Yield of Cane per Acre in English Tons.	Total Yield of Sugar per Acre.	Yield of Commercial Cane Sugar per Acre.
1	Badila ..	Plant crop subsoiled, succeeding ratoon crops will also be subsoiled. No fertilisers	13 months	47·76	6·77	6·32
2	Badila ..	Plant crop not subsoiled. No fertiliser ..	13 months	49·74	7·63	7·22
3	Badila ..	Plant crop subsoiled and fertilisers applied as follows :—Sulphate of Ammonia, 1 cwt. ; Nitrate of Soda, 1 cwt. ; Muriate of Potash, 1 cwt. ; and Superphosphate, 2 cwt.	13 months	56·38	8·24	7·75
4	Badila ..	Plant crop not subsoiled, but fertilisers applied in same manner as Plot 3	13 months	56·60	7·82	7·30

Remarks on the Crop Results—Season 1921.

In comparing this season's return with last year's results, the first ratoons in the fertilising experiment show an improvement of over 6 tons per acre as compared with the previous plant crop. This figure would have been much better but for the high percentage of fallen cane that had deteriorated through the delay in harvesting.

The thirteen months' plant cane gave a yield of 52·6 tons per acre. This crop did not suffer during the March squally weather, owing to its slower growth up to that period as compared with the ratoons.

It may be mentioned that the season, owing to the continual rain, was not favourable for regular cultivation of the cane. It is expected that the average crop returns in the South Johnstone area will run about 20 to 21 tons per acre.

Regarding the Badila cane, this variety still maintains a healthy appearance, but a considerable falling off in its vitality was noticeable on the poorer soils.

Pests.—The borer was very prevalent this year in the Badila cane, but did little damage to the other varieties. An influx of rats occurred, but the laying of strychnine baits controlled their ravages.

The Linear Bug has increased tremendously this year on the station, and it is impossible to determine the extent of damage by this pest.

4.—ANALYTICAL TESTS OF DIFFERENT VARIETY CANES CARRIED OUT FROM JUNE TO SEPTEMBER.

In order to have a record of how the various canes upon the station mature, the following series of analyses were made :—

PRELIMINARY EXAMINATION OF VARIETY CANES—1ST JUNE, 1921. NORTHERN SUGAR EXPERIMENT STATION.

Name.	Age.	Brix. of Juice.	% Sugar in Juice.	Quotient.	Glucose.	C.C.S. in Cane.
Tableland Badila	10 months	13·75	9·92	72·14	2·23	6·66
Tableland Goru	10 months	15·35	12·45	81·10	1·36	9·20
Tableland R. Bamboo	10 months	14·95	12·38	82·8	1·36	9·28
Tableland S. Singapore	10 months	16·23	14·22	87·6	1·23	11·07
Tableland Meera	10 months	17·55	15·99	91·1	·42	12·75
Q. 1133	10 months	15·50	12·54	80·9	1·85	9·22
Q. 1098	10 months	13·83	9·73	70·3	2·46	6·39
Q. 1121	10 months	8·20	3·58	43·6	3·45	1·00
Q. 1092	10 months	13·33	8·45	63·4	3·45	4·98
Q. 970	10 months	17·90	14·84	82·9	1·83	11·13
Q. 903	10 months	17·03	14·12	82·9	1·76	10·59
Q. 855	10 months	15·91	12·96	81·4	1·77	9·60
Q. 813	10 months	17·60	15·35	87·2	·62	11·91
Q. 812A	10 months	15·20	11·88	78·1	1·76	8·53
Q. 695	10 months	14·12	10·40	73·6	2·27	7·12
Shahjahanpur	10 months	15·85	13·50	85·1	·52	10·32
M. 168[94]	10 months	14·45	11·07	76·6	1·76	7·83
Petite Senneville	10 months	12·19	8·35	69·0	2·38	5·38
M. 89	10 months	14·85	10·91	73·4	2·28	7·45
M. 87	10 months	13·92	9·72	62·6	3·22	6·34
N.G. 24B	10 months	14·93	11·39	76·3	2·65	8·03
N.G. 24A	10 months	14·67	10·82	73·7	2·60	7·41
N.G. 24	10 months	14·40	10·38	72·1	2·72	6·97
N.G. 16	10 months	14·00	10·29	73·5	2·11	7·03
S R. 431	10 months	14·26	11·18	78·4	1·66	8·05
H.Q. 426	10 months	16·53	13·71	82·9	1·50	10·39
H.Q. 77	10 months	15·33	12·75	83·1	1·34	9·49
7 R. 428	10 months	15·56	12·25	78·7	2·36	8·81
H.Q. 458	10 months	15·66	12·35	79·1	2·15	8·96
Hybrid No. 1	10 months	14·35	10·99	76·5	2·08	7·77
Badila Seedling	10 months	14·70	10·97	74·5	2·12	7·58
H. 227	10 months	14·70	11·25	76·5	1·60	7·95
H. 146	10 months	14·80	12·58	85·0	1·04	9·60
H. 109	10 months	14·85	11·85	79·8	2·12	8·65
J. 247	10 months	13·23	9·69	73·6	2·50	6·59
E.K. 1	10 months	12·20	7·99	65·5	2·72	4·88
E.K. 2	10 months	12·65	9·02	71·3	2·65	6·00
E.K. 28	10 months	16·50	13·57	82·2	1·92	10·12
100 Rent	10 months	12·70	8·47	66·7	2·69	5·27
Improved Forage	10 months	15·30	11·71	76·5	..	..
Ube	10 months	14·55	11·66	80·1	..	..

FIRST PROGRESSIVE ANALYSIS, VARIETY PLANT CANES—1ST JULY, 1921. NORTHERN SUGAR EXPERIMENT STATION.

Name.	Age.	Brix. of Juice.	% Sugar in Juice.	Quotient.	% Glucose.	C.C.S. in Cane.
Tableland Badila	11 months	16·10	13·01	80·8	1·98	9·58
Tableland Goru	11 months	15·70	12·88	82·0	2·21	9·59
Tableland R. Bamboo	11 months	14·10	11·00	78·0	2·35	7·89
Tableland S. Singapore	11 months	16·50	14·20	86·1	1·16	10·03
Tableland Meera	11 months	16·83	15·16	90·1	·76	12·01
Q. 1133	11 months	14·00	9·91	70·8	2·90	6·54
Q. 1121	11 months	13·23	9·84	74·4	2·19	6·79
Q. 1098	11 months	14·80	11·11	75·1	2·10	7·72
Q. 1092	11 months	13·03	8·26	63·3	3·40	4·87
Q. 970	11 months	17·50	14·68	83·9	1·58	10·98
Q. 903	11 months	16·22	13·24	81·6	2·62	9·82
Q. 855	11 months	17·10	14·89	87·1	1·70	11·56
Q. 813	11 months	18·81	16·73	88·9	1·33	13·14
Q. 812A	11 months	17·28	15·23	88·1	1·28	11·90
Q. 695	11 months	14·55	11·07	76·1	2·67	7·79
Shahjahanpur	11 months	14·83	12·93	87·2	·52	10·03
M. 168[94]	11 months	15·22	12·12	79·6	2·22	8·83
Petite Sonneville	11 months	14·62	11·56	79·0	2·38	8·38
M. 89	11 months	14·30	9·76	68·2	3·45	6·25
M. 87	11 months	15·05	11·15	74·8	2·98	7·67
N.G. 24B	11 months	16·93	14·37	84·9	1·88	10·96
N.G. 24A	11 months	15·15	12·51	82·5	1·82	9·36
N.G. 24	11 months	16·30	13·58	83·3	1·45	10·22
N.G. 16	11 months	15·10	12·12	80·8	1·96	8·88
8 R. 431	11 months	12·13	8·59	70·8	1·75	5·72
H.Q. 77	11 months	15·15	12·81	84·5	1·30	9·74
7 R. 428	11 months	16·52	13·66	82·7	2·12	10·23
H.Q. 426	11 months	18·20	16·05	88·2	1·09	12·54
H.Q. 458	11 months	15·70	12·58	80·1	2·26	9·21
Hybrid No. 1	11 months	16·00	13·88	86·7	1·00	10·71
Badila Seedling	11 months	16·00	13·98	81·7	1·66	9·72
H. 227	11 months	15·45	12·79	82·7	1·23	9·59
H. 146	11 months	16·00	14·12	88·2	·60	11·04
H. 109	11 months	15·70	13·05	83·1	1·45	9·82
J. 247	11 months	13·00	9·11	70·1	2·21	5·95
E.K. 1	11 months	13·80	10·16	72·6	2·18	6·95
E.K. 2	11 months	13·50	9·84	72·9	3·08	6·47
E.K. 28	11 months	16·46	13·71	83·3	1·61	10·31
100 Bont	11 months	13·60	9·38	68·9	2·79	6·04

SECOND PROGRESSIVE ANALYSIS, VARIETY PLANT CANES—1ST AUGUST, 1921.

Name.	Age.	Brix. of Juice.	% Sugar in Juice.	Quotient.	C.C.S. in Cane.
Tableland Badila	12 months	19·15	17·33	90·49	12·77
Tableland Goru	12 months	17·00	14·66	86·23	11·30
Tableland R. Bamboo	12 months	15·45	13·54	88·2	10·39
Tableland S. Singapore	12 months	18·20	16·91	92·9	13·64
Tableland Meera	12 months	16·55	15·03	90·8	11·96
Q. 1133	12 months	16·50	13·76	83·4	10·37
Q. 1121	12 months	14·45	11·42	79·0	8·28
Q. 1098	12 months	16·85	14·23	84·4	10·81
Q. 970	12 months	18·93	16·67	88·06	13·03
Q. 903	12 months	19·40	17·83	91·9	14·30
Q. 855	12 months	18·26	16·62	91·0	13·24
Q. 813	12 months	20·27	19·07	94·1	15·49
Q. 812A	12 months	19·63	18·08	92·1	14·51
Q. 695	12 months	17·28	14·52	83·5	10·96
Shahjahanpur	12 months	17·25	15·97	92·5	12·86
M. 168[94]	12 months	14·73	11·55	78·4	8·32
Q. 1092	12 months	15·70	13·46	85·6	9·90
Petite Sonneville	12 months	14·45	11·32	84·9	8·80
M. 89	12 months	15·65	12·05	77·1	8·57
M. 87	12 months	17·60	15·16	86·1	11·66
N.G. 24B	12 months	17·70	16·45	92·9	13·28
N.G. 24A	12 months	17·63	16·08	91·2	12·83
N.G. 24	12 months	17·72	15·07	90·7	12·78
N.G. 16	12 months	16·37	13·71	83·7	10·36
8 R. 431	12 months	16·85	14·72	87·3	11·44
H.Q. 426	12 months	19·67	18·28	92·8	14·72
H.Q. 77	12 months	15·80	14·36	88·4	11·64
7 R. 428	12 months	15·90	14·42	85·8	11·07
H.Q. 458	12 months	18·40	16·52	89·8	13·05
Hybrid No. 1	12 months	17·00	15·74	92·6	12·65
Badila Seedling	12 months	16·44	14·26	86·3	10·95
H. 227	12 months	16·10	13·73	85·2	10·50
H. 146	12 months	17·16	15·72	91·6	12·57
H. 109	12 months	16·76	14·72	87·8	11·47
J. 247	12 months	16·30	13·82	84·7	10·53
E.K. 1	12 months	16·00	13·35	82·8	9·93
E.K. 2	12 months	14·80	13·05	80·0	8·67
E.K. 28	12 months	19·40	17·60	90·7	14·00
100 Bont	12 months	14·84	11·35	76·4	8·01

FINAL ANALYSIS OF VARIETY CANES, 20TH SEPTEMBER, 1921. NORTHERN SUGAR EXPERIMENT STATION.

Name.	Age.	Brix. of Juice.	% Sugar in Juice.	Quotient.	% Glucose.	% Sugar in Cane.	% C.C.S. in Cane.	% Fibre.
Tableland Badila	13 months	18·15	16·53	91·07	·88	14·13	13·26	9·5
Tableland Goru	13 months	19·40	18·33	94·4	·51	15·40	14·76	11·0
Tableland R. Bamboo	13 months	18·40	17·59	95·6	·20	14·86	14·33	10·5
Tableland S. Singapore	13 months	19·15	18·39	96·0	·19	15·54	15·03	10·5
Tableland Meera	13 months	19·20	18·46	96·1	·14	15·54	15·04	10·8
Q. 695	13 months	17·00	15·10	98·8	1·66	12·83	11·85	10·9
Q. 812A	13 months	20·40	19·58	95·9	·21	16·35	15·79	11·5
Q. 813	13 months	19·60	18·70	95·4	·22	15·61	15·04	11·5
Q. 855	13 months	20·1	19·08	94·9	·20	15·84	15·22	12·0
Q. 903	13 months	19·47	18·42	94·6	·52	15·62	14·93	10·2
Q. 970	13 months	19·44	17·69	90·9	·45	14·98	14·05	10·3
Q. 1092	13 months	16·60	13·25	82·8	2·20	11·26	9·93	10·0
Q. 1098	13 months	18·63	17·32	92·9	·90	14·54	13·80	11·0
Q. 1121	13 months	16·50	15·23	92·3	·83	12·91	12·21	10·2
Q. 1133	13 months	17·86	15·78	88·15	1·30	13·25	12·18	11·0
Shahjahanpur	13 months	16·10	14·36	89·1	·90	11·33	10·49	16·1
M. 87	13 months	18·60	16·64	89·4	1·10	14·14	13·12	39·0
M. 89	13 months	16·00	13·01	81·3	1·50	11·06	9·63	10·0
M. 168[01]	13 months	16·20	14·22	87·7	1·28	11·94	10·95	11·9
8 R. 431	13 months	13·70	10·90	79·5	0·76	9·42	8·08	8·6
7 R. 428	13 months	17·90	15·83	88·7	1·16	13·54	12·50	9·7
H.Q. 77	13 months	16·68	15·56	93·8	·48	13·22	12·93	10·6
H.Q. 458	13 months	18·45	16·70	90·5	·79	14·14	13·22	10·35
H.Q. 426	13 months	20·74	19·85	95·7	·15	16·87	16·29	10·0
Petite Senneville	13 months	17·40	14·15	81·3	1·38	11·81	10·28	14·5
Hybrid No. 1	13 months	17·44	16·62	95·3	·30	14·21	13·69	9·5
Badila Seedling	13 months	19·00	17·69	93·1	·80	15·12	14·37	9·5
H. 109	13 months	18·00	16·49	91·6	·60	13·88	13·07	10·8
H. 146	13 months	18·35	17·54	95·5	·25	15·12	14·37	10·35
H. 227	13 months	17·74	15·84	89·2	·24	13·03	12·07	12·70
E.K. 1	13 months	16·80	15·21	90·5	1·00	12·99	12·06	10·2
E.K. 2	13 months	15·73	13·60	86·4	1·40	11·49	9·99	10·7
E.K. 28	13 months	18·85	17·68	93·7	·56	14·97	14·29	10·3
100 Bont	13 months	16·87	14·76	87·4	1·06	12·25	11·21	12·65
N.G. 16	13 months	16·75	14·76	88·1	1·20	12·54	11·58	10·9
N.G. 24	13 months	18·25	17·01	93·2	·60	14·29	13·59	11·6
N.G. 24A	13 months	18·43	17·44	94·5	·30	14·64	14·00	11·6
N.G. 24B	13 months	17·80	15·50	92·7	·62	13·89	13·14	11·0
J. 247	13 months	16·02	13·69	85·4	1·20	11·48	10·34	11·1
Obo Badila	13 months	20·00	19·09	95·45	·22	16·05	15·47	10·9
B. 6450	13 months	15·73	14·82	94·2	·40	12·48	11·95	10·8
B. 4596	13 months	15·50	13·42	86·6	1·80	11·40	10·37	10·1
B. 4639	13 months	18·80	17 88	95·1	·29	15·10	14·52	10·5
D. 109	13 months	18·20	1 50	87·3	1·46	13·37	12·27	10·9

The Chemist in Charge has sent in the following report upon the above varieties :—

Report on Variety Canes—Season 1921.

Due to the extraordinary weather and excessive rain during the season, many of the varieties slightly changed their habits, and the canes on the whole did not develop so well in growth as in the previous year.

The Queensland Seedlings all made rapid growth, but were too advanced to withstand the cyclonic weather of the 13th March. These canes, however, although considerably straddled and lying prone at so early a period, gave a return when harvested in September of 40 tons per acre.

The canes Q. 812A, Q. 813, Q. 855, and Q. 903 give the best return in weight and sucrose content. The Q. 855 cane has an erect habit, but the stooling is on the light side; however, it gives a fairly good yield. In the early periods of growth the Q. 855 had the appearance of being affected by a root disease, but it ultimately recovered and developed a healthy foliage and stalk. A remarkable change of the Q. 855 is shown in the analysis where 2 per cent. more c.c.s. has been obtained this year under adverse conditions as compared with the previous year.

The Mauritius canes M. 87, M. 89, M. 168[01], and Petite Senneville, although making heavy growth, yield low in sugar contents, and all have unfavourable habits of throwing a high percentage of aerial shoots long before maturity.

The cane H.Q 426 made a good strike and fine growth up to a three-months' plant, but formed trash early and gave a poor return.

The canes H.Q 458 and H.Q. 77 made good growth, but stooling is on the light side. Both these canes have peculiarities of the leaf, and are of minor value in so far as sucrose yield is concerned.

The cane 8 R. 431 made no headway and died out. The 7 R. 428 gave a fair yield, but owing to the excessive rain this cane did not develop so well as in the previous year. This cane has an erect habit, stooling well.

Respecting the Hawaiian canes, the H. 109 is the best stooler, but was inferior in density this season as compared with the H. 146. This was probably due to the unseasonable weather. The H. 109 matured early and arrowed abundantly, whereas the H. 146 only arrowed very sparsely. The H. 109 showed no trace of disease in the plant cane, but a couple of stools in the first ratoons were stunted and a fungus was noted on the leaf sheath. This cane will have to be watched carefully.

The three Java canes E.K.[1], E.K.[2], and E.K.[28] made rapid and heavy growth. The E.K.[1]

is the most vigorous cane, but lodges considerably. The E.K.[28] is an early maturing cane of good density, the stools being medium to good, slightly recumbent in habit. The E.K.[2] is a fine erect stooler, and though of inferior density gives a good yield of cane. This cane ratooned well, although an excess of aerial shoots developed early.

The Badila Seedling did not show any improvement on the local Badila.

The Hybrid No. 1, although inferior in density as compared to Badila, gave a good yield. This cane was little affected by borer or rats, whereas Badila in the same plot was considerably damaged by these pests.

Obo Badila made good growth, and, although showing a darker colouration of the rind, varied little from the local Badila.

The West Indian canes B. 4030, B. 4596, B. 6450, and also D. 109, all made good growth. The B. 4030 was the most superior in yield.

The Shahjahanpur No. 10 grows well, but yields spindly canes, and would have little commercial value in our district.

The M.Q. Seedlings—viz., 2, 3, 4, 5, 6, and 7—which were planted in August, 1920, germinated well, and, with the exception of M.Q. 6, all made good growth.

DATES OF ARROWING OF CANES, 1921. NORTHERN SUGAR EXPERIMENT STATION.

Uba	29th April
Shahjahanpur	1st May
Improved Forage	1st May
H.Q. 77	3rd May
M. 87	5th May
M. 89	5th May
M.Q. 3	5th May
M.Q. 7	7th May
7 R. 428	8th May
Petite Senneville	8th May
M.Q. 4	9th May
B. 4030	10th May
Q. 1121	10th May
Q. 1133	10th May
Tableland S. Singapore	11th May
Q. 903	11th May
Q. 970	11th May
M.Q. 6	11th May
Q. 1092	12th May
Q. 1098	12th May
Q. 855	12th May
M.Q. 5	12th May
B. 4596	13th May
B. 6450	13th May
M.Q. 2	14th May
M. 1688	14th May
E.K.[28]	14th May
N.G. 16	23th May
B. 109	1st June
H. 227	1st June
H. 146	2nd June
D. 109	3rd June
J. 247	7th June
N.G. 24	9th June
N.G. 24B	10th June
N.G. 24A	12th June
812A	14th June
Q. 813	13th June
Q. 695	15th June

Not Arrowed.

E. K. 1	H.Q. 426
E.K.[2]	H.Q. 448
Hybrid No. 1	S.R. 437.
Badila Seedling	

5.—EXPERIMENTS IN RAISING SEEDLING CANES.

It was determined this year to endeavour to raise new Seedling canes at the South Johnstone Sugar Experiment Station. Previous attempts that were made at the Mackay Experiment Station over a series of years and at the Kamerunga State Nursery ended in failure. With the favourable environment at South Johnstone, it was considered that success might be obtained. Accordingly earlier in the present year Mr. McWalters was advised by the General Superintendent to commence work as soon as the arrows were sufficiently mature. Full instructions were sent, based on the experience of the Colonial Sugar Refining Company, who raised a large number of Seedlings at Hambledon many years ago, and who in 1905 kindly supplied the writer of this report with their methods.

Proper soil and boxes were prepared, and as soon as the arrows became "fluffy" they were sown separately. The Chemist in Charge supplied the following notes upon the work:—

Due to the early arrowing of canes, a commencement was made in the raising of Seedlings in the latter part of June and early in July.

The season was not very favourable for the collection of seed, due to the heavy gales which occurred in June destroying the arrows, and also the fact that the better class of canes arrowed very sparsely, and in the case of Badila only a few arrows developed in the first ratoon variety plot.

Soil used for Propagation.—The soil was taken from the scrub, being collected from the base of old bean-tree stumps. After the addition of further organic matter, the soil was sterilised by heat.

The seeds from the following varieties were planted on 27th June:—N.G.16, H. 109, Q. 903, H.Q. 77, E.K.[28], Q. 695, 812A, N.G. 24, and Badila. Germinations took place in four to five days.

The following are the number of Seedlings, first stage, obtained:—

	No. of Seedlings.
N.G. 16	80
H. 109	63
Q. 903	125
H.Q. 77	250
E.K.[28]	35
Q. 695	50
N.G. 24	10
812A	5
N.G. 15 (Badila)	118

From the above number of 736 Seedlings, 260 canes were potted out during the dates from 9th to 26th September.

The big majority of the Seedlings are progressing favourably, and are at present showing a growth from 8 to 15 inches in height.

These will subsequently be transferred to the field, and ultimately tested. A very large number of Seedlings have to be raised and examined, in order to obtain a small percentage of useful varieties.

Credit is due to Mr. McWalters for his careful handling of this matter.

Mossman Queensland Seedlings.

These Seedlings were found some years ago on the Mowbray River, near Mossman; and cuttings were last year kindly supplied by the Mossman Central Mill authorities. The following is a description of the varieties:—

M.Q. 1.—Stout purple cane, somewhat like Badila, with white wax rings, joints 1½ to 2 inches in length, eyes full round and prominent, stools

well, and habit erect; foliage large with broad, dark green leaves; germination good, and trashes easily.

M.Q. 2.—Moderately stout greenish to purple cane, white waxy bloom, internodes 2 to 4 inches, eyes small and prominent, joints slightly zigzag, foliage fairly broad and plentiful; stalks of erect habit.

M.Q. 3.—Red to purple-coloured cane, internodes about 4 inches, eyes prominent and pointed, foliage heavy, stalks heavy, inclined to lodge.

M.Q. 4.—Brown to copper-coloured cane of medium stalks, eyes oval but in some cases pointed, internodes 4 to 5 inches, cane recumbent, foliage heavy.

M.Q. 5.—Dark blue to black cane, heavy stalks, internodes constricted, eyes prominent and pointed, foliage heavy and erect, good stools of erect cane, some appearance of skin cracks.

M.Q. 6.—Dark red to purple cane, internodes 5 to 6 inches and zig-zagging, eyes small and spherical, foliage light, and leaves mottled; stools of medium canes; some appearance of skin cracks.

M.Q. 7.—Light-brown to copper-coloured cane, internodes 3 to 4 inches and zig-zagging, eyes round and inclined to be prominent, cane lodges considerably, heavy stalks of good stools.

CANES INTRODUCED, 1921.

From Bundaberg Experiment Station :—

N.G. 94	N.G. 81
N.G. 164	M.Q. 1
H.Q. 409	M. 55/11
N.G. 103	Q. 116 *sport*
N.G. 148	M. 28/10
N.G. 90	M. 32/10
N.G. 102	M. 55/1182.

From A. M. Broom, North Coast Line :—

B. 156.

Distribution of Varieties—Season 1921.

Although the date of distribution of canes was advertised for the 1st of August, orders were fulfilled up to the middle of September.

Approximately 22 tons of varieties were distributed. The following are amounts forwarded to different districts :—

To Mossman	One crate.
To Macknade and Halifax ..	Three crates.
To Cairns	151 bags of plants.
Johnstone River	240 bags of plants.
Soldier Settlement, Maria Creek	84 bags.
Parcels forwarded South ..	15.

Owing to the strike at the South Johnstone, many farmers were unable to avail themselves of visiting the station. Difficulties were also experienced in forwarding the bags of plants, owing to the station being unable to obtain trucks from the mill during the strike. It may be mentioned that all loading of the bags of plants at the railway stations had to be done by the Experiment Station. In the case of consignments to Cairns three loadings had to be done, including transfer to the 3 feet 6 inch gauge at Garradunga.

The following, in order, were the chief canes applied for :—Tableland Badila, Q. 903, E.K.^{28}, 7 R. 428, Q. 813, Badila Seedling, Hybrid No. 1' H. 109, E.K. 1, Q. 855, 812A, N.G. 24A, Q. 1098, H.Q. 458, N.G. 16.

Total Tonnage of Cane Harvested—Season 1921.

Tons cane sent to Mill :—

	Tons	cwt.	qr.
A Division—			
Variety Plant Cane	107	0	1
Badila—1st Ratoons	189	17	2
B Division—			
Variety—1st Ratoons	51	18	3
Badila—1st Ratoons	238	15	3
C Division—			
Badila—Plant Cane	102	1	1
	688	13	2
Distributed to Farmers	22	0	0
Total	710	13	2
Acreage cut	17·21		
Average tonnage per acre ..	41·29		

The above result is highly satisfactory. Less than half the area was fertilised. The greater part of the cane was first ratoons. The above shows an increase of 8 tons per acre above last year's results, which averaged out at 33·3 tons per acre.

5.—WORK OF THE CENTRAL SUGAR EXPERIMENT STATION AT MACKAY.

The Sugar Experiment Station at Mackay is in the care of Mr. F. Keogh, the Chemist in Charge. Mr. Keogh's chemical work is carefully and accurately performed, and he carried out the instructions of the General Superintendent in relation to field work in a capable manner. The Field Staff are Messrs. W. Millard (foreman) and J. Winton (teamster), and Messrs. Andersen and Bailey.

Mr. Keogh has prepared the tables which appear in the following part of this report, and furnished notes upon weather and cultural operations for the use of the General Superintendent.

Weather Notes Covering Period from March, 1920, to end of September, 1921.

The weather during March, 1920, was not very favourable to prepare land for early planting, as the rainfall then was much below the average, the registration being 204 points. However, cane planted in March struck very well, as on the 31st 94 points of rain fell, and this was followed by farther good rains during April; so that, although the fall of rain was low during February and March, the good rains of April made the early planting successful, and cane planted in April also struck well. The weather just at this time was fairly favourable to the young cane, although it was not as hot and humid as in some previous years. The total fall in April was 728 points, and this was followed by a very good fall of 787 points in May on fifteen wet days. The weather during May was very mild, and the young cane continued to grow well through the whole of this month. In June 340 points of rain fell, and as the weather was not very cold the cane made fair growth. The month of July was cool, but there was only one frost, that being on the 25th, and the young cane appeared very good and healthy; as usual there was very little rain, the total being 82 points. With the good rains during April, May, and June,

conditions were very favourable for August planting, the soil working into fine tilth and containing good moisture. The cane struck well with few misses, and the whole of the spring planting was successful, as during August the rainfall was fairly good; the last four days of the month gave 257 points of rain, the only wet day being the first, when 64 points were registered. With the moisture in the soil still good, all later plantings were also successful. The months of August and September, 1920, were not as cold as the same months of 1919; and the rainfall was much better. From the end of September to end of December the conditions were favourable to the growth of cane, the weather being warm and the rainfall fairly good. During each month a fair fall of rain was experienced, being sufficient to keep the cane constantly growing, and very much better than the same period of 1919. To show show a slight comparison, the rainfall from 1st August to 31st December, 1919, was 256 points and 1,093 points for the same period of 1920. The rainfalls in January and February, 1921, were 12·70 inches and 16·41 respectively; but, although the moisture was plentiful the hot humid conditions generally prevailing during these months were absent, and the weather instead was mild and not hot and oppressive. For the first week in March the weather was hot, and this culminated in a thunderstorm on the 6th with very heavy rain and strong wind. The rain kept on practically without a stop for seven days, and the wind was squally for about four days. At the station the gauge showed 25 inches for the seven days; the heaviest fall in a twenty-four-hour period was 753 points. A large amount of cane was blown to the ground, but no serious damage was done except in some outside districts, where the cane was flooded and stools of cane were washed out.

This abnormally heavy fall of rain checked the growth of the cane for about two weeks, as the soil was over-saturated with water; and the remainder of the month the weather was mild, and some days were cool. The total registration for the month was 26·31 inches. The cane was not making the usual rapid growth that is expected about this time of the year owing to the mild weather, but fortunately through April, May, and June no very cold weather was experienced, and with constant small falls of rain the cane kept growing right through the winter months and up to the time of harvesting; except that at the end of June a very heavy fall occurred amounting to 545 points, accompanied by a strong wind which did more damage to the cane than the blow in March, and laid a great deal of it over.

The cane made a better growth from April onwards than was anticipated. Early in May the station crop was estimated to cut 250 tons, but the actual tonnage will be over 300.

Taking the year right through it has been fairly favourable and much better than the year 1919-20. The first ratoon crops on the station have yielded much heavier tonnages per acre than the plant crops of the preceding year; also the second ratoon crops have cut heavier than the first ratoon crops did last year off the same blocks.

ABSTRACT OF METEOROLOGICAL OBSERVATIONS MADE AT THE SUGAR EXPERIMENT STATION, MACKAY, FROM 1ST SEPTEMBER, 1920, TO 31ST AUGUST, 1921—COVERING GROWTH OF EXPERIMENT CROPS.

Month.	Rainfall in Inches.	Highest Shade Maximum.	Lowest Shade Maximum.	Mean Shade Maximum.	Highest Shade Minimum.	Lowest Shade Minimum.	Mean Shade Minimum.	Lowest Terrestrial Min.	Mean Terrestrial Min.	Mean Diurnal Range.	Mean Temperature.	Mean Relative Humidity of the Air. Saturation equalling 100 at 9 a.m.	Mean Daily Evaporation in Cubic Inches.
September, 1920 ..	1·20	87·0	75·0	79·9	72·0	51·2	58·8	50·0	55·8	21·1	74·0	71·8	·199
October, 1920	2·15	89·9	78·1	83·8	73·2	55·3	62·2	51·1	59·0	21·6	78·1	71·0	·269
November, 1920 ..	2·33	92·1	82·7	87·4	72·6	58·0	65·9	54·8	63·2	21·5	81·9	66·6	·277
December, 1920 ..	2·01	97·2	87·3	91·1	76·1	56·9	67·8	54·5	65·0	23·3	83·9	64·0	·350
January, 1921	12·70	100·8	78·3	87·1	76·0	65·5	71·3	63·4	69·0	15·8	80·8	74·8	·260
February, 1921 ..	16·41	99·5	79·3	84·9	74·9	64·6	70·1	62·6	67·9	14·8	79·0	80·4	·202
March, 1921	26·31	95·9	74·9	82·7	74·6	65·4	69·6	62·8	67·4	13·1	76·4	84·0	·170
April, 1921	2·76	92·3	80·6	83·7	75·0	58·2	66·0	54·0	62·6	17·7	75·5	78·0	·198
May, 1921	1·76	88·3	74·9	81·1	67·3	56·1	61·7	52·1	57·8	19·4	72·8	81·0	·134
June, 1921	2·90	85·5	69·6	78·8	68·8	45·9	61·2	42·0	58·1	17·6	70·0	84·0	·145
July, 1921	6·97	82·6	69·1	76·1	64·5	45·4	56·1	39·9	54·2	20·0	65·8	80·0	·192
August, 1921	·64	85·9	68·1	74·7	62·3	36·4	51·7	29·7	46·5	23·0	65·5	75·5	·227
Total	78·17	..	..	..	..	..	..	..	..	..	..	75·9*	..

* Average.

The lowest grass temperature recorded was 29·7 in August. The average relative humidity for twelve months at 9 a.m. was 75·9.

The temperature readings are also of importance from the manner in which they are shown. Hilgard ("Soils," page 289) points out that it is the extremes of temperature that are most important, and that the annual mean temperature is not a good criterion, since one and the same figures may result equally from the averaging of two widely divergent data and from such as are close together. Thus an average of 60 degrees Fahr. might result equally from the averaging of 65 and 55 degrees, or from taking the mean of 15 and 105 degrees, yet the respective cultural adaptations would be widely different.

EXPERIMENTS DEALT WITH IN THE FOLLOWING SECTION.

1. Comparative field and analytical tests of fifteen of the best New Guinea canes selected from Wells's collection—second ratoon crop.

2. Further experiments in deep ploughing and subsoiling *versus* ordinary cultivation. Variety used, Green Gorn (N.G. 24B) first ratoons.

3. Experiments with varieties of cane from different countries to test their commercial value.

4. Trials with muriate and sulphate of potash. Experiments testing the action of muriate of potash *versus* sulphate of potash on cane juices. In the application of these fertilisers the same amount of potash will be used in both salts. A similar experiment is being carried out at Bundaberg.

5. Chemical examination of miscellaneous canes.

1.—Comparative Field and Analytical Tests of Fifteen Selected Papuan Canes (Wells's Collection), Second Ratoon Crop.

Full details of all the canes brought from New Guinea by Mr. Wells appear in the annual reports from 1913 to 1918. In the latter year a selection of fifteen of what had been determined by trial as free from disease and the best as sugar-producers was made.

These were carefully planted out under uniform conditions in land that had been limed, green manured, subsoiled, and cross-ploughed four times. The results of the plant crop and of the first ratoon crop appeared in the 1919 and 1920 reports. Below are given the first, second, third, and final analyses of these varieties :—

First Preliminary Examination of Fifteen Selected Papuan Canes (Wells's Collection)—Second Ratoon Crop, June, 1921. Division Z.1.

Variety of Cane.	Date of Analysis.	Age of Cane.	Total Solids (Brix).	% Sucrose in Juice.	% Glucose in Juice.	C.C.S. in Cane.	Purity of Juice.
N.G. 81	6-6-21	7½ months	14·0	8·87	3·65	5·16	63·4
N.G. 83	6-6-21	7½ months	14·4	9·99	3·07	6·4	69·4
N.G. 87	6-6-21	7½ months	12·4	7·73	3·07	4·41	62·3
N.G. 88	6-6-21	7½ months	15·4	11·83	2·27	8·24	76·8
N.G. 89	6-6-21	7½ months	16·3	13·02	2·36	9·39	79·9
N.G. 94	6-6-21	7½ months	13·3	6·78	5·43	2·82	50·9
N.G. 102	6-6-21	7½ months	13·6	9·06	3·33	5·57	66·6
N.G. 103	6-6-21	7½ months	15·5	11·0	3·47	7·19	70·9
N.G. 123	6-6-21	7½ months	15·3	11·21	2·94	7·46	73·2
N.G. 130	6-6-21	7½ months	15·4	10·76	3·47	6·93	69·9
N.G. 164	6-6-21	7½ months	16·2	12·54	2·73	8·85	77·4
N.G. 165	6-6-21	7½ months	14·0	9·77	3·01	6·28	69·8

Second Progressive Examination of Fifteen Selected Papuan Canes (Wells's Collection)—Second Ratoon Crop, July, 1921. Division Z.1.

Variety of Cane.	Date of Analysis.	Age of Cane.	Total Solids (Brix).	% Sucrose in Juice.	% Glucose in Juice.	C.C.S. in Cane.	Purity of Juice.
N.G. 81	5-7-21	8½ months	15·6	12·21	2·56	8·68	78·2
N.G. 83	5-7-21	8½ months	16·5	13·67	2·39	10·13	82·8
N.G. 87	5-7-21	8½ months	15·1	11·53	2·47	8·07	76·6
N.G. 88	5-7-21	8½ months	17·5	15·23	1·64	11·66	87·0
N.G. 89	5-7-21	8½ months	16·1	13·51	1·65	10·10	83·9
N.G. 94	5-7-21	8½ months	14·6	9·21	3·79	5·32	63·1
N.G. 102	5-7-21	8½ months	16·2	12·91	2·19	9·30	79·7
N.G. 103	5-7-21	8½ months	17·7	15·07	1·66	11·37	85·1
N.G. 123	5-7-21	8½ months	16·4	13·50	1·88	9·96	82·3
N.G. 130	5-7-21	8½ months	16·6	13·15	2·27	9·43	79·2
N.G. 164	5-7-21	8½ months	16·2	13·02	1·98	9·44	80·4
N.G. 165	5-7-21	8½ months	16·0	13·53	1·58	10·17	84·6

Third Progressive Examination of Fifteen Selected Papuan Canes (Wells's Collection) Second Ratoon Crop, August, 1921. Division Z.1.

Variety of Cane.	Date of Analysis.	Age of Cane.	Total Solids (Brix).	% Sucrose in Juice.	% Glucose in Juice.	C.C.S. in Cane.	Purity of Juice.
N.G. 81	4-8-21	9½ months	15·4	12·48	2·0	9·10	81·0
N.G. 83	4-8-21	9½ months	17·8	16·03	1·17	12·54	90·1
N.G. 87	4-8-21	9½ months	16·0	12·99	2·27	9·48	81·2
N.G. 88	4-8-21	9½ months	18·2	16·42	·95	12·86	90·2
N.G. 89	4-8-21	9½ months	18·5	16·94	·89	13·39	91·6
N.G. 94	4-8-21	9½ months	16·8	12·04	3·64	7·95	71·7
N.G. 102	4-8-21	9½ months	18·0	15·87	1·43	12·26	88·2
N.G. 103	4-8-21	9½ months	19·1	17·33	1·16	13·62	90·7
N.G. 123	4-8-21	9½ months	16·9	14·57	1·43	11·09	86·2
N.G. 130	4-8-21	9½ months	17·1	13·98	2·0	10·26	81·7
N.G. 164	4-8-21	9½ months	18·3	16·18	1·11	12·52	88·4
N.G. 165	4-8-21	9½ months	16·0	13·79	1·36	10·49	86·2

FINAL EXAMINATION OF FIFTEEN SELECTED PAPUAN CANES (WELLS'S COLLECTION)—SECOND RATOON CROP, SEPTEMBER, 1921. DIVISION Z.1.

Variety of Cane.	Date of Analysis.	Age of Cane.	Total Solids (Brix).	% Sucrose in Juice.	% Glucose in Juice.	C.C.S. in Cane.	Purity of Juice.	Fibre in Cane.	Date of Arrowing.
N.G. 81	20-9-21	11 months	17·4	15·34	·96	12·3	88·1	11·0	..
N.G. 83	20-9-21	11 months	19·9	18·31	·68	14·34	92·0	11·8	..
N.G. 87	20-9-21	11 months	18·9	16·93	·88	13·12	89·6	11·4	..
N.G. 88	20-9-21	11 months	20·4	18·67	·44	14·39	91·5	13·0	..
N.G. 89	20-9-21	11 months	20·9	19·53	·42	15·34	93·4	12·5	20 July
N.G. 94	20-9-21	11 months	18·8	15·33	2·0	11·16	81·5	11·7	..
N.G. 102	20-9-21	11 months	18·7	16·50	1·05	12·44	88·2	13·2	..
N.G. 103	20-9-21	11 months	20·0	18·27	·74	14·42	91·3	11·0	30 June
N.G. 123	20-9-21	11 months	18·3	16·26	1·10	12·24	88·0	13·4	..
N.G. 130	20-9-21	11 months	19·1	16·91	1·11	13·25	88·5	10·0	..
N.G. 164	20-9-21	11 months	19·9	18·36	·56	14·58	92·3	11·0	..
N.G. 165	20-9-21	11 months	18·1	16·70	·56	13·10	92·3	12·1	..

The following are the crop results :—

CROP RESULTS OF SELECTED PAPUAN CANES (WELLS'S COLLECTION) IN FINAL COMPETITIVE TEST, SEPTEMBER, 1921—SECOND RATOON CROP.

Name or Number of Variety.	Age of Cane.	Weight of Cane per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.
N.G. 81	11 months	32·6	4·0
N.G. 83	11 months	33·0	4·73
N.G. 87	11 months	15·7	2·06
N.G. 88	11 months	38·1	5·48
N.G. 89	11 months	21·3	3·26
N.G. 94	11 months	20·4	2·27
N.G. 102	11 months	21·3	2·65
N.G. 103	11 months	28·0	4·04
N.G. 123	11 months	24·1	2·95
N.G. 130	11 months	30·3	4·01
N.G. 164	11 months	21·2	3·09
N.G. 165	11 months	32·6	4·27

The two tables appearing below comprise the analytical and crop results to date :—

ANALYTICAL RESULTS TO DATE OF FIFTEEN SELECTED PAPUAN CANES (WELLS'S COLLECTION)—PLANT, FIRST AND SECOND RATOON CROPS, 1919, 1920, 1921.

Variety of Cane.	PLANT CROP, 1919.				FIRST RATOON CROP, 1920.				SECOND RATOON CROP, 1921.				AVERAGE THREE YEARS.	
	Total Solids (Brix).	% Sucrose in Juice.	C.C.S. in Cane.	Purity of Juice.	Total Solids (Brix).	% Sucrose in Juice.	C.C.S. in Cane.	Purity of Juice.	Total Solids (Brix).	% Sucrose in Juice.	C.C.S. in Cane.	Purity of Juice.	C.C.S. in Cane.	Purity of Juice.
N.G. 81 ..	17·82	15·01	11·13	84·2	17·2	14·94	11·19	86·8	17·4	15·34	12·3	88·1	11·54	86·4
N.G. 83 ..	18·62	16·28	12·65	87·4	18·8	16·41	12·46	87·2	19·9	18·31	14·34	92·0	13·15	88·9
N.G. 87 ..	16·82	13·69	9·86	81·4	17·9	15·53	11·69	86·7	18·9	16·93	13·12	89·6	11·55	85·9
N.G. 88 ..	18·55	16·39	12·54	88·3	20·3	18·53	14·12	91·2	20·4	18·67	14·39	91·5	13·68	90·3
N.G. 89 ..	20·35	18·50	14·80	19·9	90·4	17·91	13·92	92·3	20·9	19·53	15·34	93·4	14·69	92·2
N.G. 94 ..	15·47	10·42	6·35	67·3	18·2	14·96	11·00	82·1	18·8	15·33	11·16	81·5	9·50	76·9
N.G. 102 ..	17·10	14·35	10·97	83·8	17·0	14·41	10·82	84·7	18·7	16·50	12·44	88·2	11·41	85·6
N.G. 103 ..	18·4	15·43	11·57	83·8	19·1	17·32	13·73	90·6	20·0	18·27	14·42	91·3	13·24	88·6
N.G. 123 ..	18·2	15·39	11·38	84·5	16·4	13·56	9·82	82·6	18·3	16·26	12·24	88·0	11·15	85·0
N.G. 130 ..	18·8	16·58	12·65	88·2	19·3	17·41	13·44	90·2	19·1	16·91	13·25	88·5	13·11	89·0
N.G. 141 ..	18·9	16·23	12·23	85·9	18·9	16·94	13·14	89·6	*	..	..	..	..	..
N.G. 147 ..	19·2	16·56	12·62	86·2	18·9	16·94	13·01	89·6	*	..	..	..	..	..
N.G. 161 ..	18·9	16·82	12·80	89·0	18·5	16·13	12·21	87·1	*	..	..	..	..	..
N.G. 164 ..	19·7	17·83	13·79	90·5	19·4	17·69	13·66	90·7	19·9	18·36	14·58	92·3	14·01	91·2
N.G. 165 ..	17·9	16·01	12·71	89·4	17·0	15·21	11·96	89·4	18·1	16·70	13·10	92·3	12·59	90·4

* Ploughed out, owing to failure to ratoon.

CROP RESULTS TO DATE OF FIFTEEN SELECTED PAPUAN CANES (WELLS'S COLLECTION)—PLANT, FIRST AND SECOND RATOON CROPS, 1919, 1920, 1921.

Variety of Cane.	PLANT CROP, 1919.			FIRST RATOON CROP, 1920.			SECOND RATOON CROP, 1921.			TOTAL YIELD OF THREE YEARS.	
	Age of Cane.	Weight of Cane per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.	Age of Cane.	Weight of Cane per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.	Age of Cane.	Weight of Cane per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.	Weight of Cane per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.
N.G. 81	13 months	44·9	5·1	11 months	38·5	4·3	11 months	32·6	4·0	116·0	13·4
N.G. 83	13 months	41·4	5·2	11 months	22·0	2·7	11 months	33·0	4·73	96·4	12·63
N.G. 87	13 months	33·0	3·2	11 months	28·6	3·3	11 months	15·7	2·06	77·3	8·56
N.G. 88*	13 months	42·2	5·3	11 months	21·8	3·1	11 months	38·1	5·48	102·1	13·88
N.G. 89	13 months	23·5	3·5	11 months	21·8	3·0	11 months	21·3	3·26	66·6	9·76
N.G. 94	13 months	27·8	1·7	11 months	23·9	2·6	11 months	20·4	2·27	72·1	6·57
N.G. 102	13 months	47·0	5·1	11 months	28·6	3·1	11 months	21·3	2·65	96·9	10·85
N.G. 103	13 months	50·7	5·9	11 months	23·1	3·2	11 months	28·0	4·04	101·8	13·14
N.G. 123	13 months	34·8	4·0	11 months	14·8	1·4	11 months	24·1	2·95	73·7	8·35
N.G. 130	13 months	50·0	6·3	11 months	38·1	5·1	11 months	30·3	4·01	118·4	15·41
N.G. 141	13 months	34·2	4·2	11 months	8·0	1·0	11 months	*	..	..	..
N.G. 147	13 months	33·4	4·2	11 months	9·5	1·2	11 months	*	..	..	..
N.G. 161	13 months	17·5	2·2	11 months	24·9	3·0	11 months	*	..	..	..
N.G. 164	13 months	14·6	2·0	11 months	20·4	2·8	11 months	21·2	3·09	56·2	7·89
N.G. 165	13 months	38·8	4·9	11 months	21·8	2·6	11 months	32·6	4·27	93·2	11·77

* Ploughed out.

These varieties have, as previously stated, proved disappointing. There is nothing to equal Badila or any of the Gorus. New Guinea 81, 83, 88, 89, 103, and 130 are fair canes, and will be retained in the meantime, though there does not exist a very great demand for any of them in comparison with the best of the Queensland Seedlings.

2.—FURTHER EXPERIMENTS IN SUBSOILING VERSUS ORDINARY CULTIVATION. PLANT CROP. VARIETY USED, GREEN GORU (N.G. 24B).

Due to the cyclonic damage to the plant crop of the previous experiment with subsoiling in 1918, it was determined to repeat the trial. Accordingly uniform land was divided into two pieces, the whole being cross-ploughed four times to 12 inches, while one-half received a subsoiling with the special implement known as the sub-soiler to a further depth of 7 inches, making 19 inches in all. The other treatment of the whole of the land was identical. The cane used for plants was Green Goru, or N.G. 24B. This crop was planted in April of 1919, and the difference between the subsoiled and unsubsoiled plots was well marked during the whole period of growth in the plant crop and also in the first ratoons.

The analytical results are furnished here under:—

ANALYTICAL RESULTS OF SUBSOILING EXPERIMENT—FIRST RATOON CROP, SEPTEMBER, 1921. VARIETY, GREEN GORU (N.G. 24B).

Plot.	Treatment.	Date of Analysis.	Age of Cane.	Total Solids (Brix).	% Sucrose in Juice.	% Glucose in Juice.	C.C.S. in Cane.	Purity of Juice.	Fibre in Cane.
1	Plant Crop Subsoiled and Ratoon Crop also Subsoiled	20-9-21	12 months	20·4	18·91	·43	14·96	92·7	11·5
2	Plant Crop not Subsoiled, and present Crop Ratooned by ploughing 9 inches deep	20-9-21	12 months	20·8	19·08	·50	15·0	91·7	11·5

From the crop results of the first ratoons, which are appended, it will be seen that the yield of cane for subsoiling amounts to 35·8 tons of cane, while the plot which was not subsoiled yielded 29·9 tons, the difference being 5·9 tons of cane per acre. The increased yield of sugar amounted to ·87 ton. This confirms previous experiments, and proves the great advantage to be secured by subsoiling on alluvial lands with clayey subsoils. The subsoiling, however, must be properly done and in such a way that the land lying below the ordinary depth reached by the plough is only stirred—not turned over and brought to the top. Due to the large amount of working that the ordinary or farmer's plot received, the results for this are also good. In ordinary practice it is doubtful if all farmers cross plough four times to 12 inches deep and thoroughly ratoon to 9 inches.

CROP RESULTS OF SUBSOILING EXPERIMENT—FIRST RATOON CROP—SEPTEMBER, 1921. VARIETY, GREEN GORU (N.G. 248).

Plot.	Treatment.	Age of Cane.	Yield of Cane per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.
1	Plant Crop Subsoiled, and Ratoon Crop also Subsoiled	12 months	35·8	5·35
2	Plant Crop not Subsoiled, and present Crop Ratooned by ploughing 9 inches deep	12 months	29·9	4·48

Below are given the total crop results to date, from which it is seen that an increase of 14·5 tons of cane and 2·17 tons of sugar have been secured from the use of the subsoiler—a very payable result. The ratoons on the subsoiling plot were ploughed about 10 inches deep, the subsoiler following to another 6 inches.

CROP RESULTS TO DATE OF SUBSOILING EXPERIMENT—PLANT AND FIRST RATOON CROP. VARIETY, GREEN GORU (N.G. 248).

Plot.	Treatment.	Plant Crop, 1920.			First Ratoon Crop, 1921.		
		Age of Cane.	Yield of Cane per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.	Age of Cane.	Yield of Cane per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.
1	Plant Crop Subsoiled, and Ratoon Crop also Subsoiled ..	17 months	37·1	5·15	12 months	35·8	5·35
2	Plant Crop not Subsoiled, and succeeding Crop Ratooned by ploughing 9 inches deep	17 months	28·5	3·85	12 months	29·9	4·48

Difference in favour of Subsoiling on two Crops, 14·5 Tons of Cane and 2·17 Tons of Commercial Cane Sugar per acre.

3.—EXPERIMENTS WITH VARIETIES OF CANE FROM DIFFERENT COUNTRIES TO TEST THEIR COMMERCIAL VALUE.

In the above trial with canes from different countries the preparation of the land was commenced on the 14th November, 1919, when the soil was ploughed to a depth of 9 inches with a swing plough; it was disc-harrowed on the 26th of the same month, and planted with cowpea broadcast at the rate of 1 bushel per acre. Up to the 4th December the cowpea did not germinate too well, owing to deficient moisture; but on the 8th December there was a fall of 130 points of rain, and thereafter the seed germinated well and a good crop resulted, estimated at about 12 tons of green substance per acre. This was ploughed under with the disc on the 9th April, 1920, and left eight weeks to rot. The next act of cultivation was a cross-ploughing with a disc plough on 10th June and harrowing, followed by a further ploughing with swing plough and subsoiler to a depth of 19 inches on the 6th July and again harrowed. It was given a final ploughing to a depth of 12 to 13 inches with the disc on the 3rd August, harrowed again, and planted with different varieties on the 12th August.

All the canes struck well; some were slower than others in coming through. As usual, Q. 813 was the quickest away, with Q. 970, M.Q. No. 1, 8 R. 431, Ginger, D. 109, B. 4039, B. 4596 and B. 6450 very good; D. 1457, 7 R. 428, H.Q. 458, Q. 903, and Q. 1121 were slower at striking than the ones previously mentioned, but eventually they all came through well, and no misses were noticeable. Q. 1098 was the slowest cane at germinating, but it came through well after the others with no misses and produced a heavy crop, as well be seen from the table. All the canes, with the exception of M.Q. No. 1 and 8 R. 431, were planted in plots of four drills, and the tonnage per acre was obtained from the weights from each bed weighed at Racecourse Mill.

The varieties did well during the whole period. Some were a little slower than others in growth for the first four or five months—notably Q. 970, Q. 1098, D. 1457, and 8 R. 431; but after December they grew faster and made good, excepting 8 R. 431, which is a very short-growing cane.

About June of this year disease was noticeable in two varieties—B. 4039 and B. 4596. The former was badly affected with striped leaf disease, and at the time of harvesting fully 5 per cent. of the sticks were dead; while a fair percentage was also deteriorating, some being badly piped and others had appearance of red rot disease. The cane B. 4596 was only slightly affected with striped leaf disease.

Of the Queensland seedlings, H.Q. 458 has made improvement in growth and cane over previous years; the others have given results comparable with the previous trial, with the exception of Q. 970 and Q. 1098, which have given much lower tonnages per acre. Of the new varieties a few of the canes are very promising,

7 R. 428, a Fijian cane, has shown considerably more growth than in any previous year, and has also improved considerably in sugar content, and, as will be noted from the tables, it heads the list for production of sugar per acre. M.Q. No. 1 gave the highest sugar content, approximately 16·0 c.c.s., but the tonnage per acre is lower than some of the others; this cane also has improved considerably in growth and sugar content since its introduction, and on present indications promises very well; it is somewhat like Badila. D. 1457 (commonly called Penny's Cane), B. 6450, Gingor, and B. 4596 are also good; the latter cut a high tonnage per acre, but the sugar content is only fair. D. 109 did fairly well, but lodges badly and is hard to cut. The poorest of all the canes under trial so far as crop is concerned is 8 R. 431; this cane was introduced with 7 R. 428 by the courtesy of the Colonial Sugar Refining Company, and was always stunted in growth, the longest stick noticeable in previous years being about 2 feet; this year it has made remarkable improvement in growth, some sticks being about 4 feet long. It is hard to trash, and is not likely to improve sufficiently to be of any commercial value.

The following mixture of manure was applied to this experiment, at the rate of 600 lb. per acre, about the 22nd October:

Sulphate of Ammonia ..	100 lb.
Nitrate of Soda	100 lb.
Sulphate of Potash	100 lb.
Superphosphate	300 lb.
	600 lb. mixture.

Early in January a mixture of 50 lb. nitrate of soda and 50 lb. sulphate of ammonia was applied as a top dressing (per acre).

The tables appearing hereunder give the preliminary, progressive, and final analytical examinations of these varieties:—

First Preliminary Examination in Experiments with Varieties of Cane from Different Countries—Plant Crop, 1921—June.

Country.	Number or Name of Variety.	Date of Analysis.	Age of Cane.	Total Solids (Brix).	Sucrose in Juice.	Glucose in Juice.	C.C.S. in Cane.	Purity of Juice.
Demerara	1457	7-6-21	10 months	17·5	13·61	3·03	9·62	77·7
Queensland	Mossman No. 1	7-6-21	10 months	17·8	13·66	2·94	9·56	76·7
Fiji	8 R. 431	7-6-21	10 months	17·9	14·86	2·0	11·02	83·0
Demerara	109	7-6-21	10 months	15·9	11·16	3·45	7·22	70·2
Barbados	4030	7-6-21	10 months	11·9	7·06	3·57	3·78	59·9
Barbados	4596	7-6-21	10 months	11·0	5·04	4·59	1·62	45·8
Barbados	6450	7-6-21	10 months	16·0	14·04	1·43	10·81	87·7
Queensland	Gingor	7-6-21	10 months	16·4	12·24	3·03	8·37	74·6
Fiji	7 R. 428	7-6-21	10 months	15·0	10·62	3·70	6·93	70·8
Queensland	Hambledon 458	7-6-21	10 months	17·8	14·22	2·79	10·26	79·9
Queensland	813	7-6-21	10 months	18·3	15·47	2·13	11·63	84·5
Queensland	903	7-6-21	10 months	17·0	13·10	3·03	9·20	77·0
Queensland	1098	7-6-21	10 months	16·4	12·54	3·07	8·74	76·5
Queensland	1121	7-6-21	10 months	14·0	10·01	3·36	6·59	71·5
Queensland	970	7-6-21	10 months	16·9	12·67	3·01	8·70	74·9

Second Progressive Examination in Experiments with Varieties of Cane from Different Countries—Plant Crop, 1921—July.

Country.	Number or Name of Variety.	Date of Analysis.	Age of Cane.	Total Solids (Brix).	Sucrose in Juice.	Glucose in Juice.	C.C.S. in Cane.	Purity of Juice.
Demerara	1457	6-7-21	11 months	18·2	16·64	1·18	13·14	91·4
Queensland	Mossman No. 1	6-7-21	11 months	18·6	16·58	1·51	12·89	89·1
Fiji	8 R. 431	6-7-21	11 months	18·3	16·86	1·0	13·37	92·1
Demerara	109	6-7-21	11 months	17·9	15·79	1·65	12·20	88·2
Barbados	4030	6-7-21	11 months	14·2	11·47	1·97	8·30	80·8
Barbados	4596	6-7-21	11 months	14·1	10·23	2·81	6·83	72·5
Barbados	6450	6-7-21	11 months	17·1	16·12	·65	12·96	94·2
Queensland	Gingor	6-7-21	11 months	17·4	15·29	1·35	11·78	87·9
Fiji	7 R. 428	6-7-21	11 months	15·7	13·23	1·72	9·92	84·2
Queensland	Hambledon 458	6-7-21	11 months	18·3	16·56	1·19	13·0	90·5
Queensland	813	6-7-21	11 months	19·3	18·30	·65	14·76	94·8
Queensland	903	6-7-21	11 months	17·6	15·50	1·25	11·96	88·1
Queensland	1098	6-7-21	11 months	18·6	17·06	·98	13·50	91·7
Queensland	1121	6-7-21	11 months	17·2	15·75	·89	12·45	91·5
Queensland	970	6-7-21	11 months	17·9	15·23	1·81	11·59	85·1

THIRD PROGRESSIVE EXAMINATION IN EXPERIMENTS WITH VARIETIES OF CANE FROM DIFFERENT COUNTRIES—PLANT CROP, 1921—AUGUST.

Country.	Name or Number of Variety.	Date of Analysis.	Age of Cane.	% Total Solids (Brix).	% Sucrose in Juice.	% Glucose in Juice.	C.C.S. in Cane.	Purity of Juice.
Demerara	D. 1457	5-8-21	12 months	18·3	16·94	·80	13·47	92·5
Queensland	M.Q. No. 1	5-8-21	12 months	19·2	17·44	·87	13·72	90·8
Fiji	8 R. 431	5-8-21	12 months	18·6	17·55	·38	14·11	94·3
Demerara	D. 109	5-8-21	12 months	17·5	15·55	1·14	12·07	88·8
Barbados	B. 4030	5-8-21	12 months	13·6	10·64	1·88	7·56	78·2
Barbados	B. 4596	5-8-21	12 months	14·2	10·29	2·86	6·86	72·4
Barbados	B. 6450	5-8-21	12 months	14·9	13·21	1·08	10·24	88·6
Queensland	Gingor	5-8-21	12 months	16·8	14·89	1·12	11·54	88·6
Fiji	7 R. 428	5-8-21	12 months	15·5	13·32	1·43	10·12	85·9
Queensland	H.Q. 458	5-8-21	12 months	18·6	17·47	·66	14·01	93·9
Queensland	Q. 813	5-8-21	12 months	19·7	19·10	·42	15·59	96·9
Queensland	Q. 903	5-8-21	12 months	17·7	16·21	·85	12·81	91·6
Queensland	Q. 1098	5-8-21	12 months	16·7	14·81	1·36	11·48	88·7
Queensland	Q. 1121	5-8-21	12 months	16·9	15·88	·66	12·74	93·9
Queensland	Q. 970	5-8-21	12 months	19·8	18·51	·64	14·76	93·5

FINAL EXAMINATION IN EXPERIMENTS WITH VARIETIES OF CANE FROM DIFFERENT COUNTRIES. PLANT CROP, 1921—SEPTEMBER.

Country.	Name or Number of Variety.	Date of Analysis.	Age of Cane.	% Total Solids (Brix).	% Sucrose in Juice.	% Glucose in Juice.	C.C.S. in Cane.	Purity of Juice.	% Fibre in Cane.	Date of Arrowing.
Demerara	D. 1457	21-9-21	13½ months	20·3	18·85	·41	15·56	92·8	7·9	20 July
Queensland	M.Q. No. 1	21-9-21	13½ months	20·8	19·48	·35	15·98	93·6	9·0	..
Fiji	8 R. 431	21-9-21	13½ months	20·1	19·04	·24	15·90	94·7	8·0	..
Demerara	D. 109	21-9-21	13½ months	19·4	17·57	·97	13·96	90·6	10·2	21 June
Barbados	B. 4030	21-9-21	13½ months	17·8	16·36	·78	13·11	91·9	10·2	30 May
Barbados	B. 4596	21-9-21	13½ months	17·7	15·48	1·39	12·11	87·4	9·7	30 May
Barbados	B. 6450	21-9-21	13½ months	19·3	18·56	·22	15·27	96·2	10·0	..
Queensland	Gingor	21-9-21	13½ months	19·7	18·55	·47	15·08	94·2	10·2	22 June
Fiji	7 R. 428	21-9-21	13½ months	20·0	18·51	·69	14·99	92·5	9·5	6 June
Queensland	H.Q. 458	21-9-21	13½ months	19·2	17·85	·72	14·74	93·0	8·0	..
Queensland	Q. 813	21-9-21	13½ months	19·8	18·71	·50	15·15	94·5	10·4	21 June
Queensland	Q. 903	21-9-21	13½ months	18·5	17·13	·69	13·63	92·6	10·9	10 June
Queensland	Q. 1098	21-9-21	13½ months	19·4	17·65	·91	14·06	91·0	10·1	30 June
Queensland	Q. 1121	21-9-21	13½ months	17·6	16·30	·72	12·97	92·6	11·2	..
Queensland	Q. 970	21-9-21	13½ months	20·0	18·35	·70	14·69	91·7	9·9	10 June

From the c.c.s. in the final examination it will be seen that many of these canes are good. "Gingor"—which is a cross between Mauritius, Gingham, and N.G. 24A (Striped Goru)—has done very well; and H.Q. 458 shows an improvement on previous analysis. Mossman Queensland No. 1 is also very good.

The crop results are shown below :—

CROP RESULTS IN EXPERIMENTS WITH VARIETIES OF CANE FROM DIFFERENT COUNTRIES. PLANT CROP, 1921.

Country.	Name or Number of Variety.	PLANT CROP.		
		Age of Cane.	Weight of Cane per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.
Demerara	D. 1457	13½ months	39·3	6·11
Queensland	M.Q. No. 1	13½ months	35·9	5·74
Fiji	8 R. 431	13½ months	22·9	3·64
Demerara	D. 109	13½ months	39·3	5·48
Barbados	B. 4030	13½ months	43·5	5·70
Barbados	B. 4596	13½ months	44·9	5·44
Barbados	B. 6450	13½ months	32·7	4·99
Queensland	Gingor	13½ months	43·4	6·54
Fiji	7 R. 428	13½ months	45·5	6·82
Queensland	H.Q. 458	13½ months	42·8	6·31
Queensland	Q. 813	13½ months	44·6	5·66
Queensland	Q. 903	13½ months	35·9	4·89
Queensland	Q. 1098	13½ months	44·3	6·23
Queensland	Q. 1121	13½ months	44·9	5·82
Queensland	Q. 970	13½ months	38·3	5·63

From the above it will be seen that a number of these canes have given good results, including M.Q. 1, Gingor, D. 1457, 7 R. 428; and most of the Queensland Seedlings have done very well. The results of the ratoon crops must, however, come to hand before a definite judgment on several of the newer varieties can be passed.

4.—Trials with Muriate and Sulphate of Potash. Experiments Testing the Action of Muriate of Potash versus Sulphate of Potash on Cane Juices. In the Application of these Fertilisers the same Amount of Potash will be used in Both Salts.

The object of the above experiments is to ascertain whether muriate of potash has any prejudicial effect upon the cane juices, as is often maintained.

The preparation of the soil on Division A1 for the potash experiments was commenced on the 19th November, 1919, when the soil was ploughed to a depth of 9 inches with the swing plough. It was disc harrowed and planted with cowpea on the 24th of the same month. The germination was fair until rain came early in December, when the rest of the seed germinated, and a splendid crop of cowpea was ploughed under with disc on the 9th March, 1920. It was cross-ploughed with the disc plough on the 20th May and harrowed; ploughed and subsoiled to a depth of 19 inches on the 26th June and again harrowed. It was also harrowed on the 8th July, and the final ploughing with disc on the 26th July, and planted on the 29th July. In all there were five ploughings, and at the second last ploughing it was also subsoiled. In the other ploughings the disc reached to a depth of 13 inches, and at the time of planting the soil was in fine tilth.

For the purposes of the experiment, the division was divided into eight plots of five drills. The manure was applied at the rate per acre as shown in the table, with two plots left unmanured. No other manures were applied; only sulphate and muriate of potash were used. On the plant crop the muriate of potash has given slightly better results than the sulphate; and where only 1 cwt. of potash was applied per acre, the highest purity and c.c.s. results were obtained. Where the dressings were heavier, at the rate of 2 and 3 cwt. of potash per acre, the purity and c.c.s. contents are lower, even lower than where no manure was used. For the final analyses 20 running feet of cane were cut from each plot, the weight of cane for each sample being about 2 cwt.

The following are the results of the chemical analyses :—

First Preliminary Examination in Experiments to Test the Action of Muriate of Potash, in Comparison with Sulphate of Potash and no Potash, upon Cane Juices—Plant Crop, June, 1921. Variety used, Q. 970.

Variety of Cane.	Date of Analysis.	Age of Cane.	Total Solids (Brix).	% Sucrose in Juice.	% Glucose in Juice.	C.C.S. in Cane.	Purity of Juice.	Rate of Application per Acre.
Q. 970	9-6-21	10 months	16·8	12·86	2·91	8·98	76·55	282 lb. Muriate of Potash
Q. 970	9-6-21	10 months	16·8	12·80	2·94	8·90	76·20	188 lb. Muriate of Potash
Q. 970	9-6-21	10 months	17·8	14·08	2·67	10·08	79·10	94 lb. Muriate of Potash
Q. 970	9-6-21	10 months	17·3	13·47	2·67	9·53	77·86	No Manure
Q. 970	9-6-21	10 months	16·9	13·29	2·67	9·48	78·64	No Manure
Q. 970	9-6-21	10 months	15·4	11·45	2·91	7·84	74·35	100 lb. Sulphate of Potash
Q. 970	9-6-21	10 months	16·3	12·24	2·98	8·41	75·09	200 lb. Sulphate of Potash
Q. 970	9-6-21	10 months	16·1	12·18	2·94	8·42	75·65	300 lb. Sulphate of Potash

Second Progressive Examination in Experiments to Test the Action of Muriate of Potash, in Comparison with Sulphate of Potash and no Potash, upon Cane Juices—Plant Crop, July, 1921. Variety used, Q. 970.

Variety of Cane.	Date of Analysis.	Age of Cane.	Total Solids (Brix).	% Sucrose in Juice.	% Glucose in Juice.	C.C.S. in Cane.	Purity of Juice.	Rate of Application per Acre.
Q. 970	8-7-21	11 months	19·1	16·57	1·16	12·66	86·75	282 lb. Muriate of Potash
Q. 970	8-7-21	11 months	17·8	15·21	1·46	11·51	85·45	188 lb. Muriate of Potash
Q. 970	8-7-21	11 months	18·0	15·53	1·40	11·83	86·28	94 lb. Muriate of Potash
Q. 970	8-7-21	11 months	17·9	15·15	1·47	11·39	84·65	No Manure
Q. 970	8-7-21	11 months	17·9	14·75	1·70	10·89	82·40	No Manure
Q. 970	8-7-21	11 months	17·8	14·81	1·69	11·0	83·20	100 lb. Sulphate of Potash
Q. 970	8-7-21	11 months	17·8	14·78	1·76	10·97	83·03	200 lb. Sulphate of Potash
Q. 970	8-7-21	11 months	17·5	14·16	1·81	10·32	80·91	300 lb. Sulphate of Potash

Third Progressive Examination in Experiments to Test the action of Muriate of Potash, in Comparison with Sulphate of Potash and no Potash, upon Cane Juices—Plant Crop, August, 1921. Variety used, Q. 970.

Variety of Cane.	Date of Analysis	Age of Cane.	Total Solids (Brix).	% Sucrose in Juice.	% Glucose in Juice.	C.C.S. in Cane.	Purity of Juice.	Rate of Application per Acre.
Q. 970	9-8-21	12 months	19·0	16·89	·97	13·11	88·89	282 lb. Muriate of Potash
Q. 970	9-8-21	12 months	18·3	15·81	1·30	12·65	86·34	188 lb. Muriate of Potash
Q. 970	9-8-21	12 months	18·4	16·16	1·12	12·43	87·82	94 lb. Muriate of Potash
Q. 970	9-8-21	12 months	18·3	16·13	1·08	12·45	88·14	No Manure
Q. 970	9-8-21	12 months	17·6	15·04	1·41	11·38	85·45	No Manure
Q. 970	9-8-21	12 months	18·0	15·45	1·39	11·73	85·83	100 lb. Sulphate of Potash
Q. 970	9-8-21	12 months	18·0	16·71	1·21	12·68	87·96	200 lb. Sulphate of Potash
Q. 970	9-8-21	12 months	18·3	15·98	1·22	12·26	87·32	300 lb. Sulphate of Potash

FINAL EXAMINATION IN EXPERIMENTS TO TEST THE ACTION OF MURIATE OF POTASH, IN COMPARISON WITH SULPHATE OF POTASH AND NO POTASH, UPON CANE JUICES—PLANT CROP, SEPTEMBER, 1921. VARIETY USED, Q. 970.

Variety of Cane.	Date of Analysis.	Age of Cane.	Total Solids (Brix).	% Sucrose in Juice.	% Glucose in Juice.	Purity of Juice.	C.C.S. in Cane.	% Fibre in Cane.	Rate of Application per Acre.
Q. 970	18-9-21	13 months	20·5	18·85	·67	91·95	14·84	11·6	282 lb. Muriate of Potash
Q. 970	18-9-21	13 months	20·2	18·62	·63	92·17	14·86	10·6	188 lb. Muriate of Potash
Q. 970	18-9-21	13 months	20·8	19·43	·61	93·41	15·91	9·2	94 lb. Muriate of Potash
Q. 970	18-9-21	13 months	20·5	18·83	·62	91·86	15·09	9·8	No Manure
Q. 970	18-9-21	13 months	20·6	19·02	·56	92·33	15·11	11·2	No Manure
Q. 970	18-9-21	13 months	20·8	19·45	·54	93·51	15·47	11·3	100 lb. Sulphate of Potash
Q. 970	18-9-21	13 months	19·6	17·77	1·03	90·66	13·96	10·8	200 lb. Sulphate of Potash
Q. 970	18-9-21	13 months	19·6	17·85	1·02	91·07	14·06	11·1	300 lb. Sulphate of Potash

As far as the plant crop is concerned, no prejudicial effect on the cane juice can be seen from the use of muriate of potash, but the results from the two ratoon crops may possibly show a difference.

5.—CHEMICAL EXAMINATION OF MISCELLANEOUS CANES.

During the month of August twelve varieties of cane were received from the Sugar Experiment Station, Bundaberg. These included Forage cane, a frost-resisting cane called "Shahjahanpur," originally introduced from India; five Java varieties; three Hawaiian varieties and H.Q. 77; a Hambledon Queensland Seedling; and one from Mauritius—viz., 168[04]. These were planted on the 12th August, 1920, and all struck very well, with the exception of Java 100 Bont, E.K.[1] and E.K.[28], which were slow at coming through; but the ultimate germination was good, and no misses were noticeable. The canes grew very well from the start; the only cane a little slow was Java 100 Bont. For the whole period of growth the canes appeared healthy, and no disease was noticeable. H. 146 and H. 227 are tall upstanding canes of medium thickness and moderate stoolers. Java 247 and 100 Bont both grow erect, and are heavy stoolers. E.K.[2], E.K.[28], and H. 109 were of medium length and moderate size stools. E.K.[1] is inclined to trail, and was blown down in March and June by heavy winds, while the others stood erect. H. 109 is also slightly inclined to trail. M. 168[04] and H.Q. 77 both grew well. The former is thick in the stick and somewhat like Mauritius 1900 Seedling; the latter is dark cane of medium thickness. The Indian cane Shahjahanpur grew very well with a large number of sticks to the stool; the sticks were thin, but a little thicker than Yuban cane. The Forage cane also grew well, and should be more suited for horse-feed than the Yuban cane, as it is much softer.

The analyses of all the above canes are included under the table headed "Miscellaneous Varieties," and, judging by their growth and the analyses made this year, some of them should prove varieties of good commercial value. The Java and Hawaiian varieties appear a fine class of cane, and will undoubtedly improve as they become more acclimatised.

The other varieties included under the same table are the Queensland Seedlings planted on the 31st March, 1920. It will be noticed that the Q. 813 matures early, as it has a high c.c.s. content in June and July. The Q. 970 matures much later, and should be cut later in the year than Q. 813. The Q. 1092 is not good in sugar content, although it crops well, and it will be discarded.

FIRST PRELIMINARY EXAMINATION OF MISCELLANEOUS CANES—PLANT CROP, JUNE, 1921.

Variety of Cane.	Date of Analysis.	Age of Cane.	Total Solids (Brix).	% Sucrose in Juice.	% Glucose in Juice.	C.C.S. in Cane.	Purity of Juice.
Forage	8-6-21	10 months	17·5	12·81	3·10	8·61	73·2
Shahjahanpur	8-6-21	10 months	16·9	13·75	2·11	10·06	81·3
Java E.K.[1]	8-6-21	10 months	13·3	8·16	4·35	4·56	61·4
Java E.K.[2]	8-6-21	10 months	13·5	8·78	3·90	5·26	65·0
Java E.K.[28]	8-6-21	10 months	17·8	14·41	2·44	10·50	80·9
Java 247	8-6-21	10 months	14·8	11·18	2·82	7·72	75·5
Java 100 Bont	8-6-21	10 months	13·8	8·90	3·90	5·28	64·5
H. 109	8-6-21	10 months	15·4	11·72	3·01	8·14	76·1
H. 146	8-6-21	10 months	18·3	16·21	1·41	12·55	88·5
H. 227	8-6-21	10 months	15·5	12·05	2·26	8·51	77·7
M. 168[04]	8-6-21	10 months	16·8	13·50	2·70	9·78	80·4
H.Q. 77	8-6-21	10 months	16·3	13·13	2·17	9·53	80·5
Q. 813	9-6-21	14 months	19·6	17·81	..	14·02	90·9
Q. 970	9-6-21	14 months	18·3	15·12	..	11·18	82·6
H.Q. 458	9-6-21	14 months	17·8	14·78	..	10·97	83·0
Q. 1092	9-6-21	14 months	16·8	12·59	..	8·64	74·9

SECOND PROGRESSIVE EXAMINATION OF MISCELLANEOUS CANES—PLANT CROP, JULY, 1921.

Variety of Cane.	Date of Analysis.	Age of Cane.	Total Solids (Brix).	% Sucrose in Juice.	% Glucose in Juice.	C.C.S. in Cane.	Purity of Juice.
Forage	7-7-21	11 months	18·4	15·23	1·56	11·28	82·8
Shahjahanpur	7-7-21	11 months	18·8	17·05	·60	13·40	90·7
Java E.K.[1]	7-7-21	11 months	15·3	12·43	2·01	9·08	81·2
Java E.K.[2]	7-7-21	11 months	13·6	8·83	3·85	5·28	64·9
Java E.K.[28]	7-7-21	11 months	18·2	16·45	·88	12·90	90·4
Java 247	7-7-21	11 months	16·9	14·65	1·25	11·19	86·7
Java 100 Bont	7-7-21	11 months	14·6	10·54	3·12	7·0	72·2
H. 109	7-7-21	11 months	16·8	15·02	1·13	11·70	89·4
H. 146	7-7-21	11 months	19·3	18·08	·41	14·48	93·7
H. 227	7-7-21	11 months	17·3	15·56	·78	12·17	89·9
M. 168[04]	7-7-21	11 months	18·1	15·95	1·28	12·31	88·1
H.Q. 77	7-7-21	11 months	16·3	14·28	1·09	10·98	87·6
Q. 813	8-7-21	15 months	20·6	19·06	..	15·16	92·5
Q. 970	8-7-21	15 months	19·8	17·75	..	13·85	89·6
H.Q. 458	8-7-21	15 months	18·5	16·58	..	12·94	89·6
Q. 1092	8-7-21	15 months	16·9	13·29	..	9·48	78·6

THIRD PROGRESSIVE EXAMINATION OF MISCELLANEOUS CANES—PLANT CROP, AUGUST, 1921.

Variety of Cane.	Date of Analysis.	Age of Cane.	Total Solids (Brix).	% Sucrose in Juice.	% Glucose in Juice.	C.C.S. in Cane.	Purity of Juice.
Forage	8-8-21	12 months	18·0	15·76	1·6	12·12	87·5
Shahjahanpur	8-8-21	12 months	15·7	13·47	·87	10·22	85·8
Java E.K.[1]	8-8-21	12 months	16·7	14·47	1·43	11·05	86·6
Java E.K.[2]	8-8-21	12 months	15·6	13·12	2·0	9·82	84·1
Java E.K.[28]	8-8-21	12 months	17·6	15·79	·95	12·33	89·7
Java 247	8-8-21	12 months	16·2	14·39	·98	11·16	88·8
Java 100 Bont	8-8-21	12 months	15·0	11·61	2·27	8·18	77·4
H. 109	8-8-21	12 months	16·2	14·23	1·39	10·96	87·8
H. 146	8-8-21	12 months	18·8	17·56	·32	14·04	93·4
H. 227	8-8-21	12 months	17·8	16·20	·48	12·76	91·0
M. 168[04]	8-8-21	12 months	18·2	16·21	1·0	12·60	89·1
H.Q. 77	8-8-21	12 months	17·0	14·99	·95	11·57	88·2
Q. 813	9-8-21	16 months	19·6	18·39	..	14·74	93·8
Q. 970	9-8-21	16 months	20·1	18·72	..	14·94	93·1
H.Q. 458	9-8-21	16 months	17·9	15·81	..	12·22	88·3
Q. 1092	9-8-21	16 months	18·6	17·03	..	13·46	91·6

FINAL EXAMINATION OF MISCELLANEOUS CANES—PLANT CROP, SEPTEMBER, 1921.

Variety of Cane.	Date of Analysis.	Age of Cane.	% Total Solids (Brix).	% Sucrose in Juice.	% Glucose in Juice.	C.C.S. in Cane.	Purity of Juice.	Date of Arrowing.
Forage	14-9-21	13 months	15·1	13·26	·95	10·21	87·8	30 May
Shahjahanpur	14-9-21	13 months	18·2	16·98	·34	13·57	93·3	30 May
Java E.K.[1]	14-9-21	13 months	19·1	17·74	1·08	14·14	92·9	..
Java E.K.[2]	14-9-21	13 months	17·1	15·34	1·43	11·97	89·7	..
Java E.K.[28]	14-9-21	13 months	19·9	18·80	·48	15·13	94·5	30 June
Java 247	14-9-21	13 months	18·5	17·01	·80	13·48	91·9	29 June
Java 100 Bont	14-9-21	13 months	17·1	13·85	1·11	10·10	81·0	..
H. 109	14-9-21	13 months	18·8	17·37	·82	13·80	92·4	18 June
H. 146	14-9-21	13 months	18·2	17·17	·31	13·80	94·4	18 June
H. 227	14-9-21	13 months	17·9	16·43	·42	13·0	91·8	19 June
M. 168[04]	14-9-21	13 months	19·4	18·08	·55	14·44	93·2	10 June
H.Q. 77	14-9-21	13 months	18·2	17·06	·48	13·67	93·7	6 June
Q. 813	1-9-21	17 months	20·2	18·85	..	15·15	93·3	7 June
Q. 970	1-9-21	17 months	20·1	18·95	..	15·33	94·3	11 June
H.Q. 458	1-9-21	17 months	18·3	16·50	..	13·23	90·2	..
Q. 1092	1-9-21	17 months	18·6	16·48	..	12·84	88·6	31 May

DISTRIBUTION OF CANE VARIETIES AT MACKAY.

This year the *free* distribution of varieties took place in July; the number of farmers calling was much below the average of the two previous years, only about 70 farmers coming, whereas in the two previous years about 150 called. This was probably due to the smaller number of new varieties available, as most farmers have tried the best of the Queensland Seedlings, and have planted them out extensively during the last two years. Some new varieties were given out for the first time—Java E.K.[1], E.K.[28], and H. 109; and all the available cane of these varieties was taken. A few farmers also took some of the frost-resisting cane "Shahjahanpur." Other varieties taken were D. 1457, 7 R. 428, and

Forage cane. As a large number of new varieties will be available next year, it is expected that a much larger number of farmers will avail themselves of the opportunity of getting plants of these new tested varieties.

Besides the above free distribution, the station also sold 42 tons 8 cwt. of the best varieties. The ones chiefly sought after were Q. 813, Q. 970, D. 1457, Q. 1121, and Q. 855.

Crates of cane varieties were also sent to the Proserpine Farmers' Associations; State Farm, Home Hill; and a large number of parcels were also posted to the Home Hill district and other localities.

New Varieties Introduced this Year to the Mackay Sugar Experiment Station.

Mauritius 28/10, 32/10, 55/11, 55/1182, H.Q. 409, and Q. 116 sport from Bundaberg Sugar Experiment Station; and B. 156 from Mr. A. Broom, Booyan, *via* Moorlands.

The following varieties have been reintroduced from the Atherton Tableland, where they have been growing at Kairi State Farm for the last seven years:—Badila, Striped Singapore, Meera, and Rose Bamboo.

Dates of Arrowing of Different Varieties.

Mauritius 89 (plant)	23rd May
Mauritius 87 (plant)	27th May
Q. 1133 (plant)	27th May
Petite Senneville (plant)	29th May
Q. 1092, 7 R. 428, B. 4030 (plant)	30th May
B. 4596, Shahjahanpur (plant)	30th May
Forage Cane (plant)	30th May
Q. 1092 (1st ratoons)	31st May
Q. 903 (1st ratoons)	2nd June
B. 4596, B. 4030 (1st ratoons)	2nd June
H.Q. 77, N.G. 16 (plant)	6th June
Q. 970, Q. 813 (1st ratoons)	6th June
Q. 813, Q. 855, Q. 695 (plant)	6th June
M. 168[04], Q. 970, Q. 903, N.G. 89, N.G. 24B (plant)	10th June
Q. 1098, N.G. 24B (1st ratoons)	10th June
Q. 1098 (2nd ratoons)	11th June
N.G. 24, 24A (plant)	12th June
Mauritius 55, 1900 Seedling (plant)	15th June
D. 109, H. 109, H. 227, H. 146 (plant)	19th June
Gingor (plant)	22nd June
H.Q. 426, Java 247 (plant)	29th June
8 R. 431, Java E.K.[28] (plant)	30th June
N.G. 103 (2nd ratoons)	30th June
N.G. 89 (2nd ratoons)	20th July
D. 1457 (plant)	20th July

New Experiments to be Undertaken.

1. Competitive trials of the following varieties:—H. 227, H. 146, H. 109, Java 100 Bont, Java 247, Java E.K.[1], E.K.[2], E.K.[28], M. 168[04], H.Q. 77, Shahjahanpur No. 10, with N.G. 24B and Q. 813 for comparison.

2. Planting experiments with different distances between the rows—viz., 4 feet 6 inches, 5 feet, and 6 feet, and one plot 5 feet between rows and 3 feet between plants.

Annual Field Day.

The Annual Field Day of the Sugar Experiment Station at Mackay was held on Saturday, 2nd July, and was highly successful. About 250 farmers attended, and were conducted around the experiments, and the work explained. Keen interest was taken in the varieties. After luncheon an address on Cane Cultivation was given by the General Superintendent, and a demonstration of some of the lighter field implements took place in the afternoon.

Yield of Cane, Mackay Station.

The amount of cane cut at the Mackay Station this year was as follows:—

	Tons	cwt.	qr.
Sent to Racecourse Mill	263	0	0
Sold to Farmers	42	8	0
Distributed	6	0	0
Cut for Plants	9	0	0
Total	320	8	0

Total acreage under cane, 10·00 acres.
Average yield of cane, 32·0 tons per acre.

6.—WORK OF THE SOUTHERN SUGAR EXPERIMENT STATION AT BUNDABERG.

Mr. J. Pringle is the Chemist in Charge of the Sugar Experiment Station at Bundaberg, and he has performed his duties in a highly satisfactory manner. The appearance of the station generally reflects great credit upon Mr. Pringle and his staff. The latter consist of Messrs. A. E. Evans (foreman) and J. C. Thomsen (teamster). Both men are to be highly commended for their careful attention to duty, all work being carried out in a cheerful and reliable manner.

Mr. Pringle has prepared the tables of Analytical and Crop Results, and has supplied notes on weather conditions and growth of crops, for the use of the General Superintendent.

Meteorological.

From a growing standpoint the past season has been for the most part favourable, since, following on a comparative mild, moist winter in 1920, beneficial conditions prevailed up till February, 1921, when the weather became somewhat dry, which condition prevailed throughout the following month; and though a total rainfall of 5 inches was registered during those two months, the falls were of a very spasmodic nature, followed by high dry winds; and, as a result, the soil soon became fairly dry, and the cane suffered a setback for a few weeks during part of the best growing period, but quickly recovered again after the gale on the 5th April, which yielded 7·84 inches, and did comparatively little damage to the crops. The growth thus produced continued well into July, with the result that the tonnage exceeded the estimate considerably.

The past winter was exceptionally mild, only a few light frosts being experienced, which did very little damage even in the low-lying places. The 7 inches of rain received during June and July yielded sufficient moisture to produce a good strike in the spring plantings and bring away the ratoons of cane cut this year. It was, however, followed by light falls in August and September, and the soil was very soon dry again and the growth retarded. Unless a good fall is registered soon, the dry conditions will considerably affect the tonnage for 1922.

RAINFALL AT THE SOUTHERN SUGAR EXPERIMENT STATION, BUNDABERG, DURING THE GROWING SEASON.

Month.	Rainfall.
August, 1920	·270
September, 1920	1·460
October, 1920	3·085
November, 1920	1·060
December, 1920	5·980
January, 1921	7·890
February, 1921	1·260
March, 1921	3·780
April, 1921	8·850
May, 1921	2·480
June, 1921	5·840
July, 1921	1·500
August, 1921	1·280
September, 1921	·280
Total	44·995

EXPERIMENTS DEALT WITH IN THIS SECTION OF THE REPORT.

1. Experiments with Badila cane planted in rows with different widths; results from fourth ratoon crop (standover), 1921, and total results to date.

2. Experiments in planting cane on red soils that had been growing lucerne for a number of years. Results from first ratoon crop, 1921.

3. Experiments with pulverised limestone *versus* burnt lime. Results of plant crop (standover), 1921.

4. Experiments to test the action of different quantities of lime per acre. Results of plant crop (standover), 1921.

5. Experiments to test the comparative values of using plant cane; first ratoon; second ratoon; and third ratoon cane for plants. Results of plant crop (standover), 1921.

6. Experiments to determine the value of subsoiling. Results from plant crop (standover), 1921.

7. Experiments to test the effect of using different parts of sticks for plants. Results of plant crop (standover), 1921.

8. Analytical results of new canes from Java, Mauritius, Hawaii, and India.

9. Analytical results of miscellaneous canes.

1. EXPERIMENTS WITH BADILA CANE PLANTED IN ROWS OF DIFFERENT WIDTHS.

After the land had received three ploughings and harrowings, this experiment was planted in March, 1914, no manure being applied to the plant crop; it was cut in August, 1915, ratooned in the usual way, and mixed manure applied as follows:—

1 cwt. sulphate of ammonia,
1 cwt. nitrate of soda, and
2 cwt. meatworks manure, per acre.

The cane was cut in September, 1917, and ratooned as usual, no manure being applied to the second ratoon crop. It was intended in 1918 to stand the crop over, but, owing to a very severe frost in July of that year, it was cut in September, and ratooned, no manure being applied to the third ratoons. Owing to the dry weather in the spring of 1918 and summer months of 1919, the cane made very little growth, and would have gone over to 1920 but for the frost, which practically killed it and necessitated cutting; this crop being lost, as there was practically no cane to harvest. The fourth ratoons were ratooned as usual, and received an application of mixed manure as follows:—2 cwt. sulphate of ammonia, ½ cwt. sulphate of potash, and 2 cwt. superphosphate per acre. This crop was allowed to standover, and was cut in August, and as the experiment is now concluded the stools were ploughed out and the land will be prepared for further experiments. On taking a survey of the four crops, it will be seen that the results are consistent all through; Plot 1 (rows 5 feet apart, giving the highest tonnages each cutting, while the average c.c.s. for the four crops is practically the same.

The following table gives the analytical data in connection with the fourth ratoon crop:—

ANALYTICAL RESULTS OF CANE PLANTED IN ROWS HAVING DIFFERENT WIDTHS—N.G. 15 (BADILA) FOURTH RATOON STANDOVER—AUGUST, 1921.

Plot Number.	Variety of Cane.	Distance between Rows.	Age of Cane.	Date of Analysis.	Density of Juice (Brix).	% Sucrose in Juice.	% Glucose in Juice.	Purity of Juice.	% Sugar in Cane.	% C.C.S. in Cane.
1	Badila	5 feet	23 months	5-8-21	20·2	19·19	·27	94·5	17·00	15·46
2	Badila	6 feet	23 months	5-8-21	20·8	19·56	·25	94·2	17·54	15·83
3	Badila	7 feet	23 months	5-8-21	21·4	20·09	·27	93·8	17·99	16·26

While the crop results are contained in the table below:—

CROP RESULTS OF CANE PLANTED IN ROWS HAVING DIFFERENT WIDTHS—N.G. 15 (BADILA) FOURTH RATOON STANDOVER—AUGUST, 1921.

Plot Number.	Variety of Cane.	Distance between Rows.	Age of Cane.	Weight of Cane per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.
1	Badila	5 feet	23 months	17·53	2·71
2	Badila	6 feet	23 months	15·31	2·42
3	Badila	7 feet	23 months	13·92	2·26

The following tables contain the analytical and crop results to date :—

ANALYTICAL RESULTS TO DATE OF CANE PLANTED IN ROWS HAVING DIFFERENT WIDTHS—N.G. 15 (BADILA) STANDOVER—FOURTH RATOON.

Plot Number.	Variety of Cane.	Distance between Rows.	PLANT CROP, 1915.					FIRST RATOON CROP (STANDOVER), 1917.					SECOND RATOON CROP, 1918.					FOURTH RATOON CROP (STANDOVER), 1921.					AVERAGE FOR FOUR CROPS.		
			Density of Juice (Brix.).	% Sucrose in Juice.	% Glucose in Juice.	Purity of Juice.	% C.C.S. in Cane.	Density of Juice (Brix.).	% Sucrose in Juice.	% Glucose in Juice.	Purity of Juice.	% C.C.S. in Cane.	Density of Juice (Brix.).	% Sucrose in Juice.	% Glucose in Juice.	Purity of Juice.	% C.C.S. in Cane.	Density of Juice (Brix.).	% Sucrose in Juice.	% Glucose in Juice.	Purity of Juice.	% C.C.S. in Cane.	% Sucrose in Juice.	Purity of Juice.	% C.C.S. in Cane.
1	Badila ..	5 feet	22·4	20·77	·09	92·7	16·64	21·8	21·10	·15	96·7	17·64	21·9	20·33	·16	92·8	16·49	20·2	19·10	·27	94·5	15·46	20·32	94·2	16·56
2	Badila ..	6 feet	22·5	21·23	·08	94·3	17·17	21·4	20·43	·25	95·4	16·96	20·2	19·00	·17	94·1	15·53	20·8	19·59	·25	94·2	15·83	20·06	94·5	16·37
3	Badila ..	7 feet	22·6	21·33	·10	94·4	17·26	22·1	21·11	·17	95·5	17·51	18·7	17·37	·19	92·8	14·01	21·4	20·09	·27	93·8	16·20	19·97	94·1	16·24

CROP RESULTS TO DATE OF CANE PLANTED IN ROWS HAVING DIFFERENT WIDTHS—N.G. 15 (BADILA).

Plot Number.	Variety of Cane.	Distance between Rows.	PLANT CROP, 1915.		FIRST RATOON CROP (STANDOVER), 1917.		SECOND RATOON CROP, 1918.		FOURTH RATOON CROP (STANDOVER), 1921.		TOTAL RESULTS FOR FOUR CROPS.		AVERAGE FOR FOUR CROPS.	
			Yield of Cane per Acre in English Tons.	Yield of C.C.S. per Acre in English Tons.	Yield of Cane per Acre in English Tons.	Yield of C.C.S. per Acre in English Tons.	Yield of Cane per Acre in English Tons.	Yield of C.C.S. per Acre in English Tons.	Yield of Cane per Acre in English Tons.	Yield of C.C.S. per Acre in English Tons.	Yield of Cane per Acre in English Tons.	Yield of C.C.S. per Acre in English Tons.	Yield of Cane per Acre in English Tons.	Yield of C.C.S. per Acre in English Tons.
1	Badila	5 feet	15·04	2·50	64·50	11·38	12·91	2·13	17·53	2·71	109·98	18·72	27·49	4·68
2	Badila	6 feet	12·74	2·19	53·88	9·12	10·36	1·60	15·31	2·42	102·29	15·33	25·57	3·83
3	Badila	7 feet	11·91	2·05	49·06	8·52	9·95	1·39	13·92	2·26	84·84	14·22	21·21	3·55

NOTE.—The third ratoon crop due to frost damage was too small for weighing.

From the above table of crop results to date it will be seen that the close planting has given the highest results in each of the four crops, thus bearing out the conclusions derived from previous experiments at Mackay.

2. Experiments to try Whether Cane will Grow Well upon Red Soils that have Carried Lucerne for a Number of Years.

Many farmers in the Woongarra district hold that cane following lucerne upon red soil will not do well, or may fail to grow at all. The land chosen for the experiment had been carrying successive growths of lucerne for a period of ten years, and was divided into three plots as under :—

Plot 1.—Treated with lime and green manure before planting.

Plot 2.—Treated with lime only.

Plot 3.—No lime or green manure.

Particulars of the plant crop appeared in last year's report, and the results of this year's first ratoon crop show similar results, which will be dealt with later.

After cutting the plant crop the cane was ratooned in the usual way, and mixed manure applied as follows :—100 lb. sulphate of ammonia ; 50 lb. nitrate of soda ; 30 lb. muriate of potash and 200 lb. superphosphate per acre. The cane in each plot came away well, and for a time was quite uniform, but after a few months Plot 3 took the lead, which was maintained right through, the plot at time of cutting being very uniform, whilst Plots 1 and 2 were somewhat patchy, especially No. 2.

The crop results are in keeping with that of the plant crop, Plot 3 cutting out at 1·84 tons per acre more than Plot 1, and 2·08 above Plot 2, while there is only a difference of ·25 ton between Nos. 1 and 2, in favour of the former. The difference between the plots this year is not so wide as last. From the results it appears that cane will grow on red soils after lucerne, while, with favourable weather and the assistance of a little fertiliser, it should produce good crops, the tonnages for this year being very satisfactory for 13 months' old cane.

The following tables comprise the analytical and crop results :—

Analytical Results of Experiments to try whether Cane will Grow upon Red Soils that have Carried Lucerne for a Number of Years. D. 1135, First Ratoon Crop. October, 1921.

Plot Number.	Variety of Cane.	Treatment.	Age of Cane.	Date of Analysis.	Density of Juice (Brix).	% Sucrose in Juice.	% Glucose in Juice.	Purity of Juice.	% Sugar in Cane.	% C.C.S. in Cane.
1	D. 1135 ..	One ton of lime per acre applied, and green manure ploughed under before planting with cane	13 months	6-10-21	21·5	19·87	·48	92·4	17·69	15·78
2	D. 1135 ..	One ton of lime per acre applied before planting with cane. No green manure	13 months	6-10-21	20·2	18·38	·82	90·9	16·36	14·44
3	D. 1135 ..	No lime or green manure used	13 months	6-10-21	20·0	18·53	·63	92·6	16·50	14·73

Crop Results of Experiments to Try whether Cane will Grow well upon Red Soils that have carried Lucerne for a Number of Years. D. 1135, First Ratoon Crop. October, 1921.

Plot Number.	Variety of Cane.	Treatment.	Age of Cane.	Weight of Cane per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.
1	D. 1135 ..	One ton of lime per acre applied, and green manure ploughed in before planting with cane	13 months	22·37	3·53
2	D. 1135 ..	One ton of lime per acre applied before planting with cane. No green manure	13 months	22·13	3·19
3	D. 1135 ..	No lime or green manure used	13 months	24·21	3·56

This experiment shows that the lime and green manure applied had no result on the plant crop, and did not affect the first ratoons either. The experiments with lime on our red soils have been mostly negative.

3.—Experiments with Pulverised Limestone versus Burnt Lime.

A series of experiments have been initiated to test this matter. Plot 1 has been treated with pulverised limestone, Plot 2 with slaked burnt lime, and on Plot 3 no lime has been applied.

After the stools from the previous crop had been ploughed out and carted off, 1 ton of pulverised limestone was applied to Plot 1, and 1 ton of burnt lime to Plot 2 ; the three plots were then sown with cowpea, and a fair crop of green manure ploughed under in February, 1919, after which the land received two cross ploughings and harrowings, and was planted in March, the plants coming from forest soil at Gooburrum.

The analytical and crop results appear hereunder :—

ANALYTICAL RESULTS OF EXPERIMENTS USING PULVERISED LIMESTONE, BURNT LIME, AND NO LIME. PLANT CANE, D. 1135 (STANDOVER). AUGUST, 1921.

Plot Number.	Variety of Cane.	Treatment.	Age of Cane.	Date of Analysis.	Density of Juice (Brix).	% Sucrose in Juice.	% Glucose in Juice.	Purity of Juice.	% Sugar in Cane.	% C.C.S. in Cane.
1	D. 1135 ..	One ton pulverised limestone per acre	30 months	15-8-21	19·1	18·16	·19	95·1	16·17	14·69
2	D. 1135 ..	One ton burnt lime per acre	30 months	15-8-21	18·3	17·17	·25	93·8	15·29	13·77
3	D. 1135 ..	No lime	30 months	15-8-21	19·4	18·27	·27	94·1	16·26	14·68

CROP RESULTS OF EXPERIMENTS USING PULVERISED LIMESTONE, BURNT LIME, AND NO LIME. PLANT CANE, D. 1135 (STANDOVER). AUGUST, 1921.

Plot Number.	Variety of Cane.	Treatment.	Age of Cane.	Weight of Cane per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.
1	D. 1135 ..	One ton pulverised limestone per acre	30 months	38·33	5·63
2	D. 1135 ..	One ton burnt lime per acre	30 months	29·46	4·06
3	D. 1135 ..	No lime	30 months	37·26	5·49

The results of this experiment are disappointing. There is only a slight difference for the use of pulverised limestone in Plot 1, compared with Plot 3 (no lime), while the intermediary Plot 2 (with burnt lime) shows a decided falling off. Whether this is due to the burnt lime being too hot for our red soils, or due to some hitherto unsuspected unevenness of the soil, it is difficult to say. It only bears out previous experiments—that the application of lime is not payable on the red soils of the Woongarra.

4.—FURTHER EXPERIMENTS WITH LIME.

In the light of previous trials of lime, it was a matter of some doubt whether 1 ton of lime was sufficient to apply. In Hawaii, up to 7 tons of pulverised limestone per acre are put on. An experiment, therefore, was laid down in which varying quantities of lime were used :—

Plot 1 received no lime.
Plot 2 received 1 ton per acre.
Plot 3 received 2 tons per acre.
Plot 4 received 3 tons per acre.
Plot 5 received 4 tons per acre.
Plot 6 received 5 tons per acre.
Plot 7 received 6 tons per acre.

After the stools from the previous crop had been ploughed out, harrowed, and carted off, the whole block, with the exception of Plot 1, received an application of pulverised limestone, at the rate of 1 ton per acre. In July, the increased quantities of limestone were applied to Plots 3 to 7, Plot 2 having received 1 ton per acre previous to planting the cowpea. All plots came away well, and appeared to be very uniform up to time of cutting.

The following tables represent the analytical and crop results :—

ANALYTICAL RESULTS OF EXPERIMENTS TO TEST THE ACTION OF DIFFERENT QUANTITIES OF LIME PER ACRE ON CANE CROPS, THE QUANTITIES OF LIME IN THE FORM OF PULVERISED LIMESTONE VARYING FROM 1 TO 6 TONS PER ACRE. PLANT CANE, D. 1135 (STANDOVER). SEPTEMBER, 1921.

Plot Number.	Variety of Cane.	Treatment.	Age of Cane.	Date of Analysis.	Density of Juice (Brix).	% Sucrose in Juice.	% Glucose in Juice.	Purity of Juice.	% Sugar in Cane.	% C.C.S. in Cane.
1	D. 1135 ..	No lime		6-9-21	19·2	17·89	·20	93·1	15·93	14·28
2	D. 1135 ..	One ton pulverised limestone per acre	23 months	6-9-21	20·2	18·92	·29	93·6	16·84	15·16
3	D. 1135 ..	Two tons pulverised limestone per acre	23 months	6-9-21	20·4	19·41	·21	95·1	17·28	15·69
4	D. 1135 ..	Three tons pulverised limestone per acre	23 months	6-9-21	20·4	19·46	·20	95·4	17·32	15·73
5	D. 1135 ..	Four tons pulverised limestone per acre	23 months	6-9-21	19·5	18·25	·25	93·6	16·25	14·61
6	D. 1135 ..	Five tons pulverised limestone per acre	23 months	6-9-21	19·9	18·82	·18	94·5	16·81	15·15
7	D. 1135 ..	Six tons pulverised limestone per acre	23 months	6-9-21	20·1	19·12	·22	95·1	17·02	15·45

CROP RESULTS OF EXPERIMENTS TO TEST THE ACTION OF DIFFERENT QUANTITIES OF LIME PER ACRE ON CANE CROPS. THE QUANTITIES OF LIME IN THE FORM OF PULVERISED LIMESTONE VARYING FROM ONE TO SIX TONS PER ACRE. PLANT CANE, D. 1135 (STANDOVER). SEPTEMBER, 1921.

Plot Number.	Variety of Cane.	Treatment.	Age of Cane.	Weight of Cane per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.
1	D. 1135 ..	No lime	23 months	35·42	5·06
2	D. 1135 ..	One ton pulverised limestone per acre	23 months	37·21	5·64
3	D. 1135 ..	Two tons pulverised limestone per acre	23 months	37·65	5·91
4	D. 1135 ..	Three tons pulverised limestone per acre	23 months	38·74	6·09
5	D. 1135 ..	Four tons pulverised limestone per acre	23 months	32·83	4·80
6	D. 1135 ..	Five tons pulverised limestone per acre	23 months	38·18	5·78
7	D. 1135 ..	Six tons pulverised limestone per acre	23 months	37·21	5·75

The results of this experiment are also most unsatisfactory, and, so far, show that the application of larger quantities of lime do not affect the situation. Although there is a gradual increase shown from Plots 1 to 4, Plot 5 with an application of 4 tons of pulverised limestone per acre shows a remarkable decrease, not only in tonnage of cane, but also in the commercial cane sugar. Frost did some damage to these plots, and may have been more severe on Plot 5. Plots 6 and 7, with 5 and 6 tons of pulverised limestone per acre, are about equivalent to Plots 2, 3, and 4, with 1, 2, and 3 tons of pulverised limestone per acre. It was stated in last year's report that the experiment work at the Bundaberg Station, due to droughts and frosts continually upsetting the balance, is not nearly so satisfactory as at Mackay and South Johnstone, where more even climatic conditions prevail, and the results are generally consistent.

5.—EXPERIMENTS TO TEST THE COMPARATIVE VALUE OF USING PLANT CANE, FIRST RATOON CANE, SECOND RATOON CANE, AND THIRD RATOON CANE FOR PLANTS.

The use of second and third ratoon cane is usually condemned in most sugar districts, though plants cut from these crops are often used in the South.

After ploughing out the stools from the previous crop, this land was planted with cowpea in February, 1919, and a fairly good crop of green manure ploughed in in April, after which it was cross-ploughed twice, and the cane planted in October, Plot 1 coming through a few days before the others.

In November, 1920, each plot received an application of sulphate of ammonia, at the rate of 100 lb. per acre. It appeared, from the beginning up till the time the gale blew the cane down in April, that Plot 1 was in the lead, though for a time during the dry weather it was noticed that Plot 4 was making rapidly on it, and this appears to have been maintained, though it was not apparent after the cane was lying down. From the crop results it would appear as though the general idea that plant and first ratoon cane make the best plants is not always the case, since Plot 4 gave the best results, followed by No. 1, with a decrease of 1·21 tons per acre.

Below are given the analytical and crop results :—

ANALYTICAL RESULTS OF EXPERIMENTS TO TEST THE COMPARATIVE VALUES OF USING PLANT CANE, FIRST RATOON CANE, SECOND RATOON CANE, AND THIRD RATOON CANE FOR PROVIDING PLANTS. PLANT CANE, D. 1135 (STANDOVER). SEPTEMBER, 1921.

Plot Number.	Variety of Cane.	Plants Cut from—	Age of Cane.	Date of Analysis.	Density of Juice (Brix).	% Sucrose in Juice.	% Glucose in Juice.	Purity of Juice.	% Sugar in Cane.	% C.C.S. in Cane.
1	D. 1135 ..	Plant cane	23 months	8-9-21	21·4	20·27	·19	94·7	18·36	16·23
2	D. 1135 ..	First ratoons	23 months	8-9-21	20·4	19·30	·23	94·6	17·18	15·54
3	D. 1135 ..	Second ratoons	23 months	8-9-21	19·0	17·97	·33	94·6	16·00	14·30
4	D. 1135 ..	Third ratoons	23 months	8-9-21	19·2	17·86	·36	92·9	15·90	14·26

CROP RESULTS OF EXPERIMENTS TO TEST THE COMPARATIVE VALUES OF USING PLANT CANE, FIRST RATOON CANE, SECOND RATOON CANE, AND THIRD RATOON CANE, FOR PROVIDING PLANTS. PLANT CANE, D. 1135 (STANDOVER). SEPTEMBER, 1921.

Plot Number.	Variety of Cane.	Plants Cut from—	Age of Cane.	Weight of Cane per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.
1	D. 1135 ..	Plant cane	23 months	29·88	4·88
2	D. 1135 ..	First ratoons	23 months	26·56	4·53
3	D. 1135 ..	Second ratoons	23 months	27·38	3·97
4	D. 1135 ..	Third ratoons	23 months	31·09	4·43

These results upset a good many preconceived notions, but, at the same time, it is doubtful whether the same results would have been obtained at Mackay or Cairns.

6.—Subsoiling Experiments.

A further effort is being made to ascertain whether an increased yield can be obtained from subsoiling the red soils. So far, little difference has been obtained in previous experiments in this class of soil. A portion of land has therefore been subsoiled to 20 inches deep, and another portion, adjacent, of uniform land, has been left unsubsoiled, being only ploughed to a depth of 12 inches. With these exceptions, the remaining cultural operations were the same, the variety used for the experiment being D. 1135.

After ploughing out the stools from the previous crop, the land received an application of burnt lime, at the rate of 1 ton per acre, and was sown with cowpea in December, 1918, and a good crop of green manure turned in in March, 1919. In June, both plots were ploughed to the depth of 12 inches, with the swing plough, and Plot 1 subsoiled to 18 to 20 inches, and the cane planted in August. Both plots came away well, and appeared to be very uniform, though during the dry weather No. 1 had a better colour, and appeared to be a little better in growth, though this is not borne out by the results. It is evident that subsoiling in these red porous soils is of little value, since there is an increase of 4·99 tons in favour of no subsoiling. This is in keeping with previous subsoil experiments on the Station, when, at the conclusion of the trials, it was found that in the total crop results for the four crops there was an increase of 3·10 tons per acre in favour of the non-subsoiled plot.

In the tables given hereunder will be found the analytical and crop results :—

Analytical Results of Experiments to Determine the Value of Subsoiling. Plant Cane, D. 1135 (Standover). September, 1921.

Plot Number.	Variety of Cane.	Treatment.	Age of Cane.	Date of Analysis.	Density of Juice (Brix).	% Sucrose in Juice.	% Glucose in Juice.	Purity of Juice.	% Sugar in Cane.	% C.C.S. in Cane.
1	D. 1135 ..	Plant crop subsoiled, and succeeding ratoon crops will also be subsoiled	23 months	21-9-21	19·3	18·47	·27	95·6	16·44	14·97
2	D. 1135 ..	Plant crop not subsoiled, and succeeding crops will be ratooned by ploughing 9 inches deep	23 months	21-9-21	18·8	17·39	·43	92·5	15·48	13·82

Crop Results of Experiments to Determine the Value of Subsoiling. Plant Cane, D. 1135 (Standover). September, 1921.

Plot Number	Variety of Cane.	Treatment.	Age of Cane.	Weight of Cane per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.
1	D. 1135 ..	Plant crop subsoiled, and succeeding ratoon crops will also be subsoiled	23 months	27·96	4·18
2	D. 1135 ..	Plant crop not subsoiled, and succeeding crops will be ratooned by ploughing 9 inches deep	23 months	32·95	4·65

The results obtained are very different to similar experiments carried out in Mackay, and are no doubt due to the open porous nature of the soil, though it is hard to understand why the results were not more equal.

7.—Experiments with using different parts of the Stick for Plants.

This has been tried in so far as tops, middles, and middles and bottoms are concerned, but in this experiment all the plants in a stick are being used separately—*i.e.*, top plants, second 3 eyes, third 3 eyes, and so on, including bottoms.

After the stools from the previous crop had been ploughed out, the land was limed at the rate of 1 ton per acre with burnt lime, and sown with cowpea in December, 1919, and a good crop of green manure ploughed under in March, 1920, after which the land received two cross-ploughings before planting. All plots were planted the same day, and each plant contained only three eyes. At the end of the fourth and eighth week after planting, a count of the shoots was made, with the following result :—

——	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	No. 6.	No. 7.
Fourth week	259	297	298	275	328	297	250
Eighth week	495	525	496	503	532	490	444

All plots appeared to be quite uniform in growth until about thirteen months old, when it was noticed that No. 2 had a slight lead on those close to it, followed closely by No. 3. Plot 7 did not appear to have any special advantage, though from the results it is the best.

Below are given the analytical and crop results :—

Analytical Results of Experiments Testing the Effect of Using Different Parts of the Sticks of Cane for Plants. Plant Cane, 1900 Seedling (Standover). September, 1921.

Plot Number.	Variety of Cane.	Portion of Stick Used.	Age of Cane.	Date of Analysis.	Density of Juice. (Brix).	% Sucrose in Juice.	% Glucose in Juice.	Purity of Juice.	% Sugar in Cane.	% C.C.S. in Cane.
1	1900 Seedling	Top plants, three eyes ..	23 months	21-9-21	20·2	19·24	·21	95·7	17·17	15·60
2	1900 Seedling	Second three eyes	23 months	21-9-21	20·6	19·68	·17	95·5	17·56	15·98
3	1900 Seedling	Third three eyes	23 months	21-9-21	20·8	19·76	·31	95·0	17·63	15·99
4	1900 Seedling	Fourth three eyes	23 months	21-9-21	20·8	19·94	·34	95·8	17·80	16·22
5	1900 Seedling	Fifth three eyes	23 months	21-9-21	20·7	19·60	·28	94·7	17·49	15·83
6	1900 Seedling	Sixth three eyes	23 months	21-9-21	19·3	18·20	·45	94·3	16·26	14·62
7	1900 Seedling	Seventh three eyes (butts)	23 months	21-9-21	20·5	19·45	·22	94·9	17·35	15·72

Crop Results of Experiments Testing the Effect of Using Different Parts of the Sticks of Cane for Plants. Plant Cane, 1900 Seedling (Standover). September, 1921.

Plot Number.	Variety of Cane.	Portion of Stick Used.	Age of Cane.	Weight of Cane per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.
1	1900 Seedling	Top plants, three eyes	23 months	31·25	4·87
2	1900 Seedling	Second three eyes	23 months	35·13	5·61
3	1900 Seedling	Third three eyes	23 months	31·42	5·02
4	1900 Seedling	Fourth three eyes	23 months	31·57	5·12
5	1900 Seedling	Fifth three eyes	23 months	31·02	4·91
6	1900 Seedling	Sixth three eyes	23 months	25·46	3·72
7	1900 Seedling	Seventh three eyes (butts)	23 months	36·00	5·66

Generally speaking, the top eyes usually give the best results, as has been frequently demonstrated. In this experiment the plant crop shows the second 3 eyes and the butts to give the best yield, the first, third, fourth, fifth, and sixth 3 eyes being inferior. The experiment is an interesting one, and confirms others that butts often make excellent plants.

8.—Analytical Results of New Canes from Java, Mauritius, Hawaii, and India.

All of these varieties were the same age, though the four from Mauritius were first ratoon, while the others were plant. From the analyses it will be seen that E.K.^{28}, E.K.^{1}, and 247 Generatie are very promising varieties, while E.K.^{2} and 100 Bont are inclined to be low in quality. E.K.^{28} is a good striker and fairly rapid grower, but somewhat sparse stooler in the plant crop, though it ratoons and stools out well in the ratoon crops. E.K.^{1} is a slow but sure striker and grows slowly until it begins to make cane, when it commences to grow rapidly, and in a short space will outgrow most of those that previously were ahead of it. This variety (E.K.^{1}) is to be well recommended. 247 Generatie is a good striker, medium grower, and good stooler and ratooner. E.K.^{2} is a very vigorous quick striker and rapid grower, and a remarkable stooler; it is an erect grower and trashes easily, and, though it is comparatively somewhat low in quality, a test of 13·55 per cent. c.c.s. was recently received from the mill for a truck load sent in from this Station. It appears to be a very heavy cropper.

100 Bont is a fairly good striker, medium grower and stooler, but is somewhat deliciate under dry conditions, and inclined to be of low quality. These varieties are all more or less subject to frost.

With reference to the Mauritius canes—28/10, 32/10, 55/11, and 55/1182—the last appears to be the best in quality, and is a good striker, very rapid grower, good stooler, and ratooner. This seems to be a promising cane, while the other three are medium to good varieties. They have not yet arrowed on this Station. M. 168/04 is a cane that was introduced with four others in 1915, and is the only one that was retained after 1916, owing to "Striped Leaf" developing in the others. It is a cane of very fair quality, good striker, stooler, and ratooner, but somewhat slow in growth. It arrowed for the first time on this Station in the middle of July last.

With reference to the Hawaiian canes the behaviour of H. 109 has been very disappointing on this Station, as the first plant crop from the original sets received from Hawaii gummed very badly, and, though all affected cane was thrown out when planting out again, the gum was soon very much in evidence, and not only was gum bad in the third planting, but it seemed to contract a peculiar disease of some kind that would ulti-

mately have killed it right out, had it not been ploughed up before it got too bad. It is intended to discard all that is at present on this Station and give it another trial with fresh sets from Innisfail or Mackay, where it appears to be doing well. H. 146 is a good striker and very rapid grower, but is low in quality, and a very sparse stooler in the plant crop, but better in the ratoon, while H. 227 is a good striking, fairly rapid growing cane of good quality; it is also a good stooler and ratooner. These two canes are erect-growing, self-trashing varieties, and, no doubt, the latter will come into favour with many, but the former may be discarded owing to its low quality unless it improves.

With regard to Shahjahanpur, there is little to add to previous reports, other than that it is in very big demand, owing to its good quality and strong frost-resisting powers. In all the analyses one average stool was taken.

FIRST PRELIMINARY EXAMINATION OF NEW CANES FROM JAVA, MAURITIUS, HAWAII, AND INDIA. PLANT CANE—JUNE, 1921.

Country.	Name or Number of Variety.	Age of Cane.	Date of Analysis.	Density of Juice (Brix).	% Sucrose in Juice.	% Glucose in Juice.	Purity of Juice.	% Sucrose in Cane.	% C.C.S. in Cane.
Java	E.K.[1]	20 months	26-6-21	18·6	17·14	·78	92·1	15·37	13·70
Java	E.K.[2]	20 months	26-6-21	16·8	14·45	1·42	86·0	12·77	10·91
Java	E.K.[28]	20 months	26-6-21	18·6	16·74	·76	90·0	15·18	13·36
Java	100 Bont	20 months	26-6-21	17·6	15·40	1·56	87·5	13·60	11·73
Java	247 Generatie	20 months	26-6-21	18·9	17·49	·38	88·3	15·52	13·83
Mauritius	28/10, first ratoon ..	20 months	26-6-21	18·2	16·33	·31	89·7	14·73	12·93
Mauritius	32/10, first ratoon ..	20 months	26-6-21	19·5	17·91	·32	91·8	15·66	13·90
Mauritius	55/11, first ratoon ..	20 months	26-6-21	17·1	15·27	·57	89·2	13·34	11·64
Mauritius	55/1182, first ratoon ..	20 months	26-6-21	18·3	15·79	·56	86·2	14·07	12·03
Mauritius	168[04]	20 months	26-6-21	18·5	16·91	·34	91·4	14·87	13·37
Hawaii	H. 109	20 months	26-6-21	16·5	14·85	·96	90·0	13·14	11·54
Hawaii	H. 146	20 months	26-6-21	18·3	16·63	·47	90·8	14·72	13·00
Hawaii	H. 227	20 months	26-6-21	18·5	16·52	·35	89·3	14·59	12·75
India	Shahjahanpur No. 10..	20 months	26-6-21	16·3	14·09	·56	86·4	12·17	10·40

SECOND PROGRESSIVE EXAMINATION OF NEW CANES FROM JAVA, MAURITIUS, HAWAII, AND INDIA. PLANT CANE—JULY, 1921.

Country.	Name or Number of Variety.	Age of Cane.	Date of Analysis.	Density of Juice (Brix).	% Sucrose in Juice.	% Glucose in Juice.	Purity of Juice.	% Sugar in Cane.	% C.C.S. in Cane.
Java	E.K.[1]	21 months	28-7-21	18·7	17·44	·96	93·2	15·63	14·03
Java	E.K.[2]	21 months	28-7-21	18·7	17·47	·50	93·4	15·44	13·87
Java	E.K.[28]	21 months	28-7-21	19·0	18·17	·37	95·6	16·47	15·03
Java	100 Bont	21 months	28-7-21	16·0	13·55	1·79	84·7	11·96	10·10
Java	247 Generatie	21 months	28-7-21	18·0	16·68	·55	92·7	14·76	13·19
Mauritius	28/10, first ratoon ..	21 months	28-7-21	18·7	17·62	·13	94·2	15·86	14·37
Mauritius	32/10, first ratoon ..	21 months	28-7-21	18·8	17·32	·16	92·1	15·14	13·48
Mauritius	55/11, first ratoon ..	21 months	28-7-21	15·1	12·94	1·20	86·3	11·32	9·60
Mauritius	55/1182, first ratoon ..	21 months	28-7-21	19·4	18·08	·26	93·2	16·11	14·45
Mauritius	168[04]	21 months	28-7-21	19·2	18·09	·26	94·2	16·12	14·55
Hawaii	H. 109	21 months	29-7-21	17·8	16·71	·46	93·8	14·79	13·35
Hawaii	H. 146	21 months	29-7-21	15·9	13·85	1·34	87·1	12·26	10·55
Hawaii	H. 227	21 months	29-7-21	17·9	16·38	·43	91·5	14·99	12·83
India	Shahjahanpur No. 10..	21 months	29-7-21	17·5	15·56	·60	88·9	14·00	11·80

THIRD PROGRESSIVE EXAMINATION OF NEW CANES FROM JAVA, MAURITIUS, HAWAII, AND INDIA. PLANT CANE—AUGUST, 1921.

Country.	Name or Number of Variety.	Age of Cane.	Date of Analysis.	Density of Juice (Brix).	% Sucrose in Juice.	% Glucose in Juice.	Purity of Juice.	% Sugar in Cane.	% C.C.S. in Cane.
Java	E.K.[1]	22 months	23-8-21	19·5	17·63	·82	90·4	15·80	13·93
Java	E.K.[2]	22 months	23-8-21	19·1	17·64	·42	92·3	15·60	13·91
Java	E.K.[28]	22 months	23-8-21	19·5	18·27	·24	93·6	17·72	14·94
Java	100 Bont	22 months	23-8-21	18·8	16·73	·68	88·9	14·88	12·88
Java	247 Generatie	22 months	23-8-21	19·0	17·89	·35	94·1	15·88	14·28
Mauritius	28/10, first ratoon ..	22 months	23-8-21	19·2	17·86	·13	93·0	16·11	14·45
Mauritius	32/10, first ratoon ..	22 months	23-8-21	19·3	17·43	·12	90·3	15·24	13·44
Mauritius	55/11, first ratoon ..	22 months	23-8-21	18·2	16·72	·41	91·8	14·59	12·96
Mauritius	55/1182, first ratoon ..	22 months	23-8-21	20·4	19·11	·14	93·6	17·03	15·33
Mauritius	168[04]	22 months	23-8-21	19·5	18·05	·38	92·5	16·24	14·38
Hawaii	H. 109	22 months	23-8-21	17·0	15·51	·59	91·2	13·73	12·16
Hawaii	H. 146	22 months	23-8-21	17·1	15·16	1·01	88·6	13·42	11·68
Hawaii	H. 227	22 months	23-8-21	18·1	17·75	·27	92·9	15·67	14·03
India	Shahjahanpur No. 10..	22 months	23-8-21	18·2	16·30	·44	89·5	14·09	12·41

FINAL EXAMINATION OF NEW CANES FROM JAVA, MAURITIUS, HAWAII, AND INDIA. PLANT CANE—SEPTEMBER, 1921.

Country.	Name or Number of Variety.	Age of Cane.	Date of Analysis.	Density of Juice (Brix).	% Sucrose in Juice.	% Glucose in Juice.	Purity of Juice.	% Fibre in Cane.	% Sugar in Cane.	% C.C.S. in Cane.
Java	E.K.[1]	23 months	24-9-21	19·1	17·35	·57	90·8	10·4	15·54	13·74
Java	E.K.[2]	23 months	24-9-21	18·8	16·61	1·36	88·3	11·6	14·69	12·75
Java	E.K.[28]	23 months	24-9-21	20·0	18·81	·55	94·1	9·3	17·06	14·60
Java	100 Bont	23 months	24-9-21	18·1	16·55	·64	91·4	11·7	14·60	12·96
Java	247 Generatie	23 months	24-9-21	18·9	17·66	·36	93·4	11·5	15·62	14·01
Mauritius ..	28/10, first ratoon ..	23 months	24-9-21	18·7	17·43	·14	93·2	9·8	15·73	14·13
Mauritius ..	32/10, first ratoon ..	23 months	24-9-21	19·3	17·86	·19	92·5	12·6	15·61	13·93
Mauritius ..	55/11, first ratoon ..	23 months	24-9-21	19·2	18·17	·25	94·6	12·7	15·77	14·34
Mauritius ..	55/1182, first ratoon ..	23 months	24-9-21	20·6	19·24	·24	93·4	10·9	17·05	15·41
Mauritius ..	168[04]	23 months	24-9-21	19·4	18·24	·34	94·0	10·9	16·23	14·66
Hawaii.. ..	H. 109	23 months	24-9-21	18·0	16·78	·63	93·2	11·5	14·86	13·37
Hawaii.. ..	H. 146	23 months	24-9-21	17·8	16·21	·68	91·0	11·5	14·35	12·69
Hawaii.. ..	H. 227	23 months	24-9-21	19·4	18·02	·33	92·8	11·7	15·92	14·25
India	Shahjahanpur No. 10..	23 months	24-9-21	18·8	17·01	·14	90·4	13·6	14·69	12·78

9.—ANALYTICAL RESULTS OF SIX MISCELLANEOUS CANES.

Of these six varieties, Gingor is the best in quality, and is also a good striker and rapid grower, stools out and ratoons well, is inclined to lodge after making cane, and very brittle. It is a cane that can be highly recommended, and will be available for distribution in February or March next. H.Q. 77 and H.Q. 409 are also good canes, though the former is a fairly sparse stooler, and a poor striker under dry conditions, but a very good ratooner and rapid grower. This variety has already been distributed. H.Q. 409 is a good striker and stooler, fairly rapid grower, and good ratooner; has not yet been given out. Q. 116 Sport is of very good sugar content, though not any higher than the original Q. 116, but it is a much more vigorous grower in these red soils than the original cane, a good striker, stools out and ratoons well. The M.Q. canes appear to be very fair varieties, especially No. 2, which is a very rapid growing high quality cane, and a good striker, stooler, and ratooner; while No. 1 is a good striker and ratooner, but somewhat slow grower.

A brief description of the five Java, three Hawaiian, M. 168/04, Shahjahanpur No. 10, and the six miscellaneous varieties, appeared in the report for last year, while descriptions of the four new Mauritius canes are given later.

FIRST PRELIMINARY EXAMINATION OF MISCELLANEOUS CANES. PLANT CANE—JUNE, 1921.

Country.	Name or Number of Variety.	Age of Cane.	Date of Analysis.	Density of Juice (Brix).	% Sucrose in Juice.	% Glucose in Juice.	Purity of Juice.	% Sugar in Cane.	% C.C.S. in Cane.
Queensland	M.Q. 1	20 months	26-6-21	18·7	16·61	·36	88·8	14·70	12·80
Queensland	M.Q. 2	20 months	26-6-21	17·5	14·55	·42	83·1	12·95	10·84
Queensland	H.Q. 77	20 months	26-6-21	18·3	16·65	·37	90·9	14·83	13·13
Queensland	H.Q. 409	22 months	26-6-21	19·5	17·91	·42	91·8	15·77	13·38
Queensland	Q. 116 Sport	22 months	26-6-21	18·8	16·82	·34	89·5	14·13	12·88
Queensland	Gingor	20 months	26-6-21	19·9	18·35	·19	92·2	16·77	15·54

SECOND PROGRESSIVE EXAMINATION OF MISCELLANEOUS CANES. PLANT CANE—JULY, 1921.

Country.	Name and Number of Variety.	Age of Cane.	Date of Analysis.	Density of Juice (Brix).	% Sucrose in Juice.	% Glucose in Juice.	Purity of Juice.	% Sugar in Cane.	% C.C.S. in Cane.
Queensland	M.Q. 1	21 months	30-7-21	18·6	17·09	·56	91·3	15·13	13·41
Queensland	M.Q. 2	21 months	30-7-21	18·4	16·63	·96	90·3	14·81	13·07
Queensland	H.Q. 77	21 months	30-7-21	18·4	17·63	·26	95·8	15·71	14·31
Queensland	H.Q. 409	23 months	30-7-21	18·9	17·78	·26	94·0	15·65	14·14
Queensland	Q. 116 Sport	23 months	30-7-21	19·5	18·08	·33	92·7	15·82	14·13
Queensland	Gingor	21 months	30-7-21	20·1	19·11	·22	95·1	18·15	15·88

THIRD PROGRESSIVE EXAMINATION OF MISCELLANEOUS CANES. PLANT CANE—AUGUST, 1921.

Country.	Name or Number of Variety.	Age of Cane.	Date of Analysis.	Density of Juice (Brix).	% Sucrose in Juice.	% Glucose in Juice.	Purity of Juice.	% Sugar in Cane.	% C.C.S. in Cane.
Queesuland	M.Q. 1	22 months	23-8-21	21·2	19·90	·32	93·8	17·70	15·71
Queensland	M.Q. 2	22 months	23-8-21	20·3	18·26	·72	89·9	16·26	14·27
Queensland	H.Q. 77	22 months	23-8-21	18·5	17·37	·35	93·8	15·63	13·79
Queensland	H.Q. 409	24 months	23-8-21	20·1	18·74	·27	93·2	16·50	14·80
Queensland	Q. 116 Sport	24 months	23-8-21	19·8	18·38	·19	92·8	16·09	14·38
Queensland	Gingor	22 months	23-8-21	20·2	19·06	·19	94·3	17·44	15·87

FINAL EXAMINATION OF MISCELLANEOUS CANES. PLANT CANE—SEPTEMBER, 1921.

Country.	Name or Number of Variety.	Age of Cane.	Date of Analysis.	Density of Juice (Brix).	% Sucrose in Juice.	% Glucose in Juice.	Purity of Juice.	% Fibre in Cane.	% Sugar in Cane.	% C.C.S. in Cane.
Queensland ..	M.Q. 1	23 months	25-9-21	20·1	18·48	·51	91·8	11·5	16·36	14·56
Queensland ..	M.Q. 2	23 months	25-9-21	20·4	18·92	·45	92·7	11·0	16·84	15·50
Queensland ..	H.Q. 77	23 months	29-5-21	19·2	17·94	·22	93·4	10·9	15·94	14·36
Queensland ..	H.Q. 409	25 months	25-9-21	20·5	19·08	·31	93·1	12·0	17·74	15·03
Queensland ..	Q. 116 Sport	25 months	25-9-21	20·2	19·08	·31	94·4	12·5	16·88	15·33
Queensland ..	Gingor	23 months	25-9-21	20·8	19·36	·31	93·1	8·6	17·70	15·89

ANALYSES OF DIFFERENT SECTIONS OF THE STICK.

We are frequently asked in connection with manufacturing purposes as to how the analyses of different parts of the stick run. Accordingly, Mr. Pringle has made analyses of four different sections of Badila and D. 1135, which are set out in the tables hereunder :—

ANALYSES OF DIFFERENT SECTIONS OF THE CANE.

Variety of Cane.	Section.	Age of Cane.	Date of Analysis.	Density of Juice (Brix).	% Sucrose in Juice.	% Glucose in Juice.	Purity of Juice.	% Sucrose in Cane.	% C.C.S. in Cane.
Badila	Tops as usually cut ..	23 months	20-9-21	15·9	12·64	1·56	79·5	11·32	9·15
Badila	First third of cane stick	23 months	20-9-21	21·3	20·40	·18	96·2	18·26	16·64
Badila	Second third of cane stick	23 months	20-9-21	21·1	20·04	·18	94·9	17·94	16·28
Badila	Fourth third of cane stick	23 months	20-9-21	20·7	19·78	·18	95·5	17·71	16·16

ANALYSES OF DIFFERENT SECTIONS OF THE CANE.

Variety of Cane.	Section.	Age of Cane.	Date of Analysis.	Density of Juice (Brix).	% Sucrose in Juice.	% Glucose in Juice.	Purity of Juice.	% Sugar in Cane.	% C.C.S. in Cane.
D. 1135	Tops as usually cut ..	23 months	20-9-21	15·4	12·34	·84	80·1	10·99	8·94
D. 1135	First third of cane stick	23 months	20-9-21	20·6	19·44	·16	94·3	17·31	15·65
D. 1135	Second third of cane stick	23 months	20-9-21	20·6	19·62	·21	95·2	17·47	15·88
D. 1135	Fourth third of cane stick	23 months	20-9-21	20·8	19·52	·23	93·8	17·38	15·68

Brief Descriptions of Four New Canes from Mauritius.

M. 28/10.—A stout light-red coloured cane, with heavy white wax, eyes large and round, joints four to five inches long, foliage broad and plentiful. A good striker and very rapid grower, good stooler and ratooner, medium quality.

M. 32/10—A thin greenish-yellow cane, with slight rose blush, eyes small, round, and full; joints two to four inches, foliage narrow and sparse. A fairly good striker and fast grower, good stooler and ratooner, medium quality.

M. 55/11.—A greenish-purple cane of medium thickness, with slight white wax, eyes flat and slightly pointed, joints four to six inches, foliage broad and plentiful. Medium striker and good stooler and ratooner, rapid grower, very fair quality.

M. 55/1182.—A stout dark-purple cane, covered with heavy white wax, which gives the stick a slightly bluish appearance; eyes medium size, round and full; joints four to six inches long, foliage broad and very plentiful. A good germinator and rapid grower, good stooler and ratooner, high quality. The most promising of the four varieties introduced.

New Experiments.

(*a*) Potash Tests.—Experiments testing the action of muriate of potash *versus* sulphate of potash on cane juices. In the application of these fertilisers the same amount of potash has been used in both salts.

(*b*) Experiments with different kinds of fertilisers.

(*c*) Experiments with cane planted continuously in the row, and 6 inches, 12 inches, 18 inches, 24 inches, and 36 inches apart.

(*d*) Experiments in different methods of planting:—(*a*) Planted and covered by hand; (*b*) Planted by hand and covered with cultivator; (*c*) Planted and covered with the machine known as the "Cane Planter."

(*e*) Competitive experiments with the following varieties:—M. 28/10, M. 32/10, M. 55/11, M. 55/1182, B. 4030, B. 4546, B. 6450, 7 R. 428, D. 109, Gingor, Q. 903, Q. 116 Sport, M.Q. 1, M.Q. 2, H.Q. 409, and H.Q. 426 Sport.

Distribution of Varieties.

A free distribution of cane varieties was made on the 21st February this year, the date being made earlier to meet the convenience of growers, when over 160 applicants attended at the Station, while at the same time 185 bundles were sent to various mills, farmers' associations, and individuals along the railway lines north and south of Bundaberg. The following varieties were most in demand:—Q. 813, Q. 970, Q. 1098, Q. 694, E.K.1, E.K.28, H.Q. 77, and Shahjahanpur No. 10, while there was a slight demand for N.G. 81, N.G. 148, M. 168/04, and a few others. It is estimated that a total of 9 tons was given away on the Station, while 7½ tons were sent to places along the lines. Twelve and a-half tons of Q. 813 were sold in 4 to 5 cwt. lots, at £3 per ton, also 4½ tons D. 1135 in larger quantities.

New Varieties Introduced.

From Mauritius:—64/14, 55/453, 219/58, 33/95, 131/126, R.P. 6, R.P. 8, R.P. 73.

Annual Field Day.

The Annual Field Day of the Southern Sugar Experiment Station was held on Saturday, 4th June, when the Minister for Agriculture (Hon. W. N. Gillies) and upwards of 270 visitors from Nambour, Mount Bauple, Maryborough, Pialba, Gin Gin, Childers, and Bundaberg were present. After the visitors had been welcomed by the Minister, they were shown over the Station, and the various experiments were explained, while an opportunity was afforded growers of making an inspection of the different varieties of cane. After luncheon, addresses were delivered by the Minister and the General Superintendent, and a demonstration of field implements during the afternoon concluded a pleasant and instructive day.

Yield of Cane, Southern Experiment Station.

	Tons	cwt.	qr.
Sent to Mill	306	0	0
Cut for distribution	17	0	0
Sold to growers	17	0	0
Cut for plants	4	0	0
	344	0	0

Area from which cane was cut, 14½ acres.
Average yield per acre, 23·7 tons.

7.—WORK OF THE LABORATORIES.

The large amount of chemical data collected in this report is a comparatively small part of the analytical work carried out by the laboratories at Bundaberg, Mackay, and South Johnstone. Now that the commercial cane sugar is paid for by a scale under the awards of the Cane Prices Boards, farmers are taking a much keener interest in ascertaining the value of their canes than they did a few years ago. As a consequence, the Bundaberg and Mackay laboratories are kept very busy analysing farmers' canes during the season. Part of the staff of the Sugar Experiment Station is located in Brisbane, the chemical work being carried out in the laboratory of the Department of Agriculture, under the supervision of Mr. J. C. Brünnich, to whom with his Staff the thanks of the Bureau are due for the large number of soil and other analyses, and the promptness with which results are furnished. The amount of analytical work carried out is shown in the tables appearing hereunder.

CANE AND JUICE ANALYSES CARRIED OUT AT THE SUGAR EXPERIMENT STATION, BUNDABERG, SEASON 1921.

Materials.	Number of Analysis.
Sugar-canes and juices for growers	310
Sugar canes for the Agricultural Show, Bundaberg	143
Sugar-canes for the Agricultural Show, Gin Gin	200
Sugar-canes and juices for the Experiment Station	117
Sugar-cane fibres for the Experiment Station	12
Total	782

DETAILED REPORT OF ANALYTICAL WORK PERFORMED BY THE LABORATORY OF THE SUGAR EXPERIMENT STATION, MACKAY, FOR THE SEASON 1920-21.

Materials.	Number of Analyses.
Sugar-canes for farmers	305
Sugar-canes for Mackay Show	9
Sugar-canes for Experiment Station	207
Sugar-cane fibres	39
Limestones	5
Soils for farmers	2
Fertilisers	4
Boiler scale	1
Sand	1
Milks for Mackay Show	8
Total	581

DETAILED REPORT OF ANALYTICAL WORK PERFORMED BY THE LABORATORY OF THE SUGAR EXPERIMENT STATION AT SOUTH JOHNSTONE FOR THE SEASON 1920-21.

Materials.	Number of Analyses.
Sugar-cane juices for Station	180
Sugar-cane fibres	18
Limestones and lime earths	5
Soils	6
Fertilisers	4
Furnace ash	3
Arsenic	1
Miscellaneous	2
Total	219

ANALYSES CARRIED OUT FOR THE BUREAU OF SUGAR EXPERIMENT STATIONS AT THE AGRICULTURAL LABORATORY, BRISBANE.

Materials.	Number of Analyses.
Soils	52
Waters	2
Fertilisers	6
Slag	1
Coral sand	1
Molasses	3
Sugars	3
Burnt seaweed	1
Syrup	1
Total	70

8.—WORK OF THE DIVISION OF ENTOMOLOGY.

The extended time for which Dr. J. F. Illingworth, the late entomologist at Meringa, was engaged, having expired on the 21st May last, he shortly afterwards left Australia for Hawaii and America. Dr. Illingworth was a hard worker, and carried out a great deal of useful work, which is embodied in the various bulletins of the Bureau. He was succeeded by Mr. Edmund Jarvis, formerly Chief Assistant Entomologist, who has a wide and varied knowledge of the problem, and who is now devoting all his time and energy to the grub problem, and other insects damaging sugar-cane. In connection with his work Mr. Jarvis has supplied the following report :—

To the General Superintendent,
Bureau of Sugar Experiment Stations.

SIR,—With reference to the work of this Entomological Laboratory, I have the honour to submit the following Report for the year ending October 1921.

During about eight months of the period embraced by this Report Dr. J. F. Illingworth was in charge here, so that much of the details reported refer to work organised by him, accounts of which have already appeared from time to time in his Monthly Reports.

WHITE ARSENIC AS A GRUB DESTROYER.

The principal experimentation conducted during the past twelve months or more consisted in the establishment at Greenhills of various test-plots, in order to determine the value of arsenious acid as a controlling factor against grubs of *Lepidoderma albohirtum* Waterh. and *Lepidiota frenchi* Blackb.

On 12th May, 1920, a number of plots 25 feet wide were pegged off in field F 2 at Greenhills; five plots being 2½ chains, one 10 chains, and five averaging about 4½ chains in length. Each of these plots was separated alternately by a control plot, consisting of five rows of untreated cane. Arsenious acid, at rates of from 40 to 200 lb. per acre, was placed in the drills at a time when the cane was sprouting. When examined ten months later (23rd March, 1921) the Badila in treated and check plots alike was found by Mr. Dodd to be "yellowish and poor-looking," nor did "there appear to be any delimitating areas showing the treated and untreated blocks."

On 18th May, 1920, a block of additional experiment plots was started in field H 2, consisting of thirteen treated and an equal number of check plots, 5 chains long by 25 feet wide. Arsenic at rates of 40 to 200 lb. per acre was dusted in the drills with the plants. When examined in March 1921 (ten months later), Mr. Dodd reported as follows:—"This block is fast going all over; from a general view there seems no difference in the checks and treated plots. We dug a stool in the 100-lb. arsenic, finding one 2nd and six 3rd stage *albohirtum* = 7 grubs. Then in the check alongside a stool gave two 3rd-stage *albohirtum* = 2 grubs. In the 200-lb. arsenic block a stool gave 11 grubs; and another stool 13 grubs. In the check alongside a stool gave 11 grubs."

TACHINID PARASITE OF BEETLE-BORER.

Specimens of the tachinid fly *Ceromasia sphenophori*, bred here from time to time, have been liberated at Babinda and elsewhere. During the past twelve months attempts have been made to establish this parasite at Meringa, and Riverstone near Gordonvale, but so far without success. At the beginning of the year (1921) it was noticed that the borer had not caused as much injury as usual at Innisfail, but this was not due to parasitism by the tachinid fly, as no trace could be found of the flies that had been liberated there.

Stand-over cane from Mount Sophia, near Gordonvale, was greatly damaged by borer this season. At Babinda, however, Dr. Illingworth reported having found the fly to be well established over a very considerable area. Subsequent investigations undertaken in that district by the writer early in September 1921 resulted in the capture of a number of tachinid flies with which to recommence breeding experiments at Meringa. Specimens of the fly were found resting on loaded trucks of cane in the yard of the Babinda Central Mill, and at Mooliba; and pupæ were also located in borer-infested cane received from several farms. On selections where the parasite occurred, however, the beetle-borer was doing considerable damage, so that apparently it has not yet got the upper hand. Unfortunately, burning the cane and trash, although doubtless helpful in controlling the beetle-borer, destroys also a large number of parasites. Continued indiscriminate burning would, before long, perhaps result in disappearance of the fly from such localities. A small patch of bored cane should accordingly, when possible, be reserved in some corner of the selection to serve as a breeding place for the fly, and this, of course, should not be burnt. I would suggest that where practicable this breeding ground be situated on or near the southern boundary of the plantation, so that the south-east trade wind might help to spread the flies over the infected area; this is a point that hitherto, I believe, has been overlooked by entomologists.

ARTIFICIAL CONTROL OF THE BEETLE-BORER.

Since *Bait Collecting* has doubtless achieved great results in times past, and being within the reach of every grower affords a ready means of checking the ravages of this pest, its merits ought not to be altogether neglected. These baits consist, as most growers are aware, merely of pieces of split cane about 18 inches long, placed in heaps of from ten to twenty pieces near or among the cane-plants. As a result of rather extensive experimentation in Fiji some years ago, it was seen that molasses smeared on the baits did not make them more attractive; and, moreover, that baits cut from decomposing cane attracted far more borers than those consisting simply of fresh cane. It appeared also that collections made every second day from heaps placed near the border of a plantation gave better results than frequent collections (say three times a day) derived from single baits laid throughout the field. With regard to such collecting of the beetle-borer I may say, further, that it takes about 3,600 specimens to weigh 1 lb. of beetles, and that this number are able to destroy at least 5 acres of cane. It seems to me that in cases of severe infestation farmers should make an effort to collect if possible from these bait-traps, which if laid immediately after cutting the crop would yield payable results, since the beetles dislodged from the cane during cutting usually concentrate on these baits for some days, before flying to fresh fields.

VARIETIES OF BORER-PROOF CANE.

Some plants of the cane H 146—a variety which is said to be very resistant to attack from *Rhabdocnemis obscura*, although not altogether immune—have just been received from South Johnstone Experiment Station, and been planted by Mr. W. Griffen, a Gordonvale cane-grower, among a patch of D 1135, on land usually infested by this beetle-borer.

This latter variety is considered to be subject to slight attack only; whereas Badila and many other well-known varieties are known to become badly riddled at times.

Introduction of Parasites.

Upon taking charge of this Experiment Station last May, one of the first steps entered upon was to get into touch, if possible, with other entomologists in parts of the world where scoliid wasps that might prove serviceable here are known to occur. Several species of these so-called "digger-wasps" are, of course, obtainable for introduction, and very possibly some of them might, if brought here, do valuable work in our canefields. Before incurring the necessary expense, however, the knowledge of certain facts relating to the life-history, economy, and environment of such parasites is essential, as without information of this kind it would be impossible to decide whether a species, if introduced, would be likely either to live in Queensland or, if so, find suitable hosts, or breed freely, &c., &c. In order to secure reliable and comprehensive data of this nature regarding certain species of Scoliidæ which appear likely to meet our requirements, I prepared a list of questions, which when replied to by the various entomologists approached will considerably illuminate this matter, and enable me to select for introduction here the wasp-parasites most calculated to attack the grubs of our cane-beetle *Lepidoderma albohirtum* Waterh.

In the event of our not being able to obtain the desired information through correspondence, it will be necessary to personally visit the most promising countries, collect and breed the Scoliidæ most nearly related to our own digger-wasps, study their ecological relationships, life-histories, hosts, &c., &c., and, after rearing a plentiful supply, continue breeding them during the return voyage, so as to ensure landing with a good number of healthy wasps from which to get up a stock for future liberation in our grub-infested areas.

Occurrence of Natural Enemies of Lepidoderma albohirtum.

In our August Report (1920) Dr. Illingworth alludes to the occurrence at Greenhills of "ibises, bandicoots, parasitic and predaceous insects, and contagious diseases." "Excavating recently," he remarks, "in one of the most infested fields, where earlier in the year there was an average of a hundred or more grubs per stool (in one case I found a hundred and thirty-four) I was unable to get an average of more than four alive. A typical stool, 9th July, gave:—2 to 6 inches deep, two alive, and one just destroyed by fungus; 6 to 12 inches deep, one alive and one sick, with black spots on skin, indicating a bacterial disease." "In this same field I watched a flock of fully 500 ibises assiduously probing about the grubby stools. With all these grub-destroyers at work it is not hard to understand the rapid disappearance of the pest. *Campsomeris tasmanicusis* Saus. and *C. radula* Fabr. have been particularly abundant. The males are always seen on sunny mornings flying about in swarms close to the surface of the soil in the grubby areas. The females, too, though normally below ground, may be easily observed, for they emerge early in the day to feed at flowers." "By digging numerous pits about 3 feet deep in infested fields at Meringa I found that these friends were doing excellent service. In most instances the parasitized grubs were down 18 inches—the deepest 24 inches. Of the grubs unearthed 25 to 60 per cent. had been destroyed by these wasps. This is the highest record I have seen, and is undoubtedly due to the lateness of the grubs in hibernating."

Miscellaneous Cane Pests.

Grasshoppers (*Locusta australis* Brunner).—During November, this species occurred rather freely at Meringa and somewhat damaged the foliage of cane-plants. Fortunately this outbreak was confined to a very limited area. A poison bait consisting of bran 20 lb., white arsenic 1 lb., molasses 2 quarts, lemons 3 fruits, water 3½ gallons was made use of as a control measure, and proved effective.

Cutworms (*Cirphis unipuncta* Haw.).—This pest was in evidence as usual in certain sections but did no serious damage in the Cairns district. At Malanda a severe outbreak occurred and the caterpillars eventually destroyed certain areas of grass-land, corn, and oats.

Linear Bugs (*Pharnacantha australis* Kirk.).—"These sucking insects," reports Dr. Illingworth, "continue to be exceedingly abundant in widely separated localities. I have never seen them more abundant than I found them in the vicinity of the South Johnstone Experiment Station."

Leaf-eating Grass Worm (*Laphygma exempta* Walk.).—The presence of this insect was first noticed by the writer at Meringa during February, when the caterpillars were more than half-grown and causing noticeable damage to young plants of the cane D 1135, and to maize. They swarmed literally in hundreds of thousands over a considerable area, occurring, however, in greatest profusion on grass-covered roads and headlands. Being a new moth-pest of cane it was studied at the time, and its life-history, stages, and insect enemies figured, in illustration of a short article recently submitted to you for publication in the "Queensland Agricultural Journal."

Small Tineid Moth-Borer (still awaiting determination).—A new moth-borer of cane, discovered by the writer in 1919, has lately been described and figured for the first time in Bulletin No. 11 of this office. The severest infestations occur among third ratoons springing from buds situated above ground level, the trouble being less noticeable in the case of first ratoons arising from buried eyes, while the shoots originating well below the ground are rarely attacked. A field examination of affected ratoons revealed the fact that about 75 per cent. of ratoons with dead-hearts had been destroyed by this moth-borer.

Small Pyralid Moth-Borer (*Polyocha* sp.).—Last November the writer collected from within an area of one square chain 44 dead-hearts, from young ratoons in a canefield at Pyramid, which when examined yielded no less than 33 larvæ of this borer. Although a minor pest of sugar-cane, it is interesting to find as a result of recent observations (published in Bulletin No. 11) that the insect in question must be considered as responsible at times for injuries of a rather serious nature, extending in all probability over a considerable area.

Hepialid Grass Caterpillar (*Oncoptera mitocera* Turner).—An outbreak of this pest occurred at Atherton during July to November 1920, where the caterpillars did considerable damage to paspalum and Rhodes grass around Tungaburra and near Ravenshoe. A detailed account of this grass-pest appears in a report published by Mr. Dodd in the "Queensland Agricultural Journal," vol. xvi., p. 79, Aug. 1921.

Leaf-eating and Stem-boring Beetle (*Rhyparida morosa* Jac.).—The economy of this insect, which was recorded and figured for the first time in Bulletin No. 3 of this office, has received further investigation, resulting in the discovery of the native food-plant of the larva (*Imperata arundinacea*), and its occurrence also as a stem-borer of cane.

An illustrated account of these observations appeared in the "Queensland Agricultural Journal," vol. xiv., p. 274, 1920).

The above-mentioned discovery was made under rather peculiar circumstances. On 7th January, whilst studying the economy of our small moth-borers of cane, one of the many "dead-hearts" examined contained a coleopterous larva which had eaten a central tunnel about three-quarters of an inch long at the base of the sucker. This grub was placed in a cage containing damp soil, into which it at once burrowed, and nine days later had pupated in an egg-shaped chamber at a depth of about one and a-half inches. After an interval of nine days, transformation to the imago stage was effected, the beetle, which proved to be *Rhyparida morosa*, then being of the normal bronze-black colour, and able to fly. Three days earlier, however (22nd January), happening to notice a patch of "blady-grass" at Pyramid affected by some borer, I was interested to find the insect in question the responsible agent, and, moreover, that it occurred quite commonly in the succulent underground portions of the stalks of this plant.

Recently, at the Cairns Agricultural Show last June, I learnt from a grower at Sawmill Pocket that during the previous October, after heavy rain, some of his young cane planted on land that had been under grass for about seven years was severely damaged by this pest, the beetles having devoured most of the central leaves forming the heart of the cane.

Large Moth-Borer (*Phragmatiphila truncata* Walk.).—This pest occurred as usual around Pyramid, Meringa, and Gordonvale, but not in sufficient numbers to cause serious damage. In the Ayr district, Lower Burdekin, however, it is reported to be present in alarming numbers, and growers have sought advice from this office as to the best means of dealing with the pest. This moth-borer is usually effectively controlled in the Cairns district by natural enemies, amongst which the common little ant *Pheidole megacephala* plays a conspicuous part, by invading the tunnels of the borer and devouring the larvæ; the writer has also bred from parasitized caterpillars found in bored cane at Pyramid a dipterous tachinid fly, and a braconid wasp parasite (*Microgaster* sp.). Possibly these natural enemies may not occur on Rita Island near Ayr, where the moth-borer is causing most damage at the present time (September 1921). It is hoped, therefore, to obtain and breed numbers of the above parasites at Meringa, with a view to introducing specimens of these useful insects into the Lower Burdekin.

Collecting Cane Beetles.

Our cane-growers are beginning to realise the fact that leading entomologists as a whole, after working for more than thirty years at the "white-grub" problem, assert that up to the present no better control method than that of systematic collecting has been discovered. We naturally recommend this method to cane-growers because it has stood the test of practical application, particularly in Europe and America. It has been stated that the 22 tons of beetles collected in the Cairns district during 1914 resulted in "no apparent diminution of the pest," and yet this capture represents 8,400,000 specimens, a number able to destroy 11,000 acres of cane; which if producing an average, say, of only 15 tons per acre would mean a total loss of 165,000 tons of cane. Since the average annual loss in the Cairns district is estimated to be about 30,000 tons, it appears, however, that this 22 tons of beetles captured in 1914 were, as a matter of fact, capable of inflicting injuries amounting to more than five times that of the whole of our annual loss here from grub attack. Supposing that less than one quarter of these beetles had oviposited in canefields around which they were collected, we should still have prevented the destruction of about 40,000 tons of cane, an amount exceeding that of our annual loss throughout the Cairns district.

A few suggestions with regard to the collecting of grubs and beetles were offered by the writer recently to the Cairns Cane-growers' Association, and later on published in the "Australian Sugar Journal" (September 1921). After due consideration of this matter the association, upon the recommendation of the secretary, Mr. F. C. P. Curlewis, decided to collect the "greyback cane-beetle" only. When collecting has been followed up during previous years, specimens of the small brown cane-beetle, *Lepidiota frenchi*, have been included as a matter of course, although such procedure was, I believe, adopted in the first instance without obtaining entomological advice on the question.

Upon looking into the matter at the request of Mr. Curlewis, I am of opinion that beetles of *L. frenchi* Blackb. should not be collected, for the following reasons:—

The beetle has a two-years life-cycle, and, although in evidence each season naturally emerges in greater force every second year.

Seeing that the larval stage occupies about eighteen months, this species can, I think, be best controlled by systematic collection of the grubs; such collecting, however, of either its grubs or beetles should not be made outside canefields, for two reasons—

(1) *Frenchi* grubs occurring in cane land arise mostly from eggs laid by beetles emerging from headlands, or the actual cane area.

(2) The range of flight of this insect is apparently very limited; the beetles whilst on the wing merely circling about in an erratic manner inside a radius of less than 500 feet, and not flying to long distances, like beetles of *albohirtum*.

In view of these facts we may safely infer that collecting beetles of *frenchi* from the bush, away from canefields, as is so often done, or in the vicinity of pasture lands, is so much waste time, since these insects if left alone would in all probability oviposit under the roots of native plants, grasses, &c., close to where they may have emerged.

Moreover, seeing that these beetles occur freely throughout forest land, congregate close to the ground, and so can be obtained easily and in great numbers, collectors would, I think, be apt to devote chief attention to this species, instead of to "greyback" beetles, which have to be searched for, and are not so readily captured.

By concentrating our efforts on the primary offender, *albohirtum*, the expense of collecting might in this way be reduced, and better results secured, for this beetle has a life-cycle of one year, enjoys an extended range of flight, and certainly does infinitely more damage than *Lepidiota frenchi*.

Much of the injury to cane from attacks of the latter species arises probably in the first instance from the land having been allowed to get overgrown with weeds during the flighting period, as ground densely covered with herbage seems to have an attraction for this species. I may say that practically all small grubs unearthed in canefields during March to June are likely to be second-stage *frenchi*, and should always be picked up; as if allowed to escape they will rest during the winter in cells deep in the ground, and becoming third-stage grubs in October or November be in a position to damage the crop later on. These third-stage grubs of

frenchi, however, being very similar in size and appearance to those of *albohirtum*, are generally picked up with grubs of the latter species during cultural operations, and accordingly come under control in this way throughout cane areas.

Notes on the Metarrhizium Fungus.

Readings of the thermometer during August to September proved particularly interesting, since they helped to throw light on certain matters relating to spore germination of the parasitic fungus *Metarrhizium anisopliæ*. During a period of nearly three weeks while the mean shade temperature was 68.6 deg. F., no less than 32 third-stage larvæ of *Lepidoderma albohirtum* were killed by this fungus. These grubs, which had been paralysed by Scoliid wasps (*Campsomeris tasmaniensis* Sauss.), had lain in shallow earthern cells for about two weeks prior to the first fungus attack, so presumably must have become infected by this vegetable parasite in the field, before encountering the digger-wasps. Germination of the spores, however, did not take place until the above-mentioned temperature prevailed, although during the fortnight preceding the first outbreak of the fungus fifty or more paralysed grubs had been lying in our breeding-trays under exactly similar conditions of handling; the only apparent difference being that the maximum and minimum shade temperatures during that two weeks were 75.5 deg. and 50.8 deg. F. respectively. It appears likely, therefore, that this slight variation (an additional 2 deg. in the average maximum and 8.7 deg. F. in the minimum temperatures) is enough to cause germination of the spores of *Metarrhizium*. It may be mentioned here that our highest mortality occurred during a mean shade temperature of 67.8 deg. F.

The Winter Brood of Campsomeris Wasps.

Investigation of the fourth or winter brood of our digger-wasp *Campsomeris tasmaniensis* Sauss. yielded some rather interesting data. The cool weather conditions, as might have been expected, somewhat retarded development of the various stages of these parasites. The egg, for instance, which during summer temperature hatches in 3 days, took from 7 to 10 days, or even longer; and the period occupied by the combined egg and maggot stages varied from 18 to 24 days at an average shade temperature of 68 deg. F.; whereas these combined stages in the summer brood during January occupy a period of only 12 days under an average shade temperature of about 82 deg. F.

From data just obtained it appears that, roughly speaking, there are four broods of *Campsomeris tasmaniensis* Sauss. every year. Those giving rise to what we may term the *first* or *spring brood* commence to oviposit towards the end of September, the earliest eggs having been obtained on the 22nd and 27th of that month; egg-laying, however, becoming general towards the end of October, and the wasps finally emerging from this brood about the middle of December. The *second* or *summer brood* extends approximately from middle of December to middle of February; while the *autumn* or *third generation* originates from wasps emerging throughout March, oviposition occurring from the end of that month to beginning of May, and flighting of the adult wasps from May to August. Eggs producing the *winter brood* are laid in June and July, the wasps beginning to emerge about the second week in October. The life-cycle of the male wasp occupies a period of about 76 days, which is 30 days longer than the life-cycle period of the summer brood.

As pointed out in this Report under another heading, the winter brood of *Campsomeris* may suffer considerable mortality on account of destruction of the paralysed host by the "Green Muscardine" fungus.

Work of Assistants.

Up to 19th May, 1921, whilst Chief Assistant Entomologist, the writer's time has been occupied for the most part in the delineation of insects affecting sugar-cane. Our various cane-beetles and their parasitic enemies were figured for the first time in water-colour from nature, mostly life-size. Many black and white drawings, charts, &c., were also executed in illustration of scientific matter published in our various bulletins. Fieldwork embraced investigations of the life-histories of leaf-eating cane-insects, and further study of the ecology of parasitic Hymenoptera affecting our scarabæid grubs and moth-borers of sugar-cane. An account of some of these observations dealing with *Rhyparida morosa* has already appeared in our journal, and I hope to publish additional notes in this connection in the near future. The feeding-trees frequented by our principal cane-beetle also received attention, and a number of species of *Ficus*, &c., were added to the list of those previously recorded.

The time of the Assistant Entomologist, Mr. A. P. Dodd, has been mainly devoted to collecting insects, and getting same identified from the named museum collections in other States. Typing and other office routine also claimed a little attention. Trips were taken to the Tableland, and to the Ayr district, for the purpose of reporting on the occurrence of "grass caterpillars" at Atherton, and cane-grubs in the Lower Burdekin; a full account of these investigations has appeared in special reports.

Change of Officers.

At the termination of our agreement with Dr. J. F. Illingworth the charge of this laboratory was handed over to the writer on 19th May, 1921. Later on, at the beginning of September, Mr. A. P. Dodd, whilst on annual leave, resigned his position of Assistant Entomologist to this Bureau, as from 22nd September, 1921.

Station Improvements.

Since taking control last May, various improvements have been made in the general appearance of the station grounds, such as the planting of trees and shrubs, and the formation of a definite roadway suitable for motor cars, &c., and linking up the laboratory and other buildings.

Exhibit at Cairns Show.

At Woree on the 8th to 10th June the activities of this office were represented by various exhibits comprising—(1) A small collection of beetles, &c., injurious to sugar-cane, and other associated insects of more or less economic importance; (2) charts showing magnifications of parasitic and predaceous insects and fungus enemies of the cane-grub; (3) spirit specimens of larvæ, pupæ, and eggs of about a dozen species of cane-beetles; (4) show-cases containing giant specimens of the class Insecta, such as locusts, cicadas, and stick-insects; (5) living specimens of fully grown cane-grubs, together with samples of stools destroyed by same; &c., &c. Mr. F. P. Dodd, of Kuranda, contributed a couple of cases of showy tropical insects, which were much admired.

Many visitors, including growers, were interested in this display, and sought information respecting the grub and its control.

I have the honour, &c.,

EDMUND JARVIS,

Entomologist.

9.—SUGAR CANES, SEEDLINGS, CANES FROM KAIRI, &c.

A number of the varieties given out by the Bureau in recent years are now being grown on a commercial scale. One of the principal of these is Q. 813, which is becoming a warm favourite in many districts, and is rapidly coming into prominence in the Isis, Bundaberg, Mackay, Proserpine, and Lower Burdekin districts. Mr. T. A. Powell, a grower at Mackay, cut 300 tons of this variety during the present season, averaging 40 tons per acre, with a commercial sugar content of 15·7 per cent. average. At the Palms Mill, Mackay, this variety has analysed from 16 to 16·3 c.c.s., and the Manager of this Mill intends planting out considerable quantities during the year. At Proserpine, practically all the farmers are planting Q. 813. Other Queensland Seedlings that are giving good results are Q. 855, 903, 970, and 1121.

The cane known as Shahjahanpur No. 10 is also in large demand in the Southern districts, due to its resistance to frost. This cane was received by the Bureau of Sugar Experiment Stations from the Shahjahanpur Sugar Experiment Station, India, being recommended as a cane which would stand cold weather well. This cane was planted out at the Bundaberg Station, where it was found to resist severe frosts remarkably well. Its sugar content and cropping qualities being good, it was ultimately distributed to a considerable extent in Southern Queensland. On a recent visit to Bundaberg, attention was directed to a very fine block of this variety, about 12 acres in extent, which had been grown at Spring Hill by the Fairymead Sugar Company, under the charge of Mr. Axam. This cane was then only 9 months old, but presented a splendid vigorous growth. Mr. Axam said in his experience with the cane it had never been affected by frost, and this was borne out by Mr. Pringle, the Chemist in Charge of the Bundaberg Sugar Experiment Station. If this cane maintains its reputation, it should be extremely valuable to canegrowers whose districts suffer from frosts. The last analysis of the cane made at the Bundaberg Station last year gave the following result :—

Brix.	Purity of Juice.	% Fibre in Cane.	Commercial Cane Sugar.
21·7	91·0	13·6	15·05

Varieties at Kairi.—Some years ago a number of the older kinds of cane were sent up to the Kairi State Farm, near Atherton. These were : Rose Bamboo or Rappoe, Striped Singapore or Mauritius Gingham, Meerah, Goru, and Badila. The first three varieties were long the standard canes of the State, but in recent years they developed disease. Badila was also reported to be deteriorating in some districts. It was thought that if they were taken to a higher elevation and colder climate, and allowed to remain there for some years, they might ultimately become rejuvenated, and again become useful canes. These varieties have now been at Kairi for seven years, and, while they have met with drawbacks in the shape of cyclones and drought, they have never shown any traces of disease. They were brought down to the Innisfail Experiment Station in 1919 and planted out, and have been sent to the Bundaberg and Mackay Sugar Experiment Station this year. At the South Johnstone Experiment Station they grew rapidly, and the improvement in their constitution as plants was most marked, when compared with the same variety of cane plants which had been raised on the coast. In a comparison made with Badila plants, those raised on the Tableland germinated first and shot ahead of the local Badila plants. A distribution of these Tableland varieties was made during August, to which reference has already been made. On planting out again this year the Tableland Badila has also shown its superiority over the local plants. It not only came away more quickly, but has made a more vigorous and rapid growth. Farmers will be supplied with what the Bureau will term "Tableland Badila" as it becomes available for plants. Some of the older varieties, such as Rose Bamboo, Striped Singapore, Meerah, and Goru, have been treated under similar conditions, and may also be obtained. This work is being continued, and D. 1135 has also been sent up to the Tableland. These plants have been in the care of Mr. C. E. Olive, Manager of the Kairi State Farm, who has done everything in his power to assist the project. The Bureau is much indebted to him for his care and interest in the work.

10.—VARIETY PLOTS.

Farmers' associations who desire to establish nursery plots in their districts are invited to write to the General Superintendent, when arrangements may be made to supply varieties and manures ; a grower being selected to carry out the work. Only tested and approved varieties are supplied, and a distribution to growers is carried out every year from the local plot.

At the present time the only variety plots are the ones on Mr. Mackersie's farm, at Ayr ; Messrs. Cress Brothers' Farm, at Mossman; the State Farm at Home Hill ; and Mr. Fielding's Farm at Yerra. The varieties sent up are doing well at each farm.

11.—LIME, FERTILISERS, AND GREEN MANURES.

Cheaper forms of lime are being obtained by farmers on the Herbert and Johnstone Rivers, and at Cairns, Babinda, and Mackay. Sulphate of potash has been available during the past few months, and fresh shipments are to come in. Muriate of potash has been obtainable all through the year. There is now plenty of sulphate of ammonia available, but very little nitrate of soda. Splendid fertiliser business has been done in the Queensland canegrowing areas during the past eight months. Green manure seed is also more plentiful.

12.—ECONOMICS OF THE INDUSTRY.

This year, should we reach the estimate of 278,500 tons of sugar, the industry will be worth to Australia a sum of about eight and a-half millions of pounds.

Respecting the 1920 season, although the yield of sugar last year was a little more than in 1919, the drought conditions of that year persisted, more particularly in the Southern sugar districts, practically through the whole of 1920. This was unfortunate in many respects, but chiefly so because it was the first year in which (by the agreement between the Commonwealth and State Governments) the growers and millers were to receive a much larger price for their sugar. The rains did not fall till comparatively late in the year, when the ground in the districts below Mackay was getting too cold to take advantage of the moisture. Above Mackay, however, where the summer heat is of longer duration and the soil retains its warmth longer, the crops made a good recovery, and, in fact, in the Innisfail district, constituted a record for the Mourilyan and South Johnstone Mills. This fact created a similar situation to that occurring in 1919; the yields of the Southern districts were poor, while the Northern output was fair to good. Five sugar-mills, all in the South, did not crush at all.

The yield of sugar in 1920 amounted to 167,401 tons, or 5,265 tons more than in the previous year, and 140,313 tons less than in the record year of 1917. This was very largely due to the climatic factors mentioned above, and to the fact that there was not nearly the same amount of standover cane to be harvested as there was in 1917. This short crop led to further importations of foreign black-grown sugar at very high prices.

The total acreage under cane in 1920 was estimated by the Government Statistician to be 162,619 acres, an increase over 1919 of 14,150 acres. Of this area, the cane from 89,142 acres was crushed, also a larger area than the previous season. This left a balance of 73,477 acres, which included cane allowed to stand over till 1921, cane cut for plants, and cane planted for 1921. This area of 73,477 acres was larger by about 10,000 acres than in the previous year, and was no doubt largely due to the enhanced price for sugar causing a considerable area of new land to be put under cane. The yield of cane per acre amounted to 15·02 tons, slightly better than that of 1919, and about the same as 1918, but lower than the average yield for 10 years past. The total tonnage of cane harvested was 1,339,455 tons, and although this was 80,695 tons more cane than the 1919 yield, yet the tonnage of sugar per acre was not so high, being only 1·82 tons as against 1·91 tons in 1919, due to the commercial cane sugar in the cane not being so high.

The tons of cane taken to make one ton of 94 net titre sugar are always of great interest. In 1920, it took 8·0 tons, as against 7·76 in 1919. This latter figure was the lowest ever recorded. During the past ten years there has been a very great improvement in this figure, due to the better varieties of cane now being grown as the direct outcome of the work of the Bureau of Sugar Experiment Stations, combined with more efficient work in the mills.

The return of molasses manufactured is given as 6,175,867 gallons, made up as under :—

	Gallons.
Sold to distilleries and others	985,951
Burnt	1,876,875
Used or sold for feed	1,381,041
In stock	733,974
Used for manure	24,000
Run to waste	1,174,026
	6,175,867

13.—GENERAL.

"COMMERCIAL CANE SUGAR."

The expression "commercial cane sugar" is one that has been adopted by the Queensland Cane Prices Board, and is calculated as follows :—

$$\text{Total soluble solids in juice} \times \frac{100 - (3 + \text{Fibre})}{100} = \text{total soluble solids in cane.}$$

$$\text{Sucrose in juice} \times \frac{100 - (5 + \text{Fibre})}{100} = \text{sucrose in cane.}$$

Total soluble solids in cane — sucrose in cane = impurities in cane.

$$\text{Sucrose in cane} - \frac{\text{Impurities in cane}}{2} = \text{commercial cane sugar.}$$

The thanks of the Bureau are due to the various cane farmers' associations, their presidents and secretaries; also to the managers and officers of the various sugar-mills, for their courtesy and attention, and for their willingness to assist the work of the Bureau in every way possible.

The metropolitan and country Press are of great service to the Bureau in the dissemination of general information and reports, and the thanks of the Bureau are also due to the "Australian Sugar Journal" and the "Producers' Review" for space devoted to the work of the Stations.

The Bureau is also indebted to the Government Printer for the care taken in printing technical bulletins and reports.

HARRY T. EASTERBY,
General Superintendent.

Brisbane, 30th November, 1921.

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